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Variation in government responses to COVID-19

BSG-WP-2020/032

Version 15

June 2023

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This working paper is updated frequently. Check for most recent version here:

www.bsg.ox.ac.uk/covidtracker

The most up-to-date version of technical documentation will always be found on the project's GitHub repo: www.github.com/OxCGR/T/covid-policy-tracker

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Oxford COVID-19 Government Response Tracker

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Abstract: The COVID-19 pandemic prompted a wide range of policy responses from governments around the world. During the acute phase of the pandemic, as these responses proliferated, there was a pressing need for up-to-date policy information, so that researchers, policymakers, and the public could evaluate how best to address COVID-19. Looking forward, understanding policy responses to COVID-19 can enhance pandemic preparedness and support a broad range of research seeking to understand either the causes or effects of policy responses. The Oxford COVID-19 Government Response Tracker (OxCGRT) provides a systematic and comparable record of government responses to COVID-19 across 185 countries and territories (as well as sub-national jurisdictions in Australia, Brazil Canada, China, India, Italy, the United Kingdom, and the United States) for the three years from 1 January 2020 to 31 December 2022. Data was collected by a trained team of volunteers in real time. The database includes information on closure and containment restrictions, health policies, economic support measures, and vaccination prioritisation, delivery, funding, and requirements. In total the dataset comprises 25 indicators of government response, most of which categorise government responses into ordinal categorical scales which can then be summarised in simple additive indices to facilitate comparison. Qualitative notes are also recorded for each observation, along with permanently archived source materials. This paper describes the data collection process and summarises some of the broad patterns observed in order to facilitate additional research. The Appendix includes detailed technical information for data users. The data itself can be accessed at:

<https://github.com/OxCGRT/covid-policy-dataset>

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1. Introduction

The COVID-19 pandemic prompted an extraordinary range of responses from governments, many largely unprecedented in scale, speed, and intensity. Common measures included school closings, travel restrictions, bans on public gatherings, emergency investments in healthcare facilities, new forms of social welfare provision, contact tracing, vaccination campaigns and mandates, and other interventions to contain the spread of the virus, augment health systems, and manage the economic consequences of these actions. However, governments varied substantially—both across countries, and often within countries—in the measures they adopted and how quickly they adopted them. This variation created debate as policymakers and publics deliberated over the appropriate level of response to pursue, and when to implement different measures or roll them back, with researchers learning in real time which measures were more or less effective and what larger impacts they had.

The Oxford COVID-19 Government Response Tracker (OxCGRT) provides a systematic cross-national, cross-temporal record to understand how government responses evolved over three years, 1 January 2020 - 31 December 2022. The project tracked governments' policies and interventions across a standardised series of indicators and produced a suite of composite indices to measure the extent of these responses. Data was collected and updated in real time by a team of trained volunteers.

Over the course of the pandemic when critical information was rapidly changing, this publicly available data was offered in real time and was freely available to use. Going forward it provides a tool to understand both why governments have taken similar or different approaches, and what effects different policies have had on epidemiological dynamics, social behaviour, health outcomes, the economy, or other outcomes of interest. This information can help provide an evidence base to inform pandemic preparedness, crisis response, or other critical areas. The three primary audiences for the data are:

1. **Researchers** seeking to understand what governments have done in response to COVID-19 and what effects different responses have had.
2. **Policymakers** considering what peers are doing or not doing and to adjust their own responses accordingly, informing also efforts to build preparedness.

3. **The public and the media** wanting to understand or convey how governments around the world have responded to COVID-19

This paper provides a comprehensive description of the data collected by OxCGRT and presents some key patterns in variation across governments that emerge. It describes the data OxCGRT collected and outlines the methods used to create the indices that summarise the number and intensity of government responses. It also documents the technical specifications of the databases, including the OxCGRT indicators, the coding rules applied, and the data quality assurance procedures employed. By providing this information, we aim to promote transparency and reproducibility in our methods and to facilitate the use of OxCGRT data by researchers, governments, and the public.

To provide a comprehensive understanding of the OxCGRT dataset, we structure this paper as follows. First, we present an overview of the dataset, covering its geographical and temporal coverage, the types of indicators collected, and the coding procedures used. Subsequently, we delve into the composite indices we use to summarise government responses to COVID-19, highlighting the methodological choices around them and what uses they can and cannot serve. Using the OxCGRT data, we then analyse the global patterns of government responses to COVID-19, emphasising the differences in policy timing and adoption among countries. This analysis provides insights into the kinds of questions the data can help answer globally and sub-nationally. Finally, the Appendix provides a comprehensive description of the individual indicators, including details on the data collection process, coverage, and technical calculation of indices, and outlines the OxCGRT review methodologies.

2. Overview of OxCGRT data and methods

When COVID-19 emerged, systems were not prepared to track policy responses, even though such data provides a critical source of information alongside, and in combination with, epidemiological, virological, behavioural, and other types of data.¹ Having a system to measure and compare national and subnational policies has been critical to assess outcomes and the decisions that led to them. Since 2020, more than 40

¹

<https://www.bsg.ox.ac.uk/research/publications/what-would-data-framework-policy-responses-pandemic-diseases-look>

distinct trackers measuring public health and social measures (PHSM) emerged to collect information on the types of policies being implemented to keep the public safe.

Among these trackers, OxCGRT became one of the largest, most current, and most readily usable, with wide coverage in near real time throughout the pandemic. OxCGRT recorded policy data for each day between 1 January 2020 and 31 December 2022 from 185 countries and 210 subnational jurisdictions (in Australia, Brazil, Canada, China, India, Italy, the United Kingdom, and the United States), making this information publicly available and free online for data users to compare official responses and their potential effects on case numbers and deaths. In total, there are more than 8 million datapoints.

To amass such a substantial database, OxCGRT has relied on a team of over 1500 trained volunteers around the world—many of whom are multilingual and have local knowledge of the countries they are researching. These volunteers, who worked as either data collectors or reviewers, underwent initial training in the OxCGRT methods with additional training and guidance provided as needed.

Every week, the project assigned volunteers a country to research, interpret, and record policy data for each day in a given period of time. Volunteers collected data through publicly available government websites and official news reports, taking qualitative policy information and interpreting it in a standardised, comparable system that assessed the strictness of each policy. The majority of these indicators rank policy strictness on a categorical ordinal scale. For example, when many countries began to shut schools in early 2020, the project recorded this action as the strictest point on a scale of 0 to 3, with 3 meaning that no students were attending face-to-face learning at any level; 2 meaning that some levels were closed but others had some aspect of in-person learning; 1 indicating that in-person learning was taking place across grade levels but with significant safety protocols in place; and 0 indicating that schools were completely open with little to no difference from pre-pandemic learning.

In addition, the OxCGRT indicators are designed to capture variation in policies based on their geographic scope. In some cases, a country or territory may have adopted a policy that was only applied to certain regions or sectors, while other areas remained relatively unaffected. To address this, we included a binary variable indicating whether

a policy was targeted or general. A "targeted" policy is one that was specifically applied to a particular geographic region, while a "general" policy is one that was applied across the entire country or territory. By considering these distinctions, we aim to provide a more nuanced and accurate picture of how policies were adopted.

The 'school closing' indicator is just one example of the 25 different indicators that OxCGRT collects data on, which are described in full detail in the Appendix. Briefly, these are organised into five groups each with a specific focus:

- **Closure and containment indicators (C)** measure restrictive policies such as limitations on gatherings, workplace closures, and travel controls.
- **Economic indicators (E)** measure policies such as financial support and debt relief provided by the government.
- **Health indicators (H)** measure policies such as the presence of contact tracing or mask requirements.
- **Vaccine indicators (V)** measure policies such as which groups are prioritised groups to receive vaccines and any vaccine mandates.
- An additional indicator measures any **miscellaneous (M)** policies that are identified which do not fit within the other four categories.

In addition to categorising policies via the OxCGRT indicators, data collectors further recorded detailed notes clarifying the exact policies within each data point with a corresponding permanently archived weblink to the source of information that can be accessed by users. Together, these original source materials constitute an enormous archive of information on government responses to COVID-19.

OxCGR aims to make data easily accessible, including through a partnership with *Our World in Data*, from which the two figures below have been extracted to illustrate how these presentations provide a visual, user-friendly, and interactive interface that the public can engage with. Figure 1 presents data from our C1 (school closing) indicator on 24 October 2020—with colour codes indicating the level of strictness in the responses to close schools on that day (this information comes from the ordinal scale previously explained). Figure 2 presents vaccination policies reflected in the V1 (vaccine

prioritisation) indicator which identifies the groups that were eligible in each country to receive vaccines on 4 March 2022.

Users interested in the OxCGRT data who lack a technical background may find these interactive tools helpful. The full website can be accessed via this link:

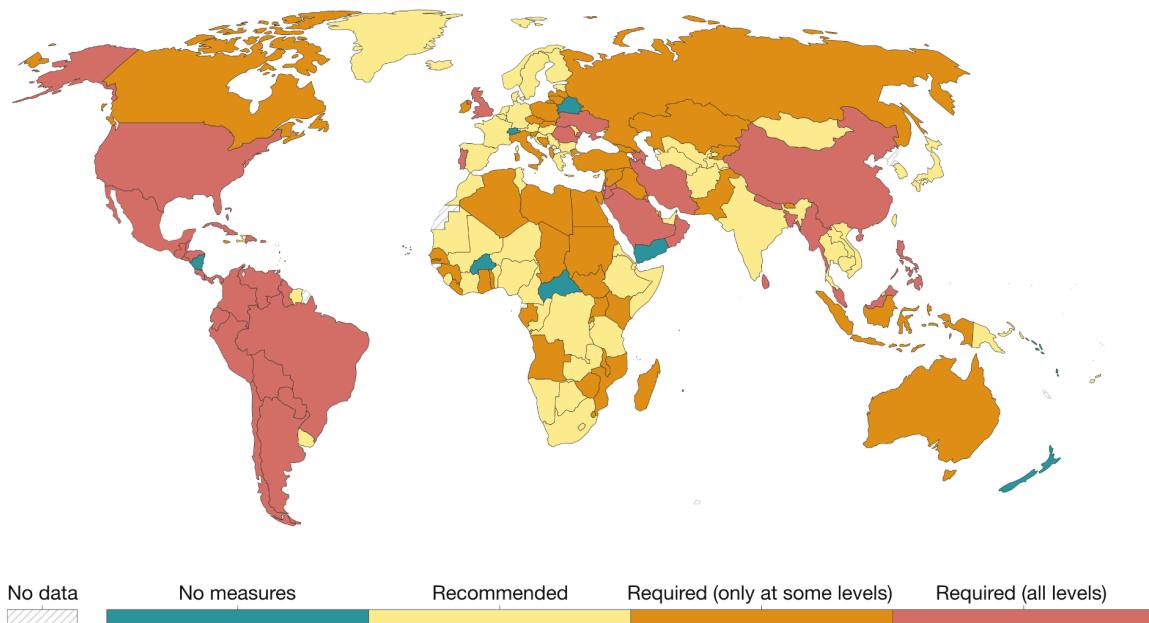
<https://ourworldindata.org/covid-stringency-index>

Figure 1. C1 ‘School Closing’ indicator presented by Our World in Data

School closures during the COVID-19 pandemic, Oct 24, 2020

If policies vary at the subnational level, the index is shown as the response level of the strictest sub-region.

Our World
in Data



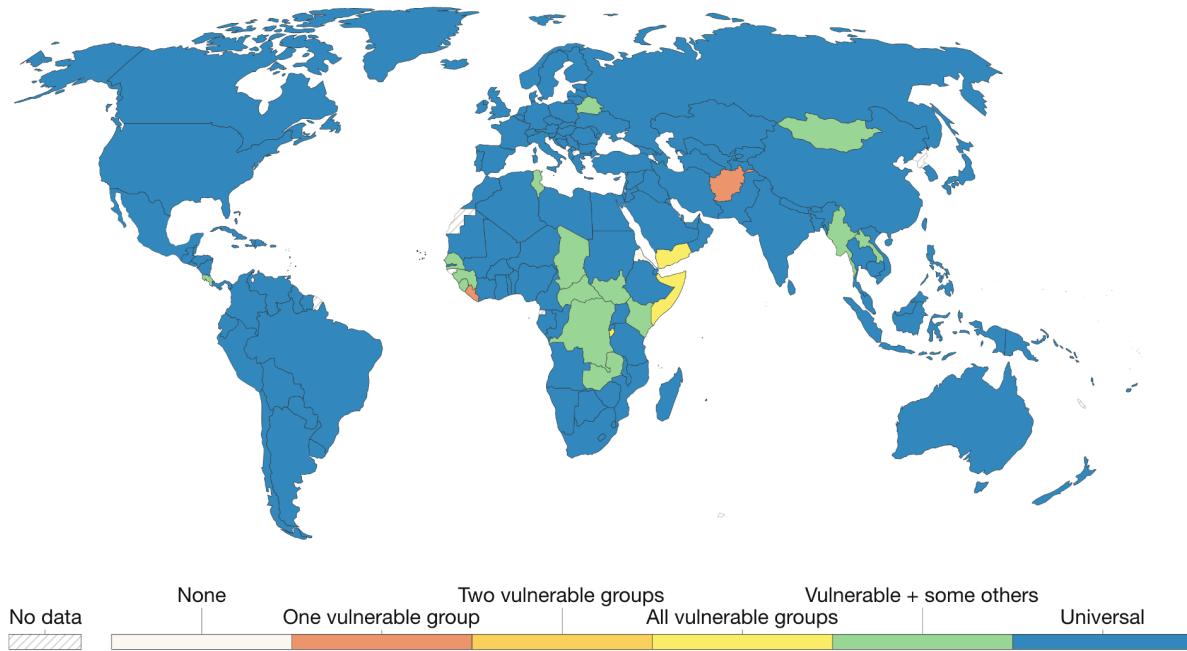
Source: Hale, Angrist, Goldszmidt , Kira, Petherick, Phillips, Webster, Cameron-Blake, Hallas, Majumdar, and Tatlow. (2021). “A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker),” Nature Human Behaviour – Last updated 22 March, 15:00 (London time)
OurWorldInData.org/coronavirus • CC BY

Figure 2. V1 'Vaccine Prioritisation' indicator presented by Our World in Data

COVID-19 vaccination policy, Mar 4, 2022

Policies for vaccine delivery. Vulnerable groups include key workers, the clinically vulnerable, and the elderly. "Others" include select broad groups, such as by age.

Our World
in Data



Source: Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford – Last updated 5 February 2023
OurWorldInData.org/coronavirus • CC BY

3. Policy indices of COVID-19 government responses

Governments' responses to COVID-19 exhibit significant nuance and heterogeneity. Consider, for example, C1, school closing: in some places, all schools have been shut; in other places, universities closed on a different timescale than primary schools; in other places still, schools remain open only for the children of essential workers. Moreover, like any policy intervention, their effect is likely to be highly contingent on local political and social contexts. These issues create substantial measurement difficulties when seeking to compare national responses in a systematic way.

When combining different indicators into a general index, composite measures inevitably overlook certain nuances. However, this approach also has both strengths and limitations. For instance, by measuring a range of indicators, they help to mitigate the possibility that any one indicator may be over- or mis-interpreted. Furthermore, composite measures enable us to synthesise large amounts of data and effectively reduce complexity.

On the other hand, composite measures have the potential to leave out important information and make strong assumptions about what information is relevant. If critical information is left out and is systematically correlated with the outcomes of interest, composite indices may introduce measurement bias, which can compromise the validity of the results. Moreover, while we aim to address this issue by carefully selecting the indicators for each index, it is still possible that the composite measures may introduce bias due to the specific weights assigned to each indicator. Therefore, it is crucial to consider the limitations of composite measures and ensure that a measure fully covers a construct's definition to avoid distorting our understanding of the phenomenon under scrutiny. To obtain a comprehensive understanding of a phenomenon, it may be necessary to also consider individual indicators and their specific strengths and limitations. Ultimately, the choice of using a composite measure or individual indicators depends on the research question and the context.

Broadly, there are three common ways to create a composite index: a simple additive or multiplicative index that aggregates the indicators, potentially weighing some; Principal Component Analysis (PCA), which weights individual indicators by how much additional variation they explain compared to the others; Principal Factor Analysis (PFA), which seeks to measure an underlying unobservable factor by how much it influences the observable indicators. Each approach has advantages and disadvantages for different research questions. In this paper, we rely on simple, additive unweighted indices as the baseline measure because this approach is the most transparent and easiest to interpret. We encourage researchers and end users to consider various aggregation approaches, such as PCA and PFA, that align with their specific research question and analytical context.

This information is aggregated into a series of four policy indices, with their composition described in the Appendix:

- Government Response Index (GRI)
- Stringency Index (SI)
- Containment and Health Index (CHI)
- Economic Support Index (ESI)

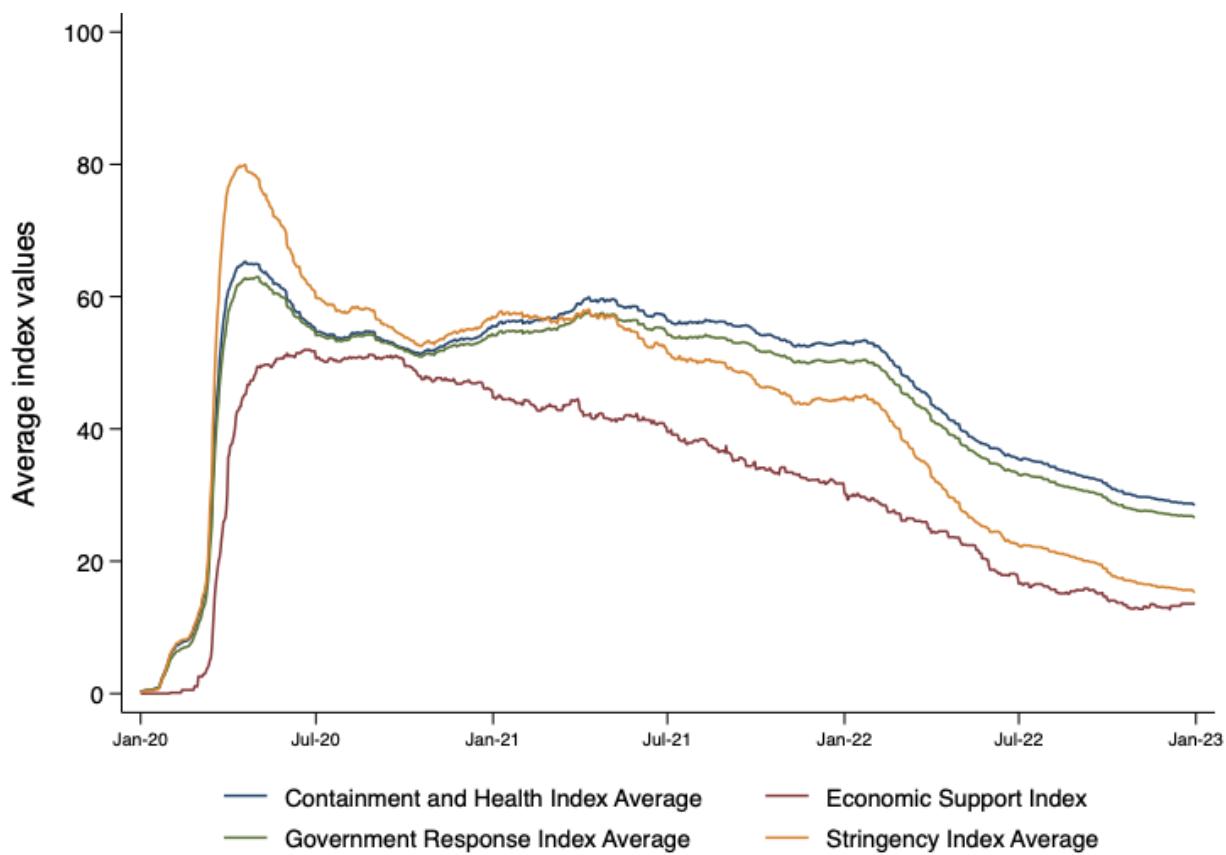
In the full version datasets², we publish four values for the GRI, SI, and CHI: non-vaccinated, vaccinated, simple average, and weighted average, as described in the Appendix.

Each index is composed of a series of individual policy response indicators. For each indicator, we create a score by taking the ordinal value and subtracting an extra half-point if the policy is general rather than targeted, if applicable. We then rescale each of these by their maximum value to create a score between 0 and 100. These scores are then averaged to get the composite indices. Figure 3 below depicts how each index evolved over time during the pandemic.

Importantly, the indices should not be interpreted as a measure of the appropriateness or effectiveness of a government's response. They do not provide information on how well policies were enforced, nor do they capture demographic or cultural characteristics that may have affected the spread of COVID-19. Furthermore, they are not comprehensive measures of policy. They only reflect the indicators measured by the OxCGRT, and thus will miss important aspects of a government response. For instance, the "economic support index" does not include support to firms or businesses and does not take into account the total fiscal value of economic support. The value and purpose of the indices are instead to allow for efficient and simple cross-national comparisons of government interventions. Any analysis of a specific country should be done on the basis of the underlying policy, not on an index alone.

² See the technical appendix for more detailed methodological information. The data can be accessed at: <https://github.com/OxCGR/covid-policy-dataset>

Figure 3. Global mean index values for 185 countries over time



Note: more detailed information on these indices is provided in the Technical Appendix.

4. Variation in government responses

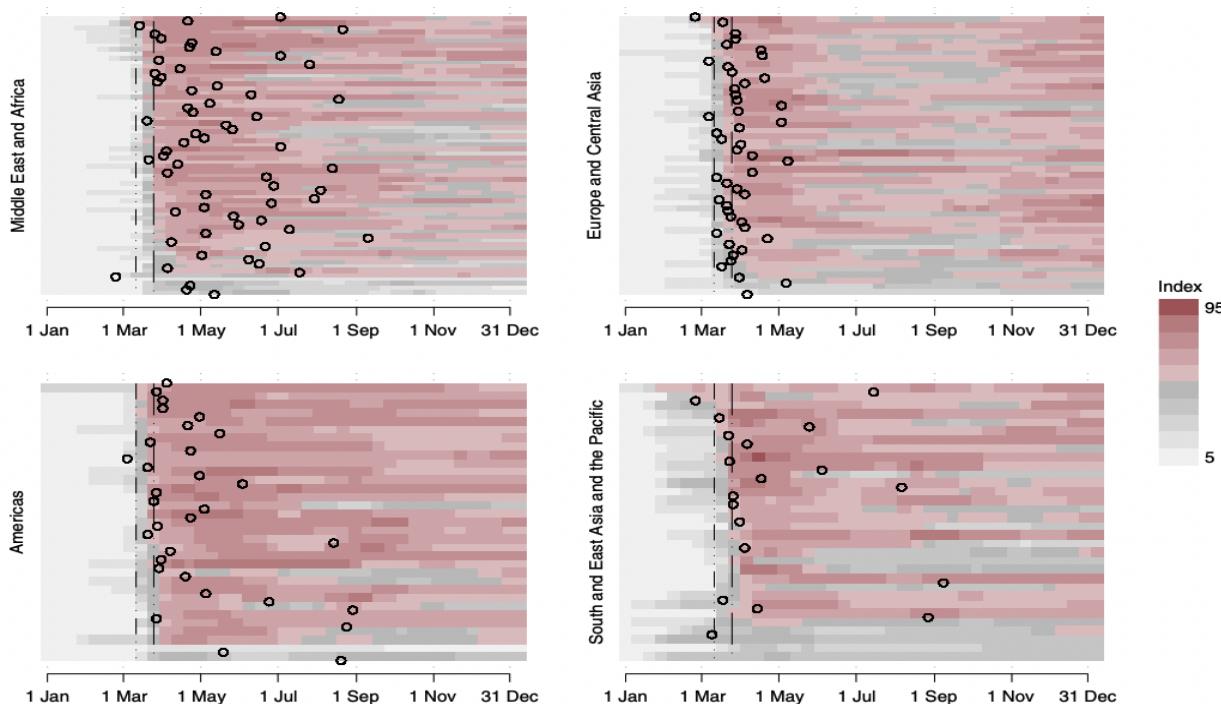
To illustrate potential uses of the data, this section provides a flavour of patterns of government response observed via the OxCGRT data.

Initial similarities diverge into distinctive approaches

At the outset of the pandemic, most governments implemented similar policies within a similar timeframe. Figure 4 shows that nearly every country worldwide enacted relatively stringent policies around mid-to-late March 2020, regardless of the disease progression, as indicated by the Containment and Health Index rising above 50 (i.e., transitioning from grey to pink).

Figure 4 also depicts how countries initially converged in their policy responses to COVID-19, but eventually diverged, particularly in decisions to roll back measures. The clustering pattern observed in mid-March did not align with the local epidemiological progression of the pandemic, as most countries had already implemented response policies before recording ten COVID-19-related deaths (the circle in figure 4). Instead, the policy response in the early phase of the pandemic was a case of "copycat effect," as policymakers worldwide, with little information beyond news reports from China and northern Italy, promptly adopted similar sets of preventative measures. However, this initial clustering pattern dissipated over time as countries' responses became increasingly distinct from one another.

Figure 4. Clustering of initial government responses compared with the spread of COVID-19



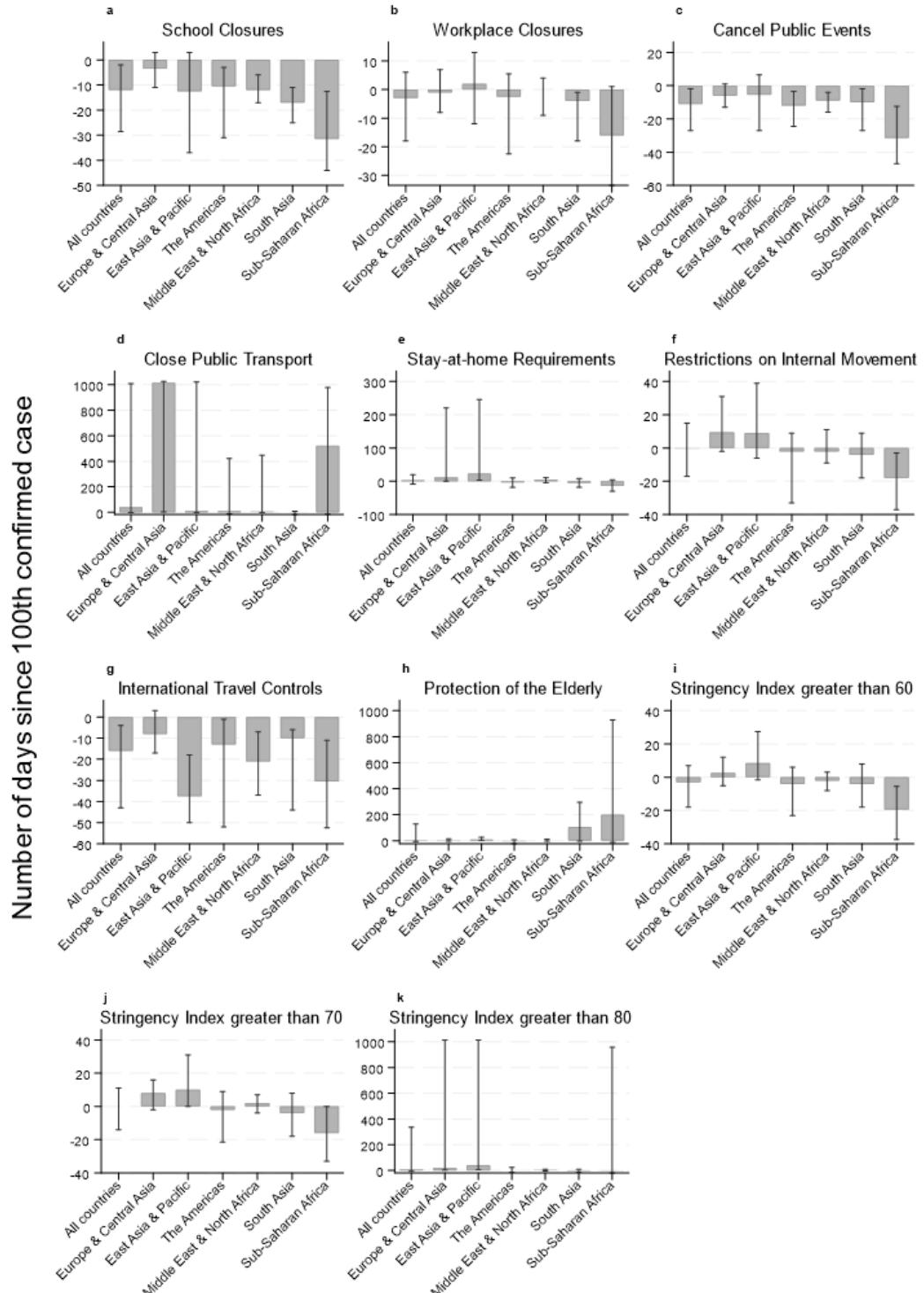
Note: the graphs depict how 183 countries (each row), grouped by world region, ramped up their response policies to scores of 50 (out of 100) on the CHI within approximately the same 2-week period in mid-March 2020 (as shown by the two vertical dash-dotted lines), despite the more scattered pattern of disease progression over time (as indicated by circles that mark the date a country experienced its tenth death) and in contrast with the greater divergence in policies observed in later months. Although the disease affected countries at different times, nearly all countries changed policy substantially in the same 2-week period. The x axis dates are all in the year 2020. **Source:** Thomas Hale, Noam Angrist, Rafael Goldszmidt, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster, Emily Cameron-Blake, Laura Hallas, Saptarshi

Majumdar, and Helen Tatlow. (2021). "A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)." *Nature Human Behaviour* 5, 529-538.
<https://doi.org/10.1038/s41562-021-01079-8>

The influence of other countries' decisions on the adoption of NPI (non-pharmaceutical interventions) policies is also reflected in the overall patterns of first adoption speed in response to the COVID-19 pandemic in 2020, as depicted in Figure 5. By looking at the number of days it took a country to adopt a more stringent policy—defined as moving from recommendations to requirements after its 100th COVID-19 confirmed case—we can see that countries in Europe and Central Asia as well as East Asia and the Pacific, which are the regions where the pandemic initially hit, were often slower than the average country to adopt stricter policies. More specifically, many countries in these two regions were slower than the average country in the world to adopt restrictions on internal movement, school closures, cancellation of public events, stay-at-home requirements, and public transport closures. European and Central Asian countries were also relatively slow in adopting international travel controls, whereas countries in East Asia and the Pacific were relatively slow in adopting workplace closures.

While countries in other regions were generally quicker in adopting stricter policy interventions, sub-Saharan African countries generally brought in public transport closures and measures for the protection of the elderly later than other regions. Overall, the slower adoption of certain stringent policies is reflected in the aggregated Stringency Index. Notably, countries in East Asia and the Pacific took longer than other groups of countries to reach a Stringency of 60 and 70 on the scale, indicating a delay in implementing stringent measures. Interestingly, sub-Saharan African countries quickly reached a Stringency of 60 and 70, but many countries in the region were slow to adopt more stringent measures than this (with a Stringency greater than 80).

Figure 5. Time since the 100th confirmed COVID-19 case to adopt a more stringent COVID-19 policy across containment and closure indicators and levels of stringency by geographical regions

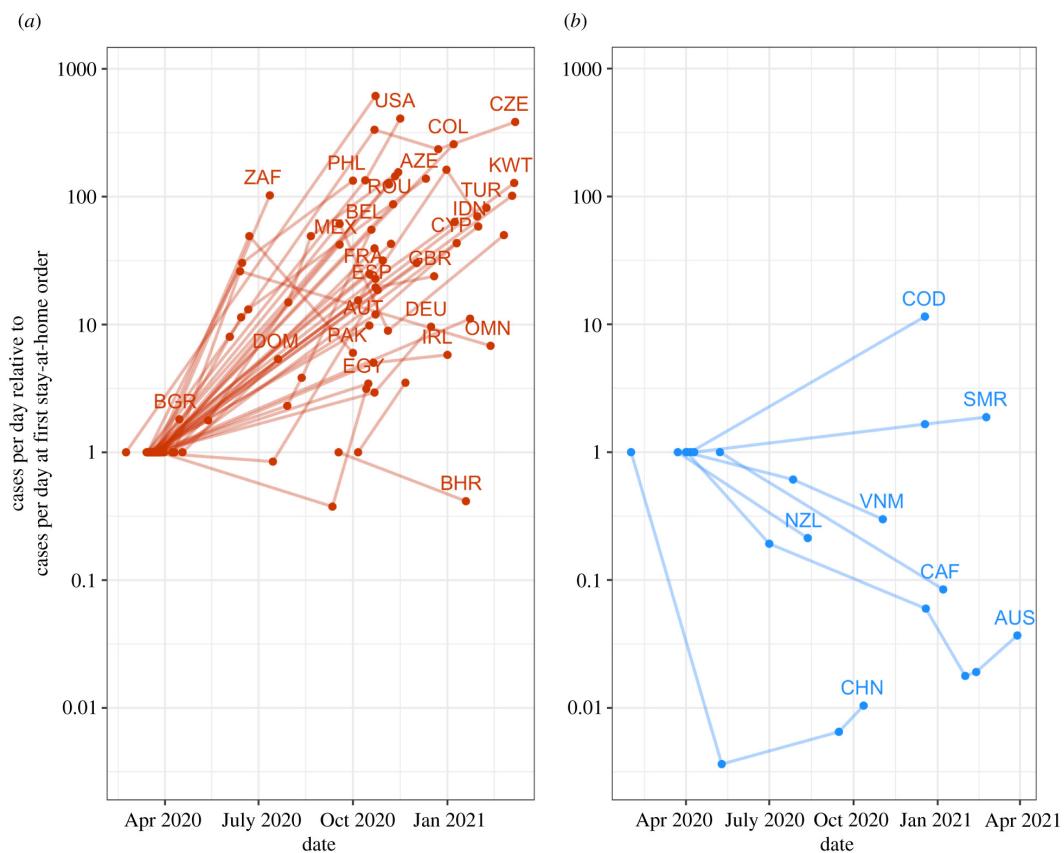


Note: this figure depicts the median number of days between the 100th confirmed COVID-19 case and the adoption of a more stringent policy by geographical region. Negative values indicate a stringent policy was adopted before this threshold. Panel a shows the median number of days to adopt a policy stringency greater than one (i.e., recommend closing or schools open with alterations) for the C1 (school closure) indicator. Panel b shows the median number of days to adopt a policy stringency greater than one (i.e., recommend closing or businesses open with alterations) for the C2 (workplace closure) indicator. Panel c shows the median number of days to adopt a policy stringency greater than one (i.e., recommend cancelling) for the C3 (cancel public events) indicator. Panel d shows the median number of days to adopt a policy stringency greater than one (i.e., recommend closing or significantly reduce means of transportation) for the C5 (close public transport) indicator. Panel e shows the median number of days to adopt a policy stringency greater than one (i.e., recommend not leaving the house) for the C6 (stay-at-home requirements) indicator. Panel f shows the median number of days to adopt a policy stringency greater than one (i.e., recommend not to travel between regions/cities) for the C7 (restrictions on internal movement) indicator. Panel g shows the median number of days to adopt a policy stringency greater than two (i.e., quarantine arrivals from some or all regions) for the C8 (international travel controls) indicator. Panel h shows the median number of days to adopt a policy stringency greater than one (i.e., recommended isolation, hygiene, and visitor restriction measures in LTCFs) for the H8 (protection of elderly people) indicator. Panel i shows the median number of days to reach 60 in the Stringency Index. Panel j shows the median number of days to reach 70 in the Stringency Index. Panel k shows the median number of days to reach 80 in the Stringency Index. This figure considers the number of days to adopt a more stringent policy over the whole territory or in at least one subnational region. Whiskers (error bars) above and below the bar indicate the 75th and 25th percentiles.

After the initial restrictions in March/April 2020, we observed much more variation in governments' approaches, as many countries began to ease their restrictions going into the Northern hemisphere summer. A key distinction emerged between the two groups of countries. So-called "zero Covid" countries sought to suppress or even eliminate COVID-19 through strict lockdowns, and then keep it at bay via stringent travel controls. When new outbreaks began, strict controls were quickly put in place to suppress them. For many of these countries, we observe an increasing sensitivity to case numbers over 2020 and early-2021 (see panel b of Figure 6), where governments introduce stay-at-home orders at progressively lower and lower transmission rates. This approach was particularly common in the East Asia and Pacific region, and typically was accompanied by rigorous testing and contract tracing. Many of these countries—if not all of them—eventually abandoned this approach in part due to the Omicron variant's higher transmissibility.

A second approach, more common in Europe, Africa, and the Americas, sought to reduce but not eliminate the spread of COVID-19 while attempting to maintain openness. Restrictions were ramped up and down as waves of infection occurred. In these countries, we observe a decreasing sensitivity to transmission rates—policymakers choose to “wait longer” during a wave before enacting a new stay-at-home order, resulting in subsequent stay-at-home orders being implemented at progressively higher case levels.

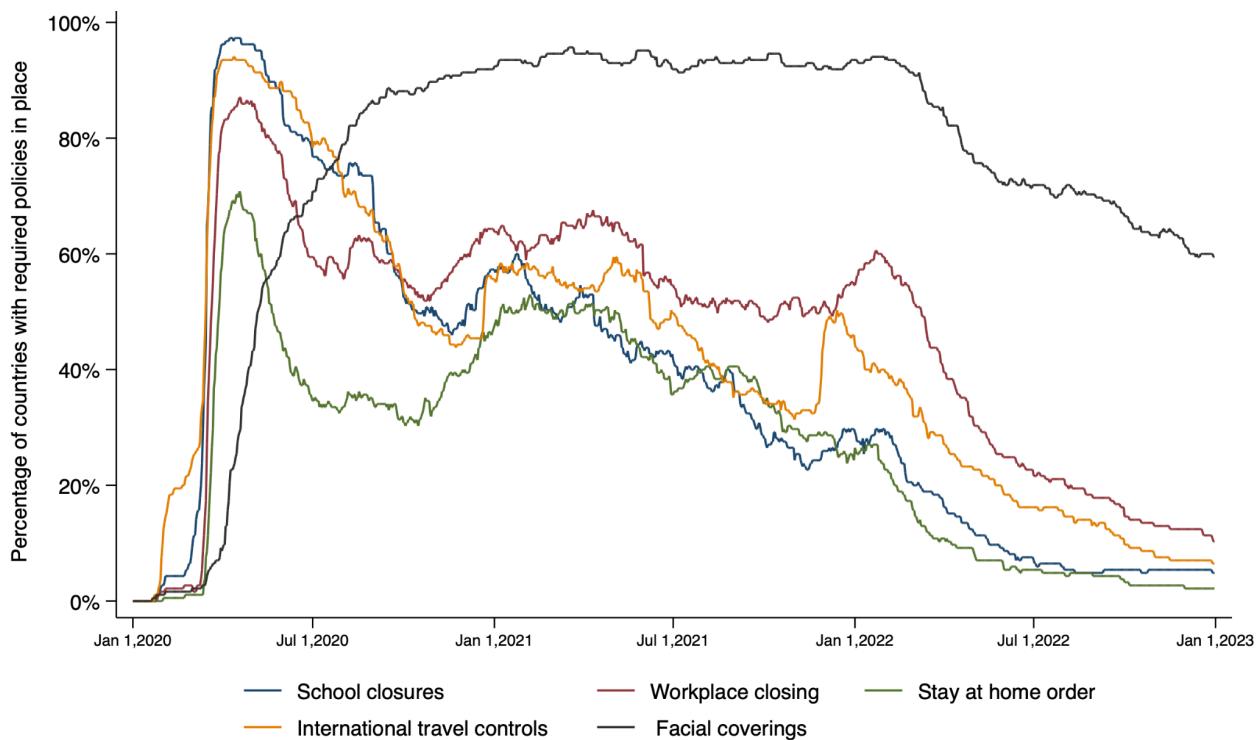
Figure 6. Stay-at-home orders adopted in countries with daily confirmed COVID-19 cases above and below 100 as the pandemic progressed



Note: each country is represented by a line connecting multiple dots, where each dot is the beginning of a new stay-at-home order. The position on the y-axis is the number of confirmed cases per day relative to the number of cases per day when that country implemented their first stay-at-home order. (a) Countries that have averaged more than 100 new cases reported per day since April 2020; (b) countries that have averaged 100 cases or fewer per day. Countries are only included if they implemented more than one stay-at-home order and had local community transmission (greater than 10 new cases per day) when they first implemented a stay-at-home order. Source: Phillips T., Zhang Y. & Petherick A. (2021) ‘A year of living distantly: global trends in the use of stay-at-home orders over the first 12 months of the COVID-19 pandemic’, Royal Society Interface Focus, 11: 20210041. <https://doi.org/10.1098/rsfs.2021.0041>

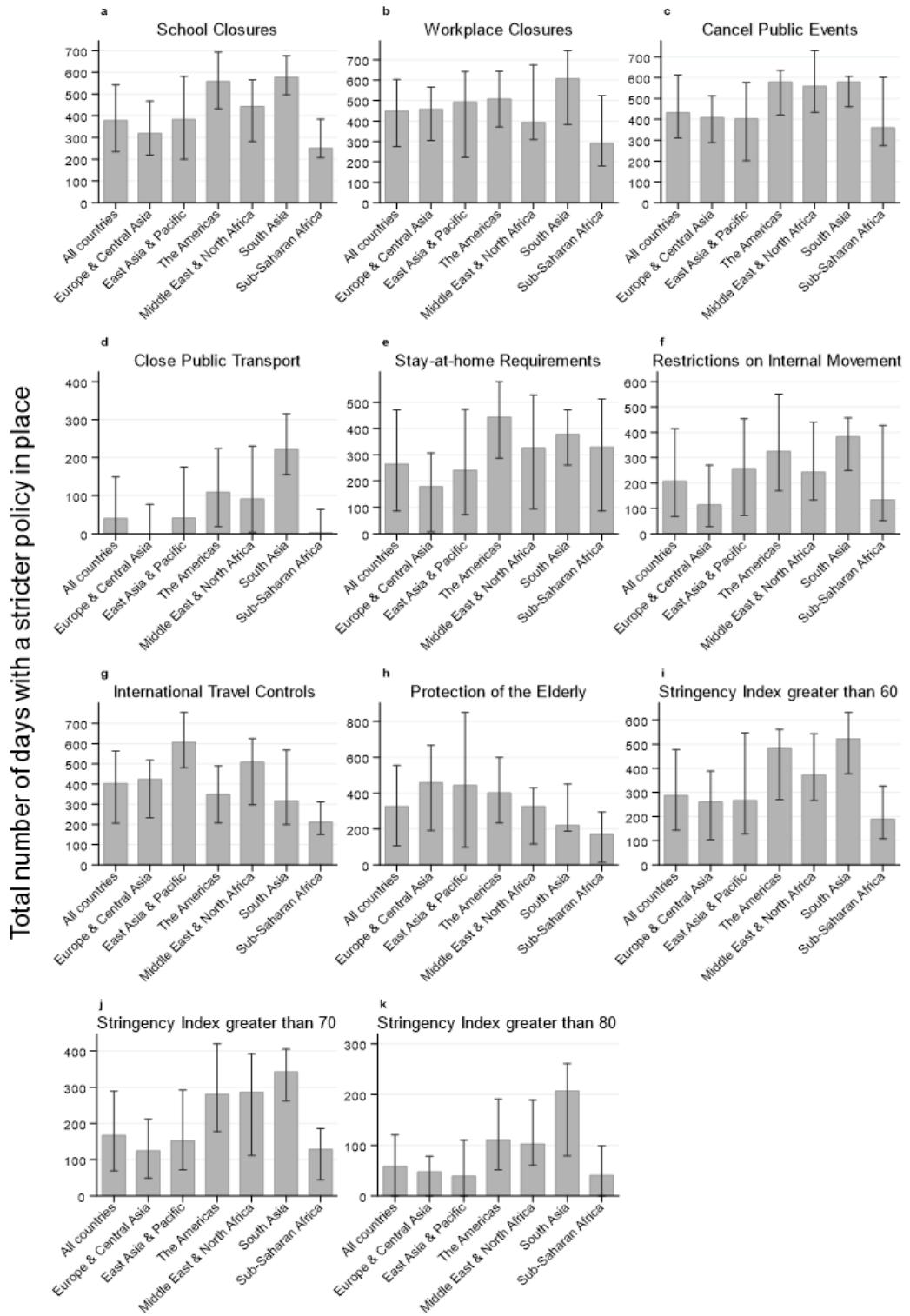
Over time, we observed a steady decrease in the number of governments employing costly restrictions. In Figure 7 we can see, as aforementioned, a sharp rise in March 2020 where almost every country closed their schools and limited international travel, and almost as many countries closed workplaces and implemented stay-at-home orders. From there, these policies gradually declined in popularity, with occasional periods of resurgence—particularly around the major waves associated with the Delta and Omicron variants. One of the most striking patterns is the uptick of border closures and other international travel controls when each of these two major variants was discovered to be widely circulating. In Figure 7, we also observe the rising popularity of mask-wearing requirements. This shift in policymaking largely followed the changing scientific evidence about the ability of COVID-19 transmission to happen via aerosol particles in the air. Policies about facial coverings were nearly ubiquitous during the pandemic, although they were so uncommon in the early months of 2020 that they were not even added to the OxCGRT codebook until October 2020.

Figure 7. Proportion of countries using various restrictions during the COVID-19 pandemic



Upon examining the total number of days during which countries across various geographical regions adopted restrictive policies throughout the entirety of the pandemic, it becomes apparent that sub-Saharan African nations experienced significantly fewer days of nearly every response domain over the three-year period, except for stay-at-home orders, as illustrated in Figure 8. Restrictions on school closures were more prevalent in countries located in the Americas and South Asia, with a higher number of days of adoption, on average. In contrast, countries in Europe and Central Asia had fewer days of stay-at-home orders and restrictions on internal movements. When considering overall stringency levels, East Asian and Pacific countries spent fewer days under stringency level 80 or higher, although this region had a significantly higher number of days with international travel controls in place.

Figure 8. Total number of days with restrictive policies in place across containment and closure indicators and levels of stringency by geographical regions

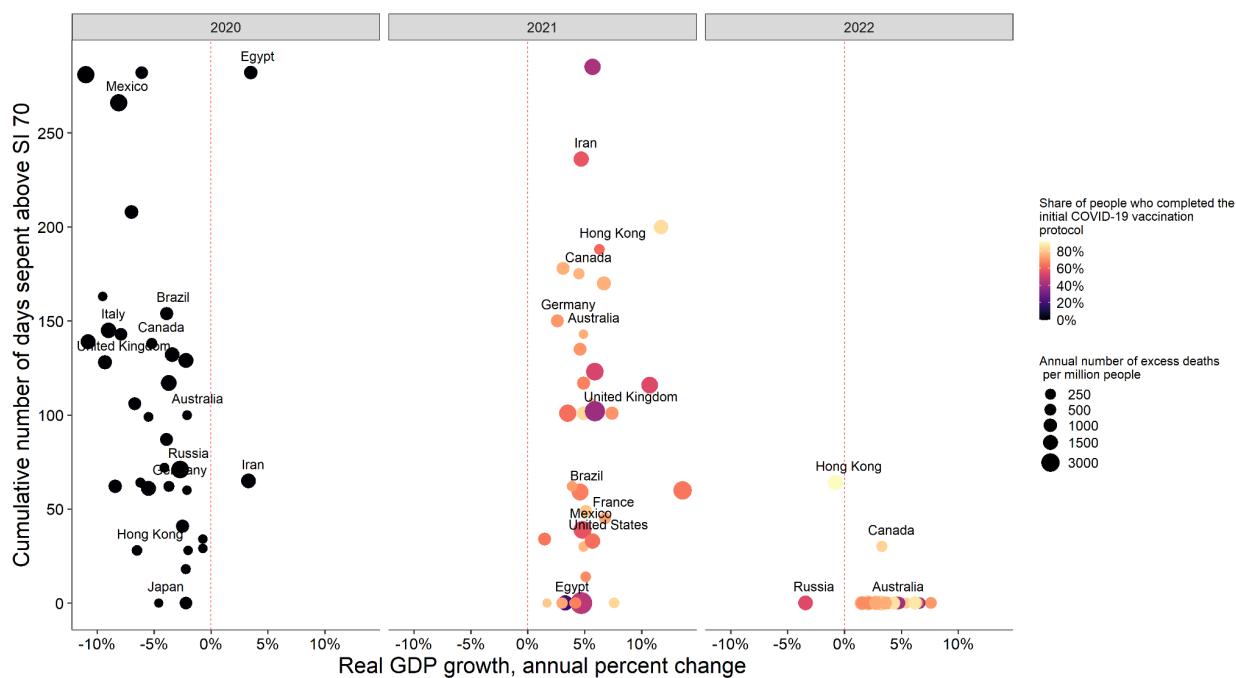


Note: this figure depicts the median total number of days with required policies over the whole territory or in at least one subnational region of a country by geographical region. Panel a shows the total number of days with policy stringency greater than one (i.e., recommend closing or schools open with alterations) for the C1 (school closure) indicator. Panel b shows the total number of days with a policy stringency greater than one (i.e., recommend closing or businesses open with alterations) for the C2 (workplace closure) indicator. Panel c shows the total number of days with a policy stringency greater than one (i.e., recommend cancelling) for the C3 (cancel public events) indicator. Panel d shows the total number of days with a policy stringency greater than one (i.e., recommend closing or significantly reduce means of transportation) for the C5 (close public transport) indicator. Panel e shows the total number of days with a policy stringency greater than one (i.e., recommend not leaving the house) for the C6 (stay-at-home requirements) indicator. Panel f shows the total number of days with a policy stringency greater than one (i.e., recommend not to travel between regions/cities) for the C7 (restrictions on internal movement) indicator. Panel g shows the total number of days with a policy stringency greater than two (i.e., quarantine arrivals from some or all regions) for the C8 (international travel controls) indicator. Panel h shows the total number of days with a policy stringency greater than one (i.e., recommended isolation, hygiene, and visitor restriction measures in LTCFs) for the H8 (protection of elderly people) indicator. Panel i shows the total number of days with Stringency Index equal or greater than 60. Panel j shows the total number of days with Stringency Index equal or greater than 70. Panel k shows the total number of days with Stringency Index equal or greater than 80. Whiskers (error bars) above and below the bar indicate the 75th and 25th percentiles.

Given the multidimensional nature of the impacts of COVID-19, the different baselines countries started from, and the characteristics of the local context, it is impossible to provide a comprehensive assessment of which countries have fared better or worse. However, we can identify macro patterns in the economic and health outcomes and examine how they correlate with different government responses. Figure 9 presents an overall description of how the 50 largest economies have performed on four dimensions during the pandemic: total time spent under stringent closure and containment policies (vertical axis), annual GDP growth (horizontal axis), the total number of excess deaths per million people (size of the marker), and the percentage of the population vaccinated (colour of the marker). Although we cannot draw any causal relationships between the stringency of government responses or vaccination rates and health outcomes from crude annual averages, the data in Figure 9 suggests that, in 2020, most countries experienced long periods of restrictions due to a large surge of infections that put the health system at risk. As COVID-19 vaccines became available and vaccination plans were implemented in many countries in 2021, there was a decrease in the number of deaths caused by the virus. As a result, countries with higher vaccination rates experienced lower mortality rates than those with lower vaccination rates. By 2022, nearly every country had removed its restrictive policies, such as lockdowns and

travel bans. This was partly due to the increasing vaccination rates and the decreasing number of COVID-19 cases and deaths.

Figure 9. How countries performed across four dimensions: annual excess deaths, stringency index, vaccination, and economic growth.



Note: this figure considers data from the 50 largest economies that have available data across all dimensions.

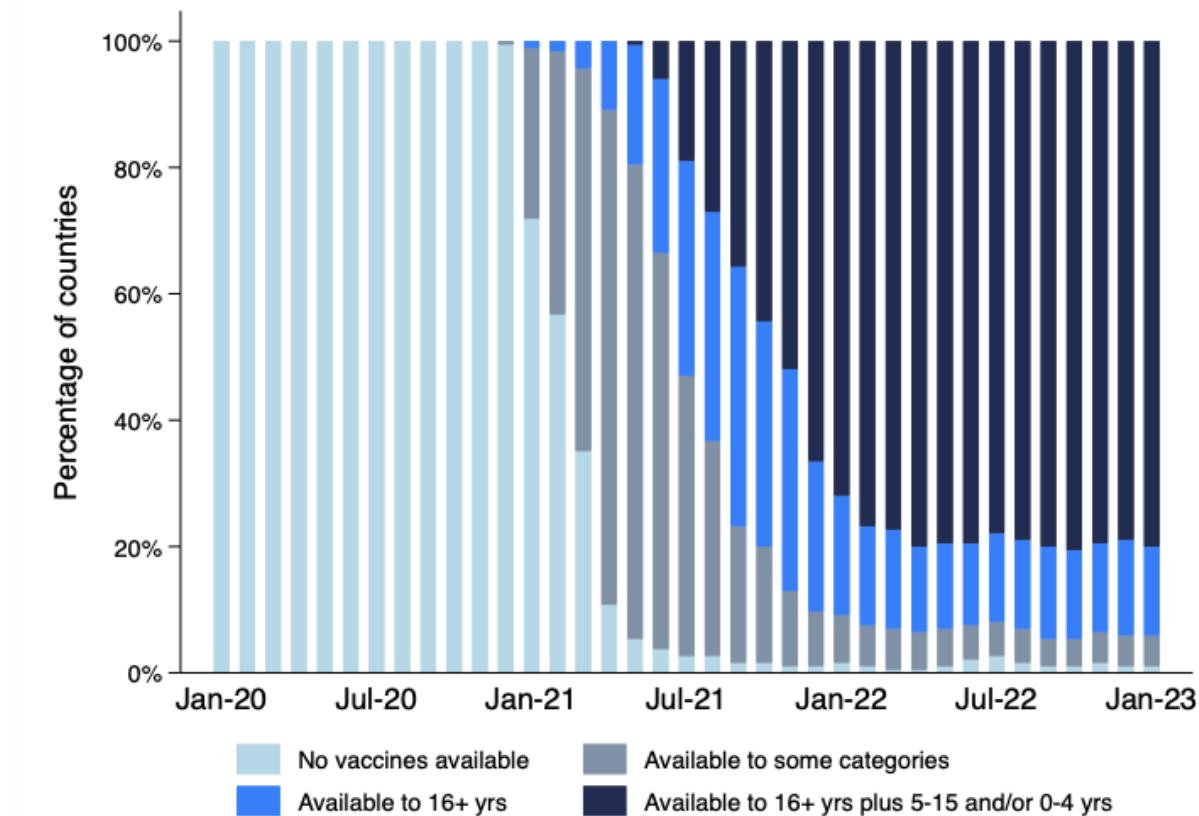
Vaccine rollout

In the second year of the COVID-19 pandemic, vaccines emerged as a crucial layer of defence against the virus. With remarkably fast development and deployment of effective vaccines, they became increasingly vital in combating the spread of the disease, although significant disparities in vaccination rates existed across countries. Overall, governments around the world responded to this challenge in various ways, shifting their policies toward vaccination from prioritisation to encouragement, incentivisation, and, in some instances, mandates.

Figure 10 shows that by the end of 2020, a few countries had started offering COVID-19 vaccines to certain priority groups. By February 2021, approximately half of the countries had begun administering vaccines to at least one priority group, and by June 2021,

almost all countries had done so. However, the transition from priority lists to universal vaccine availability was not consistent across countries. Some countries had already started vaccinating all individuals aged 16/18 years and above (depending on the vaccine type) by March 2021, whereas others struggled to reach universal availability until the end of 2021. In countries where vaccine hesitancy was a significant issue, the shift to universal availability was often faster, occurring within three months of the vaccination campaign's launch. Notably, as of early 2022, COVID-19 vaccines had become universally available in over 90% of countries.

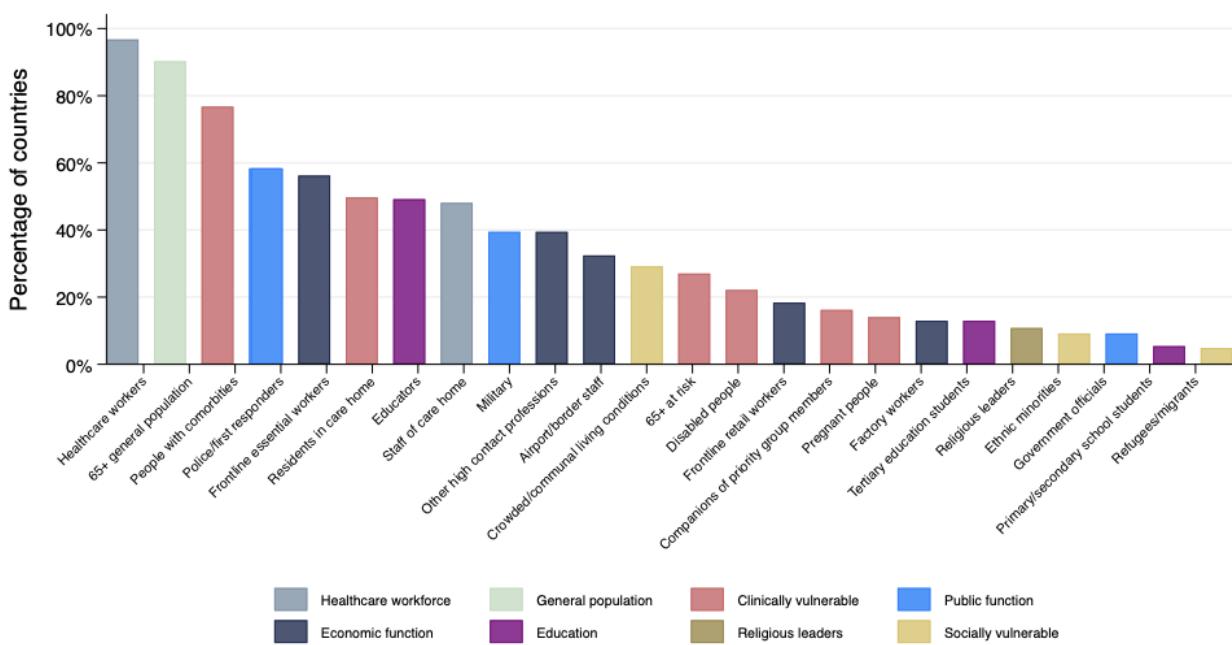
Figure 10. Proportions of countries with differing levels of vaccine availability over time



When examining the vaccine prioritisation plans across countries, we can observe that healthcare workers were the most frequently included group, with approximately 98% of countries incorporating them in their prioritisation lists, as illustrated in Figure 11. This is

not surprising, given that healthcare workers had been at the forefront of the fight against COVID-19 and were at a higher risk of contracting the virus. The next prioritised groups were the elderly and those with comorbidities, which is consistent with the pandemic's impact on these populations. In addition, the prioritisation plans also revealed that economic function categories were more commonly included than education and socially vulnerable categories. This suggests that countries prioritised maintaining essential economic activities, such as manufacturing and retail workers, to prevent further economic damage from the pandemic. Overall, the prioritisation plans reflected the challenging trade-offs between protecting public health and maintaining essential economic and social activities during the pandemic.

Figure 11. Announced vaccine prioritisation plans by group categories (prioritised at some point until August 2022)



Note: each country is weighted equally.

Differentiated policies based on vaccination status

As vaccination rates in some countries fell behind targets, policymakers turned to a range of measures to encourage vaccination. Two kinds of policy interventions became increasingly common. The first involved differentiating restrictions based on people's vaccination status. These measures aimed to limit access to public life based on whether individuals had been vaccinated against COVID-19. Restrictions such as access to shops, public transport, and schools varied between vaccinated and unvaccinated individuals. For instance, Israel introduced the 'Green Pass' in March 2021, which granted greater freedoms to those who had received two COVID-19 vaccinations. As we can see in Figure 12, as of August 8, 2022, around 140 countries had adopted or had these types of differentiated restrictions and policies, indicating the widespread adoption of these measures.

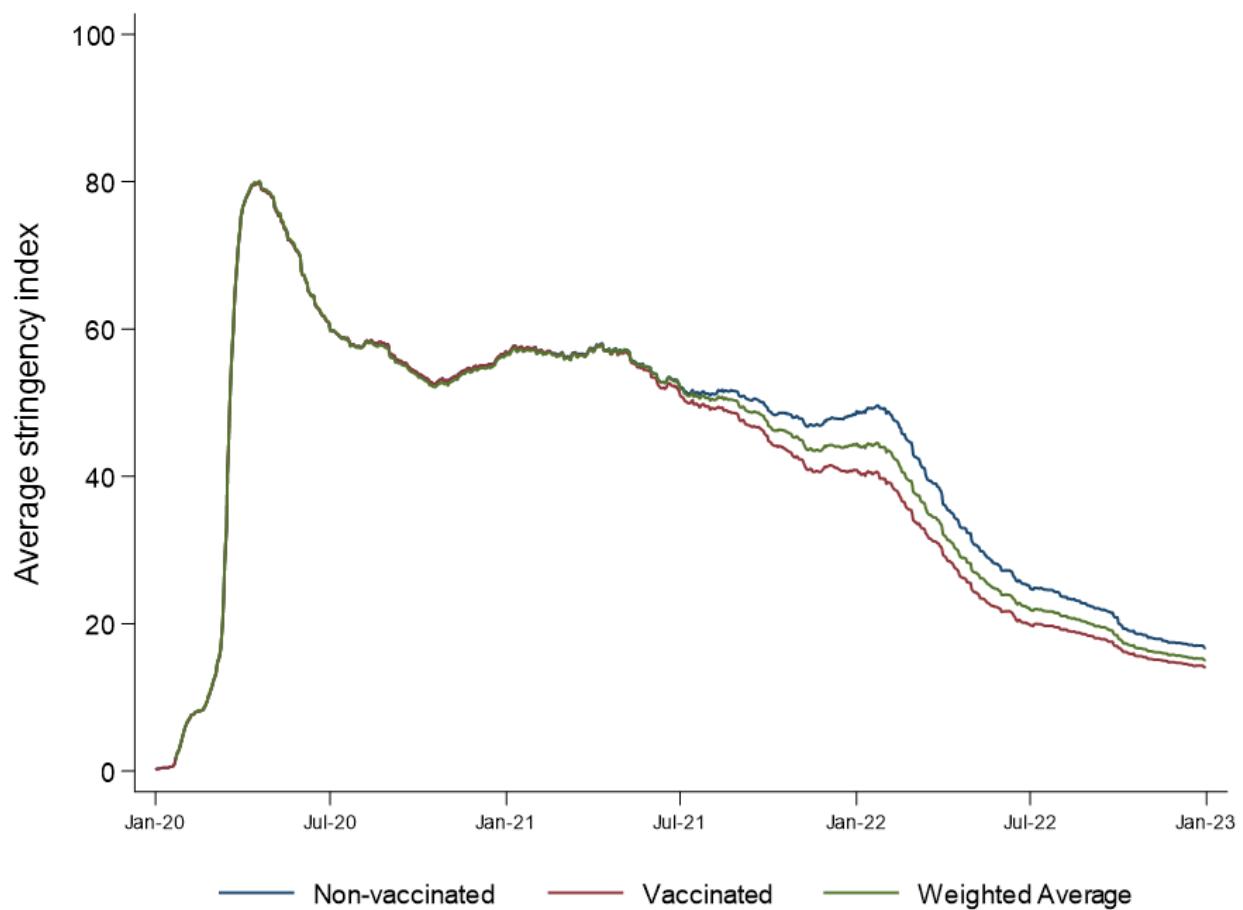
Figure 12. Countries with policies at different levels of restriction based on vaccination status at some point until 8 August 2022



Overall, we collected 10 indicators that reflected differentiated policies for vaccinated and non-vaccinated individuals, namely C1-C8, H6, and H8. These indicators can be

used to calculate various versions of our headline indices. Figure 13 presents the evolution of the Stringency Index over time, differentiated by vaccination status. We observed that differentiated policies were initially adopted in the latter half of 2021, coinciding with the time when most developed countries had achieved universal vaccine availability.

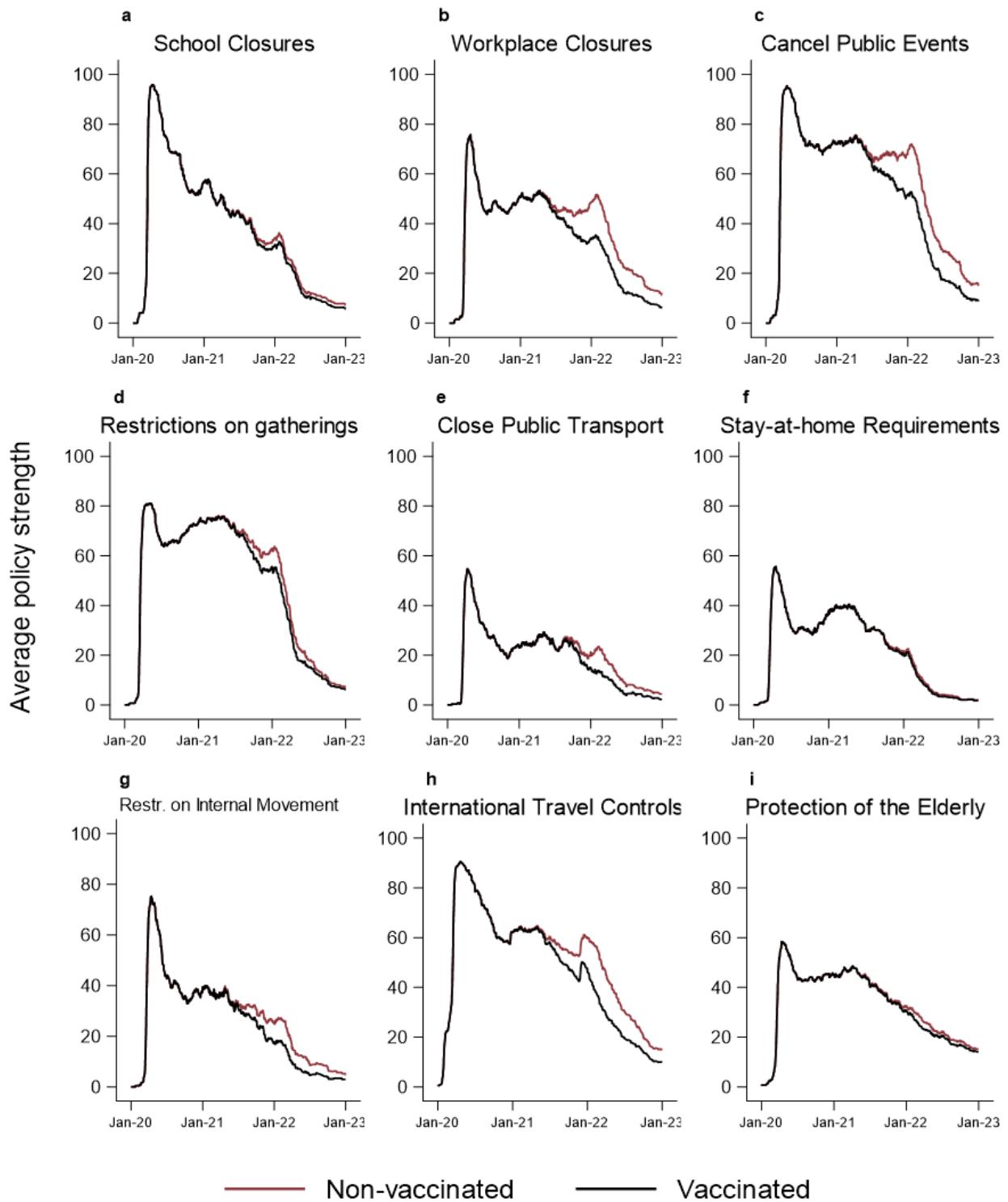
Figure 13. Global mean Stringency Index values for vaccinated and non-vaccinated people, across 185 countries over time



Note: the weighted average index takes an average of the vaccinated and non-vaccinated indices and weights this by the proportion of the population that are fully vaccinated. As vaccination levels rise, the weighted average of the index becomes closer to the value of the index for vaccinated people. For more details, see the Appendix.

While many countries have implemented differentiated policies for vaccinated and non-vaccinated individuals, there was considerable variation in the stringency of restrictions for the latter. In some cases, the values on the Stringency Index for vaccinated and non-vaccinated individuals were quite similar, while in others, they differed significantly. Across the 140 countries with differentiated policies, the average difference in the Stringency Index between vaccinated and non-vaccinated individuals in 2022 was only 6.92, indicating relatively small differences on average. The policies with the greatest variation between vaccinated and non-vaccinated individuals were those related to workplace closures, public events, public transport, internal movement, and international travel controls, as illustrated by Figure 14.

Figure 14. Global mean values for vaccinated and non-vaccinated people by indicator, across 185 countries over time



However, differentiated policies resulted in substantial differences in restrictions faced by non-vaccinated individuals in some parts of the world. One noteworthy example is Austria³, where local authorities introduced a stay-at-home order for non-vaccinated people in November 2021. In France⁴, differentiated policies applied to multiple areas of public life, resulting in the largest difference in Stringency Index value between vaccinated and non-vaccinated people in Europe during the entire pandemic, with a difference of 51.85 points. A vaccine pass was required to access inter-regional travel, long-distance public transport, and venues such as cinemas, theatres, bars, and some stores. Similarly, in Germany⁵, differentiated policies resulted in a difference of 50 points in Stringency Index value. Vaccine pass rules limited access rights based on vaccination, recovery, or PCR test status for cultural and leisure facilities, retail, buses and trains, and long-term care facilities. Even more stringent approaches to enforcement were observed in other countries. In Uganda⁶, for instance, armed police have reportedly removed unvaccinated bus travellers to vaccinate them before continuing their journey. Figure 15 below illustrates how the Stringency Index based on individuals' vaccination status in selected countries evolved over the course of the pandemic.

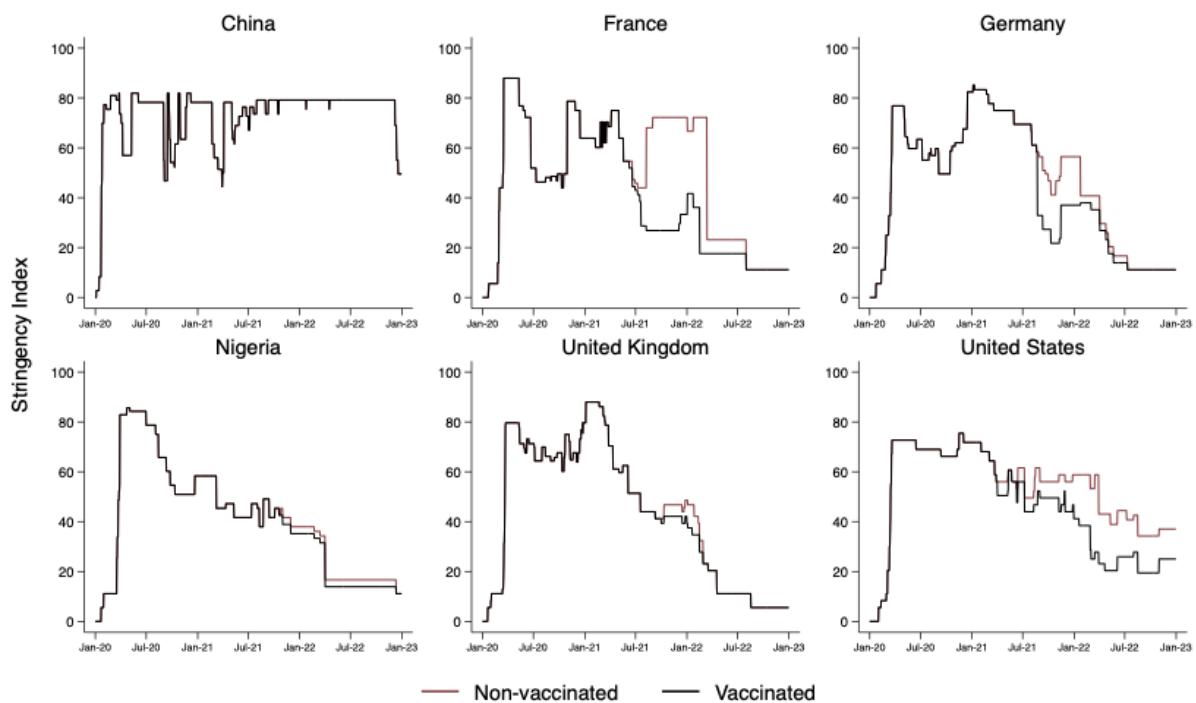
³ <https://www.bbc.co.uk/news/world-europe-59283128>

⁴ <https://web.archive.org/web/20220210095345/https://www.gouvernement.fr/info-coronavirus/pass-vaccinal>

⁵ <https://web.archive.org/web/20220126181506/https://www.bundesregierung.de/breg-de/themen/coronavirus/corona-regeln-und-einschrankungen-1734724>

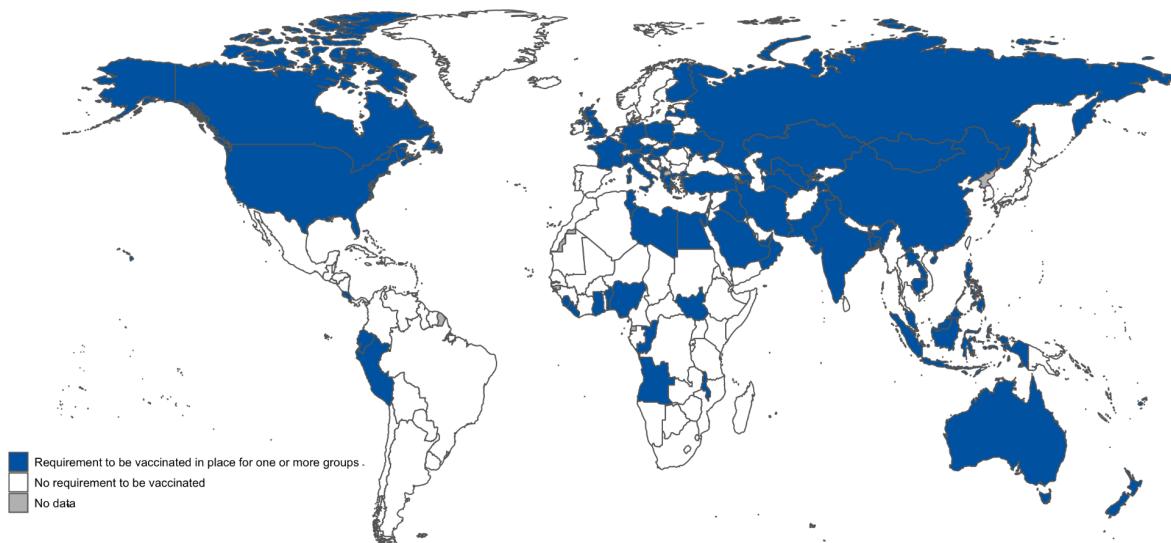
⁶ <https://www.wsj.com/articles/in-some-african-nations-armed-police-enforce-covid-19-vaccinations-11646056306>

Figure 15. Difference in Stringency Index between vaccinated and non-vaccinated people in six countries



In addition to differentiated policies for vaccinated and non-vaccinated individuals, governments have also introduced mandatory vaccination policies for certain categories of people or entire populations. As of August 2022, 75 countries had employed such policies, as shown in Figure 16. These mandates varied widely in their scope and enforcement, with some countries requiring vaccination for specific professions or activities, such as healthcare workers, teachers, or attending large events, while others have implemented mandatory vaccination policies for the entire population. In some countries like Indonesia, Tajikistan, and Turkmenistan, vaccination was mandated for the entire adult population. Ecuador, on the other hand, made vaccination mandatory for individuals over the age of 5, while Puerto Rico required vaccination for those over 5 to attend school. Similarly, Costa Rica mandated vaccination for all children between the ages of 3 and 18. However, in many countries such as Poland, Pakistan, New Zealand, and Saudi Arabia, vaccine mandates were targeted at specific groups based on occupational or clinical risk.

Figure 16. Countries with vaccine mandates at some point until 8 August 2022

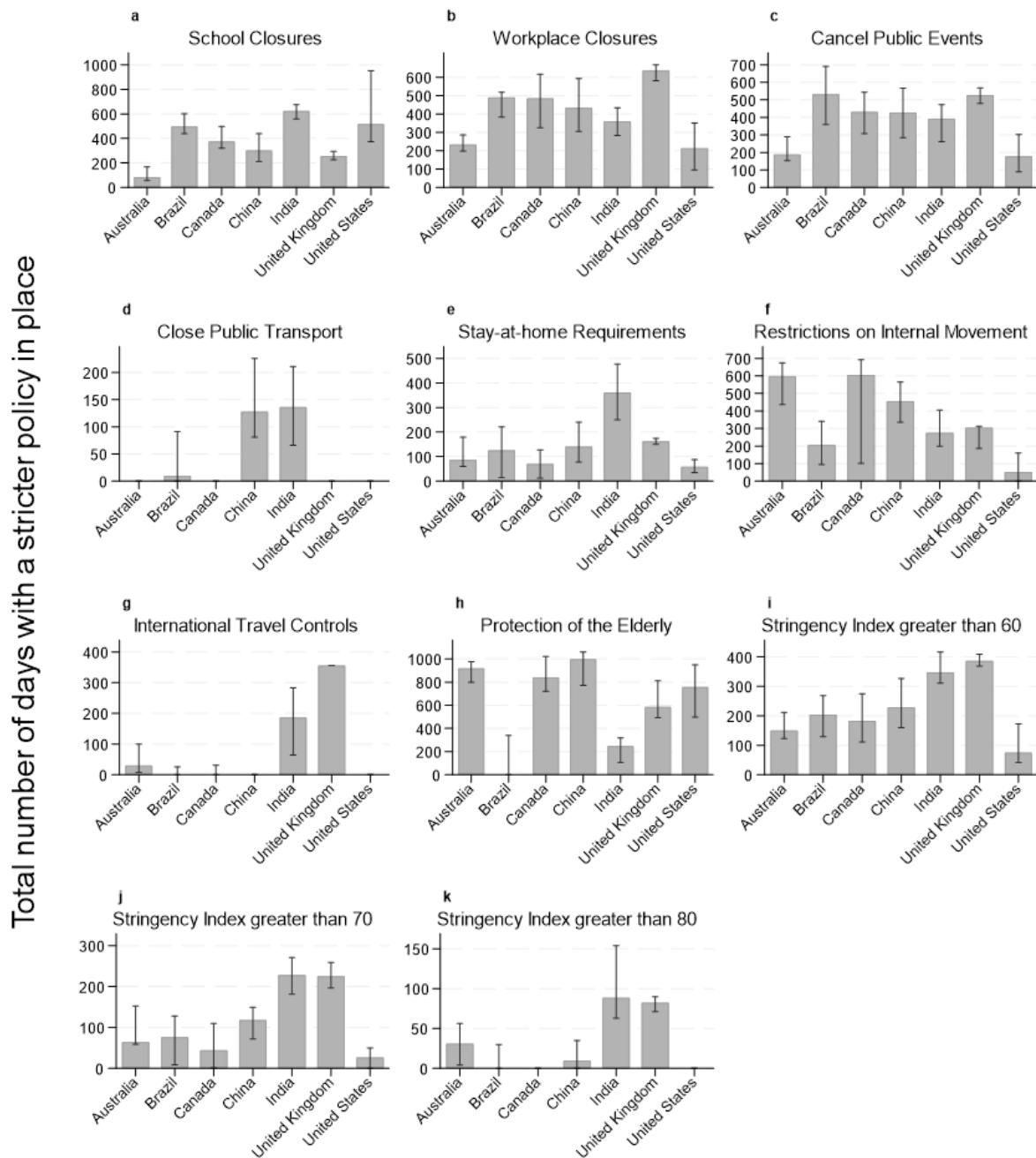


Sub-national responses

As the COVID-19 pandemic swept across the globe, it became clear that decisive action was necessary to slow the spread of the virus. While national governments were at the forefront of implementing measures to control the outbreak, sub-national decision making also played a significant role in adopting restrictive measures. This was particularly true in countries with federal systems of government, where states, provinces, or territories had a certain degree of autonomy in implementing measures to control the spread of the virus. The OxCGRT data tracked policies adopted by national and sub-national authorities in response to the pandemic in several countries. By capturing the within-country variation in policy adoption, the data is a valuable tool for understanding the effectiveness of different approaches and analysing the various policy responses to the pandemic within countries such as Australia, Brazil, Canada, China, India, Italy, the United Kingdom, and the United States.⁷

⁷ Note: data for Italy is incomplete and published separately to the main dataset.

Figure 17. Total number of days with restrictive policies in place across containment and closure indicators and levels of stringency by selected countries with sub-national data



Note: this figure depicts the median total number of days with required policies across sub-national regions of selected countries with sub-national data by country. Panel a shows the total number of days with policy stringency greater than one (i.e., recommend closing or schools open with alterations) for the C1 (school closure) indicator. Panel b shows the total number of days with a policy stringency greater than one (i.e., recommend closing or businesses open with alterations) for the C2 (workplace closure) indicator. Panel c

shows the total number of days with a policy stringency greater than one (i.e., recommend cancelling) for the C3 (cancel public events) indicator. Panel d shows the total number of days with a policy stringency greater than one (i.e., recommend closing or significantly reduce means of transportation) for the C5 (close public transport) indicator. Panel e shows the total number of days with a policy stringency greater than one (i.e., recommend not leaving the house) for the C6 (stay-at-home requirements) indicator. Panel f shows the total number of days with a policy stringency greater than one (i.e., recommend not to travel between regions/cities) for the C7 (restrictions on internal movement) indicator. Panel g shows the total number of days with a policy stringency greater than two (i.e., quarantine arrivals from some or all regions) for the C8 (international travel controls) indicator. Panel h shows the total number of days with a policy stringency greater than one (i.e., recommended isolation, hygiene, and visitor restriction measures in LTCFs) for the H8 (protection of elderly people) indicator. Panel i shows the total number of days with Stringency Index equal or greater than 60. Panel j shows the total number of days with Stringency Index equal or greater than 70. Panel k shows the total number of days with Stringency Index equal or greater than 80. Whiskers (error bars) above and below the bar indicate the 75th and 25th percentiles.

Figure 17 illustrates that there was significant variation in the total number of days during which selected countries with sub-national data adopted restrictive policies, not only across these countries but also within single countries. For instance, as shown by the longer whiskers, we record substantial within-country variation in Brazil for the cancellation of public events and for stay-at-home requirements, in Canada for workplace closures and especially restrictions on internal movement, in China for workplace and public transport closures, in India for public transport closures, stay-at-home requirements, and international travel controls, and in the United States for school closures. Australia and the United Kingdom instead had less within-country variation in the total number of days with restrictive policies in place. As shown by the relatively high bars in panels i, j, and k, among the countries with sub-national data analysed in Figure 17, India and the United Kingdom had on average the most prolonged, stringent overall restrictions.

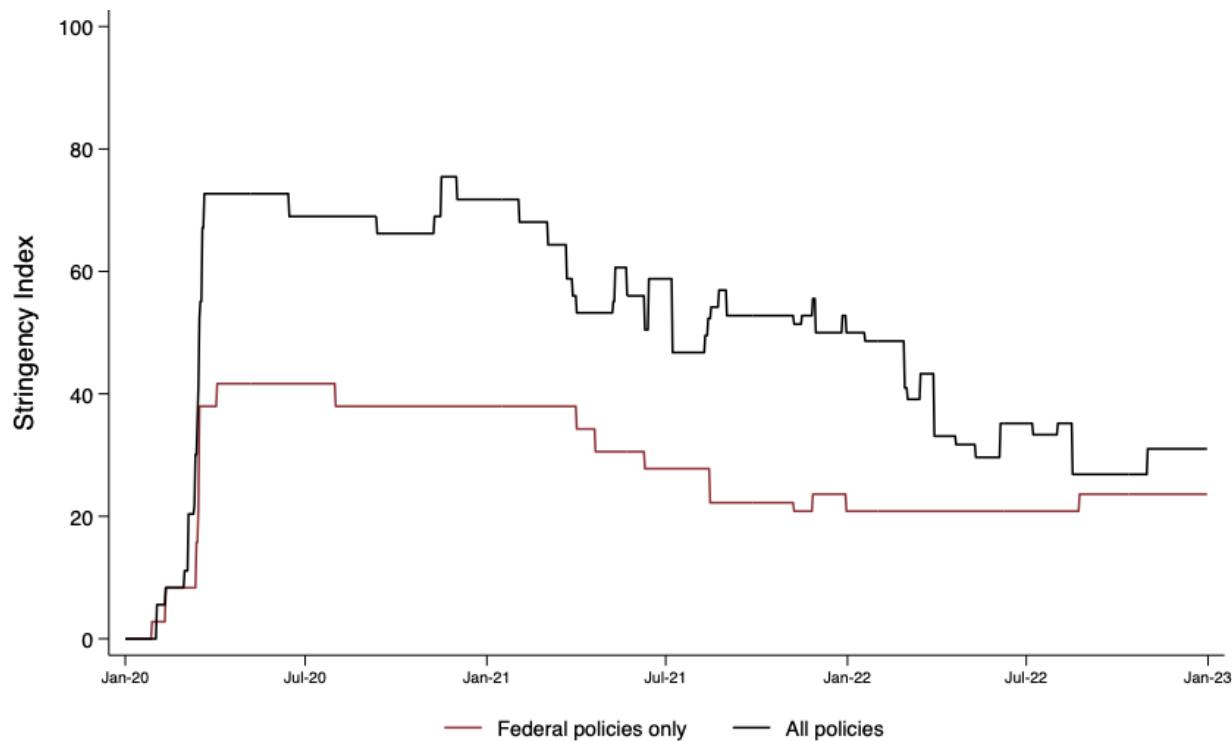
A closer look at these countries with sub-national data provides interesting insights. The United States, for instance, faced significant challenges in controlling the spread of COVID-19, resulting in high rates of cases and deaths compared to other nations, with distinct waves of outbreaks across the country. The first COVID-19 cases were recorded in the state of Washington and in New York City in 2020, but the virus soon spread throughout the country, primarily affecting the Northeast and South regions in the summer. The pandemic then shifted to the Midwest and West regions during the fall, in the second wave, but the most significant surge in cases and deaths occurred during the late fall and winter holiday seasons. By January 2021, the country had reached its

peak, with over 200,000 reported cases and more than 5,000 deaths per day, making it the country with the highest number of COVID-19 cases and deaths worldwide, with over 16 million cumulative cases and 300,000 total deaths. Although cases then steadily dropped until March, new cases began to uptick again, indicating a potential fourth wave of the virus. However, the increase in cases was mainly concentrated in specific states rather than being a nationwide outbreak.

The United States' diverse and decentralised governance structure has made it challenging to confront these epidemiological trends. Policy responses to COVID-19 remained diffused into 2021, spread between the White House, legislature, federal agencies, state and county departments of health, and legal bodies. From the beginning of the pandemic, the majority of policy action had occurred at the state level, and this remained true even as the Biden administration entered office. Placing country-level stringency index scores for the United States alongside those of federal government policies, as in Figure 18, illustrates that sub-national governments have contributed a great deal to the country-level stringency scores.

A more comprehensive analysis of sub-national responses in the United States is available in a dedicated [OxCGRT working paper](#).

Figure 18. Country-level stringency and the stringency of federal government policies in the United States over time. The gap between the two indicates that the lion's share of COVID-19 response policies in the United States has been undertaken by sub-national jurisdictions



On the other hand, as COVID-19 spread widely in the United Kingdom in March 2020, the governments of Scotland, Wales, England, and Northern Ireland adopted similar policies with comparable levels of stringency. However, like the patterns observed in the United States, the four nations began to diverge in their approaches, exercising their autonomy as devolved nations to adopt different policies and legislation. As of March 2021, restrictions were gradually being eased across all four nations, with the message that the rollout of vaccinations marked a shift toward less use of restrictions.

Figure 19 illustrates the pattern of closure and containment policy stringency in the United Kingdom over the pandemic. Initially, the four nations increased and decreased their stringency levels at similar times and within a comparable range of stringency. However, since the initial coordinated response, they have diverged somewhat in the timing and duration of their closure and containment policies. The pandemic responses

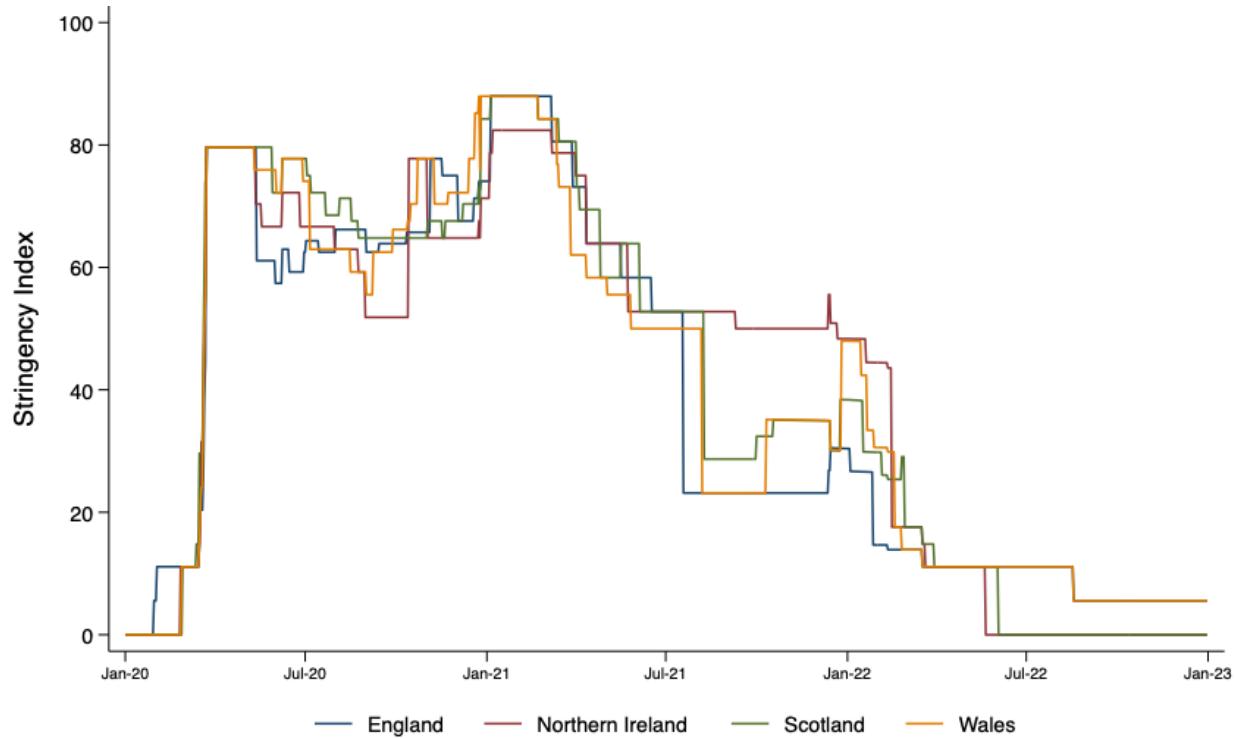
highlighted instances where they have acted independently, reinforcing their identities as separate countries with decentralised legislative powers. For example, from April to July 2020, the four nations eased restrictions at different times and varying levels of stringency.

In September and October 2020, Northern Ireland spent two months at a lower Stringency Index value than the other nations. This was due to the fact that schools were recorded as being fully open without significant sanitation and social distancing restrictions in place compared to pre-COVID-19 operations, combined with no recommendations to stay at home or restrict internal movement. In October and November 2020, England, Northern Ireland, and Wales all introduced more stringent measures briefly, with a Stringency Index value of 70-80, before reducing them. Scotland's data does not reflect this brief uptick in October and November 2020, as unlike England, Wales, and Northern Ireland, Scotland did not adopt a national 'circuit breaker' style lockdown. In January 2021, all four devolved nations introduced very stringent measures at similar levels of stringency and at the same time, similar to the measures enacted in March 2020.

In 2020, Scotland had the highest average Stringency Index value for the most number of days. Meanwhile, Wales had the highest number of days with a Stringency Index value over 80 at the end of that year. Throughout 2020, all four devolved nations maintained a Stringency Index value of over 50, with values ranging from 50-79 for most of the year. It was not until early January 2021 that all four nations reached a Stringency Index value of over 80, as a result of adopting stay-at-home orders, school closures, business closures, and most importantly, an explicit ban on international arrivals from specific countries. The first round of restrictions in 2020 had less stringent international travel controls, making the restrictions in February 2021 the most stringent in the three-year period, with a Stringency Index value of 86.11 across all four nations.

A dedicated [OxCGRT working paper](#) provides an in-depth analysis of the variation in COVID-19 responses among Scotland, Wales, England, and Northern Ireland.

Figure 19. Average Stringency Index values over time in England, Scotland, Wales, and Northern Ireland



In contrast to the policies adopted by the United States and the United Kingdom, China employed different strategies to respond to the large-scale multi-province outbreaks caused by the Delta variant in the latter half of 2021. Each outbreak spread to more than ten provinces but was effectively controlled with fewer than 5,000 domestic cases, and no death was recorded nationwide during each outbreak. In coping with the Delta variant and even the threat of Omicron at the beginning of 2022, China maintained a policy of strictly controlling transmission, sometimes termed a “zero COVID” approach, but described by Chinese public health officials as the “dynamic clearance” of confirmed cases following each local transmission episode. According to the Chinese National Health Commission, “the policy target was dynamic clearance instead of zero infection, aiming to maximise early detection, early treatment, and early disposal and resolutely prevent the continuous spread of the epidemic in communities.”

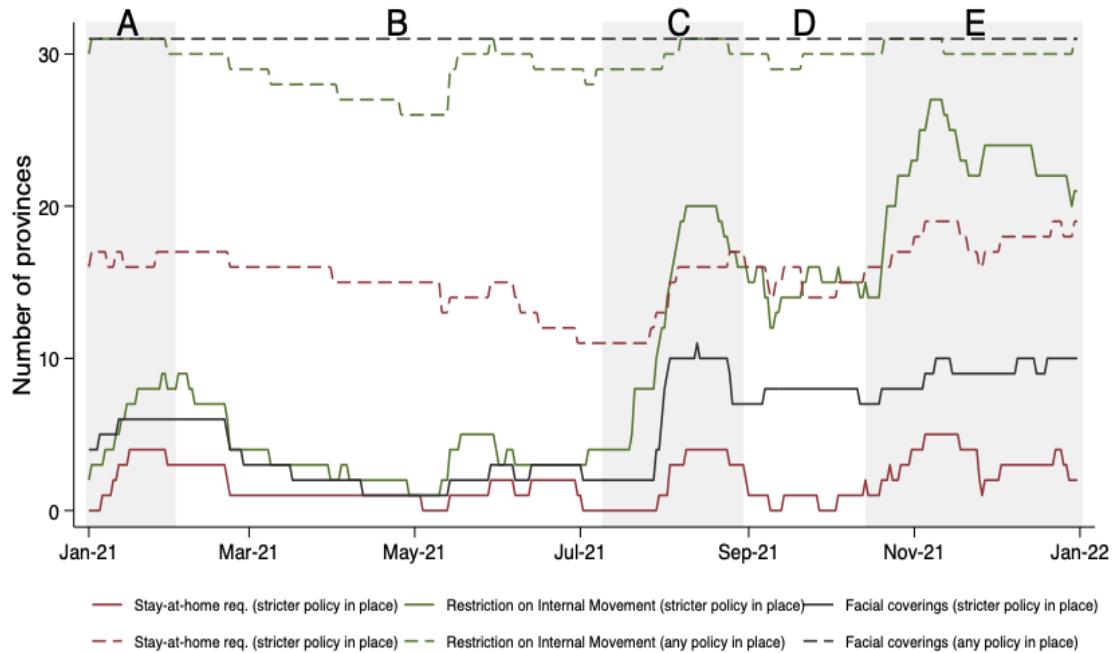
In coping with the epidemic waves in 2021, China pursued this dynamic clearance strategy in each wave. Following this consistent policy target, the overall response pattern can be divided into five stages (periods A-E in Figure 20): preventative

measures in January (period A), low baseline prevention and control from March to June (period B), reactive response in July (period C), high baseline prevention and control from August to October (period D), and more targeted responses in November and December (period E). Moreover, from the perspective of individual policies, we observed significant differences in stay-at-home policies, restrictions on internal movement, and facial covering policies across epidemic waves.

Figure 20 shows the number of provinces with stay-at-home policies, restrictions on internal movement, and facial covering policies in place (coding value greater than 0, represented by the dotted lines) compared to the number of provinces adopting more stringent versions of those policies (represented by the solid line). The dotted lines, therefore, represent the number of provinces with at least a soft version of a given policy (either at the provincial level or at a lower level of government), while the solid lines show the number of provinces with the most stringent version of that policy. Observing the longitudinal change, we find three prominent escalations of the provincial policies in 2021, corresponding to the first, second, and fourth epidemic waves, respectively. Meanwhile, the stringency of these policies stayed relatively stable from August to October, along with the third epidemic wave.

An [OxCGR working paper](#) on these provincial responses provides further insights on COVID-19 policy interventions in China.

Figure 20: Number of Chinese provinces with any stay-at-home policies, restrictions on internal movement, and facial covering policies compared to those adopting stricter versions of the policies



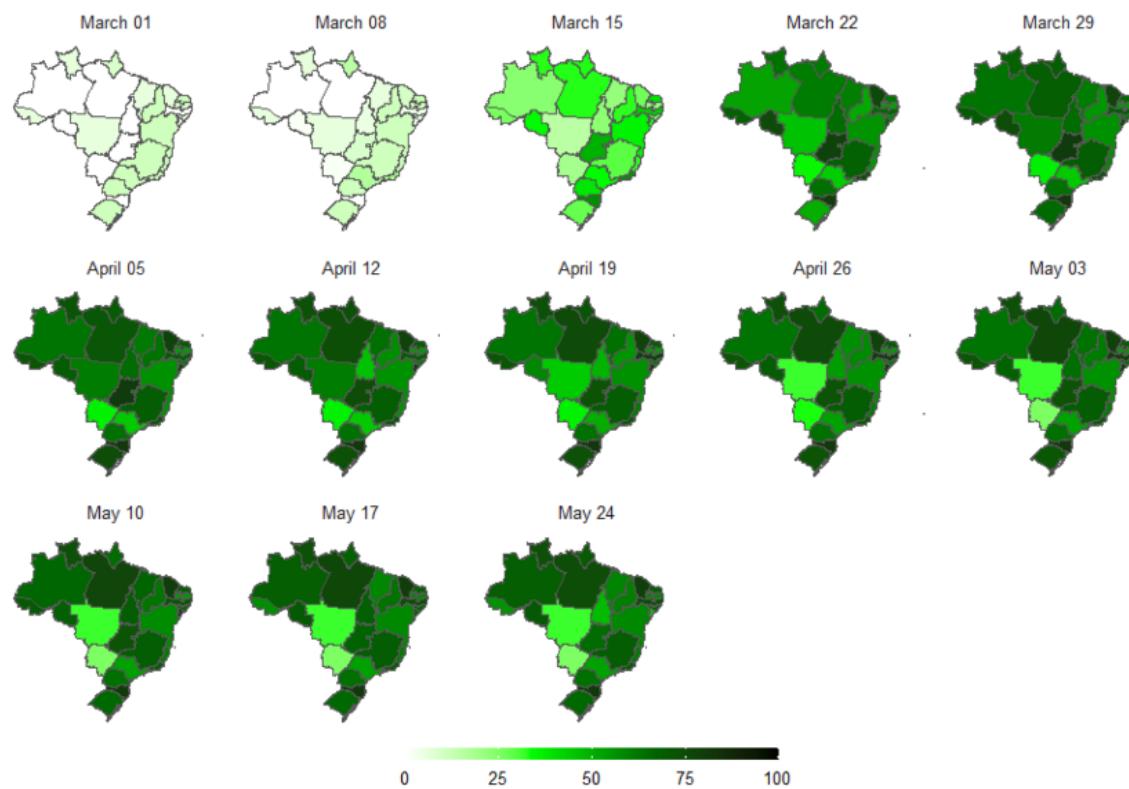
In Brazil, subnational governments took the lead in trying to contain the country's COVID-19 outbreak. The first confirmed case was reported on February 26, 2020, and the virus spread to all 27 states as well as numerous municipalities. On April 8 of that year, a Justice of the Brazilian Supreme Court ruled that state governments had the authority to adopt and maintain restrictive measures to respond to COVID-19 within their territories. Municipal governments could also supplement federal and state legislation, provided there was local interest in the measures adopted.

As a result, some states and state capitals decided to extend physical distancing measures that were already in place, while some cities brought in even stricter measures and others began to lift restrictions. Figure 21 provides a summary of the strictness of policy responses over time by Brazil's state governments during the first three months of the pandemic, with the depth of colour indicating the weekly average stringency index score of state government policies. The first map is for the week commencing Sunday, 1 March, and ending on Saturday, 7 March 2020. The last map in the figure represents the average data from Sunday, 24 May to Saturday, 30 May 2020. The figure reveals that the pandemic experience of Brazilians varied widely based on the state in which they resided. While some states enacted lockdowns and stringent measures to restrict citizens' movements for an extended period, others had few restrictions in place during the early stages of the pandemic. As a result, the severity of

the pandemic and its impact on daily life differed from one region to another, highlighting the challenges of coordinating a nationwide response to a public health crisis.

Additional information on COVID-19 responses in the Brazilian context and its sub-national jurisdictions is available in a dedicated [OxCGR working paper](#).

Figure 21. The development of state government policies over time in March, April, and May 2020, as measured by the stringency index



5. Conclusion

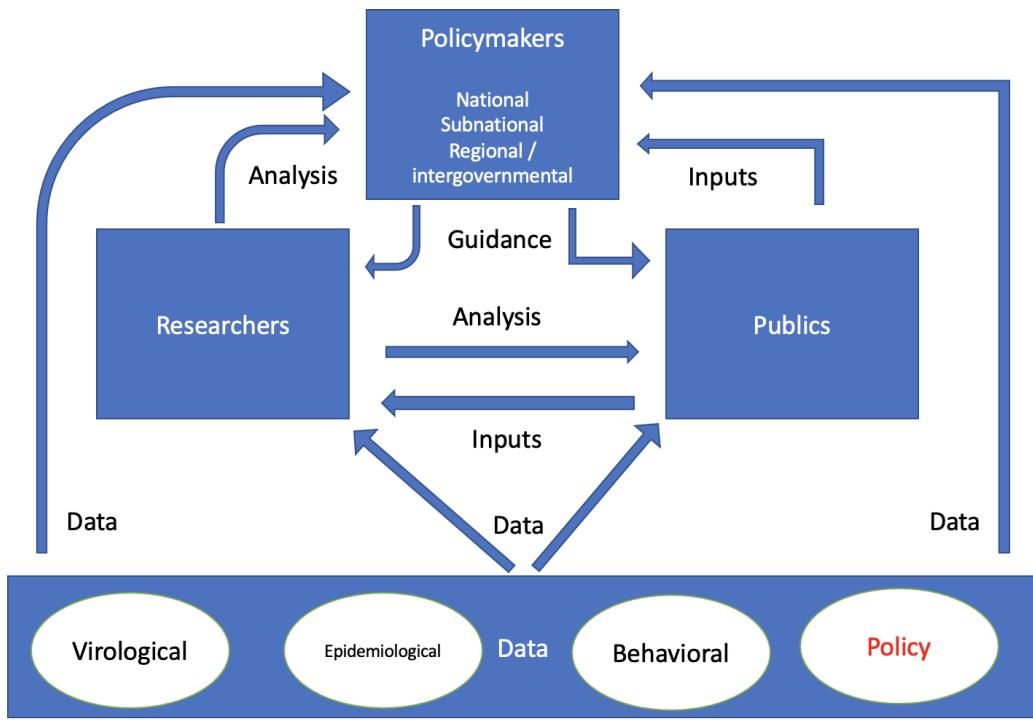
Among the key lessons reinforced by our findings is the ongoing need for good quality, real-time policy data. Just as epidemiological and virological data provide a vital snapshot of the severity and extent of COVID-19's spread, policy data, along with behavioural data, helps us understand how the decisions made by governments may have impacted disease progression and health outcomes. For its part, OxCGR has

sought to contribute to this knowledge gap by providing three years' worth of comparable measures of individual policy actions. While our data does not measure the direct effectiveness of policies themselves, it has been and continues to be a useful tool to analyse factors affecting the trajectory of COVID-19 between 2020 and 2022. As the pandemic evolved over this time period, we have found significant variation in both the measures that governments adopted and when they adopted them – with the divergent approaches correlating with wildly varying outcomes when compared both across and within countries.

To bolster greater pandemic preparedness and response, governments need to embrace an evidence-based approach to the measures they deploy. It is, therefore, imperative to continue studying which measures taken were more effective and which were not. Moreover, the occurrence of COVID-19 in our digital age demonstrates that the public at large also wants to know what is happening to inform their own decision-making and also to evaluate the decisions that they see their governments taking as events unfold. The observed demand for these types of data over the course of the pandemic necessitates having transparent data sources on a range of policy measures that are publicly available, easily digestible, and provided in as close to real time as possible.

With this in mind, OxCGRT and related efforts have signified the value of policy data as one key component in a broader ecosystem of understanding the COVID-19 pandemic response in retrospect and considering how decision-making can be improved for better outcomes in a future global health crisis. Going forward, there is a critical need for a sustained commitment to pandemic preparedness – harnessing what we've learned from PHSM tracking to develop an incorporated data framework that includes regular and ongoing policy data collection that complements other relevant data sources. Our early conception of this framework, shown in Figure 22, takes into account multiple end-users (policymakers, researchers, publics) who rely on these types of data, and it establishes a baseline response system existing between crisis intervals that can be scaled up on demand in an emergency. Converging these multiple streams of data sources will be critical in facilitating cross-sector collaboration and coordination, with the aim of building trust between participants during times of "peace".

Figure 22. The role of data in the pandemic response system



OxCGR presents a model for coordinating global policy research powered by volunteers. We welcome constructive feedback, commentary, and potential opportunities for use of our dataset across disciplines. It is our hope that scholars, medical and public health professionals, policymakers, and concerned citizens alike will continue to make use of OxCGR data to enhance preparations for and responses to pandemics and other challenges for decades to come.

Technical appendix

The OxCGRT reports publicly available information on 24 indicators and a miscellaneous notes field (see Table 1) of government response organised into four groups: containment and closure policies, economic policies, health system policies, vaccination policies. (And we also had a variable for any miscellaneous policies that did not fit into the framework)

Data was collected from publicly available sources such as news articles and government press releases and briefings. These were identified via internet searches by a team of over 1500 volunteers around the world (the contributors are acknowledged at the end of this appendix). OxCGRT records the original source material in notes so that coding can be checked and substantiated.

All OxCGRT data is published under the Creative Commons Attribution licence (CC BY 4.0) and is free to use, share and adapt, provided you give appropriate credit to the OxCGRT team at the Blavatnik School of Government.

Recommended reference for academic publications:

Thomas Hale, Noam Angrist, Rafael Goldszmidt, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster, Emily Cameron-Blake, Laura Hallas, Saptarshi Majumdar, and Helen Tatlow. (2021). “A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker).” *Nature Human Behaviour*.
<https://doi.org/10.1038/s41562-021-01079-8>

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Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford.

Getting started with OxCGRT data

The final OxCGRT dataset can be accessed primarily through a GitHub repository at <https://github.com/OxCGR/ covid-policy-dataset>.

Because of the complexity of the dataset, it is published across 25 CSV files. This appendix should contain all the information users need to navigate and use the data. However, at almost 100 pages long, users may struggle to navigate the appendix itself.

For those who want to dive in straight away, the files are labelled as follows:

- **OxCGRT_compact** is the file we expect most people will use, and is a good starting place. It will reflect the policies that applies to the majority of people in a jurisdiction.
 - It contains 56 variables (including metadata) for 185 national jurisdictions and 210 subnational jurisdictions.
- **OxCGRT_simplified** is the most basic version of the data.
 - It contains just a single variable for each indicator.
 - In total, this data file contains 50 variables for 185 national jurisdictions and 170 subnational jurisdictions (state level only).
- Files denoted **OxCGRT_fullwithnotes** provide maximum detail while still reporting the overall situation in each jurisdiction.
 - All jurisdictions in these files contain the TOTAL designation, meaning they report the overall total policy environment on residents.
 - These files are structured across 147 variables (including metadata).
- Files denoted **OxCGRT_raw** provide the raw data that our team collected for subnational jurisdictions.
 - These jurisdictions are generally designated as WIDE or GOV, meaning they report the policies set by a certain level of government (residents may also be subject to policies from other levels of government).
 - These files are structured across 128 variables (including metadata).
- The **OxCGRT_vaccines_full** files contain our raw data for the vaccine indicators V1-V4 over 226 variables (where each of the 4 indicators has a separate variable recording the policy for each of the 52 population categories).
- The four policy indices are also published in **timeseries** format, which uses the "average" version of each index from the **OxCGRT_compact** files.
- We have also separately published supplementary files for jurisdictions where we only partially completed the data collection exercise. This includes regions of Italy and second cities of Brazilian states (large non-capital cities). These are published separately, and not part of the main dataset.

If you are troubleshooting or things look wrong in the data, there are some common things to check:

- make sure you are looking at the right **version of the indicator** for what you want.
 - **M** versions of indicators (eg. **C1M**) won't always report the existence of a lockdown or closure if it doesn't apply to vaccinated people.
 - **E**, **NV**, and **V** versions of indicators (eg. **C1E**, **C1N**, and **C1V**) are not continuous and will have gaps.
 - You need to choose the right one for your situation.
 - see the section *Differentiation of policies by vaccine status (vaccine passports)* for more information.
- make sure you are looking at the **correct jurisdiction type** for what you want.
 - you might know that the US state of Oklahoma was not recommending any business closures in August 2020, and yet we report **C2M=1** (recommended business closure) for **US_OK** in our **OxCGR(compact_subnational_v1.csv)** file.
 - this is because our main files use the **STATE_TOTAL** jurisdiction type, which reports any policies that apply to residents, *including policies from the federal government*.
 - to find policies enacted by a certain level of government you need to use jurisdictions labelled **_WIDE** or **_GOV**. We only have these for some, not all, of our jurisdictions.
 - see the section *Subnational data and the jurisdiction variable* for more information.
- make sure you have **checked the flag variables** if you see a policy that is much stricter than expected.
 - because we record the strictest policy in a jurisdiction, we will sometimes report a strict policy that only applies in a very small geographic area (eg. a lockdown in one city when the rest of the country is free). Our flag variables will usually tell you if a policy is *targeted* to a specific geography, or general across the whole jurisdiction.
 - see the section *Flag variables for geographic targeting or economic support* for more information.
- make sure you have checked the **notes** to understand the thinking from our data collector.

- it is always useful to use the notes column to corroborate the value you see in an indicator – this should explain why a particular value was chosen. If there are no notes on the day you are looking at, scroll back in time until the most recent note.

Old repositories and prior versions of our data

During the course of the pandemic we published OxCGRT data in several formats – most of which are subtly different to the final dataset at:

<https://github.com/OxCGRT/covid-policy-dataset>

These repositories are still available and can be used to access data published in older data structures. GitHub also allows people to view historical versions of repositories, so it is possible to examine the data as it was at any point in time.

The repositories that may be of interest are:

- <https://github.com/OxCGRT/covid-policy-tracker>
 - this was the live production repository, updated every hour. Because it was updated in real time the repository is incredibly large, holding the entire history of past edits and changes.
- <https://github.com/OxCGRT/covid-policy-tracker-legacy>
 - this repository contains up-to-date data published in our “legacy” format. While we made several changes to the codebook and data structure over the course of the pandemic, we always maintained a version that was easily comparable back to the very first dataset we published.
- <https://github.com/OxCGRT/Brazil-covid-policy>
 - this is where we published raw data for Brazilian subnational jurisdictions (ie. **STATE_GOV** and **CITY_WIDE**)
- <https://github.com/OxCGRT/USA-covid-policy>
 - this is where we published raw data for the states in the USA (ie. **STATE_WIDE**)
- <https://github.com/OxCGRT/Australia-covid-policy>
 - this is where we published raw data for Australian subnational jurisdictions (ie. **STATE_GOV** and **CITY_WIDE**)

Codebook and interpretation guidance

This is the authoritative codebook for the Oxford Covid-19 Government Response Tracker. The dataset contains 24 indicators and a miscellaneous notes field organised into five groups (C, E, H, V, M); we also capture how policies vary based on vaccination status and geographic targeting. This codebook is divided into the following sections:

- Codebook of each variable
- General interpretation guidance
- Subnational data and the **jurisdiction** variable
- Differentiation of policies by vaccine status (vaccine passports)
- Flag variables for geographic targeting or economic support
- Common issues
- Detailed interpretation guidance for each indicator
- Codebook changelog

Most indicators are recorded on an ordinal scale that represents the level of strictness of the policy. Four of the indicators (E3, E4, H4 and H5) are recorded as a US dollar value of fiscal spending. V1 records categorical data and the ranked order of prioritised groups for vaccination in a population.

In August 2021 OxCGRT stopped updating data for the E3, E4 and H4 fiscal indicators. H5 (vaccine spending) may also be incomplete. The data for these indicators remains in the CSV files, but they have not been updated beyond August 2021 and they have not been through the same quality checking and review process as the other indicators.

The indicators are of four types:

- **Ordinal:** These indicators measure policies on a simple scale of severity / intensity. These indicators are reported for each day a policy is in place.
 - Many have a further flag to note if they are “targeted”, applying only to a sub-region of a jurisdiction, or a specific sector; or “general”, applying throughout that jurisdiction or across the economy. (Note, the flag for indicators **E1** and **H7** means something different.)
- **Numeric:** These indicators measure a specific number, typically the value in USD. These indicators are only reported on the day they are announced.
- **Text:** This is a “free response” indicator that records other information of interest.

- **Categorical:** These indicators have a range of eligible categories to select, and in some instances, rank (i.e. vaccine prioritisation/eligibility policies).
- **Binary:** This measures the presence (1) or absence (0) of a requirement to be vaccinated for certain groups

All observations also have a “notes” cell that reports sources and comments to justify and substantiate the designation.

Table 1: OxCGRT Indicators

ID	Name	Type	Targeted/ General?	Differentiation based on vaccination status?
Containment and Closure				
C1	School closing	Ordinal	Geographic	Yes
C2	Workplace closing	Ordinal	Geographic	Yes
C3	Cancel public events	Ordinal	Geographic	Yes
C4	Restrictions on gathering size	Ordinal	Geographic	Yes
C5	Close public transport	Ordinal	Geographic	Yes
C6	Stay at home requirements	Ordinal	Geographic	Yes
C7	Restrictions on internal movement	Ordinal	Geographic	Yes
C8	Restrictions on international travel	Ordinal	No	Yes
Economic Response				
E1	Income support	Ordinal	Sectoral	No
E2	Debt/contract relief for households	Ordinal	No	No
E3	Fiscal measures	Numeric	No	No

E4	Giving international support	Numeric	No	No
Health Systems				
H1	Public information campaign	Ordinal	Geographic	No
H2	Testing policy	Ordinal	No	No
H3	Contact tracing	Ordinal	No	No
H4	Emergency investment in healthcare	Numeric	No	No
H5	Investment in Covid-19 vaccines	Numeric	No	No
H6	Facial coverings	Ordinal	Geographic	Yes
H7	Vaccination Policy	Ordinal	Cost	No
H8	Protection of elderly people	Ordinal	Geographic	Yes
Vaccine Policies				
V1	Vaccine prioritisation	Categorical	No	No
V2	Vaccine eligibility/availability	Categorical	No	No
V3	Vaccine financial support	Categorical	No	No
V4	Mandatory vaccination	Binary	No	No
Miscellaneous				
M1	Other responses	Text	No	n/a

C - containment and closure policies

ID	Name	Description	Measurement	Coding
C1	C1E_School closing C1NV_School closing C1V_School closing C1M_School closing	Record closings of schools and universities	Ordinal scale	0 - no measures 1 - recommend closing or all schools open with alterations resulting in significant differences compared to non-Covid-19 operations 2 - require closing (only some levels or categories, eg just high school, or just public schools) 3 - require closing all levels Blank - no data
	C1E_Flag C1NV_Flag C1V_Flag C1M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C2	C2E_Workplace closing C2NV_Workplace closing C2V_Workplace closing C2M_Workplace closing	Record closings of workplaces	Ordinal scale	0 - no measures 1 - recommend closing (or recommend work from home) or all businesses open with alterations resulting in significant differences compared to non-Covid-19 operation 2 - require closing (or work from home) for some sectors or categories of workers 3 - require closing (or work from home) for all-but-essential workplaces (eg grocery stores, doctors) Blank - no data
	C2E_Flag C2NV_Flag C2V_Flag C2M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C3	C3E_Cancel public events	Record cancelling public events	Ordinal scale	0- No measures 1 - Recommend cancelling 2 - Require cancelling No data - blank

	C3NV_Cancel public events C3V_Cancel public events C3M_Cancel public events			
	C3E_Flag C3NV_Flag C3V_Flag C3M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C4	C4E_Restrictions on gatherings C4NV_Restrictions on gatherings C4V_Restrictions on gatherings C4M_Restrictions on gatherings	Record the cut-off size for limits on gatherings	Ordinal scale + binary for geographic scope	0 - no restrictions 1 - restrictions on very large gatherings (the limit is above 1000 people) 2 - restrictions on gatherings between 101-1000 people 3 - restrictions on gatherings between 11-100 people 4 - restrictions on gatherings of 10 people or less Blank - no data
	C4E_Flag C4NV_Flag C4V_Flag C4M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C5	C5E_Close public transport C5NV_Close public transport	Record closing of public transport	Ordinal scale	0 - No measures 1 - Recommend closing (or significantly reduce volume/route/means of transport available) 2 - Require closing (or prohibit most citizens from using it)

	C5V_Close public transport C5M_Close public transport			No data - blank
	C5E_Flag C5NV_Flag C5V_Flag C5M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C6	C6E_Stay at home requirements C6NV_Stay at home requirements C6V_Stay at home requirements C6M_Stay at home requirements	Record orders to "shelter-in- place" and otherwise confine to the home	Ordinal scale	0 - no measures 1 - recommend not leaving house 2 - require not leaving house with exceptions for daily exercise, grocery shopping, and 'essential' trips 3 - require not leaving house with minimal exceptions (eg allowed to leave once a week, or only one person can leave at a time, etc) Blank - no data
	C6E_Flag C6NV_Flag C6V_Flag C6M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C7	C7E_Restrictions on internal movement	Record restrictions on internal movement between cities/regions	Ordinal scale	0 - No measures 1 - Recommend not to travel between regions/cities 2 – internal movement restrictions in place No data - blank

	C7NV_Restrictions on internal movement C7V_Restrictions on internal movement C7M_Restrictions on internal movement			
	C7E_Flag C7NV_Flag C7V_Flag C7M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
C8	C8E_International travel controls C8NV_International travel controls C8V_International travel controls C8EV_International travel controls	Record restrictions on international travel Note: this records policy for foreign travellers, not citizens	Ordinal scale	0 - no restrictions 1 - screening arrivals 2 - quarantine arrivals from some or all regions 3 - ban arrivals from some regions 4 - ban on all regions or total border closure Blank - no data

E - economic policies

ID	Name	Description		Coding instructions
E1	E1_Income support (for households)	<p>Record if the government is providing direct cash payments to people who lose their jobs or cannot work.</p> <p>Note: only includes payments to firms if explicitly linked to payroll/salaries</p> <p>*no differentiated policies reported in this indicator</p>	Ordinal scale	<p>0 - no income support 1 - government is replacing less than 50% of lost salary (or if a flat sum, it is less than 50% median salary) 2 - government is replacing 50% or more of lost salary (or if a flat sum, it is greater than 50% median salary) Blank - no data</p>
	E1_Flag		Binary scale for sectoral scope	<p>0 - formal sector workers only or informal sector workers only 1 - all workers Blank - no data</p>
E2	E2_Debt/contract relief (for households)	<p>Record if the government is freezing financial obligations for households (eg stopping loan repayments, preventing services like water from stopping, or banning evictions)</p> <p>*no differentiated policies reported in this indicator</p>		<p>0 - no debt/contract relief 1 - narrow relief, specific to one kind of contract 2 - broad debt/contract relief Blank - no data</p>
E3	E3_Fiscal measures	Announced economic stimulus spending	USD	<p>Record monetary value in USD of fiscal stimuli, includes any spending or tax cuts NOT included in E4, H4 or H5</p> <p>0 - no new spending that day</p> <p>Blank - no data</p>

E4	E4_International support	Announced offers of Covid-19 related aid spending to other countries	USD	Record monetary value in USD 0 - no new spending that day Blank - no data
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H - health system policies

ID	Name	Description	Measurement	Coding
H1	H1_Public information campaigns	Record presence of public info campaigns *no differentiated policies reported in this indicator	Ordinal scale	0 - no Covid-19 public information campaign 1 - public officials urging caution about Covid-19 2- coordinated public information campaign (eg across traditional and social media) Blank - no data
	H1_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
H2	H2_Testing policy	Record government policy on who has access to testing Note: this records policies about testing for current infection (PCR tests) not testing for immunity (antibody test)	Ordinal scale	0 - no testing policy 1 - only those who both (a) have symptoms AND (b) meet specific criteria (eg key workers, admitted to hospital, came into contact with a known case, returned from overseas) 2 - testing of anyone showing Covid-19 symptoms 3 - open public testing (eg "drive through" testing available to asymptomatic people) Blank - no data

		*no differentiated policies reported in this indicator		
H3	H3_Contact tracing	Record government policy on contact tracing after a positive diagnosis *no differentiated policies reported in this indicator	Ordinal scale	0 - no contact tracing 1 - limited contact tracing; not done for all cases 2 - comprehensive contact tracing; done for all identified cases
H4	H4_Emergency investment in healthcare	Announced short term spending on healthcare system, eg hospitals, masks, etc	USD	Record monetary value in USD 0 - no new spending that day Blank - no data
H5	H5_Investment in vaccines	Announced public spending on Covid-19 vaccine development	USD	Record monetary value in USD 0 - no new spending that day Blank - no data
H6	H6E_Facial Coverings H6NV_Facial Coverings H6V_Facial Coverings	Record policies on the use of facial coverings outside the home	Ordinal scale	0 - No policy 1 - Recommended 2 - Required in some specified shared/public spaces outside the home with other people present, or some situations when social distancing not possible 3 - Required in all shared/public spaces outside the home with other people present or all situations when social distancing not possible

	H6M_Faci al Coverings			4 - Required outside the home at all times regardless of location or presence of other people
	H6E_Flag H6NV_Flag H6V_Flag H6M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data
H7	H7_Vaccin ation policy	Record policies for vaccine delivery for different groups *no differentiated policies reported in this indicator	Ordinal scale	0 - No availability 1 - Availability for ONE of following: key workers/ clinically vulnerable groups (non elderly) / elderly groups 2 - Availability for TWO of following: key workers/ clinically vulnerable groups (non elderly) / elderly groups 3 - Availability for ALL of following: key workers/ clinically vulnerable groups (non elderly) / elderly groups 4 - Availability for all three plus partial additional availability (select broad groups/ages) 5 - Universal availability
	H7_Flag		Binary flag for cost	0 - At cost to individual (or funded by NGO, insurance, or partially government funded) 1- No or minimal cost to individual (government funded or subsidised) Blank - no data
H8	H8E_Prot ection of elderly people H8NV_Pro tection of elderly people	Record policies for protecting elderly people (as defined locally) in Long Term Care Facilities and/or the community	Ordinal scale	0 - no measures 1 - Recommended isolation, hygiene, and visitor restriction measures in LTCFs and/or elderly people to stay at home 2 - Narrow restrictions for isolation, hygiene in LTCFs, some limitations on external visitors

	H8V_Protection of elderly people H8M_Protection of elderly people	and home setting		and/or restrictions protecting elderly people at home 3 - Extensive restrictions for isolation and hygiene in LTCFs, all non-essential external visitors prohibited, and/or all elderly people required to stay at home and not leave the home with minimal exceptions, and receive no external visitors Blank - no data
	H8E_Flag H8NV_Flag H8V_Flag H8M_Flag		Binary flag for geographic scope	0 - targeted 1- general Blank - no data

V - vaccination policies

The four V indicators focus on 52 different population groups – by occupation, risk status, and age group.

V1 – Vaccine prioritisation is a categorical indicator that captures eligible and prioritised groups of people (e.g. profession, age, vulnerability, etc.), and shows the order in which these groups are prioritised for vaccines by their country/region/territory. **V2 – Vaccine eligibility/availability** (also a categorical indicator) is linked to V1, and indicates which of the prioritised groups are actually being vaccinated at that time. **V3 – Vaccine financial support** captures information on whether vaccines are government funded, or otherwise. **V4- Mandatory Vaccination** is a binary indicator which reports the existence of a requirement to be vaccinated for a group of people.

This means that each of the V indicators are actually reported as 53 different variables. We also summarise these into 10 summary indicators: V1, V2A, V2B, V2C, V2D, V2E, V2F, V2G, V3, and V4.

ID	Name	Description	Measureme nt	Coding
V1	V1_Vaccine prioritisation (summary)	Reports the existence of a prioritised plan for vaccine rollout.	Ordinal scale	0 – no plan 1 – a prioritised plan is in place 2 – universal/general eligibility; no prioritisation between groups
V1	Vaccine prioritisation V1_0-4 yrs Infants V1_5-15 yrs Young people V1_General 16-19 yrs V1_General 20-24 yrs V1_General 25-29 yrs V1_General 30-34 yrs V1_General 35-39 yrs V1_General 40-44 yrs V1_General 45-49 yrs V1_General 50-54 yrs V1_General 55-59 yrs V1_General 60-64 yrs V1_General 65-69 yrs V1_General 70-74 yrs V1_General 75-79 yrs V1_General 80+ yrs V1_At Risk 16-19 yrs V1_At Risk 20-24 yrs V1_At Risk 25-29 yrs V1_At Risk 30-34 yrs V1_At Risk 35-39 yrs V1_At Risk 40-44 yrs V1_At Risk 45-49 yrs V1_At Risk 50-54 yrs V1_At Risk 55-59 yrs V1_At Risk 60-64 yrs V1_At Risk 65-69 yrs V1_At Risk 70-74 yrs V1_At Risk 75-79 yrs V1_At Risk 80+ yrs	Record the ranked position for different groups within a jurisdiction's prioritisation plan.	Rank order	Blank – category not selected for prioritisation 1, 2, 3, 4... – category has been selected for prioritisation; number represents the rank of prioritisation; equal-ranked categories will share the same number

	V1_Airport/Border/Airline Staff V1_Clinically vulnerable/chronic illness/significant underlying health condition (excluding elderly and disabled) V1_Crowded/communal living conditions (dormitories for migrant workers, temporary accommodations) V1_Disabled People V1_Educators V1_Ethnic minorities V1_Factory workers V1_Frontline/essential workers (when subcategories not specified) V1_Frontline retail workers V1_Healthcare workers/carers (excluding care home staff) V1_Military V1_Other 'high contact' professions/groups (taxi drivers, security guards) V1_People living with a vulnerable/shielding person or other priority group V1_Police/ first responders V1_Pregnant people V1_Primary and secondary school students V1_Religious/Spiritual Leaders V1_Residents in an elderly care home V1_Staff working in an elderly care home V1_Tertiary education students V1_Refugees/migrants V1_Government Officials			
V2 A	Vaccine eligibility/availability (summary)	Reports whether any categories of people are receiving vaccines.	Ordinal scale	Blank – no data 0 – no categories are receiving vaccines

				1 – vaccines are available to some categories 2 – vaccines are available to anyone over the age of 16 yrs 3 – vaccines are available to anyone over the age of 16 yrs PLUS one or both of 5-15 yrs and 0-4 yrs
V2B	V2B_Vaccine age eligibility/availability age floor(General population summary)	Reports lowest age range of general population being vaccinated	Numerical	Blank – no data 0 – no categories are receiving vaccines numerical range – Lowest age range for 'General' category
V2C	V2C_Vaccine age eligibility/availability age floor(At-risk population summary)	Reports lowest age range of at risk population being vaccinated	Numerical	Blank – no data 0 – no categories are receiving vaccines numerical range – Lowest age range from either 'General' or 'At-risk' categories
V2D	V2D_Medically/ clinically vulnerable (Non-elderly)	Reports the number of categories selected from thematic group: V2_At risk age ranges below 60 (one or more selected)	Ordinal	Blank – no data 0 – no categories are receiving vaccines 1 – 1 or 2 categories in group selected

		<p>counts as 1 x category)</p> <p>V2_Clinically vulnerable/chronic illness/significant underlying health condition (excluding elderly and disabled)</p> <p>V2_Disabled people</p> <p>V2_Pregnant people</p> <p>V2_People living with a vulnerable/shielding person or other priority group</p>		<p>2 – 3 or more categories selected or all from</p> <p>V2_General 16-19 years up to V2_General 80+ years present'</p>
V2E	V2E_Education	<p>Reports the number of categories selected from thematic group:</p> <p>V2_Educators</p> <p>V2_Primary and secondary school students</p> <p>V2_Tertiary education students</p>	Ordinal	<p>Blank – no data</p> <p>0 – no categories are receiving vaccines</p> <p>1 – 1 category in group selected</p> <p>2 - 2 or more categories selected or all from</p> <p>V2_General 16-19 years up to V2_General 80+ years present'</p>
V2F	V2F_Frontline workers (non healthcare)	<p>Reports the number of categories selected from thematic group:</p> <p>V2_Police/first responders</p> <p>V2_Airport/Border/Airline staff</p> <p>V2_Factory workers</p> <p>V2_Frontline retail workers</p> <p>V2_Military</p> <p>V2_Other high contact professions/groups</p>	Ordinal	<p>Blank – no data</p> <p>0 – no categories are receiving vaccines</p> <p>1 – 1 or 2 categories in group selected</p> <p>2 - 3 or more categories selected or all from</p> <p>V2_General 16-19 years up to V2_General 80+ years present'</p>

		(taxi drivers, security guards) V2_Frontline/essential workers (when subcategories not specified) (triggers an automatic 2)		
V2 G	V2F_Frontline workers (healthcare)	Reports the number of categories selected from thematic group: V2_Staff working in an elderly care home V2_Healthcare workers/carers (excluding care home staff)	Ordinal	Blank – no data 0 – no categories are receiving vaccines 1 – 1 category in group selected 2 - 2 categories selected or all from V2_General 16-19 years up to V2_General 80+ years present
V2	Vaccine eligibility/availability V2_0-4 yrs Infants V2_5-15 yrs Young people V2_General 16-19 yrs V2_General 20-24 yrs V2_General 25-29 yrs V2_General 30-34 yrs V2_General 35-39 yrs V2_General 40-44 yrs V2_General 45-49 yrs V2_General 50-54 yrs V2_General 55-59 yrs V2_General 60-64 yrs V2_General 65-69 yrs V2_General 70-74 yrs V2_General 75-79 yrs V2_General 80+ yrs V2_At Risk 16-19 yrs V2_At Risk 20-24 yrs V2_At Risk 25-29 yrs V2_At Risk 30-34 yrs V2_At Risk 35-39 yrs V2_At Risk 40-44 yrs V2_At Risk 45-49 yrs	Record which categories of people – regardless of their position in a prioritised rollout plan – are currently receiving vaccines.	Categorical / binary	Blank – no data 0 – vaccines are not being made available to this category 1 – vaccines are being made available to this category

	<p>V2_At Risk 50-54 yrs</p> <p>V2_At Risk 55-59 yrs</p> <p>V2_At Risk 60-64 yrs</p> <p>V2_At Risk 65-69 yrs</p> <p>V2_At Risk 70-74 yrs</p> <p>V2_At Risk 75-79 yrs</p> <p>V2_At Risk 80+ yrs</p> <p>V2_Airport/Border/Airline Staff</p> <p>V2_Clinically vulnerable/chronic illness/significant underlying health condition (excluding elderly and disabled)</p> <p>V2_Crowded/communal living conditions (dormitories for migrant workers, temporary accommodations)</p> <p>V2_Disabled People</p> <p>V2_Educators</p> <p>V2_Ethnic minorities</p> <p>V2_Factory workers</p> <p>V2_Frontline/essential workers (when subcategories not specified)</p> <p>V2_Frontline retail workers</p> <p>V2_Healthcare workers/carers (excluding care home staff)</p> <p>V2_Military</p> <p>V2_Other 'high contact' professions/groups (taxi drivers, security guards)</p> <p>V2_People living with a vulnerable/shielding person or other priority group</p> <p>V2_Police/ first responders</p> <p>V2_Pregnant people</p> <p>V2_Primary and secondary school students</p> <p>V2_Religious/Spiritual Leaders</p> <p>V2_Residents in an elderly care home</p> <p>V2_Staff working in an elderly care home</p> <p>V2_Tertiary education students</p>		
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	V2_Refugees/migrants V2_Government Officials			
V3	V3_Vaccine financial support (summary)	Reports the overall approach taken to vaccine funding – whether paid by the individual or the government.	Ordinal scale	Blank - no data 0 – no availability 1 – full cost to the individual for all categories identified in V2 2 – full cost to the individual for some categories identified in V2, some subsidy for other categories 3- partial funding by the government for all of the categories identified in V2 4 – partial funding by the government for some categories identified in V2, full funding for other categories 5 – all categories fully funded by the government
V3	Vaccine financial support V3_0-4 yrs Infants V3_5-15 yrs Young people V3_General 16-19 yrs V3_General 20-24 yrs V3_General 25-29 yrs V3_General 30-34 yrs V3_General 35-39 yrs V3_General 40-44 yrs V3_General 45-49 yrs V3_General 50-54 yrs V3_General 55-59 yrs V3_General 60-64 yrs V3_General 65-69 yrs V3_General 70-74 yrs V3_General 75-79 yrs	Record how vaccines are funded for each category of people identified in V2 as currently receiving vaccines.	Ordinal scale	Blank - no data 0 - full cost borne by the individual (or through private health insurance) or no policy 1 - partially funded by government and individual pays nominal fee 2 - fully covered by government funding, FREE

	<p>V3_General 80+ yrs</p> <p>V3_At Risk 16-19 yrs</p> <p>V3_At Risk 20-24 yrs</p> <p>V3_At Risk 25-29 yrs</p> <p>V3_At Risk 30-34 yrs</p> <p>V3_At Risk 35-39 yrs</p> <p>V3_At Risk 40-44 yrs</p> <p>V3_At Risk 45-49 yrs</p> <p>V3_At Risk 50-54 yrs</p> <p>V3_At Risk 55-59 yrs</p> <p>V3_At Risk 60-64 yrs</p> <p>V3_At Risk 65-69 yrs</p> <p>V3_At Risk 70-74 yrs</p> <p>V3_At Risk 75-79 yrs</p> <p>V3_At Risk 80+ yrs</p> <p>V3_Airport/Border/Airline Staff</p> <p>V3_Clinically vulnerable/chronic illness/significant underlying health condition (excluding elderly and disabled)</p> <p>V3_Crowded/communal living conditions (dormitories for migrant workers, temporary accommodations)</p> <p>V3_Disabled People</p> <p>V3_Educators</p> <p>V3_Ethnic minorities</p> <p>V3_Factory workers</p> <p>V3_Frontline/essential workers (when subcategories not specified)</p> <p>V3_Frontline retail workers</p> <p>V3_Healthcare workers/carers (excluding care home staff)</p> <p>V3_Military</p> <p>V3_Other 'high contact' professions/groups (taxi drivers, security guards)</p> <p>V3_People living with a vulnerable/shielding person or other priority group</p> <p>V3_Police/ first responders</p> <p>V3_Pregnant people</p> <p>V3_Primary and secondary school students</p>		
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	V3_Religious/Spiritual Leaders V3_Residents in an elderly care home V3_Staff working in an elderly care home V3_Tertiary education students V3_Refugees/migrants V3_Government Officials			
V4	V4_Mandatory Vaccination (summary)	Reports the existence of a requirement to be vaccinated	Binary	Blank - no data 0 – no requirement to be vaccinated 1 – requirement to be vaccinated is in place for one or more groups
V4	V4_Vaccine requirement/mandate V4_0-4 yrs Infants V4_5-15 yrs Young people V4_General 16-19 yrs VV4_General 20-24 yrs V4_General 25-29 yrs V4_General 30-34 yrs V4_General 35-39 yrs V4_General 40-44 yrs V4_General 45-49 yrs V4_General 50-54 yrs V4_General 55-59 yrs V4_General 60-64 yrs V4_General 65-69 yrs V4_General 70-74 yrs V4_General 75-79 yrs V4_General 80+ yrs V4_At Risk 16-19 yrs V4_At Risk 20-24 yrs V4_At Risk 25-29 yrs V4_At Risk 30-34 yrs V4_At Risk 35-39 yrs V4_At Risk 40-44 yrs VV4_At Risk 45-49 yrs V4_At Risk 50-54 yrs V4_At Risk 55-59 yrs V4_At Risk 60-64 yrs	Reports the existence of a requirement to be vaccinated	Binary	Blank - no data 0 - no requirement to be vaccinated 1 - requirement to be vaccinated

	<p>V4_At Risk 65-69 yrs</p> <p>V4_At Risk 70-74 yrs</p> <p>V4_At Risk 75-79 yrs</p> <p>V4_At Risk 80+ yrs</p> <p>V4_Airport/Border/Airline Staff</p> <p>V4_Clinically vulnerable/chronic illness/significant underlying health condition (excluding elderly and disabled)</p> <p>V4_Crowded/communal living conditions (dormitories for migrant workers, temporary accommodations)</p> <p>V4_Disabled People</p> <p>V4_Educators</p> <p>V4_Ethnic minorities</p> <p>V4_Factory workers</p> <p>V4_Frontline/essential workers (when subcategories not specified)</p> <p>V4_Frontline retail workers</p> <p>V4_Healthcare workers/carers (excluding care home staff)</p> <p>V4_Military</p> <p>V4_Other 'high contact' professions/groups (taxi drivers, security guards)</p> <p>V4_People living with a vulnerable/shielding person or other priority group</p> <p>V4_Police/ first responders</p> <p>V4_Pregnant people</p> <p>V4_Primary and secondary school students</p> <p>V4_Religious/Spiritual Leaders</p> <p>V4_Residents in an elderly care home</p> <p>V4_Staff working in an elderly care home</p> <p>V4_Tertiary education students</p> <p>V4_Refugees/migrants</p> <p>V4_Government Officials</p>		
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M - miscellaneous policies

ID	Name	Description	Measurement	Coding
M1	M1_Notes *no differentiate d policies reported in this indicator	Records policy announcements that do not fit anywhere else	Free text notes field	Note of unusual or interesting interventions that our data collectors think are worth flagging.

Additional variables with epidemiological statistics

ID	Name	Description	Measurement	Coding
	ConfirmedC ases	The cumulative number of reported covid-19 cases since the beginning of the pandemic ⁸	Number	Number of covid-19 cases
	ConfirmedDe aths	The cumulative number of deaths	Number	Number of covid-19 deaths

⁸ The data for confirmed cases and confirmed deaths came from multiple sources. For country-level jurisdictions, Australian states and territories, Chinese provinces, and for US states: Johns Hopkins University CSSE Covid-19 data repository (<https://github.com/CSSEGISandData/COVID-19>). For Brazilian subnational jurisdictions: from a team at the Universidad Federal de Viçosa (<https://github.com/wcota/covid19br>). For Canadian subnational data: the Canadian government's health infobase (<https://health-infobase.canada.ca/>). For Indian subnational jurisdictions: the inCovid19 project (<https://data.incovid19.org/>). For UK subnational jurisdictions: the UK government's coronavirus data API (<https://coronavirus.data.gov.uk/details/developers-guide>).

ID	Name	Description	Measurement	Coding
		attributed to covid-19 since the beginning of the pandemic		
	PopulationVaccinated	The percentage of fully vaccinated population in the jurisdiction, or, depending on data availability, a binary indicator of whether the majority of people are unvaccinated or vaccinated. ⁹	Percentage OR binary indicator ¹⁰	<p>Number - the proportion of the population that is reported as vaccinated by that jurisdiction</p> <p>Under 50% - the majority of the population is unvaccinated (used in jurisdictions where we do not have regular vaccination rate data)</p> <p>Over 50% - the majority of the population is vaccinated (used in jurisdictions where we do not have regular vaccination rate data)</p> <p>Blank - no data</p>
	MajorityVaccinated	Record a binary indicator of majority (non-)vaccinated.	Binary indicator	NV - the majority of the population is unvaccinated (used in jurisdictions where we

⁹ Data on vaccination rates come from multiple sources. For country-level jurisdictions, US subnational jurisdictions, and UK subnational jurisdictions we use the dataset published by Our World in Data (<https://github.com/owid/covid-19-data/tree/master/public/data/vaccinations>). For Australian subnational jurisdictions: the Australian COVID-19 vaccination data project (<https://github.com/jxeeno/aust-govt-covid19-vaccine-pdf>). Data for Canadian and Brazilian subnational jurisdictions comes from the same datasource as the case and deaths data. For Indian subnational jurisdictions, we hand-coded the point in time when – by our estimates of patchy data – vaccination rates in a jurisdiction exceeded 50%.

¹⁰ The binary indicator applies specifically to Chinese and Indian STATE level jurisdictions as well CITY level jurisdictions (in Australia and Brazil), where there was a lack of consistent timeseries data available. For China, Australia and Brazil, we simply use the vaccination rates of a higher-level jurisdiction (NATIONAL for Chinese provinces, and STATE for Australian and Brazilian cities) to signal whether the majority of the population was vaccinated. For Indian states the data existed but was patchy, and so we simply identified the single threshold date when the state had reached a majority vaccinated.

ID	Name	Description	Measurement	Coding
				do not have regular vaccination rate data) V - the majority of the population is vaccinated (used in jurisdictions where we do not have regular vaccination rate data) Blank - no data

General interpretation guidance

There are a few general rules that apply to our data:

- **We report the most stringent government policy** with the highest ordinal value. If the most stringent policy is only present in a limited geographic area or sector, we use a binary flag variable for most indicators to describe this scope and reflect whether the policy is targeted or general.
- **Implementation not announcement:** We start coding a policy from the day the policy was implemented in practice, not the day it was announced (except for **V1**, where the policy being recorded is the announced prioritisation list, not the actual availability of vaccines).
- **If coding a country with a contested government or multiple ruling parties**, we try to code the “dominant tendency” in the jurisdiction, which generally means recording the policies of the more formalised government, or the one which governs the larger proportion of the population
- **Where testing/vaccination exemptions are in place we still report this as a closure.** Some governments implement restrictions where citizens can gain exemption through evidence of testing or vaccination. We deal with this primarily through our differentiated coding (see more below). But the general rule is that – apart from differentiated coding – we still report the more stringent government policy that applies to people who do not obtain an exemption. The only time we would report the more open policy is if anyone can arrive and get tested onsite with a rapid test to gain entry. We would not code this as a required closure, as anyone can ‘test out’ of restrictions easily. Such at-the-door

testing must apply to all sectors within the indicator, and be a government policy, not that of a private business.

Subnational data and the **jurisdiction** variable

OxCGR includes data for nearly all national-level countries, territories, and regions in the world.¹¹ It also includes subnational-level data for Australia, Brazil, Canada, China, India, the United Kingdom, and the United States of America (as well as partial data for Italian regions).

OxCGR data are used in different ways – for instance some people may want to know the policies that apply to all residents in a state, while others may want to know the policies adopted by that state government (as opposed to the national government). To distinguish between these uses, different published versions of OxCGR data are tagged in the database using the **jurisdiction** variable.

The **jurisdiction** variable is composed of two parts: the first part specifies the level of government (ie. **NAT**, **STATE**, or **CITY**) and the second part of the variable describes type of data (ie. **TOTAL**, **WIDE**, or **GOV**), which we will describe next.

- The jurisdiction label **TOTAL** simply represents the total package of policies that apply to a resident in that jurisdiction, regardless of which level of government set the policy. This seems to be the most common use case for OxCGR data. For example, observations labelled **AUS_NSW STATE_TOTAL** describe the policies that apply to people in the state of New South Wales, regardless of whether the policy comes from the state government, the federal Australian government, or even the city of Sydney.
- The jurisdiction label **GOV** indicates that observations include only policies instigated by a particular level of government; higher- or lower-level jurisdictions do not inform the coding of these observations.

¹¹ The designations employed and the presentation of the material do not imply the expression of any opinion whatsoever on the part of OxCGR concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. We code the policies of the de facto controlling authority of a jurisdiction without prejudice to conflicting authority claims.

- The jurisdiction label **WIDE** refers to policies put in place at a given level of government as well as any policies from lower levels of government. **WIDE** observations therefore do not incorporate general policies from higher levels of government that may supersede local policies. Continuing to examine the case of New South Wales, the data recorded for **AUS_NSW STATE_WIDE** would include any policies made by the state government of New South Wales in Australia plus policies from municipal governments (eg. cities) within New South Wales, but not policies from the Australian federal government. For example, if a country has an international travel restriction (indicator **C8**) set by the national government, we would report this policy in our **STATE_TOTAL** data but not **STATE_WIDE** data.

Note that **CITY_GOV** and **NAT_WIDE** are not used, since these are functionally equivalent to **CITY_WIDE** and **NAT_TOTAL**, given that we do not consider units below city level or above national level.

Table 2: Currently available OxCGRT data across different levels of government and types of observations

	TOTAL¹²	WIDE	GOV
National	185 countries	N/A ¹³	<ul style="list-style-type: none"> • Australia • Brazil • China • Canada • United Kingdom • India • Italy¹⁴ • USA

¹² This **_TOTAL** dataset is hand-coded at the national level. At subnational levels (ie. **STATE_TOTAL** and **CITY_TOTAL**) it combines the other datasets to report the overall policy settings that apply to residents within the jurisdictions.

¹³ **NAT_WIDE** does not exist. The “**WIDE**” label refers to data that ignores policies implemented by higher levels of government (eg. reporting policies that apply to a state without including federal government policies). There are no higher levels of government above National, so any **NAT_WIDE** record would simply duplicate **NAT_TOTAL**.

¹⁴ Data for Italian regions is incomplete and published separately to the main dataset.

State/ province	<ul style="list-style-type: none"> • Australia: 8 states/territories • Brazil: 26 states & Federal District • Canada: 13 provinces/territories • China: 31 province-level divisions • UK: 4 devolved nations • India: 28 states & 8 union territories • Italy: 20 regions¹⁵ • USA: 50 states & Washington DC 	<ul style="list-style-type: none"> • Canada: 13 provinces and territories • China: 31 province-level divisions • UK: 4 devolved nations • India: 36 states and territories • Italy: 20 regions¹⁶ • USA: 50 states & Washington DC 	<ul style="list-style-type: none"> • Australia: 8 states/territories • Brazil: 26 states & Federal District
City	<ul style="list-style-type: none"> • Australia: 7 state/territory capital cities and 7 rest of states and territories • Brazil: 26 state capital cities plus Brasilia 	<ul style="list-style-type: none"> • Brazil: 26 state capital cities, Brasilia, and 26 second cities¹⁷ • Australia: 7 state and territory capital cities and 7 rest of states and territories 	N/A ¹⁸

Imputing subnational data that we have not manually collected

While we report all of the data types described in Table 2 above, we do not collect them all manually. Because of the logical connections between **TOTAL**, **WIDE**, and **GOV** data, it is possible to impute some of the data types based on existing data.

Specifically, **STATE_TOTAL** and **CITY_TOTAL** data is always imputed from other data. We start with the data collected at that jurisdictional level (ie. **STATE_WIDE**, **STATE_GOV** or **CITY_WIDE**) and we replace these responses with relevant responses from higher levels of government (ie. **NAT_GOV**) when the following two conditions are met:

- The corresponding **NAT_GOV** indicator is general, not targeted, and therefore is applied across the whole country

¹⁵ Data for Italian regions is incomplete and published separately to the main dataset.

¹⁶ Data for Italian regions is incomplete and published separately to the main dataset.

¹⁷ Data for the “second cities” of Brazilian states is incomplete and published separately to the main dataset.

¹⁸ In practice, we would not record **CITY_GOV**. The data recorded as **CITY_WIDE** would include only decisions made by city governments and any lower level governments (if they existed), while ignoring policies from state and national governments.

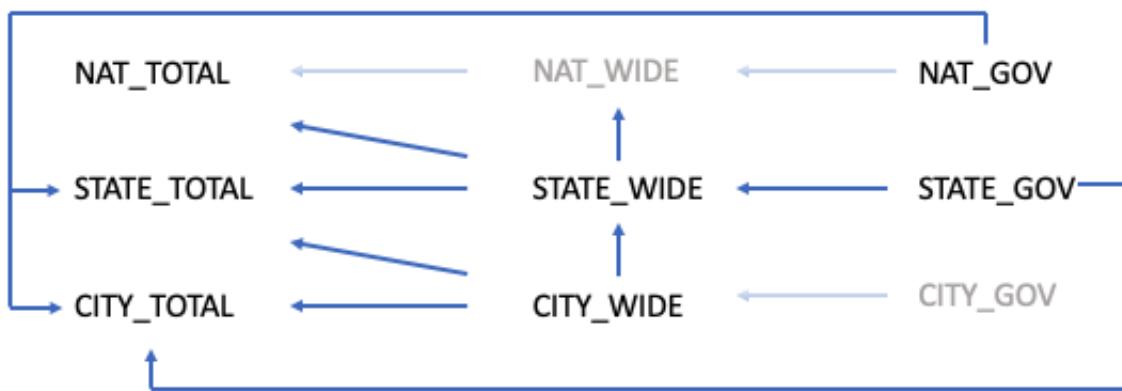
- The corresponding **NAT_GOV** indicator is equal to or greater than the **STATE_WIDE** or **STATE_GOV** indicator on the ordinal scale for that indicator

In this way, **NAT_TOTAL** and **STATE_TOTAL** measures in the core dataset are comparable, in that they show the totality of policies in effect within a given jurisdiction. We apply the same process in cities with both **STATE_GOV** and **NAT_GOV** policies to ensure that **CITY_TOTAL** also reports the totality of policies that affect people in the city.

For example, this will often occur with border closures C8. There will be a border policy from a federal government (ie. C8=4 reported for **NAT_GOV**). The state and municipal governments will not have a border policy because they don't control borders (ie. C8=0 for **STATE_WIDE**). But when imputing **STATE_TOTAL**, we will carry over the higher C8=4.

If a state robustly re-implements a national policy under their own rules, for example by repeating national rules in the state's legislation, this will be reported independently under the subnational jurisdiction coding.

Figure 1: Relationship between TOTAL, WIDE, and GOV observations for different levels of government



Differentiation of policies by vaccine status (vaccine passports)

Many countries used “vaccine passports” or similar policies that apply restrictions only to unvaccinated people. Ten of our indicators are split into separate variables for non-vaccinated (**NV**) people and vaccinated (**V**) people where policies differ between these groups. We refer to this as a ‘differentiated policy’: where vaccinated people can access greater freedoms due to their vaccination status, and are subject to less stringent restrictions. The ten differentiated indicators are: **C1, C2, C3, C4, C5, C6, C7, C8, H6** and **H8**.

For each these 10 indicators, we publish four different versions. Three versions to capture the three different populations a policy might apply to (those that apply to everyone, non-vaccinated, or vaccinated people), plus a fourth version to summarise this into a single variable.

The three differentiated versions of each indicator:

- **Everyone** (eg. **C1E_School closing**): if the same policy applies to everyone, regardless of vaccination status we report the policy as an ‘Everyone’ value. If this is the case, there will then be no values reported in the ‘Non-vaccinated’ or ‘Vaccinated’ variables, and this value is repeated in the ‘Majority’ variable. These variables will be empty during periods when vaccine-differentiated policies are in place.
 - **Note:** the use of the **E** modifier here to signal that a policy applies to everyone without differentiation is *different* to the use of **E** to denote our E1-E4 indicators about economic response (eg. **E1_Income support**).
- **Non-vaccinated** (eg. **C1NV_School closing**): if there is a requirement to present a negative test, or proof of vaccination to gain entry to optional aspects of public life (e.g., events, businesses), it is recorded as a closure to non-vaccinated people. If this is the case, we will also publish the policy that applies to vaccinated people, but there will be no value published in the ‘Everyone’ variable.
- **Vaccinated** (eg. **C1V_School closing**): if entry can be gained or movement is allowed with just proof of vaccination, we report this as being open for people who are vaccinated. The policy may be a ‘1’ level code if significant operational differences remain, or even a ‘2’ level if vaccinated people are also required to

present a negative test, as well as proof of vaccination (this is reported as a closure to reflect this stringency of policy). There will be no value published in the 'Everyone' variable if a 'Vaccinated' value is published.

- **Note:** the use of the **V** modifier here to signal that a C or H policy applies to vaccinated people (eg. **C1V_School closing**) is different to the use of **V** to denote our V1-V4 indicators that describe specific policies about vaccine rollout (eg. **V1_Vaccine prioritisation (summary)**)

The fourth summary version of each indicator:

- **Majority** (eg. **C1M_School closing**): the 'Majority' value reflects either the policy for everyone (eg. **C1E_School closing**), or the policy applying to the majority of people in a country, using vaccination rate data to determine if this is the vaccinated (eg. **C1V_School closing**) or non-vaccinated (eg. **C1NV_School closing**) part of the population.
 - reporting the "majority" policy means that sometimes the value of an **M** indicator will change due to the vaccinated rate crossing the 50% value, meaning our **M** indicator would report the **V** value instead of the **NV** value, even though there is no change to government policy on that day. This is explained with a note when it occurs.
 - **Note:** the use of the **M** modifier here to signify the policy that applies to the majority of people is different to the use of **M** to denote our **M1_Notes** field which is used for *miscellaneous* notes from our data collectors.
- **Vaccinated or Everyone** (only for **C8EV_International travel controls**): if there is a border policy that applies to everyone (**E**), we include it. If there are differentiated policies in place, we publish the vaccinated (**V**) value for **C8** in order to report the policies applying to (vaccinated) international arrivals. Because we do not have data on the vaccination rates of prospective travellers (as we do for the domestic population), we cannot publish a 'majority' variable. Note that this will not reflect if a country has quarantine requirements for non-vaccinated arrivals (or border closures to non-vaccinated travellers).

To summarise, depending on whether or not a country has policies differentiated by vaccine status, we will publish some combination of the following versions of each indicator.

Table 3. Summary of when OxCGRT would include differentiated policy indicator types

Policy setting	E	NV	V	M / EV
The same policy applies to everyone	yes	x	x	yes
There is a differentiated policy	x	yes	yes	yes

For most indicators with differentiated policies, the **M** variable (majority, eg. [C1M_School closing](#)) is the only variable that provides an uninterrupted series of data; it is always populated. For C8, there is no **M** version, but we instead publish [C8EV_International travel controls](#) to create an uninterrupted series.

To calculate majority (**M**) versions of indicators, we use the variable [PopulationVaccinated](#). We also include another variable, [MajorityVaccinated](#) to easily let users determine whether the majority of the population in that country/region/jurisdiction is either vaccinated or non-vaccinated people.

Additional notes on differentiated policies:

- If our data reports a single policy for everyone (**E**), where there was previously a differentiated policy, this may represent either the end of policy differentiation, or it could represent a targeted lockdown in a single place applying to everyone (we always record the single *strictest* policy for a jurisdiction), while the rest of the country maintains policy differentiation by vaccination status at a lower level of stringency.
- There does not need to be a vaccine “pass” in place for us to record a differentiated policy. Some jurisdictions have vaccine passes of different kinds (eg. paper, digital certificate, sign-in app) but some countries do not actively enforce their vaccine requirements. We simply record the policy settings for vaccinated/non-vaccinated people, regardless of enforcement.
- If countries distinguish between one, two, three or more vaccination doses and there are different freedoms granted based on the number of doses, we report the freedoms given for the highest number of doses under our vaccinated policy.
- We accept each jurisdictions’ decision on which vaccine brand, or number of doses makes vaccinated people eligible for less restrictive policies.

- If vaccinated people are also required to present a negative PCR test in order to access less stringent restrictions, we still report this as a closure (2 or 3) to vaccinated people, to reflect the stringency of this measure. We record policies in both the non-vaccinated and vaccinated columns here, to reflect the existence of two different policies for each group.

Table 4. Examples of differentiated policies

ID	Name	Non-vaccinated	Explanation	Vaccinated	Explanation
C3	C3_Public events	2	Vaccines required to enter large concerts and sporting events. No exceptions	0	Vaccinated people can attend with no restrictions
C8	C8_International travel controls	4	Non-vaccinated people from all countries cannot enter the country	3	Vaccinated people can enter, but some bans on entry to all people remain from specific countries
H6	H6_Facial coverings	4	Non-vaccinated people must wear masks at all times	0	Vaccinated people do not have to wear masks
C1	C1_School closing	2	Students can enter schools with a COVID-19 pass showing negative PCR test or evidence of prior infection	0	Students can enter schools with a COVID-19 pass showing vaccination status. No significant operational changes besides this
C2	C2_Workplace closures	2	Patrons must present a negative test OR a vaccine to enter nightclubs	0	Vaccinated people can enter nightclubs
C5	C5_Public transport	2	Non-vaccinated need a COVID-19 pass with negative PCR test to travel on buses	1	Vaccinated people can get on buses without testing requirements, subject to reduced capacity

Flag variables for geographic targeting or economic support

Commonly a government will enact a policy that only applies to a specific area within the jurisdiction, such as a state or a city – a “geographically targeted” policy.

Government coronavirus policies often vary by region within countries. We code the most stringent government policy that is in place in a country/territory, as represented by the highest ordinal value. Sometimes the most stringent policy in a country/territory will only apply to a fraction of the population. If the most stringent policy is only present in a targeted geographic area or sector (e.g. only some states have implemented policies at a high level), we use a binary flag variable to denote this limited scope. Ten of the indicators (C1-C7, H1, H6 and H8) have a flag variable to record whether they are “targeted” to a specific geographical region (flag=0) or whether they are a “general” policy that is applied across the whole country/territory (flag=1).

As explained in our index methodology documentation below, an indicator with flag=0 is weighted lower than flag=1 when calculating overall index values.

Two other indicators have flags that use similar logic. The E1 variable has a flag to describe whether income support is for just formal sector workers (flag=0) or whether it includes informal workers as well (flag=1). H7 has a flag to describe whether vaccine policy is funded at cost to the individual (flag=0) or by government (flag=1).

Common issues

Delineating between policy levels 0 and 1

In many of our indicators, the line between level 0 and level 1 is blurry – it is often the difference between “no policy” and a “recommendation” to avoid some activity. This can create issues when policies are reduced over time and any residual precautions could reasonably be interpreted as either a 0 or a 1. In practice, this means care should be taken in assuming a strict difference between 0 and 1 policies, as it often comes down to the judgement of our data collectors.

Our general rule is that 0 reflects a state that is comparable to pre-covid times, whereas a 1 would reflect significant differences from pre-covid operational norms. The table below provides examples of residual precautions that would indicate a 0 or a 1.

Table 5. Comparison of policies that would be rated a 0 or a 1

0 – Equivalent/comparable to pre-Covid times	1 – Significant differences to pre-Covid times, significant behavioural and/or operational differences
<ul style="list-style-type: none"> • No social distancing • Full capacity • Regular opening hours • Any recommended change to operations (such as use of facial coverings) that is not a recommendation to close 	<ul style="list-style-type: none"> • Regular Lateral Flow Testing • Social distancing • Altered operating times • Reduced capacity • Use of close contact bubbles • Significant cleaning and ventilation • Requirement to check in with track and trace

Identifying groups for vaccine eligibility

The four OxCGRT vaccine indicators (V1-V4) report vaccine policies as they apply to 52 different groups of the population. These groups are not mutually exclusive; instead they try to reflect the different ways that governments prioritised groups for vaccine access. Even with 52 groups, the codebook does not comprehensively cover every possible policy. The following points provide guidance in interpreting the groups:

- Frontline workers – We generally record policies against specific groups (eg. **Police**) and **only** use the category **Frontline/essential workers (when subcategories not specified)** if there has been a vague/ambiguous reference to frontline or essential workers without specifying discrete groups.
- Clinically vulnerable and At risk – **Clinically vulnerable/chronic illness/significant underlying health condition (excluding elderly and disabled)** represents people who live with illnesses and

conditions which place them on the prioritisation list. These may include those who have had an organ transplant, people undergoing chemotherapy, or have a severe lung condition. The age-related **At risk** categories are used for groups that are not extremely vulnerable, but still have comorbidities and underlying health conditions that make them eligible for vaccination sooner.

- Missing categories – If there is a missing category (that is, a country specifies a priority group that does not obviously fit into our list of groups), our data collectors have two options:
 - **Option A: Best Fit** – we use the ‘Best fit’ table below to decide which category to use as a proxy for this to ensure standardisation. We will also record this in detail in the notes.
 - **Option B: Do not record** – If the group is not on the list in the portal, and there is not a suitable best fit, we exclude it from V1/V2 but ensure it is mentioned in the free text notes.

Table 5. Vaccine category “best fit” table

OxCGRT Category	Examples of country-designated categories that have resulted in this box being ticked
Police/ first responders	<ul style="list-style-type: none"> ● Occupations important to functioning of society (IRL) ● Groups of persons who are of critical importance to the functioning of Singapore (SGP) ● Ambulance and paramedic staff (AUS) ● Emergency health staff (FIN) ● Firefighters (FRA) ● Fire (AUS)
Disabled people	<ul style="list-style-type: none"> ● People with a learning or neurological disability (GBR) ● People with Down’s Syndrome (PRT) ● People in communal facilities with an increased risk of infection and outbreaks (for example homes for the handicapped) (CHE)
Border staff	<ul style="list-style-type: none"> ● Key workers in essential jobs who cannot avoid high risk of exposure (IRL) ● Maritime and aviation (SGP)
Frontline retail workers	<ul style="list-style-type: none"> ● Restaurant workers

Frontline workers (when not otherwise specified)	<ul style="list-style-type: none"> • Other people aged 65-69 and key workers essential to the vaccine programme' (IRL) • Workers identified as performing a critical function in society [unspecified] (DNK) • Operators essential for the country's economic activities (FRA) • Essential professions In this phase, people with essential social and/or economic profession are vaccinated (BEL)
Tertiary education students	<ul style="list-style-type: none"> • University, college, or technical trade schools
Educators	<ul style="list-style-type: none"> • University, college, or technical trade schools • Teachers in any level of school • Instructors/professors in colleges and universities
Other high contact professions	<ul style="list-style-type: none"> • Disability care staff (AUS) • Olympic/professional/international athletes (BRB)
Ethnic minorities	<ul style="list-style-type: none"> • Aboriginal and Torres Strait Islander people > 55 (AUS) • Indigenous populations (CAN)
Factory staff	<ul style="list-style-type: none"> • Meat processing staff (AUS)
Crowded/communal living conditions (dormitories for migrant workers, temporary accommodations)	<ul style="list-style-type: none"> • People in communal facilities with an increased risk of infection and outbreaks (with residents of mixed ages) (SGP) • People living or working in crowded settings (IRL) • Prison populations (ISR) • People who live in socially vulnerable situations, such as the homeless or the undocumented. (SWE) • Homeless (KOR) • Vulnerable and precarious people (homeless...), living in communities (prisons, psychiatric establishments, homes) (FRA) • People in communal facilities with an increased risk of infection and outbreaks (with residents of mixed ages) (CHE)

Locating vaccine-related mandates and requirements in OxCGRT data

In our data we report both vaccine mandates (V4) as well as differentiated restrictions that apply to unvaccinated people (C1, C2, C3, C4, C5, C6, C7, C8, H6 and H8). It can sometimes be difficult to know where to find the right policy reflected in the data.

As a general rule: mandates apply to staff/professions, and differentiated restrictions apply to the general public.

For instance, if there is a requirement for teachers, shopkeepers, event staff, bus drivers, or care home nurses to be vaccinated in order to work, this would all be reported in V4. However, a requirement for students (C1), customers (C2), public event attendees (C3), public transport passengers (C5) or care home visitors (H8) to be vaccinated would be reported as a differentiated policy.

Detailed interpretation guidance for each indicator

C1 - School Closures

- C1 reports closures of both schools and universities. It does not report closures of childcare, nurseries, language courses, and driving schools, which are instead recorded as workplaces under C2.
- If in-person teaching is suspended and all instruction is online, this is reported as closed (physically closed). Some governments use different wording (eg. soft-closing, recommend without restricting civil liberty), but if the situation is that schools are closed, or policies make it impossible for them to open, then we report a full closure even if schools are theoretically allowed to open.
- If schools are closed, and this same closure policy then rolls into school holidays, we keep the code the same, for example 'all levels of education remain closed'. This coding would only go down only once students actually return, when schools reopen.
- If only children of essential workers are allowed in schools, this is reported as a closure for the general public.
- Some schools only open for exams, but not for classes. In this case, if schools are open for a one-off exam, for example one that is an hour long, or on one day only, this would not change the coding. If exams are running for multiple sessions,

on multiple days, or even over multiple weeks, this is a similar situation to classes being open for some groups during that time (**C1=2**).

- If teachers are back in school to prepare for the new school year, but no students are allowed back, this would not count as open.
- If individual school districts have the authority to decide closures/openings, we generally record closures conservatively with a 'targeted' flag, as recording 'general' policies would require a high level of confidence that every single schools in a jurisdiction are closed.
- Summer school counts as school. If schools have been closed (**C1=3**) but then some summer school is allowed, the value would change (likely **C1=3** and **C1_Flag=0** if some school districts remain totally closed, or **C1=2** and **C1_Flag=1** if summer school has a 'general' country/territory wide scope). Summer school or other vacation-based programming includes substantial school-run educational programming such as entrance examination classes, remedial classes, or summer term courses, but does not include more peripheral activities such as recreational summer camps.
- If a narrowly defined list of university courses which rely on essential in-person teaching, for example medical programs, are permitted to operate as an exemption, but all other in-person university teaching is cancelled, we treat this as a closure of universities.

C2 - Workplace closing

- When workplaces are meant to be closed but many people are still going to work regardless, we report the official government policy.
- If workplaces can reopen under sanitation and social distancing requirements – e.g. up to 30% of capacity or operating at reduced capacity, and/or use only outdoor seats – this is a **C2=1** (recommend closing) to reflect significant operational differences compared to pre-covid times.
- Voluntary closures are not the same thing as closures mandated by government policy. If a workplace voluntarily closes their business or makes their staff work from home – even if that employer is the government closing administrative offices – this does not count under **C2**.
- Businesses usually considered to be essential (and therefore outside the scope of **C2**) are: Healthcare, groceries, take-out food, hardware stores, plumbers/electricians, legal services, education preparations (teachers planning

courses), limited business operations support (tiny staff capacity to ensure remote working can continue).

- Some businesses that are not essential: In-person retail, personal grooming (salons, spas, barbers etc), dine-in restaurants, movie theaters, entertainment/theme parks, nightclubs.
- If a government publishes a list of essential business that is very long, particularly expansive or contains unusual inclusions, our data collectors use their best judgement on a case-by-case basis, and this is recorded in detail in the note. We try to be mindful of edge cases where governments may declare every business 'essential' or use other terminology that is inconsistent with general practice.
- Airports and schools would not count as "some businesses" in the C2 indicator here. If these workplaces have been closed by government policy decisions, this will be captured in other indicators (eg [C1_School closing](#) and [C8_International travel controls](#)).

C3 - Cancel Public Events

- When private gatherings of only 10 or less are permitted (i.e. [C4=4](#)), this restriction would prevent public events from taking place, so we also report [C3=2](#) (public events are required to be cancelled), unless there is a specific policy in place permitting public gatherings to go ahead.
- When all public gatherings are cancelled, but people can still go to church, we still record this as [C3=2](#) (all gatherings cancelled), but make a note about the exception for religious gatherings. We do the same thing (maintain [C3=2](#)) also in cases where there is a one-off exception for a large event with stringent social distancing.
- If a venue for public events is able to open (eg. a concert hall), but with a specified percentage of original capacity, this is reported at the [C3=1](#) level to reflect an operational departure from pre-covid norms.

C4- Restrictions on gatherings

- When there are variations in numbers based on the type gathering (e.g. gatherings are capped at 6 people with the exceptions of funerals/weddings where it is 30 people) we report the stricter (in this case 6 people, [C4=4](#)) policy

while including the less strict outdoor/wedding/funeral gathering limit in the notes.

- A ban on all gatherings outside of the house would be reported as C4=4, even if no specific gathering size is mentioned.
- If there are restrictions in gatherings based on a proportion of capacity of indoor spaces (e.g. up to 30% of capacity), but there is no mention of any clear gathering size, we record C4=0.

C5 - Public Transportation

- If only essential workers (or some other specific category) are allowed to use public transport, and it is otherwise closed to the general public, we still report this as C5=2.
- The sorts of significant volume reductions that would constitute C5=1 include: closing major routes, reducing the number of services, or discouraging use by members of the public
- In rare instances, governments added a significant number of buses into circulation in order to dilute capacity and enable greater social distancing. We reported this as C5=1 as it is a significant operational change.
- If closures of transport seem to be primarily the result of decreasing demand rather than deliberate government policy to prevent spreading, this is judged by our data collectors on a case-by-case basis, but if there are substantial changes to schedules we may report C5=1.

C6 - Stay at Home Order

- If the government policy is that people should stay home, but people don't seem to be actually doing this in reality, we still report the official government policy.
- We record curfews (eg. where people are not allowed out between 6pm and 6am, or people only allowed for 1 hour a day) as a C6=2. If people cannot leave the house for multiple days at a time (eg. can only go out on a specific day of the week), this would be reported as a C6=3 for total confinement.
- If during non-curfew hours people can go out of the house for non-essential trips, this is still reported as C6=2 to fully represent the limitations during curfew hours.

- If the only policy relates to clinically vulnerable groups being required to shield at home, but not the broader population, we record this as **C6=1** (recommended) with a 'general' flag of **C6_Flag=1** (if nationwide).

C7 - Restrictions on Internal Movement

- If people are allowed to physically travel within a country, but only on the condition of producing a negative test result or undergoing mandatory quarantine, then this is still reported as **C7=2** (restrictions in place).
- If a stay-at-home order (**C6**) is accompanied by an explicit geographic restriction (eg. stay-at-home and only allowed within 5km radius for exercise or groceries) then this would also be reported under **C7**.
- **For subnational (state-level) data:** **C7** is used to record state-level border closures where a state restricts entry from other states from another state, as well as recording restrictions on movement within the state.
- Non-intrusive checks at the state border (e.g. asking where you will be quarantining but not following up extensively) and voluntary quarantine measures will generally be reported as **C7=1**.
- If there are restrictions for the circulation of private cars based on certain criteria (e.g. last digit of licence plate) to reduce the number of vehicles on the streets, we also report it as restriction of internal movement (**C7=2**).

C8 - International Travel Controls

General interpretation guidance

- This indicator is to record policies relating to incoming foreign travellers to the jurisdiction being coded. We do not report restrictions on outbound travel, and we do not count citizen repatriation as a case of open borders (if all other incoming travel is restricted).
- If visitors can get a PCR test to avoid quarantine we record this as **C8=1** (screening) for everyone. If quarantine is mandatory, and visitors cannot do a test to avoid this, we record **C8=2**.
- This indicator does not have a binary flag variable to reflect geographic variation in policies. Therefore, we generally record the level of policy that

applies everywhere across the jurisdiction – the highest common value of policy nationwide or statewide.

- If visitors are meant to self quarantine/isolate after travelling to certain areas, but there are no enforcement or tracking measures in place, we record the official policy accordingly.
- If country/territory borders are completely closed, but it is because of a civil war, or other non-covid related reasons, this will still be reported as a C8=4.
- If land borders are closed, but international flights are permitted, then still we record C8 based on whether there is a total ban on entry from some countries. In most cases, residents of the country with the land border could still get on a flight. But if the policy would prevent most people from a certain country from entering, then this may be recorded as C8=3 (ban on entry from some countries).
- **Constituent countries:** some constituent countries/regions/territories have a C8 policy that is set by another. For example, Puerto Rico has international travel restrictions set by both the Puerto Rican government and the US federal government. We code the most stringent C8 policy applying to PRI even if this is from another government (in this case, the USA). Other jurisdictions in our national dataset where this may occur are: Aruba, American Samoa, Bermuda, Greenland, Guam, New Caledonia, Puerto Rico, French Polynesia, and the United States Virgin Islands.

Differentiated policy guidance

- If vaccinated people do not have to quarantine, we record this as C8V=1 for them (as they are still being 'screened' by vaccination status), and if non-vaccinated can 'test out' of quarantine, we also record this as a C8NV=1. If non-vaccinated people must present evidence of a test to arrive in a country, this is therefore a C8NV=1. If they must present a test and also quarantine, this is reported as a C8NV=2.
- If the country/region prohibits non-vaccinated people from any country from entering its borders, we record this as a C8NV=4 (total closure) for non-vaccinated people.

- This indicator does not have a binary flag variable to reflect geographic variation in policies. Therefore, we generally record the level of policy that applies everywhere across the jurisdiction - the highest common value of policy nationwide or statewide. We do not report any policies of a higher value that are only available in limited areas. For example if income support is only being provided by some cities, and not across the whole country/territory or state, we would not report it. It is only recorded when the support recorded applies nationally or statewide.
- Formal sector workers are people who are employed with contracts, and pay taxes. Informal workers may be roadside vendors, work on markets, and do not have a formal contract for their work.
- If benefits in kind are being given (e.g. dry rations, or school meals), this is recorded as a **E1=0**.
- We do not include payments made to people undergoing mandatory quarantine after international travel. It is only recorded if ALL the employees in the formal sector who cannot work are being covered.
- If a government extends or increases existing unemployment benefits (including broadening eligibility to more people) we would report this as a non-zero benefit. If a government simply makes it faster and easier to claim unemployment benefits (without changing the amount or the eligibility criteria) then this would still be reported as **E1=0**.

E2 - Debt/contract relief for households

- Debt relief for business and corporations is not reported here; **E2** only records debt relief to private households.
- This indicator does not have a binary flag variable to reflect geographic variation in policies. Therefore, we generally record the level of policy that applies everywhere across the jurisdiction – the highest common value of policy nationwide or statewide.

E3 - Fiscal Measures

- **We stopped actively updating data for E3 in August 2021.** In general, the OxCGRT's four monetary indicators (E3, E4, H4, and H5) are incomplete, have not been reviewed for quality, and should be used with caution.

- If the specific monetary value is undisclosed or unclear, we make a note recording the announcement, but don't record the monetary value.
- Sometimes governments make ambiguous funding announcements (where it is not clear what the money is for), or they announce multiple programmes under a single number (eg, fiscal stimulus, plus hospital funding, plus vaccine investment, plus support for other countries, in one number). In these cases, the spending is recorded in this **E3** category, and not in the other monetary categories (**E4**, **H4**, and **H5**).
- If the state is providing support to specific groups, for example funding children's school meals, handing out staple goods, or providing grants to single parents, this is recorded under **E3**.

E4 - Providing Support to other countries

- **We stopped actively updating data for E4 in August 2021.** In general, the OxCGRT's four monetary indicators (E3, E4, H4, and H5) are incomplete, have not been reviewed for quality, and should be used with caution.
- We only record money here that a government DONATES to another government, not money that is received. We do not record in-kind support, for example donations of medical equipment, as a monetary equivalent.
- We record donations to international organisations, such as WHO, WFP, as long as the country being recorded is the donor and it is to a specific relief fund specifically related to COVID.

H1 - Public Information Campaigns

- Evidence for the beginning of a coordinated campaign (**H1=2**) includes a website being launched, an official announcement or press release of a campaign, or government and health department social media announcements of a campaign.
- The end of campaigns are rarely announced officially. If evidence is still present of a dormant, or rarely updated COVID-19 information campaign, we may report this as **H1=1** (public officials urge caution, but no coordinated campaign). If there is no guidance remaining at all, or a campaign over 6 months out of date we may report **H1=0**.

H2 - Testing Policy

- The main purpose for H2 is to record PCR testing. For the first year of the pandemic, most countries struggled with limited supplies of PCR tests and a lack of available substitutes. We do not usually report the availability of antibody tests (known as “lateral flow tests” or “rapid antigen tests”) in H2. The only rare case where we would report other types of tests was where, say, widespread antibody testing was used to identify individuals who automatically received follow-up PCR tests.
- While government policies are often clear, availability of tests affected implementation, particularly early in the pandemic. This indicator therefore requires judgement from our data collectors – we will sometimes record a lower code than the official announced policy if sources suggest there is not capacity on the ground to meet this testing policy.
- This indicator does not have a binary flag variable to reflect geographic variation in policies. Therefore, we report the level of testing availability that applies everywhere across the jurisdiction – the highest common value of policy nationwide or statewide. We do not report any policies of a higher value that are only available in limited areas.
- In some countries, most testing is coordinated by private companies, with little oversight or coordination from the government (eg. in the USA, particularly in the first months of the pandemic). In these cases, we report as follows:
 - When the state/nation is clearly putting resources towards making testing available, we record this as a H2=1 (only symptomatic and eligible)
 - If the government implements a statewide/nationwide plan to fund and procure local testing facilities, with the intention of widespread public accessibility, we report H2=2 (all symptomatic eligible)

H3 - Contact tracing

- For this indicator we are only interested in manual contact tracing that is intended to reach all people known to a newly-diagnosed case. Digital contact tracing apps do not achieve this goal, and the presence of a contact tracing app in a country/territory would not be reported under H3. The difference between the levels here is considering whether this top-notch manual contact tracing is done for just some COVID-19 cases (H3=1) or for all cases (H3=2).
- Countries will often announce when they are successfully implementing universal contact tracing (which is possible for tens of cases per day). But countries will

rarely announce when their contact tracing resources have been overwhelmed by cases. We will sometimes downgrade a jurisdiction H3=2 to a H3=1 if there are high daily case numbers, and credible reports of newly-diagnosed cases whose recent contacts were not traced.

H4 - Emergency investment in healthcare

- **We stopped actively updating data for H4 in August 2021.** In general, the OxCGRT's four monetary indicators (E3, E4, H4, and H5) are incomplete, have not been reviewed for quality, and should be used with caution.

H5 - Investment in vaccines

- In general, the OxCGRT's four monetary indicators (E3, E4, H4, and H5) are incomplete, have not been reviewed for quality, and should be used with caution.
- This indicator records spending on vaccines procurement as well as vaccine development spending – therefore covering all vaccine related spending

H6 - Facial coverings

- No additional guidance.

H7 - Vaccination policy

- Significant bottlenecks of vaccine supply in 2020 and 2021 meant that we only report vaccine availability under H7 once three conditions are met: (1) there is an explicit policy to vaccinate a population group, (2) there are enough vaccine doses on order to vaccinate at least approx. 20% of the target population, and (3) there is evidence that vaccines are actually being administered.
- We also only report vaccination policies where a vaccine is delivered across the entire jurisdiction – if there is geographic variation we report the lowest common value.
- “Broad groups” may include a large group of adults (eg. all those aged over 40), or other broadly defined population groups (eg. students)

- A policy recorded as “no cost to individual” may also include a very small nominal cost to the individual, such as the small pharmaceutical co-payments (eg. \$5) in some public health systems.
- We do not report any policy under H7 if countries are using vaccines that have not passed phase 3 clinical trials.
- When there is a vaccine shortage and there are not enough doses to vaccinate the target population, we reduce the value to reflect this reduction.
- We report H7=5 (Universal Coverage) when the vaccine is available to all adults (and there is evidence that it is being delivered on the ground).
- After introducing H7 in late-2020, we subsequently developed indicators V1 and V2 which report similar information with much more granularity.

H8 - Protection of elderly people

- This indicator focuses mainly on institutions where elderly people live, but also has scope to record equivalent restrictions in settings where elderly people are cared for in the home or community, especially in cultures where long-term care facilities are not common.
- Policies for other vulnerable groups that live in institutionalised settings (eg. prison population or people in long-term disability care) are not recorded here.
- If masks are required to be worn as part of a specific hygiene measure in elderly care facilities, this may be reported as H8=1, but would not be reported if masks are generally required in public places.

V1 - Vaccine prioritisation

- We report groups under V1 from when the official priority groups plan is published, not from when potential categories are discussed informally. This is a departure from our usual rule of reporting a policy only once it is implemented, not when it is announced. This is because V2 reports the implementation of vaccine availability, V1 merely records the announced prioritisation order at any point in time.
- When there is no longer prioritisation between groups, and the policy is to vaccinate all adults, this is reported as a universal prioritisation list.

V2 - Vaccine eligibility/availability

- We report categories in **V2** when there is evidence from anywhere within the jurisdiction that this group is being vaccinated. This logic differs from the logic used to code **H7**, where we only report a new ordinal level when this is the situation across the whole jurisdiction.
- If access to vaccines is universal, we report all general ages above 16 in **V2**. If the vaccine is approved for additional groups, such as **0-4 yrs infants** this is added when the policy comes into effect.
- If there is a policy to restrict vaccine availability to certain groups, but there is evidence that vaccination centres have excess capacity and are offering vaccinations to people who walk in, and there is evidence of this being a widespread phenomenon in multiple locations in a consistent manner, we report the vaccines as available to the walk-in groups.

V3 - Vaccine financial support

- If people receive the vaccine from their private healthcare insurance-run organisations (e.g. Israel's HMO members) we still report this depending on whether the government is funding the organisations to deliver the vaccine, or if the government requires copayment from the insurer (therefore not fully government funded).

V4 - Mandatory vaccination

- **V4** records a policy requirement to be vaccinated against COVID-19 in order to work in a specific occupation, or for a specific group to be vaccinated. This is a mandatory vaccination as part of occupation or citizenship, and here we do not record voluntary vaccination that people may take in order to access greater freedoms (ie. if people must be vaccinated in order to travel).
- We do not report enforcement, only the presence of the policy.
- We report a vaccine mandate when there is evidence from anywhere within a country/region/territory that this group is subject to mandatory vaccination rules. If this is happening in a subnational region, but not nationally, we still report it under **V4**.
- If there is a vaccine mandate in place for workers of certain occupations, and non-vaccinated people in this occupation have the option of testing regularly to opt out of vaccination, we still record this.

Codebook changelog

Over the course of the covid-19 pandemic the OxCGRT constantly adapted by adding new indicators and refining the definitions of existing indicators. The summary below covers the major developments in the OxCGRT data structure.

- March 2020: OxCGRT begins data collection with 7 indicators named S1-S7. These were broadly comparable to C1, C2, C3, C5, C7, C8 and H1, and are the indicators on which the stringency index is based.
- April 2020: major expansion of indicators to introduce C4, C6, E1-E4, H2-H5.
- October 2020: introduction of H6 indicator (but at this point, it does not have a flag to indicate geographic targeting).
- November 2020
 - The meaning of C1=1 is updated. It previously meant “recommend closing schools” but now includes operational changes that are significantly different to pre-covid norms. Existing coding is retrospectively edited to reflect this change.
 - A flag for geographic targeting is added to H6.
- December 2020: introduction of H7 indicator
- January 2021:
 - The word “private” is removed from the definition of C4 which originally referred to private gatherings.
 - The flag variable for E1 originally differentiated between two levels of income support: “formal sector workers only” or “informal workers too”. This is changed to “formal sector workers only or informal sector workers only” or “all workers”.
- March 2021:
 - Introduction of H8 indicator.
 - The definition of H7 is revised to specify “non-elderly clinically vulnerable groups” to be distinct from “elderly groups”
- May 2021: the meaning of C2 is updated, similar to C1, to reflect that C2=1 can include major operational changes, not just a “recommended closure”.
- June 2021: introduction of V1-3 indicators.
- March 2022: introduction of V4 indicator.
- July 2022: introduction of differentiated coding structure for C1-C8, H6 and H8.

Calculation of policy indices

Policy indices

The OxCGRT calculates several indices to give an overall impression of government activity: the Government Response Index, the Containment and Health Index, the Stringency Index, the Economic Support Index, and an old (legacy) version of the Stringency Index.

The different indices are comprised as follows:

Index	k	C 1	C 2	C 3	C 4	C 5	C 6	C 7	C 8	E1	E2	E3	E4	H 1	H 2	H 3	H 4	H 5	H 6	H 7	H 8	M 1	V 1	V 2	V 3	V 4
Government response index	16	x	x	x	x	x	x	x	x	x	x			x	x	x		x	x	x						
Containment and health index	14	x	x	x	x	x	x	x	x					x	x	x		x	x	x						
Stringency index	9	x	x	x	x	x	x	x	x					x												
Economic support index	2									x	x															
Legacy stringency index (see end of doc)	7	x	x	?	?	x	?	?	x					x												

We publish four versions of each index with different treatment of vaccine-differentiated policies. These are denoted as follows:

- **_Nonvaccinated** – constructs the index using policies that apply to non-vaccinated people (ie. 'non-vaccinated' (**NV**) policies if present, or otherwise using 'everyone' (**E**) policies).
- **_Vaccinated** – constructs the index using policies that apply to vaccinated people (ie. 'vaccinated' (**V**) policies if present, or otherwise using 'everyone' (**E**) policies).

- `_SimpleAverage` – takes the sum of `_Nonvaccinated` and `_Vaccinated` indices and divides them by 2.
- `_WeightedAverage` – takes an average of the `_Nonvaccinated` and `_Vaccinated` indices weighted by the proportion of the population that is vaccinated.

In our ‘compact’ and ‘simplified’ CSVs we only present one version of each index (so 4 indices in total), using an `_Average` version that is just the weighted average for most jurisdictions (but for which we substitute the simple average for jurisdictions where it is not possible to calculate the weighted average).

Calculating sub-index scores for each indicator

All of the indices use ordinal indicators where policies are ranked on a simple numerical scale. In order to aggregate these indicators into an index, we first must calculate a sub-index score that normalises each of the indicators.

Some indicators – C1-C7, E1, H1, H6, H7, and H8 – have an additional binary flag variable that can be either 0 or 1. The codebook above has details about each indicator and what the different values represent.

Because different indicators (j) have different maximum values (N_j) in their ordinal scales, and only some have flag variables, each sub-index score must be calculated separately. The different indicators that contribute to the indices are:

Indicator	Max value (N_j)	Flag? (F_j)
C1	3 (0, 1, 2, 3)	Yes=1
C2	3 (0, 1, 2, 3)	Yes=1
C3	2 (0, 1, 2)	Yes=1
C4	4 (0, 1, 2, 3, 4)	Yes=1
C5	2 (0, 1, 2)	Yes=1
C6	3 (0, 1, 2, 3)	Yes=1

C7	2 (0, 1, 2)	Y _{es} =1
C8	4 (0, 1, 2, 3, 4)	N _o =0
E1	2 (0, 1, 2)	Y _{es} =1
E2	2 (0, 1, 2)	N _o =0
H1	2 (0, 1, 2)	Y _{es} =1
H2	3 (0, 1, 2, 3)	N _o =0
H3	2 (0, 1, 2)	N _o =0
H6	4 (0, 1, 2, 3, 4)	Y _{es} = 1
H7	5 (0, 1, 2, 3, 4, 5)	Y _{es} =1
H8	3 (0, 1, 2, 3)	Y _{es} =1

Each sub-index score (I_j) for any given indicator (j) on any given day (t), is calculated by the function described in equation 1 based on the following parameters:

- the maximum value of the indicator (N_j)
- whether that indicator has a flag ($F_j=1$ if the indicator has a flag variable, or 0 if the indicator does not have a flag variable)
- the recorded policy value on the ordinal scale ($v_{j,t}$)
- the recorded binary flag for that indicator, if that indicator has a flag ($f_{j,t}$)

$$I_{j,t} = 100 \frac{v_{j,t} - 0.5(F_j - f_{j,t})}{N_j} \quad (1)$$

This normalises the different ordinal scales to produce a sub-index score between 0 and 100 where each full point on the ordinal scale is equally spaced. For indicators that have a flag variable, if this flag is recorded as 0 (i.e. if the policy is geographically

targeted or for E1 if the support only applies to informal sector workers) then this is treated as a half-step between ordinal values.

Note that the database only contains flag values if the indicator has a non-zero value. If a government has no policy for a given indicator (i.e. the indicator equals zero) then the corresponding flag is blank/null in the database. For the purposes of calculating the index, this is equivalent to a sub-index score of zero. In other words, $I_{j,t}=0$ if $v_{j,t}=0$.

Index calculations

In this section, we explore how indices are calculated, taking into account differentiated policies that treat vaccinated and non-vaccinated people differently.

Non-vaccinated and Vaccinated Indices

For a given jurisdiction, our non-vaccinated and vaccinated indices are simple averages of the individual component indicators for each group. This is described in equation 2 below where k is the number of component indicators in an index and I_j is the sub-index score for an individual indicator. If a component indicator is one of the ten for which we record differentiated policy, then we will use either:

- the NV or V version of the policy (in the non-vaccinated or vaccinated index respectively) where there is a differentiated policy
- the E (everyone) version of the policy for both the non-vaccinated and vaccinated index where there is no differentiated policy

$$index = \frac{1}{k} \sum_{j=1}^k I_j \quad (2)$$

This results in two versions of each index that report the overall policy settings that apply to, respectively, non-vaccinated people and vaccinated people.

Simple Average Indices

For a given jurisdiction, our simple average indices are the sum of the vaccinated and the non-vaccinated indices divided by two. This is described in equation 3 below where index_v is the index for the vaccinated, and index_{nv} is the index for the non-vaccinated.

$$\text{index} = (\text{index}_v + \text{index}_{nv})/2 \quad (3)$$

Weighted Average Indices

This weights the index value using the non-vaccinated/vaccinated values based on the proportion of the population that are vaccinated. The values used for these calculations are published in our CSVs in a column labelled **Population vaccinated**.¹⁹

The process is described in equation 4 below. As with the simple average above, we start with index_v and index_{nv} and then weight these by w_v (the proportion of the population that is vaccinated) and w_{nv} (the proportion of the population that is not vaccinated).

Note that for some jurisdictions (such as Australia cities and Indian states) we do not have daily vaccination data. This means we cannot calculate and publish a weighted average, and so for these jurisdictions we only have the simple average index.

$$\text{index} = [(\text{index}_v \times w_v) + (\text{index}_{nv} \times w_{nv})]/100 \quad (4)$$

¹⁹ Sometimes the data reporting vaccination rates is incomplete or has gaps. In these cases, if there is no prior data for vaccination rates we assume it is 0%. If there is prior data, then we simply pull forward the value from the last day it was present.

Legacy stringency index

We also report a legacy stringency index (from pre-April 2020) that approximates the logic of the very first version of the Stringency Index, which only had seven components under our original database structure with the old indicators S1-S7. We generally do not recommend using this legacy index, but it may be useful for continuity purposes for people who have been using our data since March 2020.

The legacy indicator only uses seven indicators, and it chooses a single indicator between C3 and C4, and between C6 and C7, selecting whichever of those pairs provides a higher sub-index score. This is because C3 and C4 aim to measure the information previously measured by S3, and similarly for C6, C7 and the old S6. This method, shown in equation 5, faithfully recreates the logic of the old stringency index.

$$SI_{legacy} = \frac{1}{7} (I_{c1} + I_{c2} + \max(I_{c3}, I_{c4}) + I_{c5} + \max(I_{c6}, I_{c7}) + I_{c8} + I_{H1}) \quad (5)$$

The individual sub-index scores for the legacy index are calculated through a slightly different formula to the one described in equation 5 above. This formula is described in equation 6 below (with a separate formula for C8, the only indicator in this index without a flagged variable).

$$I_{j,t} = 100 \left(\frac{v_{j,t} + f_{j,t}}{N_j + 1} \right) \quad | \quad I_{c8,t} = 100 \left(\frac{v_{c8,t}}{N_{c8}} \right) \quad (6)$$

Example index calculation

Here is an explicit example of the calculation for a given country on a single day where there is no policy differentiation based on vaccine status (all the policies apply to everyone):

Indicator	$v_{j,t}$	$f_{j,t}$	N_j	F_j	Sub-index score ($I_{j,t}$)

C1	2	1			
C2	0	null			
C3	2	0			
C4	2	0			
C5	0	null			
C6	1	0			
C7	1	1			
C8	3	N/A			
E1	2	0			
E2	2	N/A			
H1	2	0			
H2	3	N/A			
H3	2	N/A			
H6	2	0			
H7	2	1			
H8	2	1			
			3	yes=1	66.67
			3	yes=1	0.00
			2	yes=1	75.00
			4	yes=1	37.50
			2	yes=1	0.00
			3	yes=1	16.67
			2	yes=1	50.00
			4	no=0	75.00
			2	yes=1	75.00
			2	no=0	100.00
			2	yes=1	75.00
			3	no=0	100.00
			2	no=0	100.00
			4	yes=1	37.50
			5	Yes=1	40.00
			3	Yes=1	66.66

Index	
Government response index	57.18
Containment and health index	52.86
Stringency index	43.98
Economic support index	87.50

Legacy stringency index	48.81
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OxCGRT review methodologies

From 2020 to 2022, the OxCGRT used two primary methods to review data and ensure quality and reliability. The first method involved peer review within the data entry portal, where different coders reviewed the data entered into the portal and provided feedback and corrections as needed. The second method was an intercoder reliability assessment, which evaluated the consistency and agreement between multiple coders who independently coded the same data.

The following details are provided to enable data users to ensure transparency into the efforts that were made to ensure data quality, provide context, and form part of the comprehensive documentation of the overall project methodology. By including this information, we aim to provide a clearer picture of the methods used to collect the data, as well as to offer a framework for future researchers who may wish to build on this work.

The initial set of data collectors in March 2020 was recruited largely from the postgraduate student body of the Blavatnik School of Government at the University of Oxford. Since then, additional contributors were recruited through Oxford University departmental mailing lists, student societies in Oxford and other universities, alumni email lists, and referrals from existing contributors and partner organisations. Subnational coders were mostly students or recent graduates from partner institutions in the countries where we collected subnational data (for example, the University of São Paulo, Fundação Getulio Vargas, and the State University of Pará in the case of Brazil, or the Australian National University in the case of Australia). All up, a team of over 1500 volunteer data collectors contributed to OxCGRT, and they are each named at the end of this Appendix.

Over the first months of the project, we developed a standard approach to training and preparing new members of the data collection team through a series of training steps. First, they completed a self-directed tutorial of training slides and videos that

explained how to search for data, interpret policies and submit contributions through the online interface. New contributors were then given a short test for comprehension and understanding of the coding schema and collection process. After that, new data collectors were expected to attend a weekly all-contributor meeting, at which point they started being included in the regular task allocation.

For most of the pandemic, OxCGRT collected data on a weekly schedule, during which new task allocations were sent to the data collection team.²⁰ This allocation was based on a regular review of database coverage, prioritising those jurisdictions that were most in need of updating. Most contributors were assigned to a group of four to six jurisdictions and they cycled through that list, being allocated 1-2 each week for updating. The data was published in real time – refreshed each hour – as contributors entered new information into the system.

After data were entered, they were marked as “provisional” on the back-end database portal used by the OxCGRT, which flagged them for the review process.²¹ First, after each allocation round, the OxCGRT management team usually performed quick spot checks to ensure that the data were entered and if there were no gross errors (for example, accidental deletion of a whole column could be noticed and fixed during this quick review). The provisional data were then queued for attention by a more thorough review team. This review team examined the data entry and the original source and either confirmed its veracity or flagged the data entry for escalation. The review process suggests a satisfactory degree of accuracy in the initial data collection.

Once data collection was nearing completion, coders were assigned to review any remaining data points that had not yet been confirmed. Priority was given to observations that were flagged for review, but other criteria were also taken into consideration to ensure the overall quality of the dataset, such as observations with a change in policy stringency but no source referencing the change.

²⁰ For the first few months of the pandemic, the OxCGRT operated on a bi-weekly schedule, with volunteers updating the database twice a week. This quickly became unsustainable as time went on, and we subsequently settled into a weekly rhythm.

²¹ This “provisional” status (and the other data status labels: flagged, confirmed, recode) were not published as part of the public dataset.

Overall, of the more than 8 million datapoints in the OxCGRT, 66.04% were reviewed (in that they were checked, amended, or marked as confirmed by an independent second person), with 63.37% marked as “confirmed”. 18.35% of data points were amended or edited during the review process.

In the national-level dataset, 63.05% of the data was reviewed with 52.39% marked as confirmed. 100 out of 185 jurisdictions have at least 50% of data points confirmed.

	Percentage reviewed	Percentage confirmed	Percentage changed during review	Jurisdictions over 50% confirmed
National (NAT_TOTAL)	63.05	52.39	11.14	100/185
Australia	68.64	63.26	22.02	11/23
Brazil	60.52	70.55	23.65	48/54
Canada	86.30	79.27	21.09	14/14
China	100	100	27.87	32/32
India	61.34	52.04	18.43	24/37
United Kingdom	100	100	26.52	5/5
United States of America	78.40	73.72	29.74	46/52
Italy ²²	12.83	0.01	12.13	0/22

In addition to the data review, the OxCGRT also conducted intercoder reliability checks. Whereas the review process involved our data collectors looking directly at the entries of other data collectors, intercoder reliability assessments involve two data collectors independently determining how they would code a policy.

²² Data for Italian regions is incomplete and published separately to the main dataset.

There were two sources of this data. First, we obtained 628 duplicated datapoints by explicitly asking volunteers to collect them. Instead of a regular assignment, a data collector would be randomly assigned a jurisdiction-indicator-date pair and asked to enter their judgement through a special form independent of the main data entry portal. Their response could then be compared to the actual data entered by another volunteer working on a regular assignment.

The other source of data for determining intercoder agreement was serendipitous: data entered in the wrong place. Because of the complexity of our subnational coding system, the OxCGRT data portal has several redundant jurisdictions that are not used and are effectively hidden (although not entirely hidden for our data entry team). For example: our USA subnational team collected **STATE_WIDE** data (not **STATE_GOV**), and for our Brazil team it was the reverse. However, it was possible for data collectors to (mistakenly) enter data for California **STATE_GOV** or Sao Paulo **STATE_WIDE**. In these cases, the data would sit in a redundant jurisdiction, almost entirely hidden from view. 29,088 datapoints were entered into these redundant jurisdictions (out of 3.76 million datapoints across our subnational datasets), and we can compare this data to the data that was eventually collected and entered into the correct place – almost always by another data collectors in the next task allocation round.

Across both these sources of intercoder agreement data, we find that our data collectors agree with each other 66.54% of the time.

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Anupah Makoond Makoond	Justin Zhang
Maheera Kamran	Tianjing Liu
Ann Hagen	Treyce Money
Andrew Lupati	Marco Aurelio Mayer Duarte Neto
Kalani Paranagama	Riya Gandhi
Maurice Odiwuor	Lizbeth Leija
Xueyan Liu	Leah-Shai Torres
Bo Jia	Sage Buchanan
Sophie Guillaumat	Caroline Pastrano
Joy Chen	Kirandeep Bal
Ana Lorena Guerrero	Siddharth. K Prakash
Guanghan Gao	Yun Zhu
Shabana Basij-Rasikh	Clara Wardi
Carla Vila	Fabrício Motta
Davi Mancebo Fernandes	Taylor Qin
Adrian Wang Xinting	Reina Li
Shane Fitzsimons	Nethra Subramanian
Michelle Chan	Alexander Trousdale
Jiayi Deng	Ashley Gilliam
Qiyuan Dong	Morgan David Kamanga
Qianyi Ye	Perkins Lui
Yixin Xu	Cindy Hu
Marcelle Costa Marinho	David Doan
Xiangyun Ren	Sriraj Aiyer
Anushka Shah	Tara Chen
Mariana Lima Maia	Elizabeth Oluwatobi Njoaguani
Leonie Lam	Manik Aggarwal
Roy Barnes	Xiaohan Xu
Zhi Yuan Ho	Mounika Tiruvaipati
Nicolas Pulik	Yawen Xie
Lingsyuan Huang	Sher Meng Tan

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Jinheon Baek	Riana Pinto
Maria Andrade	Daniel Nwaokolo
Jenna Hand	Jacqueline Dobrigna
Michael Chen	Yanshi
Cassy Inman	Xutong Li
Zara Raheem	Anqi Tang
Morgan Grobin	Salome Waweru
Viviane de Assis Ignacio	Momudat Maidoki
Scott Latham	Jiaming Ta
Tais Pelinson Gomes da Silva	Zhang Kangning
Alice Secheresse	Javier Pardo-Diaz
Siqi Liu	Robert Gorwa
Hana Dole	James Green
Margie Morrison	Serene Singh
Suryodeep Mondal	Celso Coelho
Muhammad Ali	Felipe Paiva
Natasha Priyadarshini	Mark Deakin
Yuwei Wang	Caroline Carthy
Katherine Klemperer	Hermann Pais
Nao Ogura	Xema Pathak
Isabela Gomes Pereira	Dan Fay
Mariana Emy Adati	Shirley Chen
Hannah Dawson	Alexsander Silva Farias
Akeemat Ayinla	Giulia Pirolo
Stephanie Buhle	Felipe Dias Gonçalves
Xin-Ci Lum	Shreya Mulukuntla
Ben Luria	Faroha Khan
Alejandrina Cripovich	Maliyah Goka
Jake Lerner	Paresh Chaudhari
Judy Cossins	Kethmi Gamage
Joy Carveth	Ruiqiao Jiang
Frederic Michaelsen	Ailen Di Marzio
Liu Zhang	Lakis Panteli
Zhengyu Zhang	Mphatso Kantonya
Joao Monteiro	Kathryn Hok
Keliang Zeng	Kate Whyte
Ubah Daahir	Dawit Bekele Tefera
Atharva Deshmukh	Emma Thrower
Simran Kapoor	Jason Thomas
Hartley Dutczak	Andy Hu
Edson Maia Villela Filho	Sam Darby
Esther Bosede Ilesanmi	Ashley McNeil
Qi Qi	Amun Nadeem

Maximilian Magnacca Sancho	Shu Wen Ong
Bethel Zerai Gebremedhin	Michelle Park
Bayleigh Jefferson	Uttara Kudesia
Sam Webster	Seorim Park
Twan vanderTogt	Niveditha Hari
Tiphaine Le Corre	Viraj Aditya
Anjali Viswamohanam	Aaron Ni
Tilbe Atav	Akshata Gupta
Marie Mavrikios	Bridget Ogbuagu
Thiago William Pereira Barcelos	Ranithri Patuwathavithane
Chuyun Dai	Abey Blessing
Mariana Costa Oliveira Morais	Yihao Sun
Fiona Hsu	Clara Calazans Espindola
Sasha Roberts	Kiyomi Boyes
Julie Laura Mermet	Isaac Vzquez
Hailey Myers	Danlin Liu
Yasmin de Sousa Pinheiro	Ian Chang
Pranav Bhatia	Madison Harris
Xiaoyue Zhong	Shiyao Lu
Bernard Lao	Arabella Abad
Anna Casey	Yanina Borzykh
Francisco Olivero	Ilya Zlotnikov
Mattia Casula	Zoe Lin
Gleice Kelly Donato Neves	Hala Sheikh Al Souk
Jin Zhanyu	Joseph Ssentongo
Olena Skrypnikova	Delgermaa Munkhgerel
Leyan Liang	Juliana Moura Bueno
Yang Zhao	Andrea Klaric
Qinli Lin	Lucia Soriano Espinel
Yue Zhang	Natsuno Shinagawa
Maclawrence Famuyiwa	Ohk SeungCheol
Marcela Reynoso Jurado	Emmanuel Mawuli Abalo
Alfredo Ortega	Rafael Goldszmidt
Karoline Becker	Lorena Barberia
Rushay Naik	Luiz Cantarelli
Megan McDowell	Elisabeth Mira Rothweiler
Will Marshall	Rhona Rahmani
Hakim Ronaque	Deborah Palacio do Sacramento
Matilde Stronell	Derek Messling
Paul Anderson	Felipe Natil Martins Moreira
Meskerem Aleka Kebede	Sze Oh
Xinrui Wang	Winni Yang
Yishan Yuan	Emily Nguyen
Lila Klein	Allen Haugh

Mariana Resende	Giovanna Valentim
Jonathan Chan	Ying Yu
Rafael Silva	Vinicius Sanches Pontirolle
Grace Xu	Beatriz Cristina Rodrigues Silva
Annika Browne	Daniela Costanzo de Assis Pereira
Jodie Elms	Marco Antonio Silva Costa
Kütan Bolajoko	Heliry Santiago de Souza
Pham Thao Ly Nguyen	Vara Anoosha Vijjapu
Augusto Guajardo	Yue (Nicole) Wu
Jinghuan Ma	Thao Nguyen
Jiahao Zhao	Cindy Chung
Yujin Kim	George Youssef
Ojonugwa Abubakar	Harriet Williams
Selam Iyasu	Clemence Verbrugghe
Zicheng Mai	Patricia Hernandez
Sidney Chung	Mauricio Montelongo Quevedo
Zejing Wu	Vivek Mynam
Jiayi Zhang	Varun Vivek Bansal
Gabrielly Gonçalves de Lima Dal Pozzo	Scarlett Harbin-Owens
Tatiani Schmitt	Varad Dinesh Godase
Laissa Maria da Silva Guimaraes	Vian Wagatsuma
Niki Ziai	Inara Bezerra Ferreira de Sousa
Julia Paoli	Logan Powell
Yuyin Yao	Abigale Shettig
Priyanka Bijlani	Zirui Jerry Yao
Maria Puolakkainen	Manya Sinha
Nicole Barros	Marina Tovar
Ruwa Mahdi	Marina Navarro Montilla
Ulla Mikkelsen	Xinyu Shi
Thomas Stubbs	Manasvini Moni
Matheus Ricardo Goncalves Barbosa	Finney Israel
Juliet O'Brien	Aline Sayuri Konno
Mikafui Dzotsi	Xiuyi Zheng
Mahita Yerramsetti	Avneesh Beejah
Andrew Wagner	Sandra Wohlauf
Catherine O'Donnell	Henok Mulatu Teferi
Camila Fernanda Ugaz Rojas	Angus Padley
Enyuan Zhang	Adebanwo Kuye
Clarissa Fisher	Camille Bailly
Dhruv Shetty	Katherine Wang
Melissa Leon Pons	Ira Benson
Isabela Abade Granzieri	Charlette Kokoi
Anika Buch	Stephanie Poling
Piyasha Chowdhury	Anita Kerubo

Maeve Rolland	Riley Ylagan
Nina Acharya	Dylan Kruse
Sam Aboubacar Coulibaly	Andrew Wong
Lilian Achieng Owino	Jennice Herrera
Emily Huang	Aviery Boone
Weiyi Zhang	Jennifer Kim
Emily Milan	Zeyu Zhang
Qi Zhou	Axel Nurdin
Wenqing Wu	Glaucia Grellmann
Oluwaseun Odusanwo	Miao Wang
Sabrina Nanua	Shenyue Huang
Carla Danielli Fonseca	Ikeoluwa Adeniji-Fashola
Hin Yeung	Ritesh Soule
Alexandre Duponcheele	Maha Baig
Xinyi Cui	Yashaswini Gannabathul
Luyang Liu	Xinhui Ma
Iyone Agboraw	Udit Chauhan
Dane Alivarius	Denise Koller
Francesca Lovell-Read	Fangda Yu
Sophie Pearlman	Peihao Xu
Hakeem Onasanya	Tzina Xazinah
Nadine Dogbe	Bernardo Andretti
Zilin Tu	Yaqub Yousuf
Denilson Soares Gomes Junior	Jiaxin Chai
Charlie Newton	Gai Shurui
Paul Lawson	Lily McCrohan
David McKinnon	Elinor Tsien
Alice Graham	Sanjeev Sabhlok
Isabella Borges Avila	Louisa-Madeline Singer
Marcelo Arruda Candido	Joanna Klimczak
Debora Nery Schwartz	Juhi Kore
Xingyue	Thomas Hale
Malin Bornemann	Hyerean Yoo Kang
Callum Ryan	Gaia Lisi
Maebh Gallagher	Nicole Nanci
Maria Luiza Barreto Cazumba	Haiyun Deng
Daphne Nakawesi	Yizhou Pan
Eera Fatima Bangi	Katie Tehas
Kala Pham	Ashton Wagner
Tamaghna Kasibhatta	Anahi Alvarez-Amaro
Yago Evangelista Tavares de Souza	Maha Al-Areeqi
Weiyi Huang	Ziya Utlu Karadeniz
Morgan Woods	Yanjun Lu
Joseph Hudson	Luiz Philipe de Souza Ferreira

Du Yanrong
Jessica Liana
Claire Chiang
Thin Pa Pa Hlaing
Callum Rodgers
Linchen Xie
Karolina Helnarska
Juan David Gutierrez
Manikarnika Dutta Dutta
Dang Dao Nguyen
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Sasidhar Gali
Qing Yang
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Digvijay Uddhav Patil
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Jueqiong Zhao
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