Sanjeev Sabhlok & Jason Gavrilis

(July 2022)

Lockdowns increase even COVID deaths

Lockdowns have caused at least 36 times more harms in Australia than any benefits (even more harms than that in developing nations).

But, globally, did they at least reduce COVID deaths?

DRAFT

5 July 2022 (all changes since the 4 July version are tracked)

This paper is available at: http://sanjeev.sabhlokcity.com/Misc/DraftPaper-lockdowns.pdf

Data and analysis in this paper: https://github.com/jazon7/Oxford_COVID-19_-_Our_World_in_Data

> "untargeted lockdowns allowed the virus to wreak havoc since the government took its eye off the ball. Eighty per cent of the government's effort went in "controlling" the broader society instead of focusing on aged care homes. As I will keep repeating throughout this book so no one forgets: many elderly deaths we have had could have been averted if the original pandemic plan had been followed".
>
> – Sanjeev Sabhlok in *The Great Hysteria and The Broken State* (2020).

> "I can't help, but think the safest place for an airborne virus would be to be outside. We had ... all sorts of policies ... [w]here I remember seeing people being accosted while hanging out alone on the beach".
>
> – Jan Jekielek, *Epoch Times*[1]

Comments or suggestions invited at sabhlok@gmail.com

[1] https://www.theepochtimes.com/gigi-foster-did-our-pandemic-policies-kill-more-people-than-they-saved_4523360.html

Contents

ABSTRACT 4

1. INTRODUCTION 5

1.1 Early literature of 2020 and 2021 which suggested that lockdowns increase COVID deaths 7
1.2 Lockdown impacts on COVID deaths will firmly be known only at the end of the pandemic 11
1.3 Data integrity issue with reported COVID deaths 12

2. PART 1: THE OXCGRT DATASET 14

2.1 The OxCGRT database and Stringency Index 14
2.2 Illustrative studies that use the OxCGRT database 15
2.2.1 *Martin Lally's study of 33 European nations* *15*
2.2.2 *Jonas Herby meta-analysis of many OxCGRT studies* *15*
2.3 Other approaches to measure lockdown NPIs 16
2.3.1 *Automated data on lockdown impacts* *16*
2.3.2 *Manually coded datasets* *17*

3. REVIEW OF THE OXCGRT CODING SYSTEM AND STRINGENCY INDEX 19

3.1 Option 1: An objective tool based on the social costs of NPIs 19
3.2 Option 2: A scientific, risk-based tool built on the benefit-cost ratio 20
3.3 Review of the OxCGRT coding system 21
3.3.1 *No overarching theoretical framework for measurement* *21*
3.3.2 *Unable to distinguish mitigation (Sweden) from zero-COVID nations* *22*
3.3.3 *Mandatory vs. recommended NPIs conflated* *24*
3.3.4 *Procedural shortcomings and complexities* *24*
3.3.5 *Examples of problems with specific codes* *25*
3.3.6 *Stringency Index weights probably don't help* *27*
3.4 Retrieving value from the database: Sub-Stringency and Lockdown indices 27

4. PART 2: ASSESSING THE IMPACT OF LOCKDOWNS ON COVID DEATHS 30

4.1 Identification of the control variable/s 30
4.1.1 *Correlations for Europe* *30*
4.1.2 *Correlations for the world* *31*
4.1.3 *Correlation matrix* *33*
4.1.4 *Shortlisted variables that did not make the final cut* *33*
4.2 Equation for the final regressions 34
4.3 The case of the United States of America 35
4.3.1 *Assessment using the Maryland University index* *35*
4.3.2 *Assessment using CDC data* *36*
4.4 Distinguishing correlation vs. causation: Testing for reverse causality 36
4.4.1 *Excluding jurisdictions with heavy case loads* *37*
4.4.2 *Using an instrumental variable* *37*
4.4.3 *Can early stage death rates explain stringency?* *37*
4.4.4 *Did actions voluntarily taken by people cancel out government lockdowns?* *38*

5. PART 3: WHY LOCKDOWNS CAUSE MORE COVID DEATHS 39

5.1 Consequences of inverting the standard risk-based approach 39
5.1.1 *Reduced head space to deal with the virus* *39*
5.1.2 *Delayed natural barrier to the virus by reducing infections among the young* *39*
5.2 Increased transmission of SARC-CoV2 39
5.2.1 *Increased exposure of the elderly outside aged-care homes* *40*
5.2.2 *Concentration of people in restricted markets* *40*
5.2.3 *Impacts of transmission on being cooped indoors* *40*
5.2.4 *Covid-congestion effects in hospitals and testing queues* *40*

5.2.5 *Behavioural change when people are lulled into dropping their guard* *41*
5.3 INCREASED VULNERABILITY TO COVID 41
5.3.1 *Fear-induced reduction in timely treatment of COVID* *41*
5.3.2 *Reduced immunity through reduction in Vitamin D* *41*
5.3.3 *Reduced immunity through increased stress* *42*
5.3.4 *Reduced adaptive immunity (cross-reactivity) to COVID* *42*
5.3.5 *Increased obesity and diabetes* *42*
5.3.6 *Lockdowns increase the proportion of the vulnerable* *43*

6. DISCUSSION AND CONCLUSION **44**

6.1 CONCLUSION 44
6.1.1 *Further research possibilities* *45*
6.1.2 *Acknowledgements* *45*

ATTACHMENT A **46**

6.2 REPLICATION MARTIN LALLY'S RESULTS 46
6.2.1 *Replication of the Lally results* *46*
6.2.2 *Test bed for the main regressions – in Europe* *47*

Abstract

This paper examines whether lockdowns increase or decrease COVID deaths.

The OxCGRT database[2] with its Stringency Index (SI) is one of the most significant tools available today to inform studies of whether, and to what extent, various non-pharmaceutical interventions (NPIs) reduced COVID fatalities. But it is one thing to make a list of NPIs and quite another thing to order them in a manner that is useful for statistical analysis. The design of the database and its coding system, has enormous and fundamental inbuilt shortcomings which distort the nature and effect of NPIs and so – like with a carnival mirror – we get a distorted picture of reality. The SI is unable to help us sharply distinguish between nations that took a risk-based approach (basically Scandinavian nations, mainly Sweden) from nations that undertook an aggressive zero-COVID. Studies that unquestioningly make use of the SI could fall into the "garbage-in-garbage-out" trap.

The risk of poor analysis is multiplied in studies what produced "recommendations" early in the pandemic. Such studies could not, and therefore did not, take into account the different distributions over time of COVID deaths under a risk-based (mitigation) scenario and a zero-COVID (eradication) scenario. The true impact of NPIs emerges over a medium term.

This paper corrects for some of the shortcomings of OxCGT by using some of its components that are able to (albeit weakly) distinguish Sweden from other nations. It also uses data up to the end of 2021, which captures sufficiently the distribution of COVID deaths to be able to make a robust analysis.

The paper provides a range of regressions for European nations and the world that test whether lockdowns "worked" by using COVID deaths data from Worldometer and various forms of stringency. A family of related variables that relate to a nation's income, health system capacity, and co-morbidities is controlled through the median age variable. The other variable controlled for is vaccine uptake.

The paper finds that, no matter which version of the SI is considered, lockdowns increased COVID deaths. The version that is closest to the definition of lockdowns finds a statistically significant effect. We can firmly conclude that lockdowns do not decrease COVID deaths in the medium to long-term, and that instead, they increase COVID deaths. The paper outlines biological and behavioural reasons why this is so.

Authors' contributions SS[3] led the project conceptualisation and the drafting of the paper and JG undertook the data analysis. The authors consulted with Martin Lally for validation of the statistics methodology. The authors have approved the final version and will ensure any questions related to any part of their work will be appropriately investigated, resolved and documented. The authors read and approved the final manuscript.

[2] https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker; https://www.nature.com/articles/s41562-021-01079-8

[3] Sanjeev Sabhlok, based in Melbourne, has a PhD in economics from the University of Southern California. Jason Gavrilis, xxx

1. Introduction

Never-before seen (and always theoretically opposed in the science literature) city-wide, state wide, or nation-wide lockdowns can theoretically be considered to be an extreme non-pharmaceutical intervention (NPI) for pandemics mainly characterised by mandatory stay-at-home orders enforced by the police. In the more extreme versions, these can be supplemented by curfews during certain hours. Their goal is to keep the entire population out of the streets. Lockdowns go hand-in-hand go with indiscriminate workplace closures for the bulk of workplaces with only "essential" services allowed to continue to operate.

Lockdowns are known to the literature but were never recommended for very good reasons. A few failed attempts were made in the past for Ebola[4]. In a 2006 article[5] co-authored by Donald Henderson, perhaps the greatest epidemiologist of the 20th century, we find a direct rejection of lockdowns:

> There are no historical observations or scientific studies that support the confinement by quarantine of groups of possibly infected people for extended periods to slow the spread of influenza. A World Health Organization Writing Group, after reviewing the literature and considering contemporary international experience, concluded that "forced isolation and quarantine are ineffective and impractical." Despite this recommendation by experts, mandatory large-scale quarantine continues to be considered as an option by some authorities and government officials.
>
> The interest in quarantine reflects the views and conditions prevalent more than 50 years ago, when much less was known about the epidemiology of infectious diseases and when there was far less international and domestic travel in a less densely populated world. It is difficult to identify circumstances in the past half-century when large-scale quarantine has been effectively used in the control of any disease. The negative consequences of large-scale quarantine are so extreme (forced confinement of sick people with the well; complete restriction of movement of large populations; difficulty in getting critical supplies, medicines, and food to people inside the quarantine zone) that **this mitigation measure should be eliminated from serious consideration**.[6] (emphasis mine.)

We have unambiguous proofs that lockdowns were not a recommendation of the World Health Organisation. Gauden Galea, the WHO's representative in China on 24 January 2020: "trying to contain a city of 11 million people is new to science. The lockdown of 11 million people is unprecedented in public health history, so it is certainly not a recommendation the WHO has made."[7]

Lockdowns directly breach international human rights obligations and therefore should belong a different category of NPIs – the prohibited category[8]. We can say this conclusively since lockdowns were never recommended in any pre-2020 public health book, journal article or official pandemic plan, or even by the October 2019 World Health Organisation guidance for pandemics (Figure 1.1)[9].

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[4] See details in a 13 November 2020 complaint to the International Criminal Court by Sanjeev Sabhlok: https://web.archive.org/web/20201114074316/http://sanjeev.sabhlokcity.com/Misc/ICC-complaint-sabhlok-13November2020.pdf

[5] Inglesby, Thomas et al (2006). Disease Mitigation Measures in the Control of Pandemic Influenza, in *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*; Volume 4, Number 4, 2006) here: https://archive.ph/0SQx9

[6] Inglesby, Thomas V., et. al., "Disease Mitigation Measures in the Control of Pandemic Influenza", *Biosecurity and Bioterrorism*. Volume 4, Number 4, 2006. Short URL: https://bit.ly/3mTUrCN.

[7] Senger, Michael P., "China's Global Lockdown Propaganda Campaign", *Tablet*, 16 September 2020. Short URL; https://bit.ly/2RXS0RA.

[8] See detailed description of these breaches in the 13 November 2020 complaint to the International Criminal Court by Sanjeev Sabhlok, cited above.

[9] World Health Organisation (2019). *Non-pharmaceutical public health measures for mitigating the risk and impact of epidemic and pandemic influenza*, https://bit.ly/3yO2No9.

Table 1. Recommendations on the use of NPIs by severity level

SEVERITY	PANDEMIC[a]	EPIDEMIC
Any	Hand hygiene Respiratory etiquette Face masks for symptomatic individuals Surface and object cleaning Increased ventilation Isolation of sick individuals Travel advice	Hand hygiene Respiratory etiquette Face masks for symptomatic individuals Surface and object cleaning Increased ventilation Isolation of sick individuals Travel advice
Moderate	*As above, plus* Avoiding crowding	*As above, plus* Avoiding crowding
High	*As above, plus* Face masks for public School measures and closures	*As above, plus* Face masks for public School measures and closures
Extraordinary	*As above, plus* Workplace measures and closures Internal travel restrictions	*As above, plus* Workplace measures and closures
Not recommended in any circumstances	UV light Modifying humidity Contact tracing Quarantine of exposed individuals Entry and exit screening Border closure	UV light Modifying humidity Contact tracing Quarantine of exposed individuals Entry and exit screening Internal travel restrictions Border closure

Figure 1.1: Summary of NPI recommendations from WHO's October 2019 guidelines for respiratory pandemics

Lockdowns for a respiratory virus are therefore experimental measures invented by Chinese leadership initially in Wuhan in January 2020. However, for well-understood reasons which are outside the scope of this paper[10], within a short period of a few weeks, the WHO-China Joint Mission on Coronavirus Disease 2019 co-led by Bruce Aylward concluded on 24 February 2020, without any detailed statistical analysis, without any published peer-reviewed evaluation, that "China's uncompromising and rigorous use of non-pharmaceutical measures to contain transmission of the COVID-19 virus in multiple settings provides vital lessons for the global response"[11]. The world apparently had "vital lessons" to learn (Figure 1.2) from the world's first ever implementation of lockdowns – without the slightest scientific evaluation of these totalitarian measures.

2. **China's uncompromising and rigorous use of non-pharmaceutical measures to contain transmission of the COVID-19 virus in multiple settings provides vital lessons for the global response. This rather unique and unprecedented public health response in China reversed the escalating cases in both Hubei, where there has been widespread community transmission, and in the importation provinces, where family clusters appear to have driven the outbreak.**

Figure 1.2: Extract from the WHO's February 2020 report

In February 2020, the WHO confidently overturned, without the slightest scientific evaluation, decades, if not hundreds of years of known science about pandemic management. The Chinese lockdown invention and the WHO's endorsement of these policies not only turned the standard risk-based, targeted approach on its head, but such indiscriminate restrictions comprehensively breach international human rights obligations, requiring specific ethical analysis and justification in nations' parliaments.

[10] https://web.archive.org/web/20210221074600/https://catallaxyfiles.com/2021/02/03/how-the-world-fell-into-xi-jinpings-trap/

[11] https://web.archive.org/web/*/https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf

Almost all nations – Sweden stuck steadfastly to the known science – buckled to the enormous political pressure exercised by the WHO and the media to not just comply with the WHO's complete reversal of its own pandemic guidance, but to innovate in extreme measures at levels unprecedented. Sweden stood out as a beacon in the midst of the storm. The head of the Swedish Public Health Agency, Anders Tegnell, provided the world with a masterclass on public health by explaining the logic of his actions at each step. He explained, in the course of interviews to journalists from across the world, how Sweden was following the well-established science and how others were not. He exclaimed on 24 June 2020 that "It was as if the world had gone mad, and everything we had discussed was forgotten"[12].

The adage, "act in haste, repent at leisure", applies to lockdowns. A good number of cost-benefit analyses have by now been conducted (none, however, by any government agency). Almost all (except a few initial ones that suffered from extremely poor quality analysis) confirm that lockdowns have caused devastation, including many additional non-COVID deaths.[13]

That part is now settled science: that lockdowns are an extremely harmful public policy and cause massive non-COVID harms. The question this paper examines is this: do lockdowns at least do what they claim to do, i.e. do they reduce COVID deaths? This paper finds that lockdowns increase even COVID deaths, and outlines reasons why this is the case.

1.1 Early literature of 2020 and 2021 which suggested that lockdowns increase COVID deaths

The possibility of lockdowns causing additional COVID deaths was being canvassed by a few researchers by mid-2020 based on a comparison of COVID deaths in Sweden with those in other nations like the UK (Figure 1.3). It was increasingly becoming evident that nations which imposed severe lockdowns were not reducing COVID deaths and were probably increasing them.

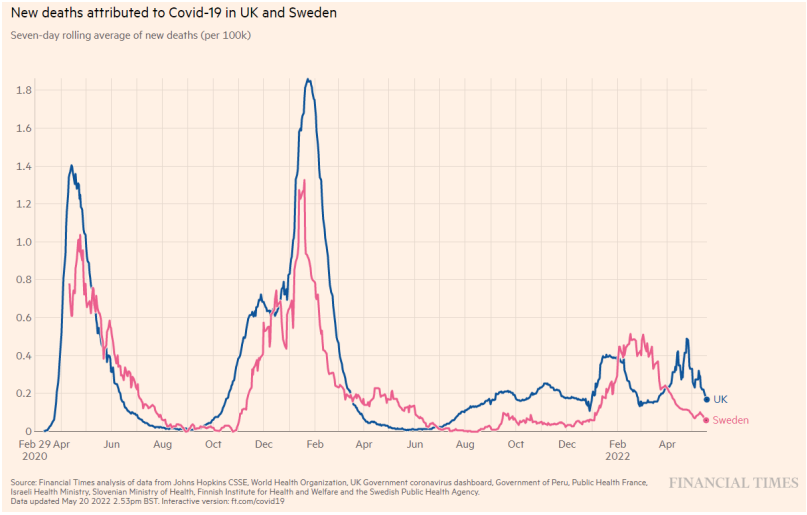

Figure 1.3: Comparison of COVID deaths in the UK (with severe lockdowns) and Sweden (without lockdowns)

Similarly, South Dakota (population 0.885 million) did not have lockdowns while North Dakota (0.762 million) did. Figure 1.4 shows that their COVID death outcomes were virtually identical (South Dakota's COVID death rate was 2,526 per million, while North Dakota's COVID death rate was 2,312 per million). At a minimum, North Dakota subjected itself to a lot of pain for very little apparent gain.

[12] Rolander, Niclas (2020). "Sweden's Covid Expert Says 'World Went Mad' With Lockdowns" in *Bloomberg Quint*, 24 June 2020, https://bit.ly/3PExylo.

[13] E.g. see a recent cost benefit analysis for Australia by Gigi Foster at: https://www.thegreatcovidpanic.com/_files/ugd/23eb94_920d5ddd484640ee8dfca8f045b14886.pdf (Do lockdowns and border closures serve the "greater good").

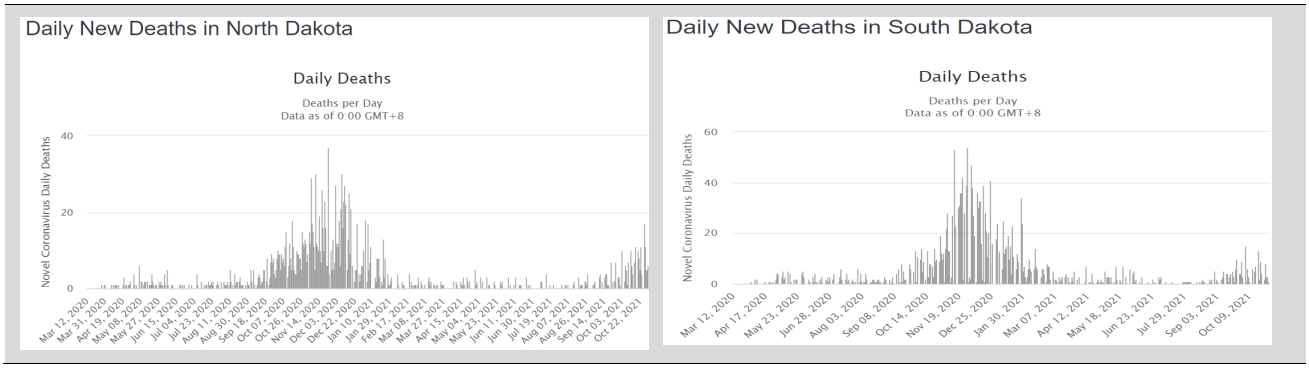

Figure 1.4: Comparison of COVID deaths in North Dakota (with lockdowns) and South Dakota (without lockdowns), *Source*: Worldometer, October 2021

Many other comparisons have been done, such as between Florida and other USA states[14]. Such comparative studies find that states with lower restrictions have either outperformed the more restrictive states, or at least have done comparably well, in terms of COVID outcomes.

The hunch – that lockdowns increase COVID deaths, or at least do nothing to reduce COVID deaths – is clearly and self-evidently supported from Worldometer data[15]. As at 4 July 20220, over 55 lockdown countries have a higher COVID-19 death rate than Sweden even though Sweden has an exceptionally high elderly population.

Fortunately, there has been a booming cottage industry since 2020 of studies that look into the impacts of lockdowns on COVID fatalities. A list of 31 such studies was compiled by the American Institute for Economic Research on 19 December 2020[16]. Most such studies have demonstrated since early in the pandemic that lockdowns do not reduce COVID deaths (in fact, might increase them). Illustratively:

- On 20 May 2020, Elaine He at Bloomberg reported "there's little correlation between the severity of a nation's restrictions and whether it managed to curb excess fatalities."[17]
- A June 2020 study published in Advance by Stefan Homburg and Christof Kuhbandner found that the data "strongly suggests" that "the UK lockdown was both superfluous (it did not prevent an otherwise explosive behavior of the spread of the coronavirus) and ineffective (it did not slow down the death growth rate visibly)."[18]
- 9 July 2020: A study by PANDA, South Africa, "Exploring inter-country coronavirus mortality"[19] showed that there was no effect of stringency on COVID deaths: "our analysis suggests there is no basis for expecting lockdown stringency to be an explanatory variable".
- In a 21 July 2020 cross-country study published in *The Lancet*, Rabail Chaudhry et al. concluded that "[r]apid border closures, full lockdowns, and wide-spread testing were not associated with COVID-19 mortality per million people".[20]

[14] E.g., http://youtu.be/_DOwDAbibQI ("Ivor Cummins: Florida Wins the Science War - Hands Down - no problemo!!!").

[15] https://www.worldometers.info/coronavirus/#countries – sorted on 4 July 2022 by reported deaths per million.

[16] https://www.aier.org/article/lockdowns-do-not-control-the-coronavirus-the-evidence/

[17] He, Elaine (2020). "The Results of Europe's Lockdown Experiment Are In" in *Bloomberg*, 20 May 2020, https://bit.ly/3MIqP8e.

[18] Homburg, Stefan et al (2020). "Comment on Flaxman et al (2020): The illusory effects of non-pharmaceutical interventions on COVID-19 in Europe" in *Advance*, 18 June 2020, https://bit.ly/3lxyY39.

[19] https://web.archive.org/web/20201107125736/https://pandata.org/wp-content/uploads/2020/07/Exploring-inter-country-variation.pdf

[20] Chaudhry, Rabail et al. (2020). "A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes" in *eClinical Medicine*, 21 July 2020, https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(20)30208-X/fulltext.

- 12 August 2020: Liu, Yang, et. al., "The impact of non-pharmaceutical interventions on SARS-CoV-2 transmission across 130 countries and territories"[21]. The study concluded that "there was **limited added value to introducing stay-at-home orders** as an addition to other physical distancing measures".
- In an August 2020 paper published with the National Bureau of Economic Research, authors Andrew Atkeson et al. found that covid-19 deaths followed a similar pattern "virtually everywhere in the world" and that "[f]ailing to account for this familiar pattern risks overstating the importance of policy mandated NPIs for shaping the progression of this deadly pandemic".[22]
- 16 August 2020: Journalist Peter Andrews noted: "If lockdowns played any part at all, we would expect to see a correlation between the different forms of lockdowns enforced by various regions or countries, and the shape of the death curves there. But we do not—the correlation is zero. Belgium, the UK, New York: strict lockdowns; lots of deaths. Sweden, Japan, Uruguay: light or no lockdowns; few deaths"[23].
- 1 September 2020: An article[24] by Donald L. Luskin noted:

  > TrendMacro, my analytics firm, tallied the cumulative number of reported cases of Covid-19 in each state and the District of Columbia as a percentage of population, based on data from state and local health departments aggregated by the Covid Tracking Project. We then compared that with the timing and intensity of the lockdown in each jurisdiction. That is measured not by the mandates put in place by government officials, but rather by observing what people in each jurisdiction actually did, along with their baseline behavior before the lockdowns. This is captured in highly detailed anonymized cellphone tracking data provided by Google and others and tabulated by the University of Maryland's Transportation Institute into a "Social Distancing Index."
  >
  > [I]t turns out that lockdowns correlated with a greater spread of the virus.

- 14 October 2020: Brauner, Jan M. et. al., "The effectiveness of eight nonpharmaceutical interventions against COVID-19 in 41 countries"[25]. The study concluded that "closing schools and universities was highly effective; that banning gatherings and closing high-risk businesses was effective, but closing most other businesses had limited further benefit; and that **many countries may have been able to reduce R below 1 without issuing a stay-at-home order**".
- 13 November 2020: In his complaint to the International Criminal Court, Sanjeev Sabhlok wrote "data now suggests that lockdowns may increase COVID deaths".[26] Further, "By now we know conclusively that the 2020 lockdowns have not "worked". Instead, there is are strong reasons to suggest that lockdowns may be causing additional COVID (i.e. virus) deaths – even ignoring the additional carnage they cause"
- On 19 November 2020 a paper by De Larochelambert et al.[27] found that "[s]tringency of the measures settled to fight pandemia, including lockdown, did not appear to be linked with death rate" and that other factors outside governments' short-term control actually drove COVID death rates, such as prevailing life expectancy, co-morbidities, and latitude: "[r]egarding government's actions (i.e., containment and stringency index), no association was found with the outcome, suggesting that the other studied factors were more important in the Covid-19 mortality than political measures implemented to fight the virus, except for the economic support index."

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[21] https://www.medrxiv.org/content/10.1101/2020.08.11.20172643v1

[22] Atkeson, Andrew et al (2020). "Four Stylized Facts about COVID-19", NBER Working Paper 27719, http://www.nber.org/papers/w27719.

[23] https://www.rt.com/op-ed/498007-covid-19-myths-lies-exposed/

[24] https://www.wsj.com/articles/the-failed-experiment-of-covid-lockdowns-11599000890

[25] https://www.medrxiv.org/content/10.1101/2020.05.28.20116129v4

[26] https://web.archive.org/web/20201114074316/http://sanjeev.sabhlokcity.com/Misc/ICC-complaint-sabhlok-13November2020.pdf

[27] De Larochelambert, Quentin et al (2020). "Covid-19 Mortality: A Matter of Vulnerability Among Nations Facing Limited Margins of Adaptation" in *Frontiers of Public Health*, 19 November 2020, https://doi.org/10.3389/fpubh.2020.604339.

- 24 December 2020: Eran Bendavid et. al (including Jay Bhattacharya and John Ioannidis) published a paper which looked at 10 nations and concluded: "While small benefits cannot be excluded, we do not find significant benefits on case growth of more restrictive NPIs".

  > [W]e fail to find strong evidence supporting a role for more restrictive NPIs in the control of COVID in early 2020. We do not question the role of all public health interventions, or of coordinated communications about the epidemic, but we fail to find an additional benefit of stay-at-home orders and business closures. The data cannot fully exclude the possibility of some benefits. However, even if they exist, these benefits may not match the numerous harms of these aggressive measures. More targeted public health interventions that more effectively reduce transmissions may be important for future epidemic control without the harms of highly restrictive measures.[28]

- 3 February 2021: Paul Frijters wrote on 3 February 2021:

  > The 10 countries above 5 million inhabitants with the highest reported covid death count per million at this moment are Belgium, the UK, Czechia, Italy, USA, Bulgaria, Hungary, Spain, Portugal, and Peru. The curious aspect is that each of these countries has had a particularly severe lockdown policy in most of its territory. Moreover, in pretty much each case the large glut of covid-deaths came after the imposition of lockdowns, most clearly in the second wave in the UK and the US.[29]

- 13 February 2021: Chisadza et al. (2021)[30] find that stricter lockdowns (higher OxCGRT stringency index) increase COVID-19 mortality by 0.01 deaths/million per stringency point.
- 13 April 2021: Christopher R. Berry, et al showed that "shelter-in-place orders had no detectable health benefits"[31]
- 25 April 2021: In an article in *Times of India* blogs, Sanjeev Sabhlok wrote:

  > the most obvious proof that lockdowns don't work is hiding in plain sight. The timing and pattern of covid deaths in Sweden (without lockdowns) and the UK (with harsh lockdowns) in 2020 has been exactly the same but the UK has had far more deaths than Sweden. A similar situation was seen in South Dakota (without lockdowns) and North Dakota (with lockdowns). It is clear that neither lockdowns (nor mask mandates) improve the outcomes for any nation; but that both these can increase covid deaths.

- June 2021: Virat Agarwal et al.[32] examined 43 countries and all US states, looking for a positive link between shelter-in-place ("SIP") orders and excess deaths. The only countries in which they observed a fall in the trajectory of excess deaths were Australia, New Zealand and Malta. "All three countries are islands," they reported. "In every other country, we observe either no visual change in excess deaths or increases in excess deaths."
- July 2021: A July 2021[33] and January 2022[34] analysis by Martin Lally of 33 European countries found that COVID deaths are higher the greater the stringency of lockdowns in a country.

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[28] Bendavid, Eran et al (2020). "Assessing mandatory stay- at- home and business closure effects on the spread of COVID- 19" in *European Journal of Clinical Investigation*, 24 December 2020, https://onlinelibrary.wiley.com/doi/epdf/10.1111/eci.13484.

[29] https://clubtroppo.com.au/2021/02/03/covid-congestion-effects-why-are-lockdowns-so-deadly/

[30] Chisadza, Carolyn, Matthew Clance, and Rangan Gupta. 2021. "Government Effectiveness and the COVID-19 Pandemic." *Sustainability* 13 (6). Multidisciplinary Digital Publishing Institute:3042. https://doi.org/10.3390/su13063042

[31] Berry, Christopher R. et al (2021). "Evaluating the effects of shelter-in-place policies during the COVID-19 pandemic" in *PNAS* April 13, 2021 118 (15) e2019706118; https://doi.org/10.1073/pnas.2019706118, https://archive.ph/6OUW6.

[32] Agrawal, Virat et al (2021). "The impact of the Covid-19 pandemic and policy responses on excess mortality", NBER Working Paper 28930, DOI 10.3386/w28930, http://www.nber.org/papers/w28930.

[33] Lally, Martin (2021). "The Costs and Benefits of Covid-19 Lockdowns in New Zealand" in *med*R*xiv* 2021.07.15.21260606; doi: ,27 July 2021. https://doi.org/10.1101/2021.07.15.21260606.

[34] Lally, Martin (2022). "A cost–beneft analysis of COVID-19 lockdowns in Australia" in *Monash Bioethics Review*, Published online on 28 January 2022, https://doi.org/10.1007/s40592-021-00148-y, https://link.springer.com/content/pdf/10.1007/s40592-021-00148-y.pdf

1.2 Lockdown impacts on COVID deaths will firmly be known only at the end of the pandemic

Lockdowns were not imposed during the COVID pandemic in a single episode. For instance, lockdowns in Melbourne in Australia continued over the course of 18 months, in multiple episodes. Each episode was different, some more stringent than the others. While many harms of lockdowns emerged early, the impact of lockdowns on COVID deaths has been relatively more difficult to conclusively assess, given the innumerable variables involved.

But there is a very important thing about duration of effects which we need to consider. Johan Giesecke pointed at the outset of the pandemic:

> *Interviewer*: But you think that at the end of the day they're all pretty much going to end up with the same fatalities, the same results, the same deaths regardless of what measures they took. Explain that.
>
> *Giesecke*: Yep. .. [T]he other thing with a lockdown is – when you open it you will have more cases, so the countries who pride themselves in having few deaths now will get these deaths when they start lifting the lockdown.[35]

The reality is that ultimately, lockdown nations have to open up and even if lockdowns don't increase COVID deaths in the interregnum, the COVID deaths being pushed into the future finally occur. The correct method to evaluate the effect of lockdowns on COVID deaths is therefore to consider COVID mortality only at the end of the pandemic.

This issue (of duration of the study) shows up most clearly in Australia. Island nations like Australia and New Zealand in the Southern hemisphere had peak summer when COVID first hit their shores in late 2019 or early 2020, which means its spread was naturally contained (due to high seasonal levels of Vitamin D in people's bodies) and then shut down their borders. This enabled them to better prevent COVID from spreading but they could not entirely prevent the "cat" from getting "out of the bag". The moment lockdowns ended (e.g. in Melbourne on 22 October 2021[36]) and borders opened in the first half of 2022, COVID spread rapidly in Australia. The elderly who had been saved from COVID for two years, were not only older and more vulnerable, but their immunity was weakened enough (despite vaccines) for them to succumb at the first exposure to respiratory viruses. This is the well-known dry tinder effect.

This has been happening on a large scale in Australia in 2022 (Figure1.5).

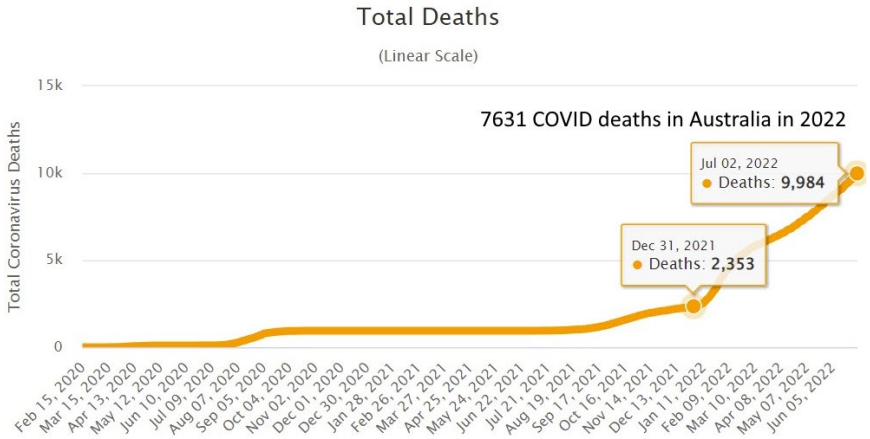

Figure 1.5: Cumulative deaths in Australia from Worldometer, with most (7,631 out of 9,984) happening in 2022

Some early studies "jumped the gun" and declared lockdowns to be effective[37] but such studies were inevitably flawed and their results will not be replicable. Studies need a comprehensive understanding of the theory of pandemics if they are to provide useful, sustainable results.

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[35] https://www.youtube.com/watch?v=2SdUmsMLW0o

[36] https://www.nytimes.com/2020/10/28/world/australia/melbourne-lockdown-ends.html

[37] https://www.reuters.com/article/uk-factcheck-lockdowns-idUSKBN2842WS

While the COVID pandemic is not yet over (of course, one could easily argue that there was no COVID pandemic at all, since there is no evidence of the pandemic in Sweden's death rates data[38], but for nations with lockdowns, we do need to wait a bit more), this study is able to consider a bulk of the data. The analysis in this study should be replicated in the future to include 2022.

1.3 Data integrity issue with reported COVID deaths

One of the limitations of this and other studies that make use of reported official statistics on COVID deaths is that such data virtually never match the total mortality statistics of these same nations. That is because there are three kinds of possibilities with COVID death reporting (Figure 1.6).

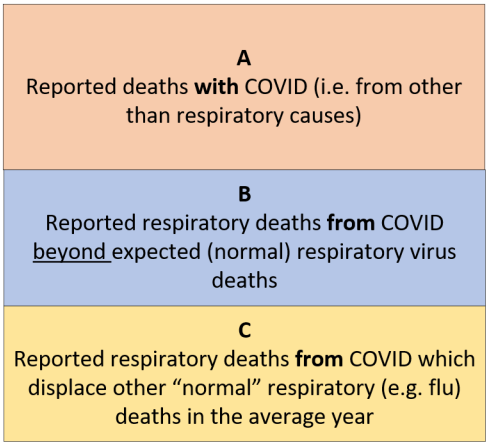

Figure 1.6: Three notional categories of reported COVID deaths

COVID is a respiratory disease and if it were on par with the seasonal flu, or merely displaces deaths that would have normally occurred from the flu (e.g. category C), then we would not find any evidence of a pandemic in the overall mortality data – this is precisely what has happened in the case of Sweden, despite it reporting a 19,091 COVID deaths as at 4 July 2022. What matters, for a real pandemic to occur, is that there should be a significant number of excess deaths beyond what is "normal" (i.e. category B). Finally, reported COVID deaths that take the total figure beyond actual deaths (Category A) are fictitious COVID deaths. These are necessarily due to causes other than COVID – in most countries, these constitute a significant chunk of reported deaths.

Category A "deaths" – deaths from causes other than COVID but reported as COVID deaths because the person might have tested positive to COVID a month or two before the death – are the most pernicious of all. The officially reported COVID deaths are the sum of A, B and C categories but we need a method to remove Category A. There is no such method but one way to prove that the reported death statistics are picking up a lot of false information is to look at Sweden's mortality rate data.

We know that Sweden undertook appropriate restrictions (all within the scope of science), almost all of them voluntary. There was no vaccine in 2020, either. Let us assume, for the sake of argument, that all excess deaths in Sweden in 2020 and 2021 were caused by COVID – even though there must have been at least some excess non-COVID deaths (for example, due to reductions in visits to GPs and hospitals by people too scared to venture there). This allows us to estimate Category B, i.e. how many *more* deaths occurred in Sweden due to COVID than what we would have expected in a typical year from respiratory viruses.

Despite criticisms that its elderly were inadequately cocooned at the start of the pandemic, Sweden ended up with no noticeable excess deaths in 2020. Figure 1.7 shows that if the dry tinder effect of 2019[39] is combined

[38] https://archive.ph/dgTod.

[39] "Sweden's chief epidemiologist has partly blamed the country's high coronavirus death toll on mild flu outbreaks in recent winters"(*CNBC*. "Sweden's high coronavirus death toll could be linked to mild flu seasons, chief scientist says", 23 September 2020, https://bit.ly/3aaEc2p).

with the presence of the COVID pandemic, the mortality rate in 2020 drops close to the trend (90.6 per 10,000 is the average across the two years, which is the same as the mortality rate for 2018). Its 2020 death rate – even if taken in isolation – is far less than the average death rate from 2000-2021. Such "business as usual" results (i.e. no exceptional deaths) were achieved without any lockdowns, mandatory masks, quarantines, or extended border closures. There were clearly no deaths in category B in Sweden. There is no signal of any pandemic.

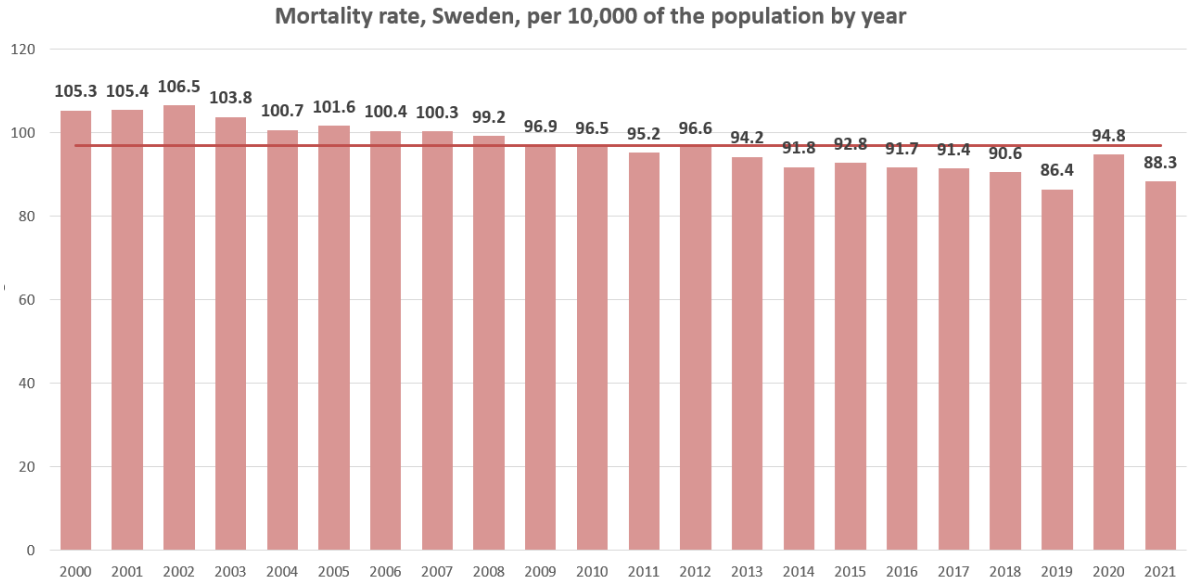

Figure 1.7: The death rate of Sweden over the past 20 years: COVID was evidently not a severe pandemic[40]

Using deaths of 2017-2019 in Sweden as a baseline, Nobel laureate Michael Levitt has found that 2,996 excess deaths occurred in Sweden in 2020,[41] representing around 3% of its expected annual deaths. Levitt's analysis can be considered to be a credible upper estimate of Sweden's excess COVID deaths (Category B). Note that this figure of 3,000 excess deaths from COVID is vastly lower than the 10,000 odd reported COVID deaths in Sweden in 2020.

One can only hope that while using the Worldometer data (which this study does) such errors are either uniformly biased in one direction, or that these errors cancel each other out.

There is an alternative to this method, i.e. to consider only excess deaths, but as we the analysis of Sweden's excess deaths shows, identifying excess deaths correctly is a challenge in itself. We are not aware at the moment of any dataset on excess deaths that is comprehensively superior to just using reported deaths from Worldometer.

This paper is broken into three parts. Part 1 reviews the OxCGRT database and identifies the pitfalls of using it without appropriate corrections. Part 2 reports on the statistical analysis that proves that lockdowns increase COVID deaths. Part 3 identifies reasons why lockdowns increase COVID deaths.

[40] Statistics Sweden (SCB). "Mortality rate per 1,000 of the mean population by age and sex. Year 2000 – 2020", https://bit.ly/3MEgmdX.

[41] *Source:* Tweet dated 25 February 2021 by Michael Levitt, https://bit.ly/38BA0sk.

2. Part 1: The OxCGRT dataset

This part looks at databases to assess the severity of lockdowns and considers the OxCGRT in detail.

2.1 The OxCGRT database and Stringency Index

A large-scale COVID policy (mainly NPIs) database constructed by the Blavatnik School of Government at the University of Oxford, called OxCGRT, tracks different 23 policy responses (such as school closures, travel restrictions, vaccination policy) since 1 January 2020 in more than 180 countries.

One of the popular indices created from this data is the **Stringency Index**, comprising the sum of 9 individual components of the database, being the mathematical average of 9 variables, with some additional weights. Quoting from the Oxford university's text[42]:

> The stringency index is calculated using the policy indicators C1 – C8 and H1. The value of the index on any given day is the average of nine sub-indices pertaining to the individual policy indicators, each taking a value between 0 and 100:
>
> $$I = \frac{1}{9}\sum_{j=1}^{9} I_j$$
>
> Indicators C1 to C7 and H1 have an additional flag corresponding to whether the policy has been applied locally, in specific areas/circumstances, or generally, nationwide. We define G' to be 0 if the policy is targeted and 1 if general. Note that a policy can only be general if it has a non-zero value, since a zero value corresponds to no measures being taken.
>
> Because different indicators *j* have different maximum values N' in their ordinal scales, we weight the additional contribution of a general policy by the average number of ordinal points across the eight indicators that have the targeted/general qualification. This ensures that general policies are not "over-contributing" to indicators with fewer ordinal points or "under-contributing" to indicators with more ordinal points. Specifically:

Indicator	NPI being coded	*Nj*	Targeted/General?
C1	closings of schools and universities	3 (0, 1, 2, 3)	Yes
C2	closings of workplaces	3 (0, 1, 2, 3)	Yes
C3	cancelling public events	2 (0, 1, 2)	Yes
C4	limits on gatherings	4 (0, 1, 2, 3,	Yes
C5	closing of public transport	2 (0, 1, 2)	Yes
C6	orders to "shelter-in-place" and otherwise confine to the home	3 (0, 1, 2, 3)	Yes
C7	restrictions on internal movement between cities/regions	2 (0, 1, 2)	Yes
C8	restrictions on international travel	4 (0, 1, 2, 3,	No
H1	presence of public info campaigns	2 (0, 1, 2)	Yes

[42] https://www.bsg.ox.ac.uk/sites/default/files/Calculation%20and%20presentation%20of%20the%20Stringency%20Index.pdf

2.2 Illustrative studies that use the OxCGRT database

A number of studies make use the OxCGRT database to identify the effect of lockdowns on COVID deaths. A few of these are outlined below.

2.2.1 *Martin Lally's study of 33 European nations*

A July 2021[43] and January 2022[44] analysis by Martin Lally of 33 European countries confirms that the more stringent a country's policies in terms of lockdowns and border restrictions, the greater its COVID deaths. European nations are considered as comparable to Australia: "similar (on average) to Australia in ethnicity, cultural norms, demographics, GDP per capita, and the quality of their health care systems".

The main result of this study (using the uncorrected Stringency Index from the OxCGRT database) are outlined below.

> Regressing the death rate per 1m (*D*) up to 31 December [2020] on the maximum Stringency Index value (*S*), the population density (*PD*, in millions per 1,000 square miles), and date of first death (*FD*, in days from 15 February) yields the following result:
>
> $D = 273.9 + 7.34S + 473.1PD - 12.3FD$
>
> The R^2 is 0.29, and the *p* values are 0.66, 0.27, 0.10 and 0.10 respectively. The coefficient on *S* is statistically insignificant and the sign on it is 'wrong' (positive rather than negative).

A positive estimated coefficient on the stringency index implies that COVID deaths are higher the greater the stringency applied in a country.

2.2.2 *Jonas Herby meta-analysis of many OxCGRT studies*

In January 2022, Jonas Herby, Lars Jonung, and Steve H. Hanke[45] published a meta-analysis of 24 studies (out of 34 initially shortlisted) that look into the effect of lockdowns on COVID deaths. These 24 studies were separated into three groups: lockdown stringency index studies, shelter-in-place-order (SIPO) studies, and specific NPI studies.

> Out of these 34 studies, … [m]ost … (29) use data collected before September 1st, 2020 and 10 use data collected before May 1st, 2020. Only one study uses data from 2021. … Seven studies analyze the effect of SIPOs, 10 analyze the effect of stricter lockdowns (measured by the OxCGRT stringency index), 16 studies analyze specific NIP's independently, and one study analyzes other measures (length of lockdown).

Most studies considered in the meta-analysis use officially reported COVID-19 deaths as the dependent variable but one study (Bjørnskov's) considered excess mortality. Some of the studies in the Herby et al. meta-analysis which use the OxCGRT database are listed below. The reported summary result in brief: "stringency index studies find that lockdowns in Europe and the United States only reduced COVID-19 mortality by 0.2% on average".

- 10 November 2020: Stockenhuber (2020)[46] find no significant effect of stricter lockdowns (higher OxCGRT stringency index).

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[43] Lally, Martin (2021). "The Costs and Benefits of Covid-19 Lockdowns in New Zealand" in *medRxiv* 2021.07.15.21260606; doi: ,27 July 2021. https://doi.org/10.1101/2021.07.15.21260606.

[44] Lally, Martin (2022). "A cost–beneft analysis of COVID-19 lockdowns in Australia" in *Monash Bioethics Review*, Published online on 28 January 2022, https://doi.org/10.1007/s40592-021-00148-y, https://link.springer.com/content/pdf/10.1007/s40592-021-00148-y.pdf

[45] Herby et al. (2022). "A Literature Review and Meta-Analysis of the Effects of Lockdowns on Covid-19 Mortality", SAE/No.200/January 2022, https://bit.ly/3wHaNEP.

[46] Stockenhuber, Reinhold. 2020. "Did We Respond Quickly Enough? How Policy-Implementation Speed in Response to COVID-19 Affects the Number of Fatal Cases in Europe." *World Medical & Health Policy* 12 (4):413–29. https://doi.org/10.1002/wmh3.374.

- 13 February 2021: Chisadza et al. (2021)[47] find that stricter lockdowns (higher OxCGRT stringency index) increase COVID-19 mortality by 0.01 deaths/million per stringency point.
- 25 March 2021: Berry et al. (2021)[48] find that SIPOs increase COVID-19 mortality by 1% after 14 days.
- 29 March 2021: A study by Christian Bjørnskov that looks at total excess mortality found "no clear association between lockdown policies and mortality"[49].

The meta-analysis found that "(SIPOs) were also ineffective… They only reduced COVID-19 mortality by 2.9%." Overall, the study finds that "lockdown policies are ill-founded and should be rejected as a pandemic policy instrument".

In addition to the self-identified limitations of this meta-analysis, two shortcomings in relation to stringency are noted below:

a) Most of the 24 studies in the Herby study are from the early period of the pandemic. Their results do not reflect of the true effect of lockdowns which, as pointed out earlier in this study, can take time to emerge.

b) The Herby study assumes the validity of the OxCGRT database. Further, the study's definition of lockdowns is unrelated to a risk-based approach to public health. The Herby study does not distinguish between risk-based closures of schools (e.g. the higher years of schools in Sweden) from inverted-risk policies in which the lower school classes are closed. And it conflates recommended (partial) school closures in Sweden with compulsion, so it finds that even Sweden had imposed "lockdowns"[50] in March 2020.

Its definition of lockdowns:

> **Compulsory** non-pharmaceutical interventions (NPIs), commonly known as "lockdowns" – policies that restrict internal movement, close schools and businesses, and ban international travel – have been mandated in one form or another in almost every country.

To its credit, the Herby study does note that Sweden did the "least"[51] in terms of NPIs, which, although not the correct way to represent Sweden's risk-based approach, is at least a recognition that it did not go overboard into policies that are prohibited in the literature.

2.3 Other approaches to measure lockdown NPIs

2.3.1 *Automated data on lockdown impacts*

The Google Community Mobility Reports[52] aim to provide insights into what has changed in response to policies aimed at combating COVID-19. The reports chart movement trends over time by geography, across different categories of places such as retail and recreation, groceries and pharmacies, parks, transit stations, workplaces, and residential. This is the same type of aggregated, anonymized insights that are used in products such as Google Maps.

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[47] Chisadza, Carolyn, Matthew Clance, and Rangan Gupta. 2021. "Government Effectiveness and the COVID-19 Pandemic." *Sustainability* 13 (6). Multidisciplinary Digital Publishing Institute:3042. https://doi.org/10.3390/su13063042

[48] Berry, Christopher R., Anthony Fowler, Tamara Glazer, Samantha Handel-Meyer, and Alec MacMillen. 2021. "Evaluating the Effects of Shelter-in-Place Policies during the COVID-19 Pandemic." *Proceedings of the National Academy of Sciences* 118 (15):e2019706118. https://doi.org/10.1073/pnas.2019706118

[49] Bjørnskov, Christian. 2021a. "Did Lockdown Work? An Economist's Cross-Country Comparison." *CESifo Economic Studies* 00 (00):14. https://doi.org/10.1093/cesifo/ifab003

[50] It notes: "Of the 186 countries covered by the Oxford COVID-19 Government Response Tracker (OxCGRT), only Comoros, an island country in the Indian Ocean, did not impose at least one NPI before the end of March 2020", thus excluding Sweden from the list of nations that did not lockdown.

[51] "Virtually all countries in the world implemented mandated NPIs in response to the COVID-19 pandemic. Hence, most estimates are relative to "doing the least," which in many Western countries means relative to doing as Sweden has done".

[52] https://www.google.com/covid19/mobility/

The advantage of using this data is that it is objective and not subject to human error. The disadvantage of this is that it fails to identify the precise nature of the public policies underpinning this data.

The University of Maryland's Transportation Institute's "Social Distancing Index" is one example of the use of this data.[53] Detailed anonymized cellphone tracking data provided by Google and others and tabulated by the University of Maryland's Transportation Institute into a "Social Distancing Index" provides objective observations on people's actual behaviour during the covid pandemic.

2.3.2 *Manually coded datasets*

Apart from OxCGRT, there are a few other manually coded lockdown NPI datasets.

a) Statistic Canada's COVID-19 restrictions index

A COVID-19 restrictions index was developed to measure the severity of restrictions in Canadian provinces and territories. The index builds on the Stringency Index developed by Oxford University in a similar manner to the ones produced by the Bank of Canada and the Institute for Research on Public Policy (IRPP).[54]

> To produce a more "Canada-centric" index, the bins used in the Oxford index were first modified based on the thresholds in the restrictions that were used in the provinces and territories. For example, rather than a single variable to capture gathering size limits, separate categories were used to distinguish between indoor and outdoor gatherings. In addition, smaller bin sizes were used. For example, for indoor gatherings, bins that correspond to "prohibited, family only or 5 or less," "10 or less", " 25 or less", "50 or less", "100 or less", "250 or less" and "no restrictions" were implemented to reflect common restrictions used across the provinces rather than the larger "10 people or less", "11 to 100" and "101 to 1000", "1001 or more", "no restrictions" buckets used in the Oxford index.
>
> Second, additional variables were added to better reflect the restrictions enacted in Canada. These variables correspond to business restrictions (e.g., restaurant capacity limits for dining in versus take-out only) or business types (e.g., gyms, hair salons or non-essential retail) that were forced to close during certain periods or were instructed to implement capacity restraints. While a large number of restriction variables were available to choose from, considerable effort was taken to ensure that the additional variables were common (or as common as possible) across the provinces and territories.
>
> Fourth, the bin values were scaled so that the effect of imposing mild restrictions is smaller than when a more severe restriction is imposed. This means that moving from lower to higher levels of restrictions is assumed to have an increasingly stronger effect. For example, the move from having no restrictions to wearing a mask being recommended while in school leads to a smaller increase in the restrictions index than the change from partial online learning to schools closing.

b) Bank of Canada COVID-19 stringency index

The Bank of Canada index[55] takes the Oxford database and adds a few more variables. Statistics Canada describes it as follows:

> The Bank of Canada and the IRPP also produce restriction indexes that incorporate elements of the Oxford indexes. The Bank of Canada indexes have some overlap with the indexes produced here as both set of indexes use a number of the same Oxford index restrictions as their starting point, and both make some adjustments to the Oxford indexes to account for the way Canadian policy makers implemented restrictions (e.g. bin sizes for gatherings). The indexes produced by the Bank of Canada include measures of enforcement that are not included here, and make more adjustments for the degree to which measures are targeted at specific regions within a province. The indexes produced here have finer delineations of gathering types and more individual restrictions for business activity.
>
> The IRPP indexes employ an overlapping set of Oxford variables with the Bank of Canada indexes and the indexes reported here. The IRPP differs in that its indexes treat the curfews in Quebec as a separate restrictions category, and that the IRPP restriction indexes fit within the larger set of Oxford indexes that look at a wider array of responses to the COVID-19 pandemic. For example, the IRPP/Oxford set

[53] https://data.covid.umd.edu/about/index.html

[54] https://www150.statcan.gc.ca/n1/pub/11-633-x/11-633-x2022003-eng.htm

[55] https://www.bankofcanada.ca/2021/02/staff-analytical-note-2021-1/.

of indexes also include information on restriction on activity as well as indexes for health measures (e.g. testing) and economic responses (e.g. government support) that are not examined here. This means that the IRPP restriction indexes are more aligned with the full set of Oxford indexes than those that are produced here, but that the indexes produced here have more categories devoted to business restrictions.[56]

[56] https://www150.statcan.gc.ca/n1/pub/11-633-x/11-633-x2022003-eng.htm

3. Review of the OxCGRT coding system and Stringency Index

Coding NPIs is important for public health policy analysis. It is surprising that such a coding system was not already in place before COVID.

But it is one thing to make a list of NPIs and quite another thing to order them in a manner that is useful for statistical analysis. The design of the database and its coding system, has enormous and fundamental inbuilt shortcomings which distort the nature and effect of NPIs and so – like with a carnival mirror – we get a distorted picture of reality. The SI is unable to help us sharply distinguish between nations that took a risk-based approach (basically Scandinavian nations, mainly Sweden) from nations that undertook an aggressive zero-COVID. Studies that unquestioningly make use of the SI could fall into the "garbage-in-garbage-out" trap.

The OxCGRT database seems to have been assembled in great haste and put into use *before* various countries had taken a stance on their pandemic policies. Given the speed at which the project was rolled out, a number of limitations remain. While it does a good job on some variables, on most it fails to reflect the true nature of the policies implemented.

NPIs imposts costs, and have both costs and benefits. In relation to the NPI of social distancing, in 2007, "Donald Henderson of the University of Pittsburgh Medical Center cautioned against relying on models that do not take into consideration the adverse effects or practical constraints that such public health interventions would entail. Accepting such models uncritically, he warned, could result in policies that "take a perfectly manageable epidemic and turn it into a national disaster."[57]

When we do not consider such societal impacts, we can end up in disaster, as with the advice prompted by epidemiological models that are entirely divorced from analysis of societal impacts. On 12 May 2022, one of the SAGE members in the UK admitted the failure of epidemiological models:

> Professor John Edmunds said the models were only supposed to be 'one component' of decision-making but were leaned on too much by ministers. He accepted the models failed to account for the economic harm and the knock-on health effects that lockdowns caused. Professor Edmunds admitted that these harms 'in principle' could have been factored into models 'but in practice they were not'.[58]

NPIs are not cost-less. They can impose not just economic and health costs, they can undermine the very foundation of Western civilisation by engaging human rights. Any coding system must necessarily be linked to either the costs or benefits of NPIs, or (ideally) both.

There are two options to build an NPI database: a) an agnostic measuring tool, that only considers social costs of NPIs; and b) a risk-based measuring tool that considers both costs and benefits.

3.1 Option 1: An objective tool based on the social costs of NPIs

This option would take into account only the societal impacts (costs) of NPIs. It could be compared with an objective observation of a surgery: that it cuts a hole, makes a deep cut, or saws off a limb. The tool would not consider the benefits of these actions, nor place the observations in the context of any medical information.

OxCGRT is seemingly of this type – intended to be an agnostic tool that measures the intensity of NPIs agnostically. Its codes are presumably related in some way to the costs imposed by the NPI on society. But this is not consciously built into the design.

Options for such coding include:

a) Rank NPIs based on the standardised dollar costs imposed on society (say, per million persons).

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[57] https://www.ncbi.nlm.nih.gov/books/NBK54157/#summary.s15

[58] *Daily Mail*. "SAGE models were too 'scary' and held too much weight... says lockdown architect behind them! No10 Covid expert admits death forecasts were 'eye watering' and should have considered economy", 12 May 2022, https://archive.ph/7Viff.

b) Rank NPIs on QALYs or WELLBYs lost. Lockdowns not just affect millions of people (being untargeted, broad-brush, across-society measures), they also vastly increase panic/hysteria/mental health issues in the community, so WELLBYs can be a good measure.

In such a ranking, stay-at-home mandates would have an objective value associated with each type of lockdown. Being sealed inside the house, like they did with (the fake) videos from China, could end up with a cost (say) of $1 billion per million persons per month. A stay-at-home order like Melbourne's (with a 23-hour requirement to stay at home, including an 8-hour curfew) could cost (say) $0.5 billion per month.

While we probably have sufficient information today to estimate the cost impacts for each NPI, this approach was obviously not feasible when the OxCGRT database was conceptualised. So a third, simpler option is outlined below:

c) Create a non-linear scale that broadly reflects the disproportionate impact on the community of certain kinds of mandatory policies. So, instead of values 2 and 3 for different kinds of stay-at-home orders (as used in the OxCGRT database), values 4 and 9 could be used instead. Or even squares of these (4, 9) or cubes (8, 27).

Illustratively, under this simpler option (c), the 23-hour lockdowns in Melbourne with 8-hour curfew could be coded as a 20 in comparison with Sweden's voluntary stay-at-home recommendations which could be coded as 1. Under the current system, by allocating 1 to recommended stay-at-home orders and 3 to extreme lockdowns, the Oxford database is unable to distinguish the vastly different impacts of these policies.

3.2 Option 2: A scientific, risk-based tool built on the benefit-cost ratio

This option would take into account both the societal impacts (costs) and benefits of NPIs. It could be compared with making nuanced observations of surgeries. In such a case it would consider the fact that the harms caused (cutting a hole, deep cut, or sawing off a limb) are also beneficial, therefore a good surgery would be given a score of 0. A surgery which fails to undertake the "necessary" level of cuts (e.g. which leaves behind a gangrened part) would cause greater harm than benefit despite being "less intrusive" and would be given a negative score. A surgery that cuts a good body part and causes excessive harm would be given a positive value (which would indicate it is excessive). Such a measuring tool for surgery would place the observations in the context of medical information.

For NPIs there is another level of complexity involved: the same level of intrusion can be either too little or too much in certain circumstances. A risk-matrix would need to underpin such a measuring tool. The matrix would take into account the risk, severity, harm, costs, and the science. The field of occupational health and safety (OHS) is more comparable in this case than the earlier example of a surgery. A mechanistic approach for OHS coding interventions could lead to an Index in which "testing and tagging of equipment" (such as the electrical lead of a toaster or a computer) is weighted equally with preventative arrangements for falls from heights of construction workers. But the probability of harm and magnitude of harm in these two cases is of an entirely different order, with the dollar magnitude of compensation claims (including standardised estimates of the value of a death) providing far more useful insights than any other method. Experts in OHS would probably not accept a coding system for OHS interventions which is unrelated to the risks involved.

Depending on the virus, both too little and excessive interventions can cause more harm than good (Figure 3.1). In a mild pandemic like COVID, optimal intervention could include a recommendation to increase hygiene. "No action" is unlikely to be an appropriate response in this case. For more lethal pandemics, even coercive actions could be appropriate (e.g. closure of some workplaces). But for all pandemics, lockdowns would qualify as excessive.

Figure 3.1 A risk-based framework for coding NPIs

In order to derive a cogent coding system in this case, each NPI would need to go through its own ethical and cost-benefit analysis. An act of coercion (mandatory NPIs) engages a vast set of human rights. This needs to be built into the assessment. A risk-based approach to a disease like COVID would consider its biological

characteristics of transmission, its infection fatality rate (IFR) and age-distribution of risk (heavily skewed towards the elderly). Only such analysis could yield the **appropriate** response for individual NPIs.

The entire theory of public health is about risk assessment and proportionality. Consider Australia's pandemic plan in which there is a well-graded system in place to assess the proportionality of responses. The **lowest** level of clinical severity was "Scenario one", in which:

> The majority of cases are likely to experience mild to moderate clinical features. People in at-risk groups and those with comorbidities may experience more severe illness. Strategies to support at-risk groups, once they are identified, may be required (e.g. people with underlying illness, people with immunocompromised conditions, aged care, infants, Aboriginal and Torres Strait Islander peoples, remote communities). **At the peak of the outbreak, and increasingly when transmissibility is higher, primary care and hospital services may become stretched in areas associated with respiratory illness and acute care.**

There was never a situation in Australia during the COVID pandemic in which Australia's health services were "stretched" in any way**.** The severity of this pandemic never exceeded Scenario one. Accordingly, rather mild, voluntary measures were called for.

Since stay-at-home orders do not form part of the recommendations of any pre-2020 scientific book, pandemic plan or WHO guidelines, this system of coding would code such things "out of the ballpark", i.e. at a level that exceeds any other measure.

In a hypothetical case, a risk-based approach to school closures for COVID could make the following recommendation:

- Keep schools open for younger classes where children are not affected by the disease. Schools being kept open also provides young parents (including health workers) with a place to drop off their children while they work.
- Close the higher classes of schools since children can study from home, then evaluate as soon as practical, and review the need for such closures.

Implementing this option for the OxCGRT database

In hindsight, the Oxford database design team could have queried the literature and the experts: What are the standard, well-accepted NPIs for a pandemic like COVID: NPIs for which benefits exceed harms? Such NPIs could then be coded as 0, with those which are "too little" being given negative values e.g. -1, -2, and those which are "excessive" being coded positively – each number *precisely reflecting the relevant benefit/cost ratio.*

This approach would be expected to be somewhat easier than the first one because every public health expert knew precisely the correct approach for different kinds of pandemics. Formal guidance was documented in national and state pandemic plans. Public health science required targeted restrictions to prevent high levels of harm (such as for the elderly in aged care centres), with only recommendations elsewhere. Illustratively, Victoria's 10 March 2020 pandemic plan said that "COVID-19 is assessed as being of moderate clinical severity". It took a risk-based approach and "focused on protecting vulnerable Victorians". It explained that "older Victorians and people with chronic diseases are known to be at greater risk of COVID-19 infection". And it said that it would "ramp up risk reduction activity [for] at-risk groups". Lockdowns were not even remotely part of the policy mix under such a targeted approach.

Using ball-park estimates of the benefit-cost ratio would be a relatively easy thing to implement – being the opinion of a panel of public health experts. More precise measures could also be undertaken, should resources permit (the fact that the world has spent trillions of dollars on this pandemic suggests that resources should never be a constraint for such a coding design).

3.3 Review of the OxCGRT coding system

3.3.1 *No overarching theoretical framework for measurement*

The OxCGRT codes are neither fish nor fowl. They are unrelated either to the magnitude of societal harm of an NPI or to the scientific, risk-based recommended approach for NPIs. The OxCGRT database does not, for instance, incorporate insights from the public health literature such as the WHO's October 2019 guidelines.

The term "Stringency Index" suggests a well-considered capacity to compare the "stringency" of NPIs. A knot can be just right, too tight or too loose. Likewise, stringency can be at the "correct level", "too low" or "too high". But the OxCGRT Stringency Index cannot be translated into any such categories since it has no foundation in any theory of measurement. In a risk-based approach, the **appropriate level of stringency** of an NPI depends on many factors, including the clinical severity of a pandemic - had COVID been severe, the appropriate level of stringency would have to be relatively high.

The standard science of managing pandemics is about mitigation, to ensure that we keep the burdens on the health system in check. But except for Sweden and perhaps for a couple of other nations, most declared a zero-COVID strategy: eradication of the virus from within their country. That led to polices not only unprecedented but in fact, forbidden by the public health literature. The basic question at the design stage of the OxCGRT database should therefore have been: How do we distinguish zero-COVID nations from others. Zero-COVID nations mostly followed coercive measures, the mitigation nations followed mainly voluntary measures. This distinction should have been the first port of call in the design of the OxCGRT database. However, the absence of a risk-based approach linked with the known scientific literature is evident throughout the OxCGRT database.

3.3.2 *Unable to distinguish mitigation (Sweden) from zero-COVID nations*

OxCGRT designers should have known, among other things, that lockdowns are an experiment never implemented anywhere before in the world. A key design principle of the OxCGRT database would have been to sharply distinguish lockdown effects from other effects.

A debate has raged over the past two years about Sweden which has been attacked by the media, politicians and public health officials because it allegedly took a "relaxed" approach to the pandemic compared with other nations. While Sweden ranks relatively low on the Stringency Index for most of the duration of the past two years, at times it has been coded as being more stringent than the USA. That is an absurdity.

It appears that the OxCGRT database "over-codes" Sweden which comes out among the relatively stringent countries.

Sweden's school closures (C1)

Sweden, which had most grades in school open throughout the pandemic and was cited globally as an example of a nation which kept its schools open, is coded (for C1) as a 2G which stands for "*require closing only some levels or categories, eg just high school, or just public schools*". This coding of 2 is on par with heavily stringent nations for school closures, for instance Australia's policy has been coded as 2T (targeted – i.e. in some states).

Clearly this is arguably inaccurate. Sweden's policy was both risk-based and considered options that cause the least harm. Sweden recommended that all primary and lower secondary schools (up to age 16) remain open for face-to-face teaching while upper secondary students could study from home. On the other hand, in some states in Australia, schools simply shut down and every child was forced to study from home. Australia's policy caused significant harms to children but has been given the same score as Sweden.

Not just that, a strict reading of the OxCGRT coding would allocate Sweden a score of 1G since its school policy was a recommendation but it has been coded as a mandate (2G) since most schools complied with the recommendation.

Vincenzo Alfano[59] conducted a study based on the OxCGRT database and concluded that "school closure is effective in reducing the number of people who are infected with COVID-19". Such studies, which uncritically use of the OxCGRT database, are likely to end up with not just wrong, but even dangerous recommendations. If such studies are accepted, official guidelines and pandemic plans may soon call for schools being shut down even for a virus like COVID which has virtually no impact on children's health.

The risk of COVID transmission from leaving schools open has been miniscule. A comparison by the Public Health Agency of Sweden in June 2020 (which continued with face-to-face schooling till upper secondary, i.e. till age 16) showed no statistical difference in paediatric COVID cases and no increased risk to teachers compared

[59] The Effects of School Closures on COVID-19: A Cross-Country Panel Analysis, Applied Health Economics and Health Policy volume 20, pages223–233 (2022), https://link.springer.com/article/10.1007/s40258-021-00702-z.

to other professions.[60] Statista shows a total of 23 reported deaths from COVID of children below the age of 19 through 13 April 2022 in Sweden.[61] Data from various countries confirms that very few of these children are likely to have died directly from COVID, as most had serious co-morbidities. For a risk of this insignificant magnitude, similar to or lower than from the flu, there was never any reason to shut down schools anywhere in the world. But misguided use of the OxCGRT database could doom the education of children to an excessive response from governments even in the future.

International border closures (C8)

Another example of over-coding of Sweden is for the component C8, or international border controls.

On 30 March 2020, CNBC reported: "Unlike its immediate neighbors Denmark, Finland and Norway Sweden has not closed its borders or its schools"[62]. On 21 April 2020, Anders Tegnell said: "Closing borders, in my opinion, is ridiculous, because COVID-19 is in every European country now"[63]. On 3 June 2020, Al-Jazeera published a chart which showed (Figure 3.2) Sweden as having open borders (green).

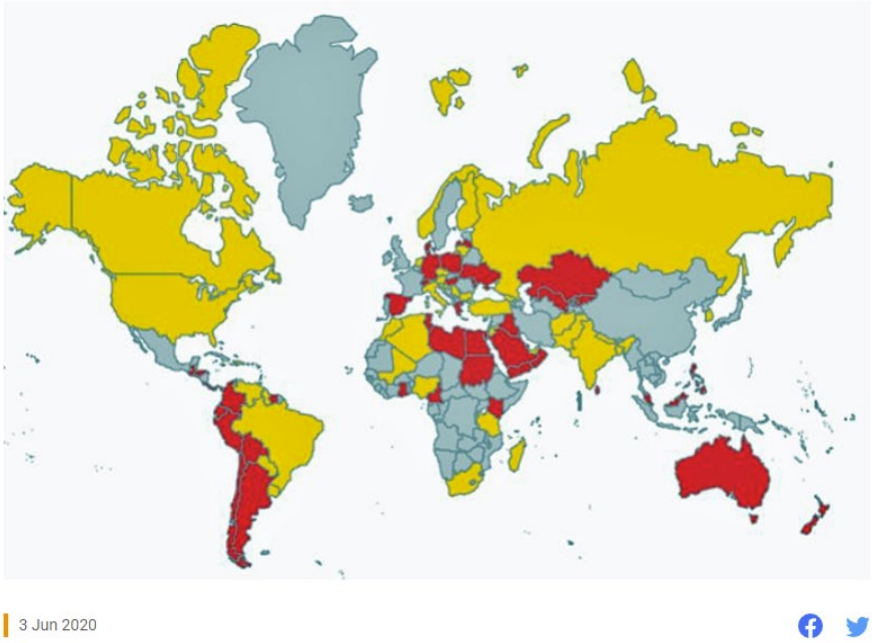

Figure 3.2: Chart published by Al-Jazeera on 3 June 2020, showing countries with open vs. closed borders

Nevertheless, Sweden has been coded as 3 on C8, suggesting that Sweden had major border closures for much of the duration of the pandemic.

It is true that since 19 March 2020, a ban applied in Sweden to "all foreign citizens travelling to Sweden from all countries except EU Member States, the United Kingdom, Norway, Iceland, Liechtenstein and Switzerland". But as a 17 April 2020 news report clarified: "Swedish citizens are not affected by this measure, pointing out that the entry ban does not prevent travel within the EU". In comparison with Australia where both incoming and outcoming travel was banned for over two years, the ability of Swedish citizens to travel within the EU would have provided significant mental comfort to its citizens. The ordinal scale value of 3 for Sweden on this measure over-states the actual restriction. In due course, Sweden extended the list of countries from which foreigners might enter, but it continued to be coded as 3.

[60] Public Health Agency of Sweden (2020). Covid-19 in schoolchildren: A comparison between Finland and Sweden, https://bit.ly/3MTJ1vI.

[61] Statista. "Number of coronavirus (COVID-19) deaths in Sweden, by age groups", as of 13 April 2022, https://bit.ly/3GdsCjd.

[62] https://www.cnbc.com/2020/03/30/sweden-coronavirus-approach-is-very-different-from-the-rest-of-europe.html

[63] https://www.nature.com/articles/d41586-020-01098-x

Stay-at-home orders (C6)

The code for C6 ranges from 0 to 4. On many days, e.g. 8 November 2020, the code allocated for the stay-at-home component (C6) in Sweden and Australia is the same (1G). But Sweden never had stay-at-home orders. A recommendation to work from home where possible is definitely not a stay-at-home order – which applies to all persons and all workplaces. An approach by which a work from home recommendation (not mandate) is treated equivalent to a stay-at-home *order* is incorrect. This becomes even more of a concern when we note that Australia's policymakers were drumming up hysteria on a daily basis throughout 2020 and 2021, calling COVID a once-in-100-year event[64], while in Sweden, Anders Tegnell was calming down the people. The level of irrationality and hysteria across Australia was astronomically higher than in Sweden.

Further, Melbourne gets a rating (2) for most of the duration of its lockdowns in the OxCGRT sub-national database but its restrictions were enormously harmful. Restrictions of 23 hours including a 9-hour curfew with a 5 km border as well as a "ring of steel" around Melbourne were extremely severe in their impact. Saying that Sweden had a restriction of 1 and Melbourne a restriction of 2 makes no sense.

3.3.3 *Mandatory vs. recommended NPIs conflated*

Currently the database codes "no measures" as 0, whereas such inaction probably represents a failure of the public health response and should probably be coded negatively, such as -1. The codes often conflate recommendations with mandates, unable to distinguish between them in terms of any objective magnitude of harms. This tends to bias the database towards more restrictive policies.

- The coding considers recommendations which are complied with by the community to be mandates. The fact that Public Health Agency of Sweden had developed a relationship of trust with the community is ignored, and recommendations are coded as if these were mandates.
- Recommended measures allow people to carry on with their life, with precautions. They are not asked to produce justification for their presence on the streets. They are not fined, beaten, or arrested for moving about. Likewise, a mask recommendation is a peaceful suggestion to our good sense. But with a mask mandate people are fined, or worse – beaten up by the police – which is detrimental to community wellbeing. Recommended NPIs are classified as 1 in most cases in the OxCGRT database. But such recommendation are probably best coded as 0, particularly for the COVID pandemic. Voluntary measures (such as governmental recommendations, information campaigns, access to mass testing, voluntary social distancing) should not have been coded higher than 0.
- A mandated policy is backed by the brute force of the police. It is an act of violence by the state on the community on the basis that it is for their own good. But just like we can't go about assaulting people except in self-defence, there is a much higher (human rights) standard for the application of force by the government. The OxCGRT database tries to capture this difference – to an extent. Consider a government (e.g. Sweden) which recommends that people work from home where possible and another (e.g. Australia, India) which uses the police to ensure that no one is in the streets. The OxCGRT database codes the first of these as 1, the second as a 2 or 3. But the relative impact on society of these measures is vastly different – by an order of magnitude.

3.3.4 *Procedural shortcomings and complexities*

- Coding inconsistencies. A small army of volunteers across the world does the coding, so some inconsistencies are inevitable. For instance, it appears in the coding for Hungary for C7 that some volunteers have conflated C7 with C6. Such errors can potentially be ironed out – albeit at a great cost of time and effort.
- NPIs that were implemented don't fit the codes: It is impossible to specify the varieties of distinctions that can be made in different contexts with NPIs. But the differentiation built into the codes is often either not sufficient, or in some cases, misleading.

[64] https://www.sabhlokcity.com/2022/06/list-of-statement-by-politicians-media-and-academics-comparing-covid-with-spanish-flu/

- Complexity of directions: There have been many cases of businesses and not-for-profit organisations not being able to grasp the implications of official directives that are worded in complex and convoluted bureaucratic language.
- Coding errors: It is unclear whether there has been any diligent check on coding. But during the process of sub-national coding for Australia, Sanjeev Sabhlok found enormous errors which – if replicated elsewhere in the world – make the database almost entirely unusable. For instance, for C8 (International travel controls), most volunteers had coded Queensland as "2" since March 20-2020 because the state required a quarantine for arrivals. They entirely ignored the fact that Australia's borders had been sealed tight and shut both ways (foreigners could not enter Australia, nor Australians leave the country). This was a restriction that should have been coded far greater than 4 (if such an option existed), but most volunteers missed even that, thus making mincemeat of the database. Someone using this database will think that Australia had very mild border restrictions even though the magnitude of its restrictions competed with North Korea's.

3.3.5 *Examples of problems with specific codes*

Masks H6

The masking component is largely unusable since the most fundamental question is not asked: the kind of mask that is required or recommended. Since COVID largely spreads by aerosols, not droplets, the distinction between masks becomes even more important. Only a tightly fitted N95 mask can provide any theoretical protection against aerosol-driven viruses. But there again, any meaningful impact would only occur in high-risk settings. The only thing that mask mandates outdoors (coded as 4) can tell us is about the state of hysteria in society. Later in this paper we use this code (H6) mainly because it provides information about the indiscriminate over-reach of the government: not because it meaningfully identifies the impact of masks.

The masks policy (H6) is hard to code (and this is not just about the lack of specificity about the kind of mask). For example, on 7 August 2020 the guideline of the Australian Capital Territory[65] stated: "Masks are not required in the ACT". We could assume, then, that the code 0 ("no policy") should apply. But that would be incorrect since there *is* a policy on masks. Further, the government seems to believe that masks work. They claim that "masks are just one line of defence against COVID-19" (which means they work). And they recommend its use under certain circumstances (e.g. if you have COVID-like symptoms such as coughing and sneezing, and need to leave your home for an essential reason, are in quarantine or self-isolation and need to leave your home for medical attention, etc.).

Schools C1

For schools (C1) the coding design is largely unusable, as well. The code 2 "*require closing (only some levels or categories, eg just high school, or just public schools)*" is fundamentally problematic, being unrelated either to social costs or to risk. There is a vast difference between requiring senior classes to study online from home and requiring little children in primary school to do so. Equating entirely different policy interventions confounds this code. The code "1" for C1 is also problematic. For instance, by 2 June 2020, all schools in the Australian Capital Territory returned to face-to-face education. A range of relatively mild measures were implemented including a "school cleaning plan" to ensure regular cleaning of high-touch surfaces, and strong social distancing requirements for those over the age of 25 including parents. For the most part, schools operated normally during this period. Since these (particularly mild) measures are not "no measures", these have been coded in the database as 1. But in a risk-based system, such measures would have been coded as 0 since these are not excessive or costly.

[65] https://web.archive.org/web/20200807205624/https://www.covid19.act.gov.au/stay-safe-and-healthy/protect-yourself#Using-masks-latest-advice

On 5 August 2020, in Queensland[66], it was stated that while schools are open, "Physical distancing measures between adults remain in place". It is unclear whether these were mandatory, nor is it clear whether these qualify as "significant", but most volunteers have coded this as 1 in the OxCGRT database.

There is ambiguity in the coding. Consider the code 1 for C1: "recommend closing or all schools open with alterations resulting in significant differences compared to non-Covid-19 operations". If a government recommends closing its own (i.e. government) schools, it amounts to a mandate and private schools would find it hard to remain open in the presence of such a recommendation – but for them it is still not a mandate. Similarly, the NPI of schools being open with alterations can mean many kinds of alterations, some of which cause significant harm. The word "significant" is not well-defined so subject to interpretation of the volunteer who creates the code.

Working from home C2

For C2 ("recommend closing (or recommend work from home) or all businesses open with alterations resulting in significant differences compared to non-Covid-19 operation") a non-binding (non-enforceable) recommendation is considered equivalent to businesses being open but with significant (mandatory) "alterations". These two cannot be treated on par, since "alterations" cause severe additional economic and wellbeing harm, while "recommendations" do not.

Income support E1

Consider E1 (income support). In this case, during April 2022, there was no Victorian direct cash payment to people who lost their jobs or couldn't work due to COVID. However, emergency accommodation was available to people in Victoria who need support to quarantine or isolate safely because of a COVID-19 diagnosis or a close contact. Food and essential items support were also available but only for the most vulnerable and in need. Any such support was likely to be well below 50% of someone's salary but not entirely zero. Coding options for such a situation do not exist, so many volunteers have coded it as 1 ("government is replacing less than 50% of lost salary"), but this is likely to mislead.

International travel controls C8

Consider C8 (international travel controls) for which the options include 0 - no restrictions, 1 - screening arrivals, 2 - quarantine arrivals from some or all regions and 3 - ban arrivals from some regions. During April 2022, in Australia[67] there continued to be screening of all international arrivals into Australia with a ban on the unvaccinated (Australian permanent residents and citizens can travel to Australia regardless of vaccination status). Australian citizens/ permanent residents who enter without vaccine "may need to complete a mandatory quarantine period", but the code has no scope to reflect this information.

Aged care H8

Consider the coding of H8 (Aged care) in the Northern Territory. The 19 August 2021 "COVID-19 Directions (No. 48) 2021: Directions for Aged Care Facilities"[68] were amended on 24 December 2021. In this, there is a distinction between vaccinated and unvaccinated visitors: "a person who does not have an up-to-date vaccination against influenza". Since this refers to the flu and not the COVID vaccine, this is treated by some volunteers as 1, others as 2, and some treat this as a vaccine differential policy, others not.

Public event cancellations C3

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[66] https://web.archive.org/web/20200805000838/https://qed.qld.gov.au/about-us/news-and-media/novel-coronavirus/frequently-asked-questions-for-parents

[67] https://web.archive.org/web/20220513015836/https://www.smartraveller.gov.au/covid-19/covid-19-and-travel/covid-19-re-entry-and-quarantine-measures

[68] https://web.archive.org/web/20220316133759/https://coronavirus.nt.gov.au/__data/assets/pdf_file/0004/1079482/cho-directions-no141-of-2021.pdf

There are an array of public event orders which do not fit neatly into "2 - require cancelling" or "0 - no measures". In such cases, volunteers have coded as 1, which conflates a large number of measures.

3.3.6 *Stringency Index weights probably don't help*

The weakness of OxCGRT coding are compounded by weighting the 9 components of the Severity Index almost equally. This distorts things further.

- For example, it makes little sense to weigh public transport restrictions in the Stringency Index equally with stay-at-home restrictions. Stay-at-home restrictions affect an entire city or nation while public transport restrictions affect only those who use it. The negative impact of stay-at-home restrictions is for the entire day, while public transport restrictions impact people only for a short duration. And people can use alternatives like a personal car (which they did), but there is no option available when one is locked for 23 hours inside the house, with an 8-hour curfew at night, and allowed to go out for one hour within 5km of the house – and when international borders and states borders are also closed.

The uncorrected SI distorts reality, like a carnival mirror. We propose a way out by which the OxCGRT work (which is enormous) and the SI can be put to some meaningful use.

3.4 Retrieving value from the database: Sub-Stringency and Lockdown indices

Foster and Sabhlok (2022) proposed that a sum of C2, C6, C7 and H6 (Workplace closing, Restrictions on internal movement, Stay at home requirements and Facial Coverings) could potentially provide a meaningful measure of the severity of lockdowns. This index can be called **Sub-Stringency**. The components C6 and H6 have shortcomings, as noted above, but these are included because there is nothing better to use.

Mask mandates are among the most the most intrusive and physical manifestations of the power of the State over the people. Nothing says: "I the government control your life", as much as mask mandates outdoors in open parks, enforced through brute force (this happened even in so-called Western nations, such as Australia, with Melbourne seeing innumerable police brutalities in the name of public health). Not wearing a mask outdoors publicly signalled "disobedience", enabling the police to identify and pounce on the disobedient. Further, when people saw others wearing masks, it must have increased overall panic and hysteria. Due to this ability to proxy the level of hysteria in a society, these (H6) are included in the Sub-stringency index.

Samir Bhatt of Imperial College, London considers that mandatory mask wearing cannot be part of lockdowns[69]. The issue here is of the severity and panic that is experienced by people – and we consider that police-enforced mask mandates should form part of the model of "lockdowns" that people actually experience during the pandemic. To control for the fact that the ordinal scale of the OxCGRT database does not recognise the non-linearities involved, the regressions in this paper will also cube the Sub-stringency index.

A further index has been proposed in this paper, the **LockDown index**. It is the sum of C2 and C6. Figure 3.3 shows that this index can better distinguish the risk-based, less mandatory approach of Sweden and other Scandinavian nations, compared with the Stringency Index.

[69] "The authors define lockdown 'as the imposition of at least one compulsory, non-pharmaceutical intervention'. This would make a mask wearing policy a lockdown," Bhatt said in a statement. "For a meta-analysis using a definition that is at odds with the dictionary definition (a state of isolation or restricted access instituted as a security measure) is strange" - https://www.webmd.com/lung/news/20220204/lockdowns-covid-deaths-study

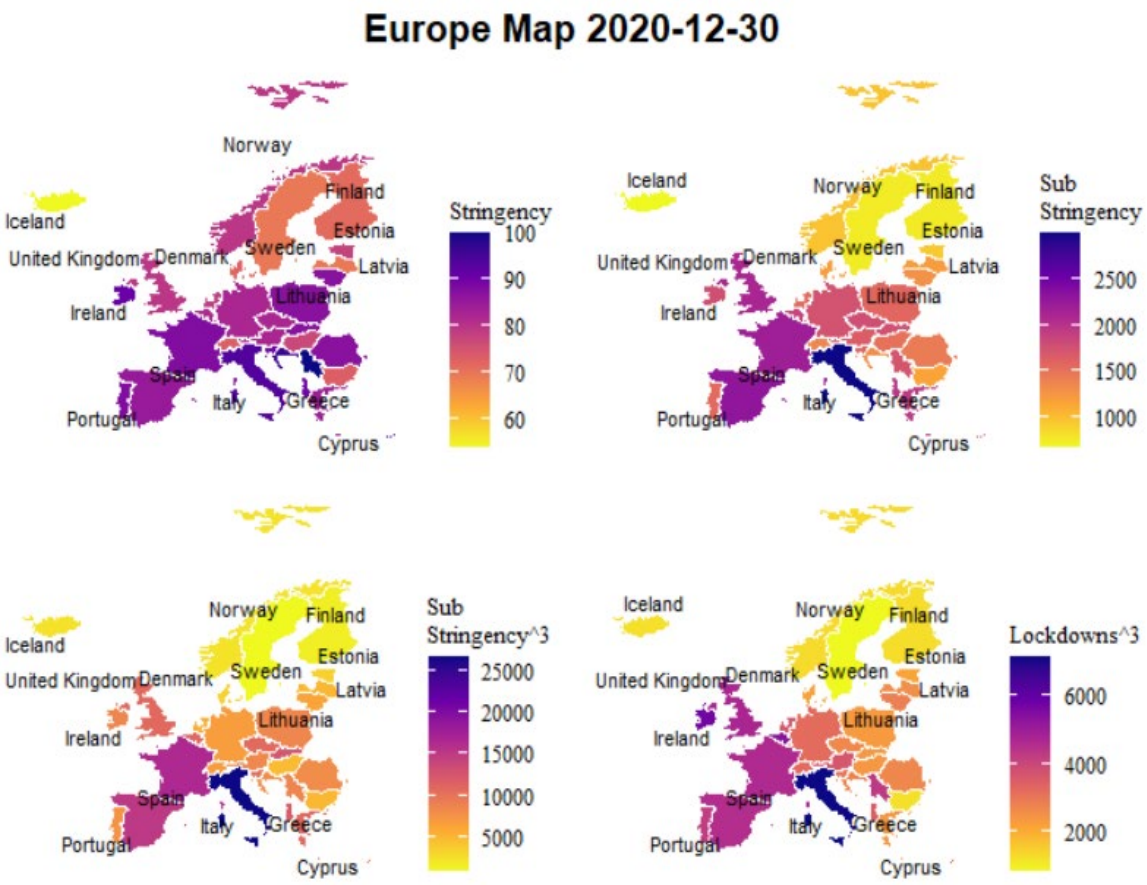

Figure 3.3: Comparing the impact of the Stringency Index, Sub-stringency index and Lockdown indices in Europe.

The chart on the top left-hand corner of Figure 3.3 is based on the uncorrected Oxford Stringency Index, the one on the top right hand uses the Sub-stringency index. The third one (bottom left) cubes the Sub-Stringency, and the fourth chart (bottom right) depicts the Lockdown index. Neither is perfect but SI is clearly inconsistent with the narrative in the media about Sweden.

The map of the world in Figure 3.4 is based on Sub-stringency cubed. This is closer (although still imperfectly) to the reality experienced by the people of these nations, than the direct use of the SI.

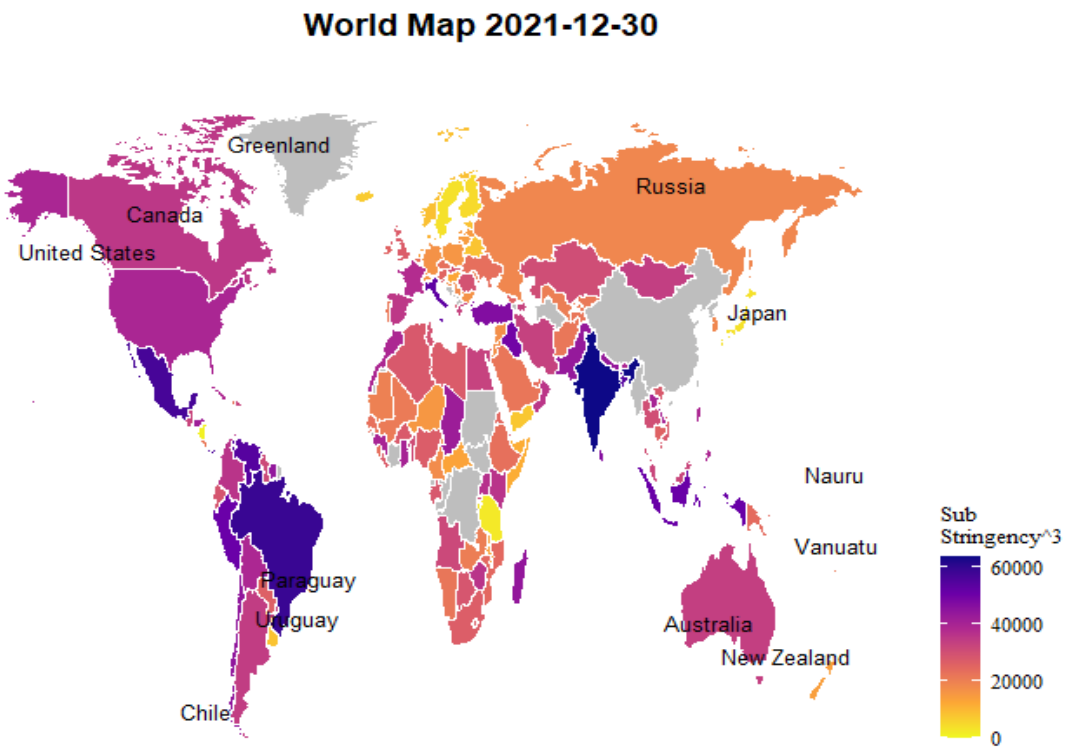

Figure 3.4: The world's Sub-stringency (cubed) index, summed since February 2020 to December 2021

4. Part 2: Assessing the impact of lockdowns on covid deaths

In this section we undertake OLS regressions to identify the impact of two policy variables: **vaccine uptake** and **lockdowns** (mandatory NPIs), on COVID death rates in Europe and across the world.

Data from Worldometer is used in these calculations as a proxy for COVID deaths, keeping in mind the weaknesses pointed out earlier. Relevant vaccine data from Our World in Data (OWID)[70], the OxCGRT database, and other relevant datasets were extracted and merged into a large data set (~82MB).

4.1 Identification of the control variable/s

The first step was to identify one or more independent variables which impact COVID death rates – so we could isolate the effect of the two policy variables. For this, the raw correlations and correlation matrix was considered.

4.1.1 *Correlations for Europe*

Some of the correlates of COVID deaths (from Worldometer) in 2020 and 2021 in Europe are illustrated in Figure 4.1.

Correlation - Europe - Total deaths per million - 2020-12-30

Variable	total_deaths_per_million
date_first_death_days	-0.4070428
latitude	-0.3561210
diabetes_prevalence	-0.1297926
cardiovasc_death_rate	-0.0769702
gdp_per_capita	-0.0729270
human_development_index	-0.0709198
life_expectancy	0.0629080
obesity_prevalence	0.1415056
extreme_poverty	0.1673838
stringency	0.2239225
lockdowns	0.4053529
median_age	0.4152708
population_density	0.4211077
lockdowns_cubed	0.4524311
sub_stringency	0.4923267
sub_stringency_cubed	0.4944718
people_fully_vaccinated_per_hundred	NA

Correlation - Europe - Total deaths per million - 2021-12-30

Variable	total_deaths_per_million
people_fully_vaccinated_per_hundred	-0.7198844
life_expectancy	-0.6166721
human_development_index	-0.5655302
gdp_per_capita	-0.4859389
latitude	-0.3772373
lockdowns_cubed	-0.0403744
lockdowns	-0.0396702
population_density	0.0126181
diabetes_prevalence	0.0593467
date_first_death_days	0.1492891
sub_stringency	0.1907932
stringency	0.2094245
sub_stringency_cubed	0.2591879
extreme_poverty	0.3582585
obesity_prevalence	0.4297658
median_age	0.4523546
cardiovasc_death_rate	0.5725272

Figure 4.1: Illustrative correlates of COVID deaths for Europe

The correlations for lockdown variables in Figure 4.1 are clearly in the opposite direction to what has been claimed by politicians and the media since the 24 February 2020 WHO report came out. Raw correlations suggest that the more stringent the lockdowns, the more the COVID deaths.

Scatterplots were then considered for key variables for Europe (Figure 4.2, Figure 4.3).

[70] https://ourworldindata.org/covid-vaccinations

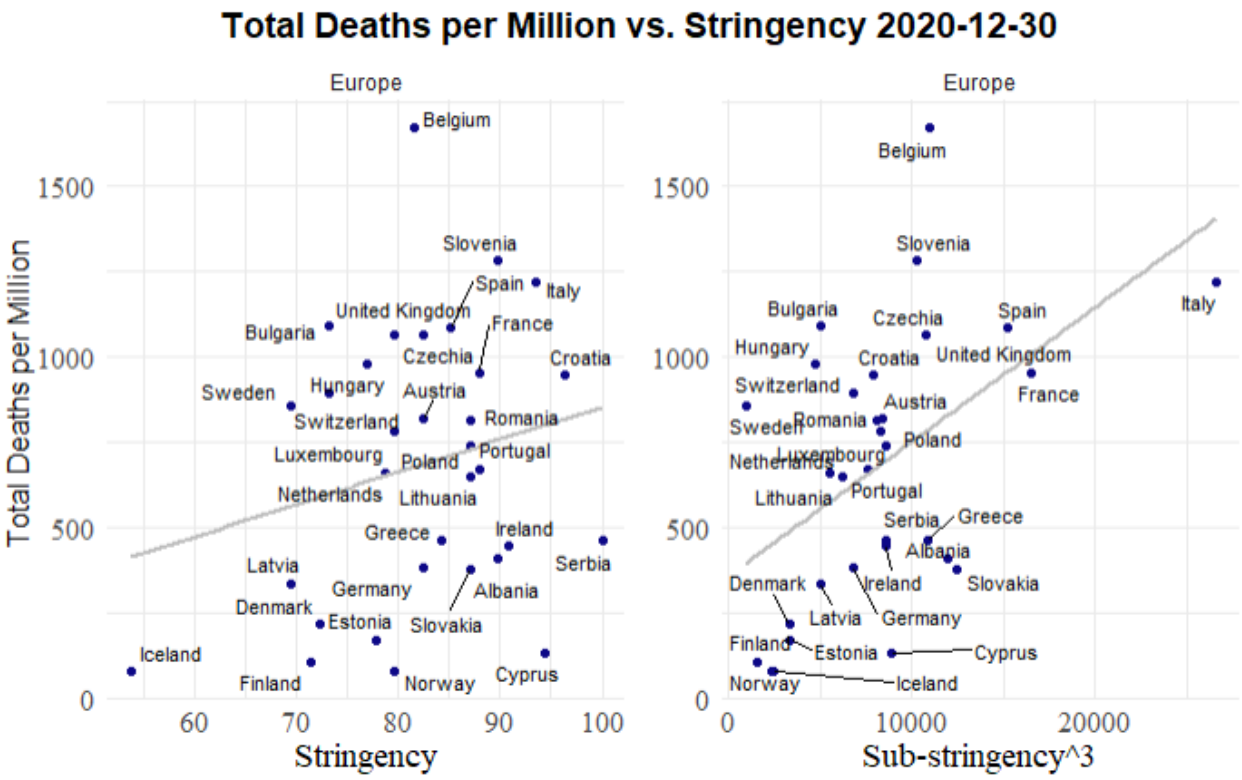

Figure 4.2: Scatterplot for the Stringency Index and Sub-stringency cubed, Europe, as at 30 December 2020

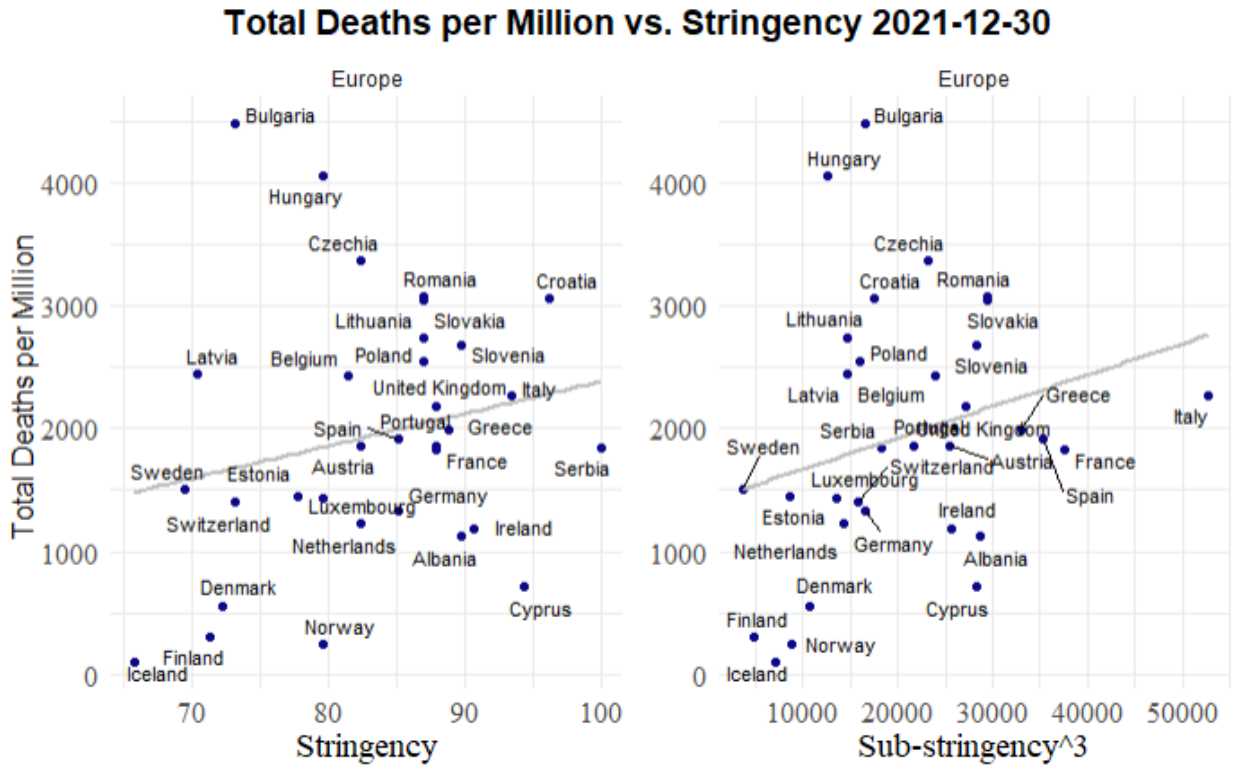

Figure 4.3: Scatterplot for the Stringency Index and Sub-stringency cubed, Europe, as at 30 December 2021

4.1.2 *Correlations for the world*

Thereafter correlations were considered between relevant variables for the whole world (Figure 4.4).

Correlations - World - Total deaths per million - 2021-12-30

Variable	total_deaths_per_million
extreme_poverty	-0.4718384
date_first_death_days	-0.1917820
cardiovasc_death_rate	-0.1441773
population_density	-0.0852757
diabetes_prevalence	0.0623282
people_fully_vaccinated_per_hundred	0.0642464
sub_stringency_cubed	0.0743003
sub_stringency	0.1679505
stringency	0.1801596
gdp_per_capita	0.1878911
lockdowns_cubed	0.2306175
lockdowns	0.2500879
latitude	0.4063262
obesity_prevalence	0.4391924
life_expectancy	0.4545279
human_development_index	0.5185698
median_age	0.5813696

Figure 4.4: Correlates of COVID deaths in across the world

Likewise, scatterplots were considered for the world (e.g. Figure

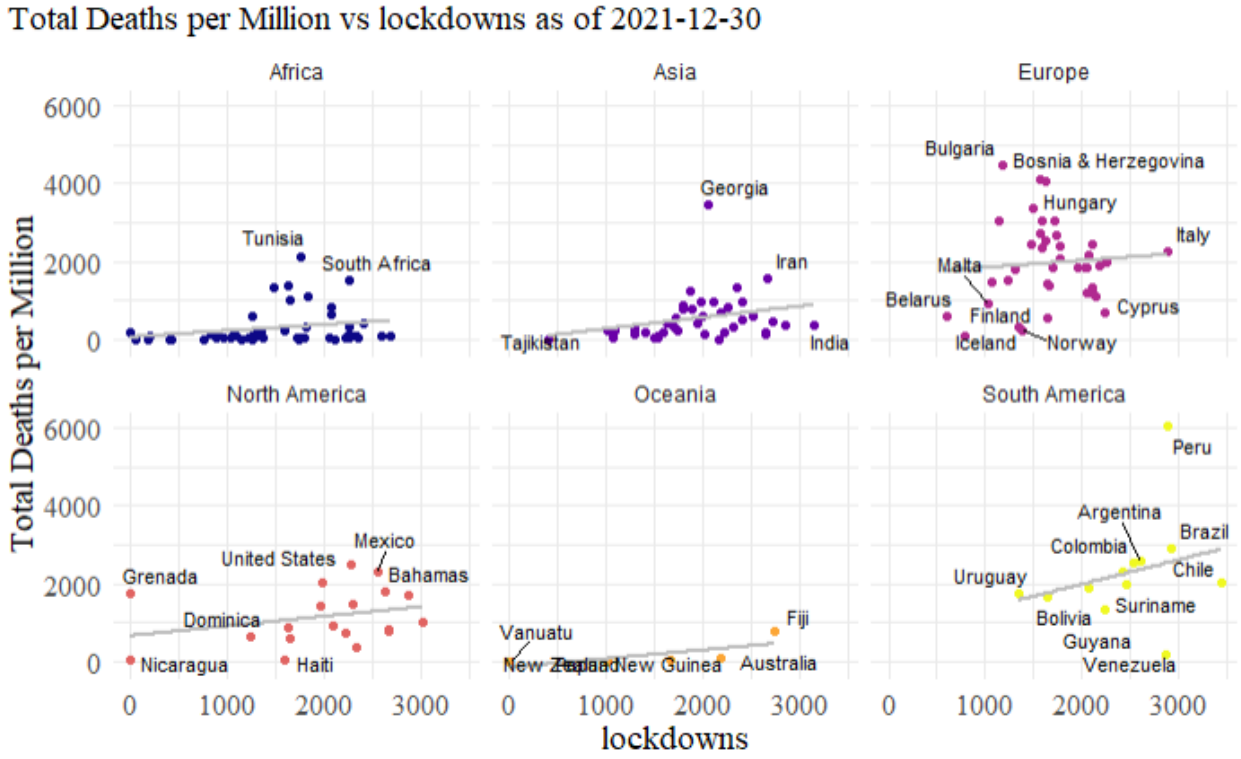

Figure 4.5: Scatterplot for lockdowns as at 30 December 2021, major continents

When consdiered globally (Figure 4.5), the correlation between lockdown stringency and COVID deaths drops a little, but the direction is still the opposite of what policy makers have argued during the pandemic.

4.1.3 *Correlation matrix*

The correlation matrix (global) for the variables shortlisted for this study is provided below:

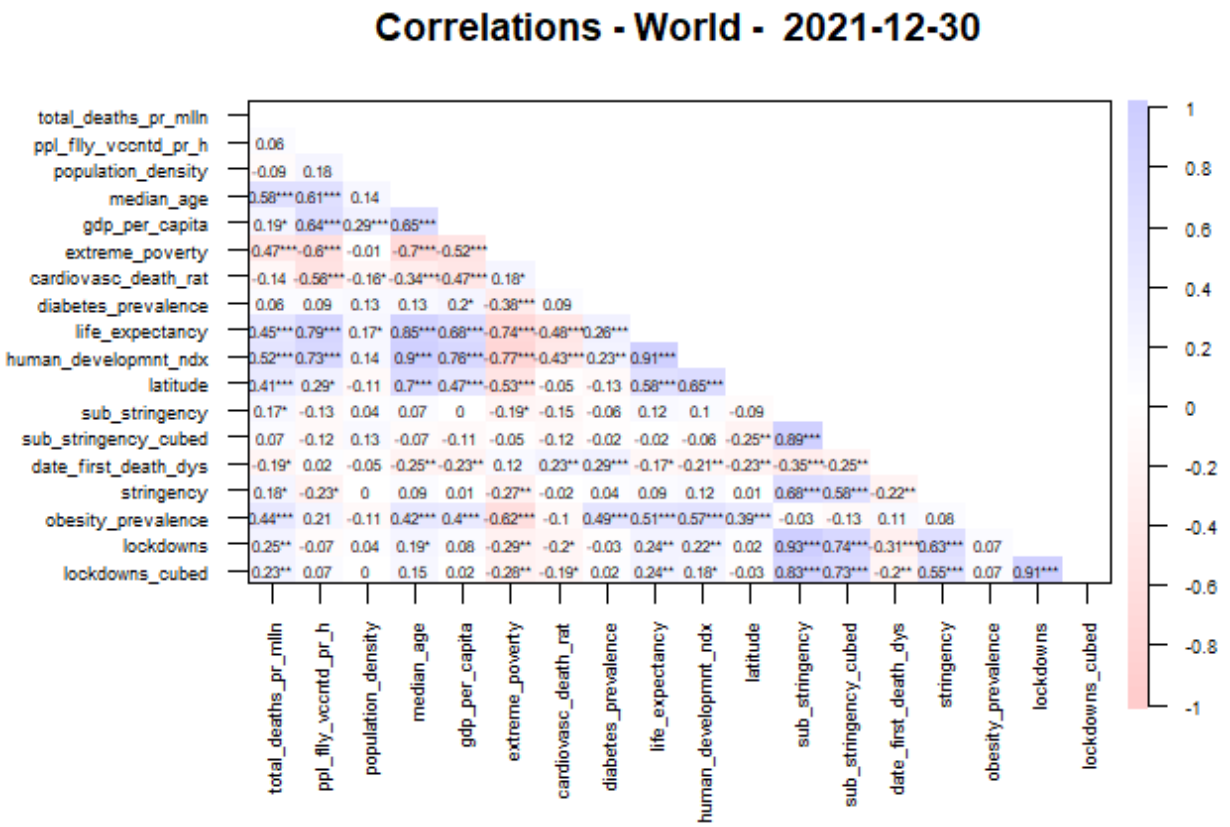

Figure 4.6: Correlation matrix between shortlisted variables to help determine suitable independent variable/s

It is well understood that COVID causes exponentially greater harm to the elderly. The population structure or the proportion of elderly in a society should generally be a good predictor of the level of COVID deaths per million. Related variables include life expectancy and median age. It turns out that these two variables are also intricately linked to a number of economic and health variables (human development index, obesity) – which indicate the level of development in a society. On the flip side, the extreme poor have significantly lower diabetes and obesity.

Given that so many development-related variables belong to this family of variables, we consider that it is best to just include one. For that purpose, the **median age** variable, which has the best correlation overall with the COVID death rate, is included in this study as the single **control variable**.

4.1.4 *Shortlisted variables that did not make the final cut*

A fundamental problem is that variables which are closely correlated will disrupt the regressions. That, as well as other theoretical factors outlined below, have led to the following shortlisted variables being dropped from consideration.

- **Population density** seems to be correlated in 2020 but not in 2021. We have also decided not to use this variable since its theoretical predictive capacity is unclear. It seems self-evident that a respiratory virus will spread more densely inside heavily populated tall multi-storied buildings or in dense indoor marketplaces, but people do not live densely in most countries. Even in Bangladesh, with its high population density, most people live in wide open spaces in villages.
- **Latitude** was shortlisted since it might capture the effect Vitamin D deficiency. But latitude correlations have a sign that is contrary to what is expected (higher latitudes are correlated with fewer deaths). This suggests that this variable is picking up something else (e.g. income/ quality of the health care system), not Vitamin D. We have therefore excluded latitude.

- **Obesity:** It appears in the USA, in particular, that mortality was higher than in many countries because of its high levels of obesity. But obesity is correlated to other economic development variables, we have therefore excluded it from the final regressions.

4.2 Equation for the final regressions

We ran five regressions each for Europe and the world based on the following generic equation.

$$Death/million = median\ age + vaccine\ uptake + [Stringency/Lockdown] + \delta$$

The only thing that changed each time was the relevant stringency/lockdown variable. The cube of the stringency variables is considered in two out of five regressions in order to reflect the fact that higher values of stringency are disproportionately more impactful (harmful to society).

Detailed results including correlation matrices and variance inflation values (VIF)[71] are available here. The results are summarised in the tables below.

Final regressions for Europe till 30 December 2021

The summary of the coefficients of the regressions for Europe is presented in Table 4.1. Significance codes: *** (0.001), ** (0.01), * (0.05)

Regression	Intercept	Median age	Stringency/Lockdown variable	Vaccine uptake	R^2
1. Stringency	-707.67	117.75	17.51	-56.19 ***	0.6106
2. Sub-Stringency (C2, C6, C7 and H6)	1789.4914	84.7404	0.2071	-62.1543 ***	0.6214
3. Sub-stringency cubed	1416.10926	98.12522	0.01730	-59.25770 ***	0.618
4. Lockdown (C2 and C6)	2351.5108	75.1486	0.5352	-66.9363 **	0.6228
5. Lockdown cubed	2302.97020	85.27000	0.08334	-68.00309 **	0.6258

Table 4.1: Regressions summary for Europe

Final regressions for the world till 30 December 2021

The summary of the coefficients of the regressions for the world is presented in Table 4.1.

Regression	Intercept	Median age	Stringency/Lockdown variable	Vaccine uptake	R^2
6. Stringency	-3370.996 *	92.352 ***	26.908	-14.089	0.2322
7. Sub-Stringency (C2, C6, C7 and H6)	-2238.9738 *	99.5122 ***	0.2485	-16.6467 *	0.2379

[71] A VIF > 5-10 indicates an issue with cross-correlation. The final regressions included in this study all have a VIF well below 5.

8. Sub-stringency cubed	-1820.52617 *	100.42574 ***	0.02241 *	-16.94625 *	0.242
9. Lockdown (C2 and C6)	-2156.7330 *	99.1117 ***	0.5375 *	-17.2339 *	0.242
10. Lockdown cubed	-1652.78407 *	100.58525 ***	0.07061 *	-19.56095 *	0.2528

Table 4.1: Regressions summary for the world

Interpretation

The European sub-sample seems to show that median age is not significant. That's likely because median age doesn't vary as much in this group of nations. Further, the high R^2 for Europe is likely due to there not being much dispersion in the nations (all had a high death rate, on average).

The last regression (for the world) with lockdown sub-index (cubed) shows the best results for global analysis. It has a bit higher R^2, and the coefficients are more significant. In summary, result No. 10 confirms that lockdowns have increased COVID deaths globally, albeit by a very small amount.

The other take-away is that vaccines have helped reduce COVID deaths, albeit by a relatively modest amount.

4.3 The case of the United States of America

It would be useful for a future project to run similar regressions for the USA from the OxCGRT database. Assembling the relevant variables (median age/ vaccine uptake) for the USA is beyond the scope of this project. However, there are some indications that the results would not be significantly different from the global analysis, above.

4.3.1 *Assessment using the Maryland University index*

We have conducted a simple correlation analysis of the Maryland University index (cited earlier) in Figure 4.7, to compare the death rates in USA with stringency of lockdowns as determined by the Maryland Mobility and Social Distance index. This strongly suggests that lockdowns increased COVID deaths, even in the USA.

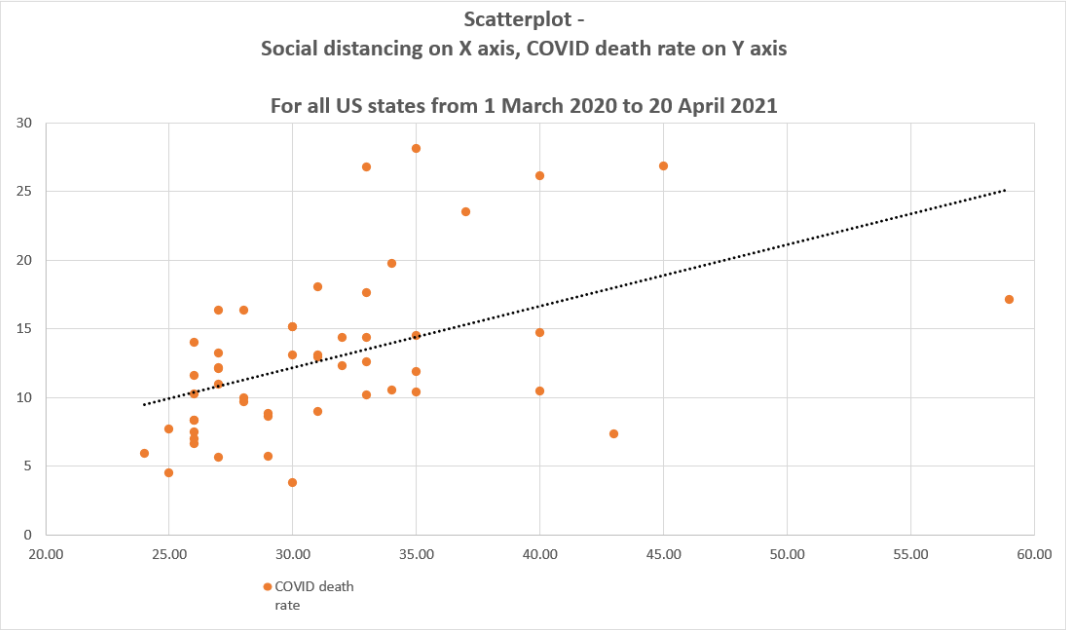

Figure 4.7: Scattergram of COVID death rate against the Maryland Mobility and Social Distance index[72]

4.3.2 *Assessment using CDC data*

Figure 4.8 (as reported on Twitter[73]) seems to further confirm the above results even for the USA. In this case, the Democratic states seem to have had higher COVID death rates despite having more stringent lockdowns.

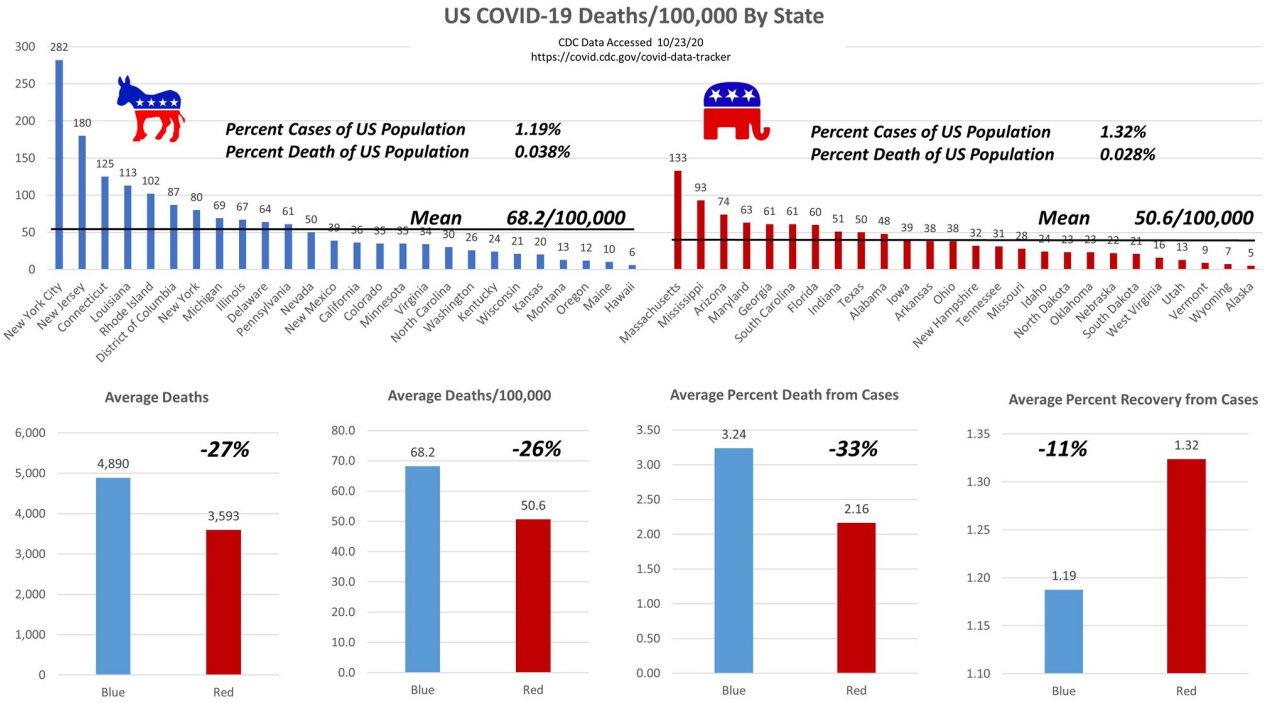

Figure 4.8: Comparison of Democratic states vs Republican, USA, as at 23 October 2020

4.4 Distinguishing correlation vs. causation: Testing for reverse causality

Tim Harford argued on 21 October 2021 that "lockdowns don't cause waves of Covid. Waves of Covid cause lockdowns. … It is all too easy to cherry-pick treacherous statistics to argue that lockdowns cause Covid."[74].

He cites the example of the UK and New Zealand. In doing so he makes a different kind of an error: of cherry-picking data to prove his point. Factors at work in Australia and New Zealand in March 2020 (in a late stage of summer) were different to factors at work in the UK (early stage of autumn/winter). The more appropriate comparison in this case, which controls for the weather, would be between European nations, particularly Sweden and the UK, which we have already outlined earlier.

Nevertheless, this is still a vitally important question that must be resolved. It is possible that governments increase the severity of lockdowns when COVID deaths increase? As Lally notes in his 2022 paper[75]:

> One possibility is that reverse causality applies, i.e., the choice of policy is influenced by the death rate as well as the death rate being affected by the policy choice. The Appendix investigates this possibility and concludes that it does not operate.

[72] Source: https://data.covid.umd.edu, Data is available at: http://sanjeev.sabhlokcity.com/Misc/Maryland_data.xlsx

[73] Source: https://twitter.com/RealScienceMat2/status/1319818688837672962

[74] https://timharford.com/2021/10/a-nobel-memorial-prize-for-turning-statistics-into-insight/

[75] https://link.springer.com/content/pdf/10.1007/s40592-021-00148-y.pdf

At a higher level we can easily rule out reverse causality since we know that except for a couple of jurisdictions, in most countries across the world, lockdowns were imposed in anticipation of a possible wave of COVID. It was models which determined lockdowns, not actual cases.

Reverse causality has been tested by many authors, using different methods:

4.4.1 *Excluding jurisdictions with heavy case loads*

Donald L. Luskin noted on 1 September 2020:

> It could be that strict lockdowns were imposed as a response to already severe outbreaks. But the surprising negative correlation, while statistically weak, persists even when excluding states with the heaviest caseloads.[76]

4.4.2 *Using an instrumental variable*

As reported by Martin Lally (2022), Gibson[77] "uses average stringency in other countries within the same OECD group as an instrumental variable, to test for reverse causality between stringency and death rates, and finds no evidence of reverse causality"[78].

4.4.3 *Can early stage death rates explain stringency?*

Martin Lally (2022)[79] conducted the following analysis of reverse causality:

> The traditional method of dealing with this is to use an "instrumental variable", but no good candidates are apparent. I therefore enquire into the extent of these problems".
>
> I regress its Stringency value ten days after its first reported death S_{10} on its death rate up to that point D_{10}, to assess whether D_{10} can explain S_{10}. I repeat the process for 20 and 30 days after each country's first death. I also test whether any of these three early stage death rates can explain the maximum S value chosen by governments S_m.
>
> These regressions yield the results shown in the first six columns of Table 6 below. Only two of these regressions even yield a positive coefficient on early death rate and none of them yields a statistically significant coefficient on it. So, the hypothesis that early stage death rates did not affect governments' choice of *S* cannot be rejected.

Table 6 Stringency levels and death rates

Dep Var (DV)	S_{10}	S_{20}	S_{30}	S_m	S_m	S_m	D	D	D
Indep Var (IV)	D_{10}	D_{20}	D_{30}	D_{10}	D_{20}	D_{30}	D_{10}	D_{20}	D_{30}
Mean DV value	68	77	79	81	81	81	198	198	198
Mean IV value	3	17	50	3	17	50	3	17	50
Coeff on DV	1.9	−0.07	0.002	−0.57	−0.10	−0.02	7.8	7.4	2.8
P Value for DV	0.09	0.59	0.96	0.37	0.37	0.52	0.53	0	0
Adjusted R^2	0.06	−0.02	−0.03	−0.01	−0.01	−0.02	−0.02	0.40	0.66

Figure 4.9: Table 6 in Martin Lally's 2022 paper

We are confident, therefore, that the possibility of reverse causality in the regressions we have reported in this paper, does not exist.

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[76] https://www.wsj.com/articles/the-failed-experiment-of-covid-lockdowns-11599000890

[77] Gibson, J. (2020). "Hard, not early: Putting the New Zealand Covid-19 response in context", Working paper, University of Waikato.

[78] Lally, Martin (2022). "A cost–beneft analysis of COVID-19 lockdowns in Australia" in *Monash Bioethics Review*, Published online on 28 January 2022, https://doi.org/10.1007/s40592-021-00148-y, https://link.springer.com/content/pdf/10.1007/s40592-021-00148-y.pdf

[79] Lally, Martin (2022). "A cost–beneft analysis of COVID-19 lockdowns in Australia" in *Monash Bioethics Review*, Published online on 28 January 2022, https://doi.org/10.1007/s40592-021-00148-y, https://link.springer.com/content/pdf/10.1007/s40592-021-00148-y.pdf

4.4.4 *Did actions voluntarily taken by people cancel out government lockdowns?*

As Martin Lally points out, there is a possibility that "even without government restrictions, people will take actions to lower their risks in a pandemic and the incremental effect of government actions may then be too little to be statistically significant". This would then make it difficult to consider government mandates as a policy variable.

However, this hypothesis can be readily ruled out. In Sweden, the only major nation without lockdowns, driving volume remained at normal levels, along with walking and public transport volumes, throughout 2020. It is clearly government mandates that have an overwhelming impact on behaviour. For someone who lived in Melbourne through its darkest night – of perpetual lockdowns for nearly two full years – the idea that people would have locked themselves indoors without the police patrolling the streets and fining or beating up people, is an absurdity.

Figure 4.10 is also further proof that the OxCGRT stringency index exaggerates Sweden's true "stringency". In the figure, both Australia and Sweden's Stringency index value is largely similar, even though the impact of government policy is dramatically different.

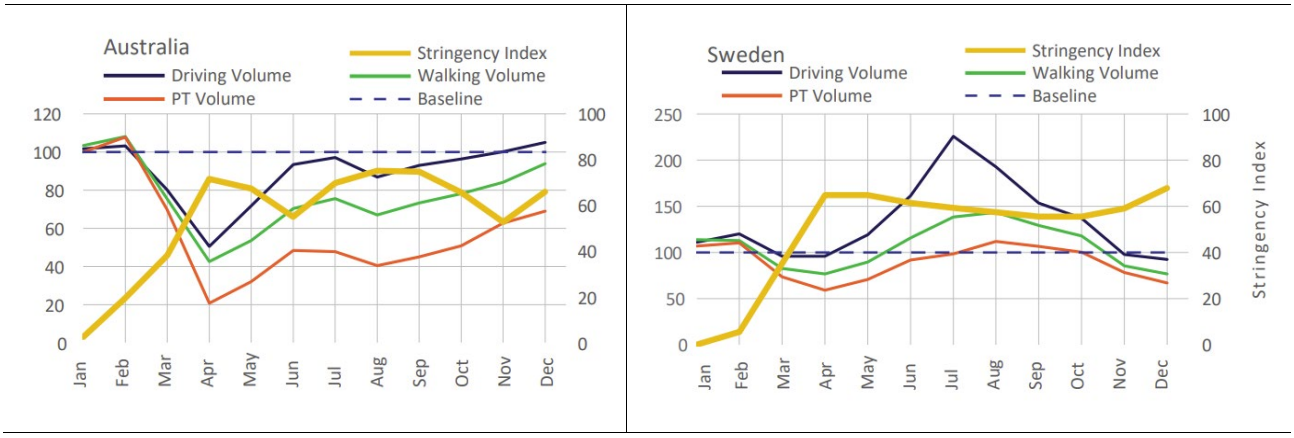

Figure 4.10: Comparison of traffic movement and stringency, Australia and Sweden, for 2020[80]

[80] Source: https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2021.pdf

5. Part 3: Why lockdowns cause more COVID deaths

The increase in non-COVID deaths from lockdowns is huge and has been extensively proven.[81] The net impact on society of lockdowns is therefore devastating. But do lockdowns at least reduce COVID deaths. This paper provides very strong evidence that lockdowns did not reduce COVID deaths. Instead, it provides weak evidence that lockdowns increased COVID deaths.

Even the possibility that lockdowns might have increased COVID deaths requires an explanation. Some of the reasons why lockdowns increase transmission of COVID and vulnerability to COVID are outlined below.

5.1 Consequences of inverting the standard risk-based approach

Lockdown nations focus their energy on trying to prevent low-risk people (such as the young) from contracting the virus. This inverted focus, being the opposite of a risk-based approach, has consequences.

> "untargeted lockdowns allowed the virus to wreak havoc since the government took its eye off the ball. Eighty per cent of the government's effort went in "controlling" the broader society instead of focusing on aged care homes. As I will keep repeating throughout this book so no one forgets: many elderly deaths we have had could have been averted if the original pandemic plan had been followed." – Sanjeev Sabhlok in *The Great Hysteria and The Broken State*.

5.1.1 *Reduced head space to deal with the virus*

Lockdowns require the political and health leadership to deal with entirely self-created problems, including the mass confusion (and even mass-protests) created by insistence on locking up the young who are at little or no risk from COVID. In Victoria, for instance, the news has been full of cases of police brutality and anger in the streets of Victoria during the lockdowns, which necessarily diverted the mental energy of the leadership. This meant that the energy and time for thinking and planning to save the high-risk lives by cocooning and caring for the elderly was adversely impacted. As a result, *more* of the elderly die from COVID.

5.1.2 *Delayed natural barrier to the virus by reducing infections among the young*

Herd immunity is a law of nature for all infectious disease – regardless of whether it comes from recovery from infection or from a vaccine. Respiratory viruses peak fairly quickly, with those who've recovered becoming immune, which then makes it hard for the virus to infect others. It is the young who form a wall against COVID by recovering from an infection. Lockdowns stop the development of such immunity among the young who therefore cannot act as barriers to the spread of disease.

5.2 Increased transmission of SARC-CoV2

As Martin Lally notes:

> lockdowns will in some cases increase the risk of transmission to high-risk individuals, and this at least partly offsets the reduction in risks achieved in other ways. For example, lockdowns will have caused some young people to return to live with their older parents, perhaps because of the loss of their job or closure of the university they were attending, and if already infected to thereby infect their parents, who are at much greater risk of death.

[81] E.g. A cost benefit analysis of Australia's lockdowns by Gigi Foster: https://www.thegreatcovidpanic.com/_files/ugd/23eb94_920d5ddd484640ee8dfca8f045b14886.pdf

5.2.1 *Increased exposure of the elderly outside aged-care homes*

It is possible that stringent protections might actually be implemented in aged-care homes during lockdowns but many of the elderly (or not-so-elderly) live in their own home. According to Lally "lockdowns induce some behaviours that increase the death rate, such as young people returning to live with their older parents, due to loss of their job or closure of the university they were attending, and if already infected to thereby infect their parents, who are at much greater risk of death"[82].

5.2.2 *Concentration of people in restricted markets*

With many markets closed, people are funnelled into a few open supermarkets. This increases the density of the virus in these places, potentially increasing transmission. This has been pointed out also in the Herby and Hanke study[83]:

> If people voluntarily adjust their behavior to the risk of the pandemic, closing down non-essential businesses may simply reallocate consumer visits away from "nonessential" to "essential" businesses, as shown by Goolsbee and Syverson (2021), with limited impact on the total number of contacts.

5.2.3 *Impacts of transmission on being cooped indoors*

Just like with the Black Plague where a form of lockdowns were first implemented, when people are cooped indoors, the disease can spread more than less. During the Plague, people were cooped inside with rats, so the disease spread further.

In the case of COVID, aerosol transmission meant that people living indoors were more vulnerable should a member of the household get infected by COVID. In a normal situation, people would distribute their physical presence and activity across open spaces, but by staying at home the intensity of aerosol transmission can increase. Particularly in winter, homes with recirculating heat systems can become virus incubators.

In fact, there are arguments in the respiratory virus literature that one of the reasons for the peaking of such viruses during winter is that people are cooped up inside their homes or in confined spaces. Lockdowns mimicked this situation wonderfully, thereby increasing transmission.

Herbe and Hanke also point this out:

> lockdowns have limited peoples' access to safe (outdoor) places such as beaches, parks, and zoos, or included outdoor mask mandates or strict outdoor gathering restrictions, pushing people to meet at less safe (indoor) places. Indeed, we do find some evidence that limiting gatherings was counterproductive and increased COVID-19 mortality.

There is an associated issue – that people often break lockdowns rules and meet secretly indoors – that increases transmission.

> Late last week, Chicago mayor Lori Lightfoot — typically cautious on COVID-19 policy — raised some eyebrows after calling for restaurants and bars to reopen "as soon as possible." Her logic: The current COVID-19 surge has been primarily fueled by at-home gatherings and parties, and if people are going to gather regardless of what any stay-at-home order dictates, state and local governments should try to provide spaces where at least some mitigation efforts will be taken.[84]

5.2.4 *Covid-congestion effects in hospitals and testing queues*

Paul Frijters has described this in detail: https://clubtroppo.com.au/2021/02/03/covid-congestion-effects-why-are-lockdowns-so-deadly/.

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[82] Lally, Martin (2021). "The Costs and Benefits of Covid-19 Lockdowns in New Zealand" in *med*R*xiv* 2021.07.15.21260606; doi: ,27 July 2021. https://doi.org/10.1101/2021.07.15.21260606.

[83] Herby et al (2022), "A Literature Review and Meta-Analysis of the Effects of Lockdowns on Covid-19 Mortality", SAE/No.200/January 2022, https://bit.ly/3wHaNEP.

[84] https://www.sfgate.com/news/editorspicks/article/California-outdoor-dining-ban-COVID-19-surge-worse-15882565.php#

This points a situation (based on a factual account) in which the hospital Emergency department is worried about being criticised for letting patients mingle, so they care a filter - they ask all comers get a covid-test (or questionnaire). The covid-infected are subsequently moved to a sealed part of the hospital with the uninfected going to another part. This is inevitable since space is at a premium in hospitals so queues necessarily form when such an approach is taken. However, the very act of sorting and queuing patients for a test can create a more crowded space in which infection is better transmitted.

Frijters suggests that covid-congestion effects can be of three types: physical covid-congestion effects, mental-health mediated covid-congestion effects, and reflection-limiting covid-congestion effects.

> A recent Scottish study found 2/3 of serious covid cases were due to infections in hospitals, exactly in line with the mechanisms of described in the post. The whole song and dance about what the general population should or should not do is largely irrelevant for the issue of serious covid cases. https://www.medrxiv.org/content/10.1101/2021.03.02.21252734v1

(one of the comments in Paul's article)

5.2.5 *Behavioural change when people are lulled into dropping their guard*

Herby and Hanke[85] cite a study by Atkeson (2021) which points out that lockdowns might create a behavioural response which may "counteract the effect completely, as people respond to the lower risk by changing behavior". For instance, "If closing bars and restaurants causes the prevalence of the disease to fall toward zero, the demand for costly disease prevention efforts like social distancing and increased focus on hygiene also falls towards zero, and the disease will return".

5.3 Increased vulnerability to COVID

5.3.1 *Fear-induced reduction in timely treatment of COVID*

This is a consequence of fear and propaganda – with the result that COVID affected people end up in hospital at a more advanced stage than they would otherwise.

> many people with genuine health problems get too afraid to go to hospital or their GPs because they fear, not without cause, that they might get infected there. Yet, in turn, that means they get more ill before they are forced to seek help anyway which makes them more vulnerable when they actually do turn up.[86]

5.3.2 *Reduced immunity through reduction in Vitamin D*

Workplace closures, lockdowns (including internal restrictions on movement) and masking policies cause a sense of panic. Negative spillovers then ensue, from reduced immunity due to stress and avoidance of sunlight which then reduces Vitamin D, which is a protective against respiratory disease like COVID.

> I can't help, but think the safest place for an airborne virus would be to be outside. We had ... all sorts of policies ... [w]here I remember seeing like people being accosted while hanging out alone on the beach."
> - Jan Jekielek, *Epoch Times*[87]

There is some evidence that people with darker skin in northerly latitudes have more Vitamin D deficiency, which was exacerbated by lockdowns:

> An estimated 40% of American adults may be vitamin D deficient. For African-Americans, that number may be nearly double at 76% according to a new study by The Cooper Institute.[88]

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[85] Herby et al (2022), "A Literature Review and Meta-Analysis of the Effects of Lockdowns on Covid-19 Mortality", SAE/No.200/January 2022, https://bit.ly/3wHaNEP.

[86] https://clubtroppo.com.au/2021/02/03/covid-congestion-effects-why-are-lockdowns-so-deadly/

[87] https://www.theepochtimes.com/gigi-foster-did-our-pandemic-policies-kill-more-people-than-they-saved_4523360.html

[88] https://www.cooperinstitute.org/2019/09/24/african-americans-at-greatest-risk-of-vitamin-d-deficiency

5.3.3 *Reduced immunity through increased stress*

The stronger a lockdown and mandatory masks, the greater the fear signal communicated to the community. Lockdowns and extended government messaging promoting fear and anxiety have resulted in lengthy anxiety induced responses in our bodies.

> When a health system scares the hell out of a large population because it genuinely wants to tell people there is a problem they should be aware of, that population becomes far more anxious about any sign of covid than before. Their anxiety slowly reduces their resilience. Hordes of anxious people then want to get tested and be reassured, whilst chronic anxiety weakens the immune system of millions that then makes them more vulnerable to all kinds of diseases.[89]

The American Psychological Association noted significant increases in stress during the lockdown years of 2020 and 2021 in comparison to 2019 in a recent survey. The average increase in stress across all classifications in the "very/somewhat significant" categories was a 13.9% increase in 2020 and 9.5% increase in 2021 when compared to 2019. [90]

The pathway from stress to increased COVID susceptibility is through cortisol. Cortisol is part of our "fight or flight mechanism" induced during high stress events and designed for short bursts. The Mayo clinic attributes overexposure to cortisol in response to prolonged stress to an increased risk of heart disease, heart attack, high blood pressure, stroke and weight gain – all increasing chances of an adverse reaction to COVID[91]

- This is supported in a June 2020 study by the Imperial College titled "High cortisol levels associated with greater risk of death from COVID-19"[92] which concluded that "cortisol levels are a marker of the severity of the illness" and "patients with very high levels of the stress hormone cortisol in their blood are more likely to deteriorate quickly and die".
- A 2022 article in the British Medical Journal[93] supports this view noting increased cortisol levels in patients with severe COVID-19.

5.3.4 *Reduced adaptive immunity (cross-reactivity) to COVID*

Dr Sunetra Gupta has repeatedly highlighted the importance of international travel in boosting immunity across the world.[94] Border closures reduced cross-reactivity to COVID. The fact that people were not getting the common cold because of social distancing reduced their cross-reactivity.

5.3.5 *Increased obesity and diabetes*

Lockdowns increase a sedentary lifestyle, increasing obesity and diabetes. Being obese increases the risk of COVID deaths. An Australian study in 2021 by Bette Liu, Paula Spokes, Wenqiang He & John Kaldor[95] found that obesity, in the presence of diabetes and chronic lung disease, increased the risk of ICU or death by a factor of 5.34 and concluded by recommended targeted prevention strategies.

In some countries like the USA, vulnerable age groups (baby boomers) gained significant weight, up to 7 kg.[96]

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[89] https://clubtroppo.com.au/2021/02/03/covid-congestion-effects-why-are-lockdowns-so-deadly/

[90] https://www.apa.org/news/press/releases/stress/2021/october-decision-making, https://www.apa.org/news/press/releases/stress/2021/infographic-stress-sources

[91] Mayo Clinic (2021), https://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/stress/art-20046037

[92] https://www.imperial.ac.uk/news/198437/high-cortisol-levels-associated-with-greater/

[93] https://jim.bmj.com/content/70/3/766

[94] https://www.sabhlokcity.com/2021/07/sunetra-guptas-thesis-that-international-travel-is-essential-if-we-want-to-avoid-major-pandemics/

[95] https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-021-06378-z

[96] https://www.apa.org/news/press/releases/2021/03/march-weight-change

The American Psychological Association noted that the majority of Americans reported experiencing weight gain with 42% experiencing an average weight increase in 2020 of 13kg. The median weight gain was 6.8kg. Thus, a large number of people gained substantially more than 13kg. [97]

5.3.6 *Lockdowns increase the proportion of the vulnerable*

In March 2021, epidemiologist Dr Raghib Ali compared countries with early lockdowns and those with late lockdowns. He found either no difference between them in endpoint COVID outcomes, or that (as discussed earlier) nations that locked down earlier ended up with more deaths:

> Based on current trends, it seems likely that many of these countries that we thought were doing well due to their early lockdowns and small first waves will end up having higher excess mortality than the UK, including Czechia, Poland, Portugal, and many others…On the so called two-week 'circuit breaker lockdowns,' it should also be remembered that Wales did follow SAGEs advice – but ended up with the same level of infections and deaths as England as it just postponed more infections to the winter months.[98]

Raghib Ali In his words, one reason why many nations that implemented early lockdowns ended up with even more total COVID deaths is that "by effectively delaying part of the first wave from the spring until the second wave in the winter, this meant that many countries had a higher proportion of the population still susceptible to infection, and so led to even higher death tolls as health systems struggled to cope."

[97] https://www.apa.org/news/press/releases/stress/2021/one-year-pandemic-stress

[98] Ali, Raghib (2021). "Would an earlier lockdown really have saved tens of thousands of lives?" in *The Telegraph*, 21 March 2021, https://bit.ly/39HxoJq.

6. Discussion and conclusion

Researchers untrained in public health are likely use the Stringency Index and other elements of the OxCGRT data without consideration of its limitations, and without regard to the nature of the public health hazard that arose in late 2019/early 2020 through COVID, or to the costs and benefits of various NPIs. Such research output would amount to persons untrained in the basics of biology attempting to rediscover the long-known principles of biology, virology, immunology, epidemiology and public health, on the basis that the OxCGRT database is an Oracle which will somehow help them deliver "new wisdom" for humanity. Sadly, most such research will only contribute to an increase in confusion in the public health discipline.

Existent pre-2020 biological and pandemic science was – and remains – the gold standard. It is vastly more valuable than any new information achieved during the pandemic.

For the future, any such NPI databases should be designed in advance of pandemics with a consensus formed among public health experts about the kinds of restrictions that would be risk-based (and therefore appropriate) for different kinds of virus.

6.1 Conclusion

The Herby and Hanke meta-analysis concluded that: "The evidence fails to confirm that lockdowns have a significant effect in reducing COVID-19 mortality. The effect is little to none". It added that "lockdowns … have had devastating effects. They have contributed to reducing economic activity, raising unemployment, reducing schooling, causing political unrest, contributing to domestic violence, and undermining liberal democracy. These costs to society must be compared to the benefits of lockdowns, which our meta-analysis has shown are marginal at best. Such a standard benefit-cost calculation leads to a strong conclusion: lockdowns should be rejected out of hand as a pandemic policy instrument".

This study finds that even COVID deaths increase the moment lockdowns commence. This effect is depicted schematically in Figure 6.1.

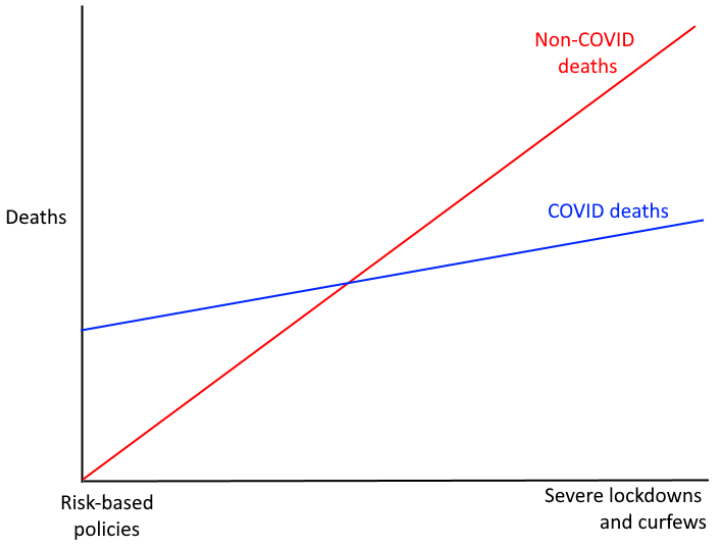


Figure 6.1: A stylised summary of this study's conclusion

The exception seen in some places like Australia and New Zealand to the above rule was merely due to temporary fortuitous circumstances outlined earlier in this study, with any advantage from intense border closures now having been lost.

6.1.1 *Further research possibilities*

Being unfunded research, there remain many opportunities to take this work further by those who are properly funded. All data and analyses are in the public domain, so the work can be verified first and then expanded by those who are appropriately funded.

6.1.2 *Acknowledgements*

The authors wish to thank Martin Lally for his comments on the data analysis, and Paul Frijters for providing a link to his work on "covid congestion". Jason Strecker provided inputs relating to stress and obesity for one of the sections of the chapter on reasons why lockdowns increase COVID deaths.

ATTACHMENT A

This attachment is being provided for archival purposes. It notes the results of the attempt to replicate Martin Lally's results as party of this study. Personal validation by Martin Lally was important in confirming the appropriateness of the methodology used in this study.

6.2 Replication Martin Lally's results

Martin Lally (2022) tested data from 33 countries in analysis: Austria, Albania, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

The Lally (2022) analysis was replicated in this study, and further variables added and considered. In the initial stage, the Stringency Index was called max_stringency and the Sub-Stringency index called total_restrictions.

6.2.1 *Replication of the Lally results*

This initial work considered only 29 countries, with the same variables used in the Lally (2022) paper. The results below:

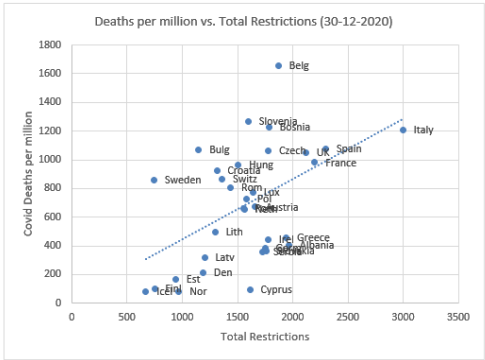
$D = 202 + 8.26S + 0.64PD - 8.89FD$; $R^2 = 0.26$

Note that population_density does not typically show up as significant variable in our data but it was significant for Lally's analysis run on 30-12-20.

If the max_stringency to total restrictions (as per the revised index), the model improves.

$D = 365 + 0.27S + 0.43PD - 4.67FD$; $R^2 = 0.29$

The results are summarised below.



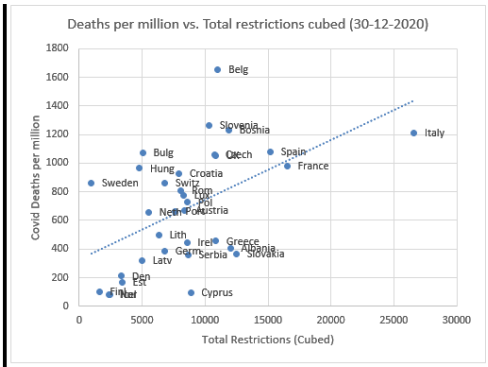
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.524963714
R Square	0.275586901
Adjusted R Square	0.251439798
Standard Error	355.3689855
Observations	32

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1441293.994	1441293.994	11.41283483	0.002036554
Residual	30	3788613.475	126287.1158		
Total	31	5229907.469			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-0.322288532	213.7175333	-0.001508012	0.998806765	-436.7917203
1966	0.443841086	0.131380447	3.378288742	0.002036554	0.175526417



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.534308306
R Square	0.285485365
Adjusted R Square	0.261668211
Standard Error	352.9327332
Observations	32

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1493062.045	1493062.045	11.9865438	0.001632616
Residual	30	3736845.424	124561.5141		
Total	31	5229907.469			

	95.0%	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept		326.135556	122.1669658	2.669588739	0.012139387	76.63732679	575.6338	76.63733	575.6338
	12004	0.043784215	0.012646507	3.462158835	0.001632616	0.017956603	0.069612	0.017957	0.069612

6.2.2 *Test bed for the main regressions – in Europe*

For Europe 2022-05-20, regressing Total deaths per million by *total restrictions cubed + people vaccinated per hundred + life expectancy + latitude gives a* ***R2 of 0.83***

Coefficients:

Estimate S.Error t value Pval

(Intercept) 26744.46 4922.02 5.43 0.0000552

total_restrictions_cubed 0.02 0.01 1.64 0.12126

people_fully_vaccinated_per_hundred -22.61 12.58 -1.80 0.09122

life_expectancy -247.08 62.70 -3.94 0.00117

latitude -65.98 24.30 -2.72 0.01529

R-squared: 0.8334, Adjusted R-squared: 0.7918

For Europe up to 2020-12-30. The results are same as reported above The Total Restriction cubed variable significantly increases the strength of correlation with deaths per million compared to Maximum Stringency.

For Europe 2021-12-30 and 2022-05-20, the strength of correlation of Total restriction cubed is reduced and becomes non-significant compared to 2020-12-30. However, a few other variables show stronger correlations including people vaccinated per hundred, life expectancy, and latitude.