Expert Report for the UK Covid-19 Public Inquiry

Module 2: Oxford COVID-19 Government Response Tracker Evidence for UK COVID-19 Inquiry

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About the author

Thomas Hale is Professor of Global Public Policy at the Blavatnik School of Government, University of Oxford. His research explores how political institutions evolve – or not – to face the challenges raised by globalisation and interdependence, with a particular emphasis on environmental, economic and health issues. He holds a PhD in Politics from Princeton University, a master's degree in Global Politics from the London School of Economics, and an AB in public policy from Princeton's School of Public and International Affairs. A US national, Professor Hale has studied and worked in Argentina, China and Europe. His books include *Beyond Gridlock* (Polity 2017), *Between Interests and Law: The Politics of Transnational Commercial Disputes* (Cambridge 2015), *Transnational Climate Change Governance* (Cambridge 2014), and *Gridlock: Why Global Cooperation Is Failing when We Need It Most* (Polity 2013). Professor Hale leads the Oxford COVID-19 Government Response Tracker and co-leads the Net Zero Tracker.

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Author statement

I confirm that this is my own work and that the facts stated in the report are within my own knowledge.

I understand my duty to provide independent evidence and have complied with that duty.

I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

Professor Thomas Hale

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Summary

This document responds to the questions posed by the COVID-19 Inquiry, focusing on two primary areas:

1. What has the scientific literature concluded about the effectiveness and impacts of various policy interventions governments have made in response to COVID-19?
2. How do the policy responses in the UK and devolved administrations compare to other jurisdictions?

The evidence draws on the Oxford COVID-19 Government Response Tracker, a dataset produced by the Blavatnik School of Government, University of Oxford, which records policy measures

related to COVID-19 and is used by researchers and policymakers globally, as well as the wider scientific literature.

Contents

1. Background Information

1. The Oxford COVID-19 Government Response Tracker (OxCGRT) was launched in March 2020 by Professor Thomas Hale and colleagues at the Blavatnik School of Government, University of Oxford. Professor Hale holds a PhD in Politics from Princeton University and his expertise focuses on the politics of policymaking across national boundaries and how policymakers address transnational challenges. He has written extensively on environmental, economic, and health policy issues – including COVID-19 – and has taught at the Blavatnik School since its founding in 2012.[1]

2. The COVID-19 pandemic illustrates the challenges of transnational policymaking, as health policies (or lack thereof) in one country or region also had many potential effects on others due to the transmissibility of SARS-CoV-2. The differences in governmental responses to COVID-19 have varied substantially and with varying effects. For that reason, having a system to measure and compare national and subnational policies has been critical to assess outcomes and the decisions that led to them.

3. OxCGRT has become the primary database used globally for this type of comparative information. The project began collecting data in March 2020, when governments around the world were taking significant measures to contain the disease's spread. At the time, no official system for tracking this type of global policy data existed – but soon, more than 40 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. The complete list can be found in section A1 of the Appendix.

4. Among these trackers, OxCGRT became one of the largest, with up-to-date coverage in near real time throughout the pandemic. OxCGRT recorded policy data for each day between 1 January 2020 and 31 December 2022 from more than 187 countries and several subnational jurisdictions (e.g., UK devolved nations, US states, Chinese provinces, etc.), making this information publicly available and free online for data users to compare official responses and their potential effects on case numbers and deaths.

5. To amass such a substantial database, OxCGRT has relied on a team of over 1500 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 and were also provided additional training and guidance, as needed.

[1] Further details about Professor Hale and his work can be found at the following link: https://www.bsg.ox.ac.uk/people/thomas-hale

6. Every week, volunteers were assigned a country from which they would research, interpret, and record policy data for each day in a given period of time.[2] Data was collected through publicly available government websites and official news reports, and the data collectors were tasked with taking qualitative policy information and interpreting it in a standardized, 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, this action was recorded as the strictest 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.

7. This 'school closing' indicator is just one example of the 21 different indicators that OxCGRT collects data on, which are described in full detail in section A2.3 of 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.

8. 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 which can be accessed by users. Together these original source materials constitute an enormous archive of government responses to COVID-19.

9. To facilitate comparison, OxCGRT also aggregates individual indicators, which reflect real-world policies, into composite indices that summarise the number and intensity of

[2] Information on volunteer training and quality assurance is published as part of the project's most recent working paper, Thomas Hale, Anna Petherick, Toby Phillips, Jessica Anania, Bernardo Andretti de Mello, Noam Angrist, Roy Barnes, Thomas Boby, Emily Cameron-Blake, Alice Cavalieri, Martina Di Folco, Benjamin Edwards, Lucy Ellen, Jodie Elms, Rodrigo Furst, Liz Gomes Ribeiro, Kaitlyn Green, Rafael Goldszmidt, Laura Hallas, Nadezhda Kamenkovich, Beatriz Kira, Sandhya Laping, Maria Luciano, Saptarshi Majumdar, Thayslene Marques Oliveira, Radhika Nagesh, Annalena Pott, Luyao Ren, Julia Sampaio, Helen Tatlow, Will Torness, Adam Wade, Samuel Webster, Andrew Wood, Hao Zha, Yuxi Zhang, Andrea Vaccaro "Variation in Government Responses to COVID-19" Version 15. Blavatnik School of Government Working Paper. June 2023. Available: www.bsg.ox.ac.uk/covidtracker

policies in place in a given jurisdiction at a given moment. A more detailed description of the specific indices developed by OxCGRT (such as the Stringency Index, which measures closure and containment policies as well as mask and testing and contact tracing policies) and how they are used, can also be found section A3 of the Appendix. Using composite indices such as these has both strengths and limitations, due to the loss of nuance in understanding the particular details of the mix of policies in force in a given jurisdiction, and so should only be used as a starting point for analysis. Users of OxCGRT data should also understand that it only records the number and degree of government policies – not how well policies are implemented, enforced, communicated, or complied with. Typically researchers therefore combine the OxCGRT data with other sources of information to assess their effectiveness.

10. OxCGRT 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 identify the groups that were eligible in each country to receive vaccines on 4 March 2022.

11. 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

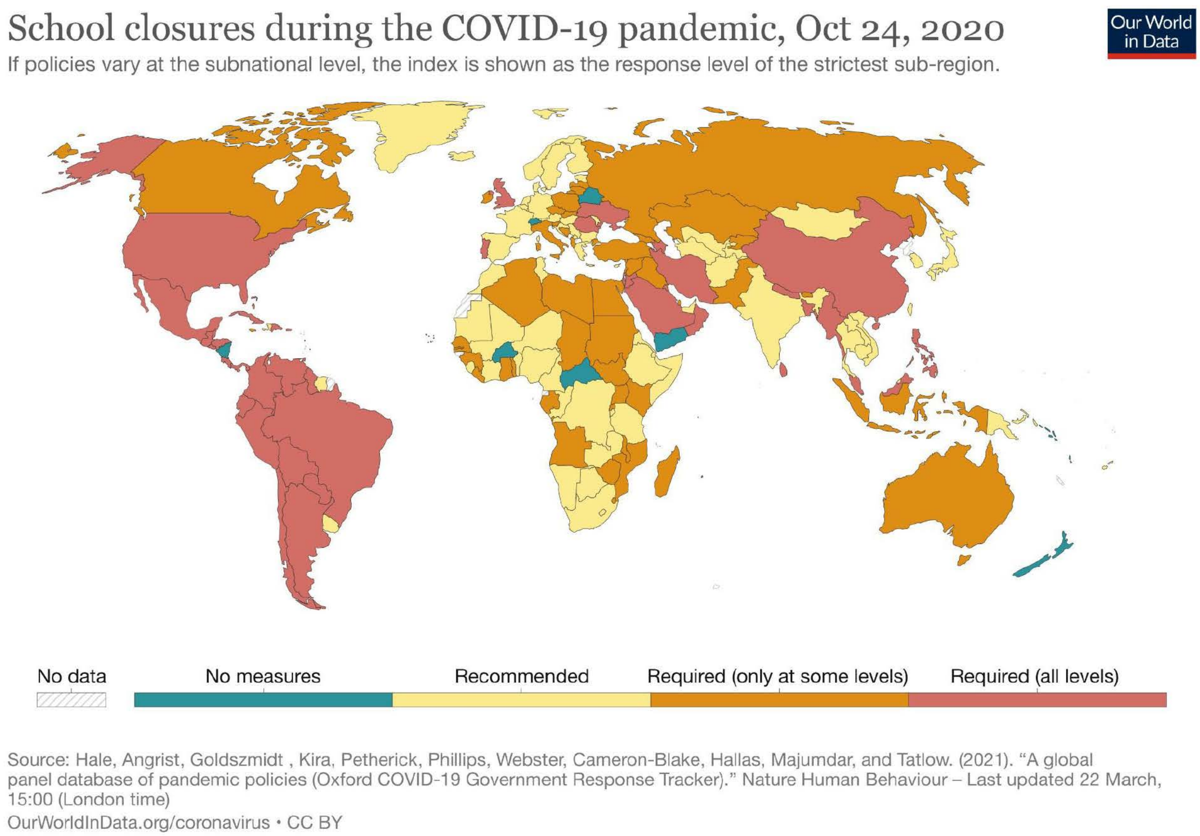
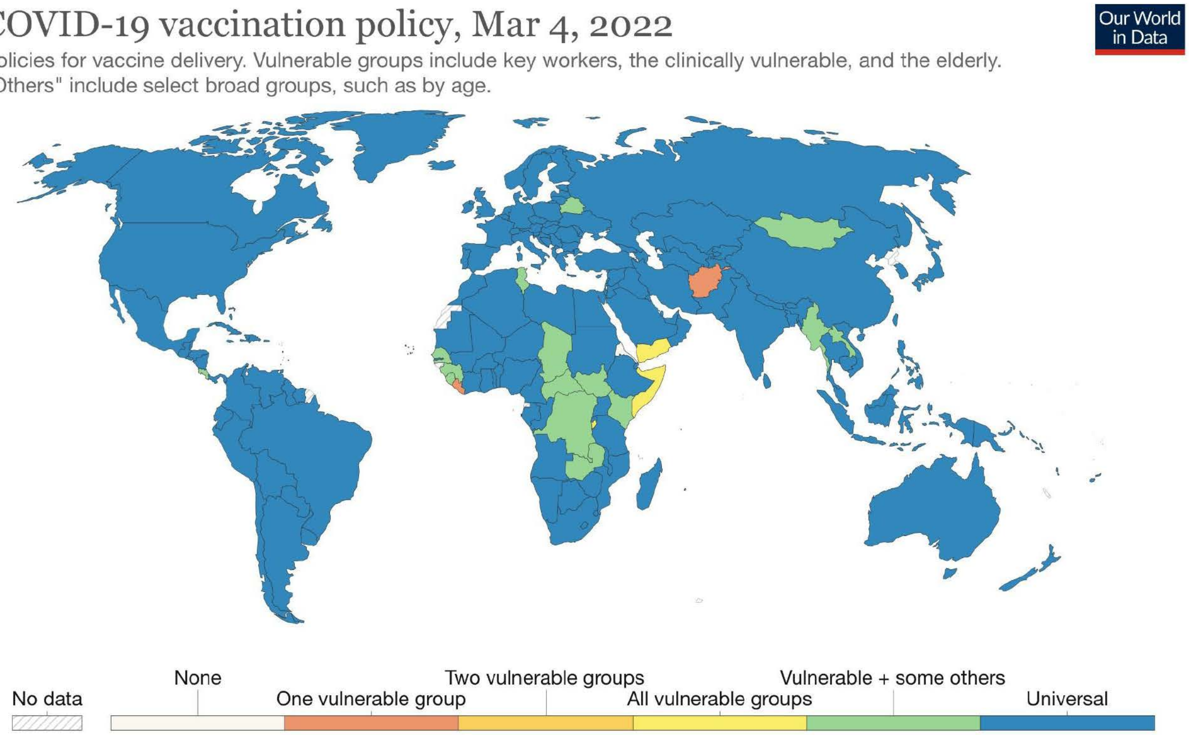


Figure 2. V1 'Vaccine Prioritisation' indicator presented by Our World in Data

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.



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

12. 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. The three primary audiences for the data are:

- Researchers – the data has been used in thousands of studies to, for example, understand the effects of different policies on health outcomes or other areas of interest.
- Governments – policymakers have used the data to see what peers are doing or not doing and to adjust their own responses accordingly.
- The public – media organisations have frequently used the data to help convey how governments around the world have responded to COVID-19

13. Many governments incorporated the OxCGRT data into their pandemic response analysis and planning processes. In the UK, the two academic leads of OxCGRT, Professor Hale and Dr. Anna Petherick, were both part of the UK Government's International Comparators Joint Unit Expert Advisory Group, providing regular advice to the UK Government. The OxCGRT data was one of several sources included in regular briefing notes prepared by the Cabinet Office for senior figures across government. OxCGRT worked closely with the Cabinet Office over much of 2021 and 2022 to ensure the data the Government was relying on was

up-to-date in time for these briefings, and OxCGRT provided several rounds of additional ad hoc data collection on topics of interest outside our core set of indicators.

2. Relationship between government responses and the spread and health impact of COVID-19

14. Policymakers seeking interventions to mitigate the severity and spread of a pandemic may wish to identify the most effective measures with the lowest corresponding social and economic costs (Zhang *et al.*, 2022; Sharma *et al.*, 2021). Evidence on the impact of NPIs on outcomes of interest (including health, economy), as well as the many mediating factors that condition that effectiveness, is therefore essential. This question has been a major topic of research during the last three years, and continues to be investigated today. The OxCGRT project supports this work primarily by providing one key type of data – policy data – that is necessary (but by itself not sufficient) to answer questions around the impact of NPIs on health outcomes.[3] Thousands of studies have been published that use the OxCGRT data to answer aspects of this question. In addition, the OxCGRT research team, together with external partners, has conducted several of our own analyses. Below we briefly summarise this large body of literature.

15. In general, analyses of the effectiveness of policies need to consider:

- The content of the policies themselves
- Changes in peoples' behaviour
- The characteristics and prevalence of the disease
- Health outcomes, or other outcomes of interest
- Other factors that mediate the effect of 1 on 2 (such as, for example, trust, the degree of enforcement, communication strategies, etc.)
- Other factors that lead to behavioural changes that are not due to policies (e.g. weather, ideology, informational)
- The timing of the above
- The characteristics of people and populations (e.g. gender, ethnicity, race, comorbidities, etc.) .

16. Models that seek to measure the impact of policies on outcomes need to address all of these factors robustly, accounting in particular for the timing of implementation, (ibid.) nuanced social and political contexts of a given country, (Lewis, 2022) or the level of interpersonal trust observed within a particular society (Petherick *et al.*, 2021). Moreover, NPIs introduced

[3] The OxCGRT looked at closure and containment policies, economic support policies, health system policies, and vaccine roll-out policies. The specific NPIs are detailed in appendix A2.

during the pandemic were typically done so concurrently, in some cases with significant interaction or overlap,(Sharma *et al.*, 2021; Banholzer et al., 2021) and alongside the adoption of other protective behavioural changes that occurred as a result of increased public awareness (ibid.). This coexistence may obscure the impact of any particular policy intervention (ibid.). Robust analyses use a variety of research designs and statistical techniques to address these various challenges. Such work helps researchers to assess the average effects of different policy responses. The extent to which these average effects apply to any specific example will of course depend on the specific conditions around a given set of policy measures; for instance, in some places, a measure might be very effective, but in other places – eg. where there is lower trust in government or in the presence of contradictory messages from leaders – the same policy settings may have no effect at all. Correspondingly, generalisations about the effect of different policies should be understood as average and conditional tendencies, not immutable rules.

17. With these considerations in mind, there is abundant evidence that NPIs that reduced physical contact and proximity reduced viral spread, particularly when implemented early during a period of community transmission (Zhang *et al.*, 2022; Sharma *et al.*, 2021; Koh, Naing and Wong, 2020). Here we emphasise six general findings from the literature that provide relevant context for understanding the UK's responses:

    1. Speed matters
    2. Strength matters
    3. Effective use of test, trace, and isolate measures limits both health impacts and the need for restrictive policies
    4. Economic support bolsters compliance
    5. Prolonged restrictions can have costs
    6. Policy responses have different effects on vulnerable and non-vulnerable populations.

    Each point is elaborated in further detail below.

18. Before elaborating these six points, it is important to provide more detailed information on how the literature review was conducted. The search for relevant studies on the effectiveness and impact of COVID-19 policy interventions was carried out in February and March 2023, mainly through Google Scholar. In this search we focused mainly —but not only— on studies using the OxCGRT data because this links to our area of expertise. These six points stood out as the most recurrent and relevant themes in the literature, so we structured the literature review exclusively around these points and carried out an additional search with more specific terms related to the selected points. Studies on these six points available in English were carefully examined and identified for further analysis first based on their academic relevance (e.g., number of citations) and quality of journals (e.g., impact factor and peer review process), and then based on the transparency and quality of the methods used in each study. However this process does not constitute a full systematic review of the literature, and so should be interpreted as expert judgement based on available literature.

2.1 Speed matters

19. There is broad consensus among researchers that timely adoption of NPIs is a key factor in reducing the transmission of COVID-19. Estimates show that even a single day of delay in implementing NPIs can significantly increase the virus' death toll, (Amuedo-Dorantes, Kaushal and Muchow 2021) and that the adoption of stringent policy measures during the first five days of the pandemic significantly reduced the transmission of the virus in the subsequent ten days (Allel, Tapia-Muñoz, and Morris, 2020). The exponential growth rate of the virus and its average incubation time of several days, at least of the first variants (Wenqing, Yi, and Zhu 2020), highlight the importance of quick response measures, as once the virus is spreading uncontrollably, every day of delay results in an ever increasing degree of spread. For example, a study on US states indicates that the implementation of NPIs takes about 10-14 days to be effective on COVID-19 health outcomes (Dey *et al.* 2021). Similarly, a study on the first wave of the pandemic in EU countries suggests that mobility restrictions substantially reduce COVID-19's basic reproduction rate with a delay of about two weeks (Linka, Peirlinck and Kuhl, 2020). In China the impact of NPIs was relatively small in the first week after their enactment, increased considerably during the second week, and became stable in the third week (Hsiang *et al.*, 2020).

20. A significant amount of empirical evidence indicates also that the effectiveness of rapidly adopted policy interventions varies across NPIs. One study finds that the rapid banning of public events played a crucial role in explaining decreases in death rates across European countries during the first wave of the pandemic (Fountoulakis *et al.* 2020). Another study on the first wave of COVID-19 shows that cumulative mortality was most reduced in countries where mass gatherings bans and school closures were implemented at an early stage of the pandemic (Piovani *et al,* 2021). According to the estimates from the latter study, a single day of delay in implementing a mass gathering ban or school closures meant respectively a 6.97% and 4.37% increase in cumulative deaths. The findings of a third cross-national study additionally indicate that international travel restrictions effectively reduce the spread of COVID-19 more quickly than other common NPIs but that their effect is short-lived, suggesting that international travel controls are highly effective only if adopted at an early stage (Askitas, Tatsiramos and Verheyden, 2021). This last study also confirms that common policy responses effectively reduce the number of new infections with a delay of many days, corroborating the view that a timely adoption of NPIs is crucial in curbing the virus.

2.2 Stringency matters

21. Empirical evidence leaves little doubt that not only the speed but also the stringency of policy interventions matters. Strong government responses have generally played a key role in reducing the transmission of the virus and mitigating COVID-19's adverse health effects. Indeed, a study on 37 European countries finds that both more stringent and quicker NPIs were crucial in reducing the number of COVID-19 related deaths (Fuller *et al,* 2021). A global cross-country study confirms that countries enacting more stringent NPIs early on had fewer pandemic deaths in early 2020 (Degrades *et al.,* 2022). A study in Latin American countries

found that the stringency of NPIs became an increasingly important factor in reducing the number of new infections as the pandemic moved forward (Ratto *et al,* 2021).

22. In order to contain the virus, governments adopted various NPIs with different effects on the pandemic. In our work, we use the word "stringency" to refer to how restrictive a policy is – it describes the strength of the NPIs. For instance, a government that closes all schools and universities is more stringent than a government that only closes primary schools; or a government with a total stay-at-home order is more stringent than a government that allows trips out of the house for daily exercise. In our work we also developed a Stringency Index (described in more detail below) that provides a simple aggregate measure, ranging from 0-100, reflecting the number and severity of closure and containment policies enacted by a government. These sorts of policies include school closures, border closures, limits on gathering sizes, and stay-at-home orders. A larger number indicates that a jurisdiction had more types of policies and that these closures were more stringent.

23. Stay-at-home orders were some of the strongest policy interventions that were adopted. One study on the first wave of COVID-19 in European countries found that strict requirements to not leave one's home were by far the most effective policy measure in reducing the transmission of the virus (Flaxman *et al,* 2020). Such measures have been found to be effective in reducing the spread of COVID-19 also at a broader global level (Alfano & Ercolano, 2020).

24. A cross-country study focused on the first few months of 2020 finds that closing schools and universities as well as limiting gatherings to 10 people or less were the most effective government responses in reducing the transmission of COVID-19 (Brauner *et al,* 2021). Similarly, a study on US counties argues that school closures were the most effective policy intervention in containing the virus(Yang *et al,* 2021). Another cross-country study shows that during the first half of 2020 school closures and internal mobility restrictions reduced transmission regardless of the degree of stringency but that other policy interventions including gathering bans and public event restrictions were effective only if adopted at the highest degree of stringency (Liu *et al,* 2021). A review of 34 papers on the impact of various common NPIs indicates that school closures were the most effective policy interventions for mitigating the disease's adverse health outcomes, followed by workplace closures, business closures, and public event bans (Mendez-Brito, El Bcheraoui & Pozo-Martin, 2021).

25. Stringent government responses have been important also in reducing human mobility, which in turn has been associated with a decrease in the spread of COVID-19 (Nouvellet *et al,* 2021; Khataee *et al,* 2021). Empirical evidence indicates that more stringent government responses were effective in reducing human mobility around the world (Mendolia, Stavrunova & Yerokhin, 2021). Geographically narrower studies show that the adoption of stronger NPIs was related to a drop in mobility for instance in Latin America (Martinez-Valle, 2021) and Africa (Carlitz and Makhura, 2021), and that stay-at-home orders successfully reduced mobility in the US (Jacobsen and Jacobsen, 2020). Nevertheless, the relationship between the stringency of NPIs and mobility has evolved during the pandemic: recent evidence suggests that adherence to mobility restrictions decreased over time. While more stringent

policy interventions are associated with a decline in mobility throughout the pandemic, this relationship was considerably stronger in the initial months than in the later phases of COVID-19 (Smyth, 2022). As the pandemic moved on, observance of physical distancing measures decreased across the world, and the decline was particularly strong in countries with low interpersonal trust (Petherick *et al,* 2021).

26. The lion's share of current evidence is based on the initial stages of the pandemic, but some of the most recent studies on the impact of NPIs demonstrate that more stringent government responses had the intended effects on COVID-19 health outcomes not only in the first wave of the pandemic but also across different waves (Hale *et al,* 2021). That said, recent evidence also points out that while adopting stringent NPIs was essential, once a certain level of stringency was reached, the most stringent policy measures were not always the most effective. To be more specific, estimates show that—on a scale from 0 to 100—the strongest effect of NPIs on both case and death growth rates occurred between 61 and 70, suggesting that after this threshold is reached there are diminishing marginal returns to additional policies (Spiliopoulos, 2022). Interestingly, a cross-country study shows that during the second wave of COVID-19 in Europe—between August 2020 and January 2021—school closures had only a small impact on the transmission of the virus, whereas business closures and gathering bans were the most effective interventions in curbing the contagion (Sharma *et al,* 2021). As argued by the authors of the study, it may be that the effect of school closures was small in the second wave because after the first wave governments adopted better safety protocols especially in schools. These findings indicate that even if in general enacting stringent NPIs leads to better health outcomes throughout a pandemic, the magnitude of the effect of specific interventions may vary across different phases of the pandemic. Factors such as improved safety protocols and waning adherence to restrictive measures may have affected the impact of some policy interventions.

2.3 Effective use of test, trace, and isolate measures limits both health impacts and the need for restrictive policies

27. While empirical evidence shows that both rapid and strong NPIs have been crucial for better COVID-19 health outcomes, the literature also shows that different phases of a pandemic require different types of policy interventions. Fast, stringent policy measures —such as school closures, business closures, and stay-at-home mandates—were likely indispensable in the pre-vaccination era when COVID-19 began to overwhelm health systems. But because such measures come with clear trade-offs (see below), the most effective governments were able to minimise the use of stringent measures by relying on effective systems to test people for COVID-19, rapidly trace their contacts, and ensure that infectious or potentially infectious individuals did not spread the disease. Studies show that such testing, tracing, and isolation (TTI) strategies are a viable and attractive way to keep the transmission of a virus like COVID-19 under control. Such strategies are particularly effective when combined with fast, stringent, but limited NPIs should an outbreak escape the TTI system.

28. Current knowledge on the effectiveness of TTI vis à vis NPIs is mainly based on simulation or modelling studies. One modelling study estimates that TTI strategies can keep transmission

under control but only if the time between the onset of symptoms and isolation is less than three days (Kretzschmar *et al,* 2020). The findings from another modelling study indicate that TTI strategies could have been successful in avoiding a second wave of COVID-19 in the UK only if implemented more comprehensively (Panovska-Griffiths *et al,* 2020). The study, published in August 2020, predicted that without high levels of testing and contact tracing, the relaxation of restrictive policies and reopening of schools would lead to a second wave characterised by a higher number of infections than in the first wave. A case study on Italy estimated that timely TTI strategies would have drastically reduced COVID-19's death toll (Bandyopadhyay *et al*, 2022). Cross-country evidence on the association between contact tracing and COVID-19 health outcomes shows that indeed stronger contact tracing policies were related to less COVID-19 deaths and a lower case fatality rate (Yalaman *et al,* 2021). Systematic review studies further corroborate the evidence that extensive TTI policies are important in keeping the pandemic under control (Pozo-Martin *et al,* 2023; Misra *et al,* 2022).

2.4 Economic support bolsters compliance

29. The implementation of various NPIs aimed at reducing the adverse health impact of COVID-19 presented notable economic consequences, leading most governments to implement economic support policies aimed at mitigating the economic burden of the pandemic. Numerous studies show that stronger economic support policies played a key role in bolstering compliance with NPIs. One of the underlying mechanisms here is that individuals who receive significant economic support have better economic means to afford losses caused by strong policy interventions such as stay-at-home mandates and business closures. Moreover, economic support policies could augment trust in both institutions and government, which in turn have been linked to increased compliance with stringent containment measures (Bargain & Aminjonov, 2020; Brodeur, Grigoryeva & Kattan, 2021a). Evidence suggests then that early adoption of economic support measures is a useful tool to fight pandemics.

30. A study on US states—focusing on the first seven months of 2020—finds that when stronger economic support policies were adopted, NPIs were generally more effective in reducing the growth rate of COVID-19 infections (Dergiades *et al,* 2022). Similarly, findings from another study on US counties indicate that economic support policies were a significant factor in reducing human mobility and increasing compliance with social distancing policies (Wright *et al*, 2020). In Italy, a large food relief programme was associated with higher compliance with stay-at-home orders, (Deiana *et al,* 2022) whereas in Israel, survey respondents were much more willing to comply with self-quarantine orders if compensated for lost salary (Bodas & Peleg, 2020). Cross-country evidence also demonstrates that while more stringent workplace closures were generally related to increased COVID-19 related social unrest, stronger economic support policies successfully mitigated this positive link between workplace closures and unrest (Wood *et al*, 2022). More broadly, empirical evidence shows that higher levels of poverty are related to a lower support or compliance with NPIs (Dang, Malesky & Nguyen, 2022; Besley & Dray, 2022; Hyun, Ji & Lim, 2021). Overall, the literature provides thus robust support to the view that economic incentives matter for better pandemic outcomes.

2.5 Prolonged restrictions can have costs

31. As discussed above, there is robust empirical evidence that strict and timely policy interventions are effective in mitigating the adverse health outcomes of a pandemic like COVID-19. Yet, even if NPIs do reduce the transmission of the virus itself, their prolonged use tends to have negative effects as well. Such costs seem to be especially relevant for school closures and stay-at-home mandates. Because some of these costs may only manifest or become apparent over time, it is important to continue evaluating the evidence of COVID-19 restrictions into the future.

32. Emerging evidence suggests that strict and prolonged NPIs may have a negative impact on mental health. One cross-country analysis on the relationship between COVID-19 response policies and mental health in the first 15 months of the pandemic found a significant—albeit small—negative effect of policy stringency on mental health (Akin *et al,* 2022). Another cross-country analysis on the topic focusing on higher education students found that more stringent policy interventions—in particular school closures, workplace closures, and stay-at-home orders—were significantly related to more severe depressive symptoms (Buffel *et al,* 2022). Cross-country studies focusing on older adults in Europe also found that more stringent physical distancing measures were associated with a significant deterioration in mental health (Mendez-Lopez *et al,* 2022; García-Prado, González & Rebollo-Sanz, 2022). Findings from other studies on single countries lead to similar conclusions. A study on England and Scotland found that easing the stay-at-home order was related to improvements in mental health in these two UK nations (Serrano-Alarcón *et al,* 2022). Similarly, a study on New Zealand found that COVID-19 related lockdown measures had a negative effect on life satisfaction and loneliness, and that the magnitude of this effect increased hand in hand with increases in lockdown stringency (Grimes, 2022). Evidence indicates also that Dutch children and adolescents had significantly better mental health before the pandemic than during lockdown (Luijten *et al*, 2021), and that Israeli children and adolescents had significantly better mental health before the COVID-19 than right after an eight-week lockdown (Shoshani & Kor, 2021). Moreover, while adopting strict NPIs is an important factor in reducing human mobility, decreases in mobility are associated with increases in both depressive and anxiety disorders (Santomauro *et al,* 2021).

33. An increasing number of studies shows also that the prolonged use of some NPIs may cause substantial increases in domestic violence. In the US, COVID-19 related stay-at-home restrictions were associated with considerable increases in domestic violence (McCrary & Sanga, 2021). In Spain, the first COVID-19 related lockdown was associated with a significant increase in sexual and psychological abuse (Arenas-Arroyo, Fernandez-Kranz & Nollenberger, 2021). In Peru, the first lockdown was associated with a significant rise in phone calls to a national helpline for domestic violence (Agüero, 2021). Evidence from Wales suggests that while the total number of domestic abuse referrals did not increase during the first lockdown, there was a significant increase in the proportion of 'high risk' referrals (Moore *et al*, 2022). Evidence from Greater London suggests that during the first lockdown abuse by current partners and family members increased whereas abuse by ex-partners decreased (Ivandic, Kirchmaier & Linton, 2020). Overall, first review studies on the topic seem to confirm

that the strict and prolonged stay-at-home orders implemented especially in the initial stages of COVID-19 have had a deleterious impact on domestic violence (Kourti *et al,* 2021; Viero *et al,* 2021).

34. Evidence from both developed and developing countries reveals a significant drop in student achievement during the pandemic. For instance, in India—a country with particularly long school closures—primary students experienced a large learning loss during the pandemic and that this learning loss has disproportionately affected students who were disadvantaged already before COVID-19 (Recch *et al,* 2022). A similar pattern of learning loss was found in primary students in the Netherlands after its first national school closures, even if they lasted 'only' eight weeks (Engzell, Frey & Verhagen, 2021). A meta-analysis of multiple country-level studies confirms that in general school closures had a negative impact on student performance (König & Frey, 2022). Estimates from cross-country analyses suggest also that prolonged and strict NPIs negatively affect short-term economic growth (Pitterle & Niermann, 2021), reduce economic activity by about 10% (Demirgüç-Kunt, Lokshin & Torre, 2021), and increase wage inequality and poverty (Palomino, Rodríguez & Sebastian, 2020). Additionally, prolonged and strict NPIs have increased gender inequalities because the pandemic has hit more severely contact-intensive sectors where women tend to be over-represented, and intergenerational inequalities because older people have more savings and tend to receive stable retirement income whereas young workers typically rely on their job earnings which are more likely to be affected by lockdown measures (Caselli *et al*, 2022).

2.6 Differential impacts of NPIs on vulnerable and non-vulnerable populations

35. The COVID-19 pandemic has exacerbated existing inequalities not only in health but also other spheres of society (Marmot & Allen, 2020). While there is little doubt that the disease itself has been more severe in the elderly (Ho *et al*, 2020), ethnic minorities (Pan *et al*, 2020), those with obesity, heart disease, or other comorbidities, and economically disadvantaged people (Laajaj *et al*, 2022), we have also seen above that the prolonged use of restrictive NPIs has had differential effects on vulnerable groups of the population. Often, similar groups of people are at heightened risk of both COVID-19 and the 'side effects' of responses to it, highlighting the dilemmas that vulnerable groups face.

36. There is mounting empirical evidence that vulnerable groups including women, older adults, children, ethnic minorities, migrants, and persons with disabilities and other health conditions have been particularly affected by common pandemic responses. One cross-country study finds that more stringent containment policies were particularly harmful for the mental health of women, those aged 50-65, and those living alone (García-Prado, González & Rebollo-Sanz, 2022) Some scholars have argued for targeted restrictions for the elderly to contain the virus, (Savulescu & Cameron, 2020) but evidence from Turkey indicates that an age-specific stay-at-home mandate—targeted mainly on individuals aged at least 65—led to significant increase in mental distress in the targeted population compared to those who were

not directly affected by the restriction (Altindag, Erten & Keskin, 2022). Further evidence from Italy and the UK (mainly the North West Coast of England) suggests that stringent policies decreased the quality of life of older people in particular suffering from existing health conditions such as dementia (Chirico *et al,* 2022; Giebel *et al,* 2021).

37. We have noted above how school closures have been detrimental for both the mental health and the educational outcomes of children. Global predictions show that school closures will have deleterious impact on children's future, causing significant learning losses and a substantial drop in lifetime earnings (Azevedo *et al,* 2021). Moreover, the negative impact of pandemic responses on educational outcomes has been more severe in younger children (König & Frey, 2022) and in those children who were already disadvantaged before COVID-19 (Recch *et al,* 2022). The possibilities for remote learning are not distributed equally and studies have shown that effective remote learning is difficult especially for primary students (Azevedo *et al,* 2022). Furthermore, scholars have argued that strict lockdown measures have had a particularly negative impact on children with disabilities (Kaur, Boobna & Kallingal, 2022; Neece, McIntyre & Fenning, 2020).

38. Notably, some studies show that restrictions have decreased women's wellbeing more than men's. Evidence from both developed and developing countries — for instance the UK (Etheridge & Spantig, 2022), the US (Adams-Prassl *et al,* 2022), India (Bau *et al,* 2022), and Norway (Reme, Wörn & Skirbekk, 2022) — provides robust evidence that more stringent COVID-19 containment policies have increased mental health distress more in women than men. Moreover, as previously discussed, prolonged lockdowns increased domestic violence around the world.

39. In addition to this gender gap in wellbeing, emerging findings point to a differential impact of the pandemic on the mental health of ethnic minorities. One study focusing on the entire UK finds that the mental distress caused by the pandemic was substantially higher in women and ethnic minorities than in white men, and that the pandemic led to a deterioration of mental health – especially Bangladeshi, Indian and Pakistani men (Proto & Quintana-Domeque, 2021). Another study in the UK shows that while the mental health gap produced by the pandemic between white men and women seems to be now closing, there are no indications of such reversal in COVID-19 induced mental health problems among white men and ethnic minorities (Quintana-Domeque & Proto, 2022). Evidence also suggests that migrants and refugees have been disproportionately affected by pandemic responses. In some countries such as Greece refugees were subject to more stringent NPIs (Kondilis *et al,* 2021). In others, such as South Africa, undocumented migrants, asylum-seekers, and refugees were excluded from certain economic support policies (Mukumbang, Ambe & Adebiyi, 2020).

40. The differential impacts of some policy interventions on vulnerable and non-vulnerable populations have been spotted even in countries that have been frequently praised for their pandemic response. For instance, a study on South Korea's COVID-19 related policy interventions shows that its globally acclaimed handling of the pandemic failed to consider appropriately vulnerable populations: the elderly were negatively affected by the closure of local welfare centres, foreigners had to cope with the government's decision to provide

emergency text messages only in Korean, and persons with disabilities were left without help due to strict quarantine measures (Chung & Yi, 2021).

3. UK government responses in comparative perspective

41. The research findings highlighted above provide important context in which to understand the policy responses adopted in the United Kingdom, both in Westminster and in the devolved administrations. This section places the UK's responses to COVID-19 in comparative perspective. We review different types of responses, following the OxCGRT typology. For each, we are interested in both the level and timing of response relative to the spread of disease. As discussed above, the information presented here is not able to decisively attribute specific outcomes to the choices made by UK policymakers as policy responses are one of several factors shaping health outcomes.

42. OxCGRT collects data at several different levels. In the UK, we collected information on the policies of each devolved nation as well as the policies that applied to the country as a whole. Unless otherwise specified, in this report "UK" refers to the country as a whole (the NAT_TOTAL category in the OxCGRT database), combining both national and subnational policies following the logic described in the OxCGRT working paper. Aggregating national and sub-national policies is necessary to enable like-to-like comparisons across countries. When referring to the policies of the devolved nations specifically (the STATE_TOTAL category in the OxCGRT database), we name them individually.

43. Readers interested in exploring further international comparisons may wish to examine the data via the Our World in Data platform (https://ourworldindata.org/policy-responses-covid) which provides an intuitive, interactive tool with which to visualize the data. Similarly, our main data repository contains further information regarding the UK devolved nations, which can be accessed by interested users.

3.1 Initial speed of reaction

44. First, we focus on the initial response in 2020. With respect to timing, we consider two metrics: the number of days it took a jurisdiction to adopt a more stringent policy (defined as moving from recommendations to requirements after its first case of COVID-19 (**Figure 3a**), and after its 100th case (**Figure 3b**). Of these alternative metrics, we find the latter to be more informative, given the stochastic nature of transmission, but we include the former for reference. By this metric, the UK was slower than the average country to adopt stricter measures across nearly every domain of response (this is partly due to the fact that the UK's first recorded case was on 31 January 2020 and the 100th case was recorded on 2 March 2020, earlier than most other countries in the world). The response across the UK as a whole lagged least in closures of public transport, restrictions on internal movement, protections for the elderly, and stay-at-home orders. The UK government was particularly slow to adopt

international travel restrictions and school and workplace closures after the initial cases, when compared to other countries.

45. Relative to the spread of the virus, measures came into force in England slower than in Scotland, Wales, and Northern Ireland, largely because viral spread began first in England. In particular, relative to the spread of the virus, the devolved administrations implemented stricter policies on school and workplace closures as well as restrictions on public events before Westminster. However, if we look simply at the date of adoption, these policies were adopted more or less on the same day across the four UK nations. While the speed of adoption varied slightly for public transport and international travel controls, all four UK nations were less swift than comparator groups in implementing these measures. Looking at overall stringency levels, it becomes apparent that the slower adoption of some stricter policies is reflected in the aggregated Stringency Index. Notably, the four UK nations took significantly longer than other groups of countries to reach stringency 80 on the scale, indicating a delay in implementing stringent measures. (We choose a threshold of 80 on the scale because this generally signals a significant degree of stringent policies, almost certainly including significant restrictions and "lockdown" style rules.)

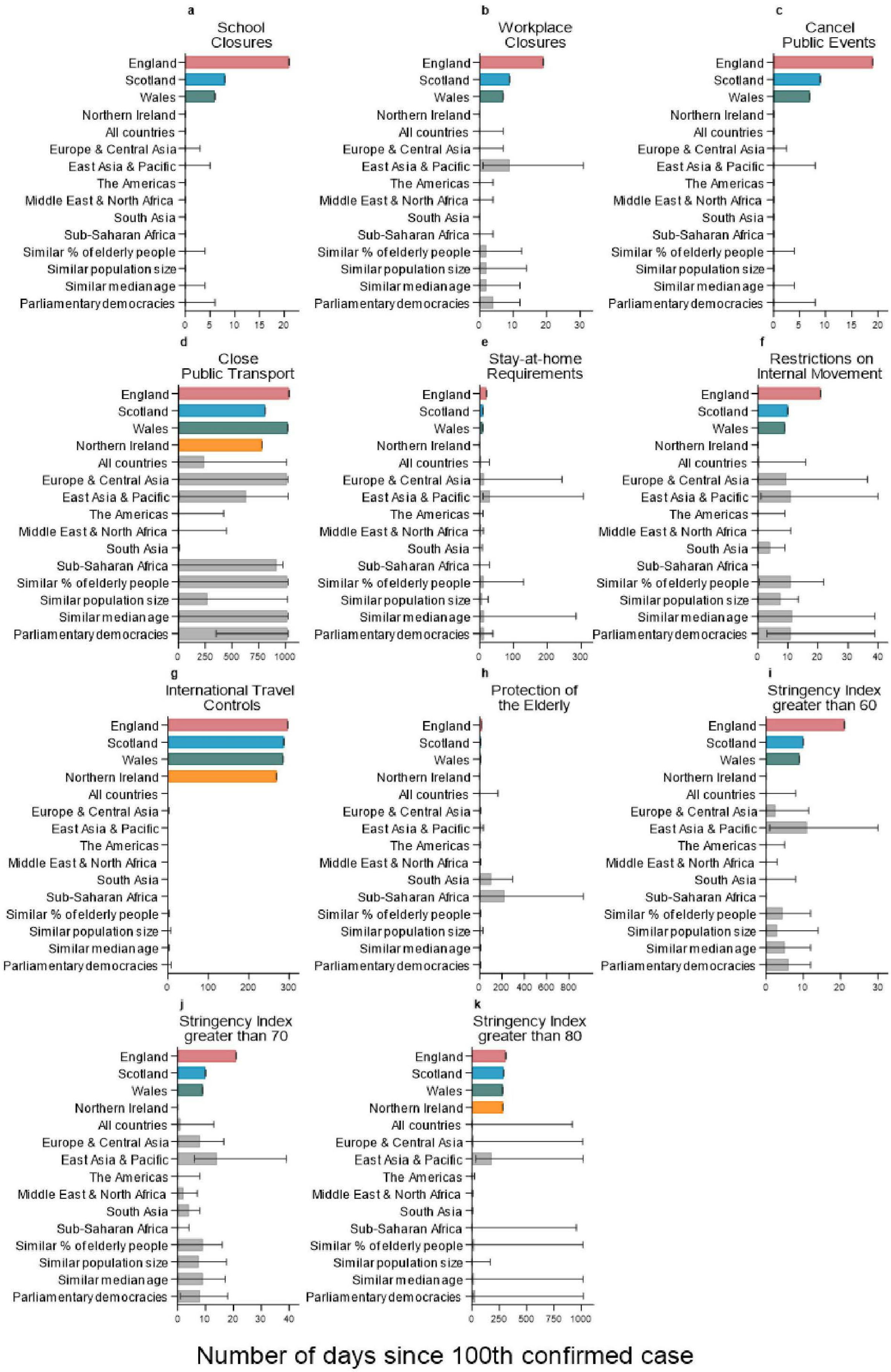
46. As noted above, faster responses are on average associated with significantly improved health outcomes. It is therefore quite likely that the health impacts of COVID-19 in the UK in Spring 2020 would have been lower if policy responses had been more timely.

Figure 3a (below). Time since the 1st confirmed COVID-19 case to adopt a more stringent COVID-19 policy across containment and closure indicators and levels of stringency. This figure depicts the median number of days between the 1st confirmed COVID-19 case and the adoption of a more stringent policy by groups of countries. 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. Rather than including bars for 185 countries, they are grouped by geographic regions. Whiskers (error bars) above and below the bar indicate the 75th and 25th percentiles; this range is often quite wide, demonstrating that even within geographic regions there was a significant diversity of approaches.


a
School Closures
b
Workplace Closures
c
Cancel Public Events
d
Close Public Transport
e
Stay-at-home Requirements
f
Restrictions on Internal Movement
g
International Travel Controls
h
Protection of the Elderly
i
Stringency Index greater than 60
j
Stringency Index greater than 70
k
Stringency Index greater than 80
England
Scotland
Wales
Northern Ireland
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies
Number of days since 1st confirmed case

47. **Figure 3a headline:** Relative to the spread of the virus, the four UK nations adopted more stringent policies more slowly than the average country in the world. England was notably "slow" to react to the virus, but it is important to consider that the first COVID-19 case was recorded in England much earlier than in most other countries in the world —and also earlier than in Scotland, Wales, and Northern Ireland— creating more challenging conditions for stringent early responses.

Figure 3b (below). 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. This figure depicts the median number of days between the 100th confirmed COVID-19 case and the adoption of a more stringent policy by groups of countries. 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. Rather than including bars for 185 countries, they are grouped by geographic regions. Whiskers (error bars) above and below the bar indicate the 75th and 25th percentiles; this range is often quite wide, demonstrating that even within geographic regions there was a significant diversity of approaches.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International Travel Controls
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Protection of the Elderly
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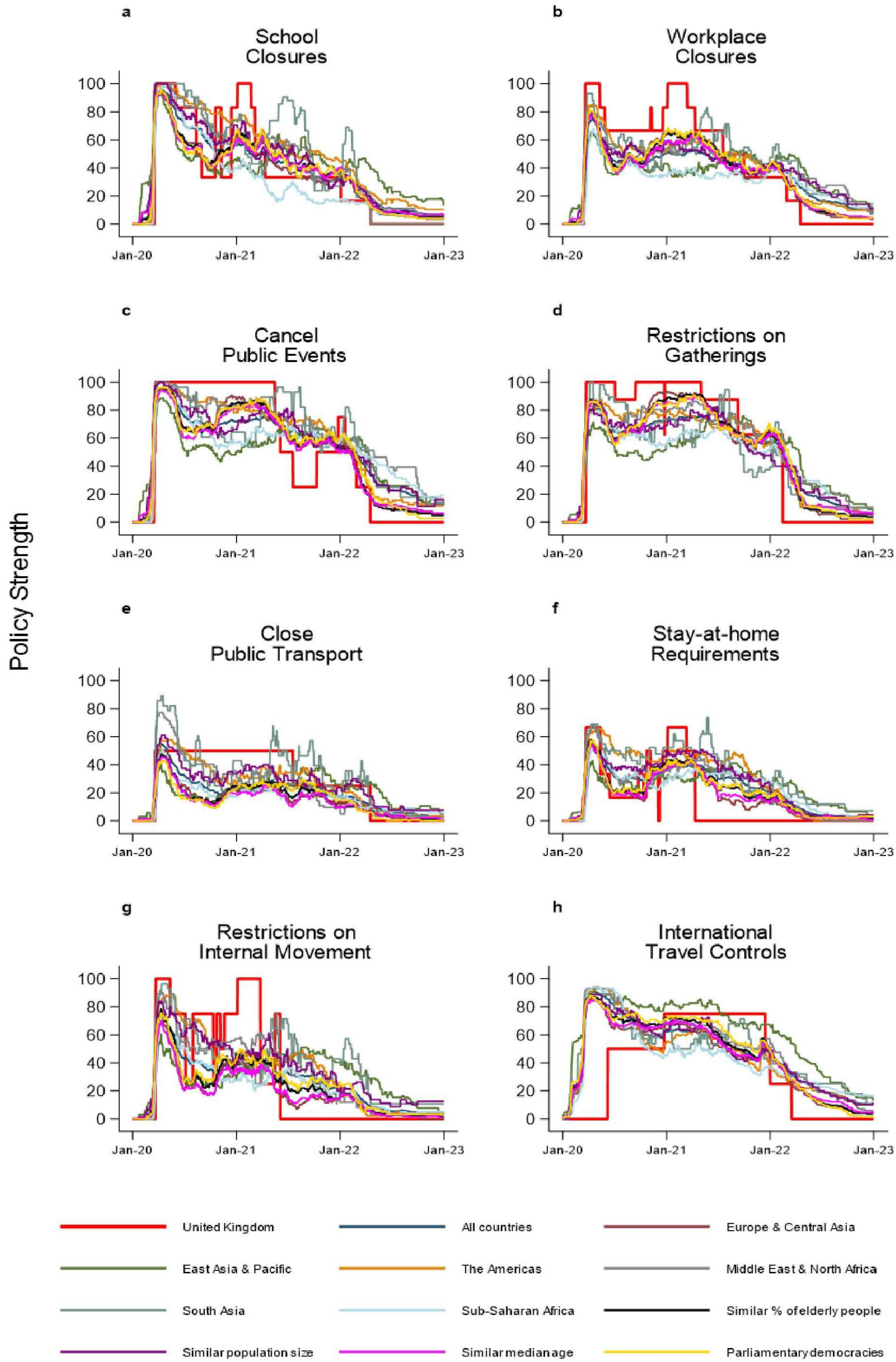
Stringency Index greater than 60
j
Stringency Index greater than 70
k
Stringency Index greater than 80
England
Scotland
Wales
Northern Ireland
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies
Number of days since 100th confirmed case

48. **Figure 3b headline:** Compared to other countries in the world, the UK in Spring 2020 adopted a number of restrictive policies more slowly than other countries relative to the spread of the virus. This gap was most pronounced for school and workplace closures, cancellation of public events, restrictions on internal movement, and international travel controls. Within the UK itself, there was variation in the timing of stringent policy responses relative to the prevalence of the disease because the virus spread to different parts of the country at different times. Overall, relative to the spread of the virus, Northern Ireland saw measures adopted relatively early in spread of the disease, while England had already reached a significant prevalence before measures came into force.

3.2 Comparing the timing and intensity of UK responses to other countries

49. Second, for each category of response, we compare the UK overall against other groups of countries (**Figure 4**). The graphs visualise both the timing and intensity of the UK government's response compared to others, though they do not account for variation in the spread of disease across countries during this time period. **Figures A5a-A5d** in the appendix provide analogous information for the policies that applied in each of the four UK nations. **Figures A2a-A2h** in the appendix break down a comparison between the UK and different groups of comparators for each type of policy response. Across indicators, UK responses tend to be more stringent than comparator groups until Spring 2021, at which point they tend to become less stringent. Two notable exceptions are public transport restrictions, for which UK policies are broadly similar to comparator groups across the whole period, and international travel controls, for which UK policies are notably less stringent than comparators during 2020 and 2022, but broadly similar to comparators during 2021.

Figure 4 (below). Average aggregated policy strength by indicator over time. This picture depicts how policy strength evolved over time. The red line indicates the containment closure policies enacted by the UK overall, and each coloured line represents the average aggregated policy strength by a group of comparison countries.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Workplace Closures
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Cancel Public Events
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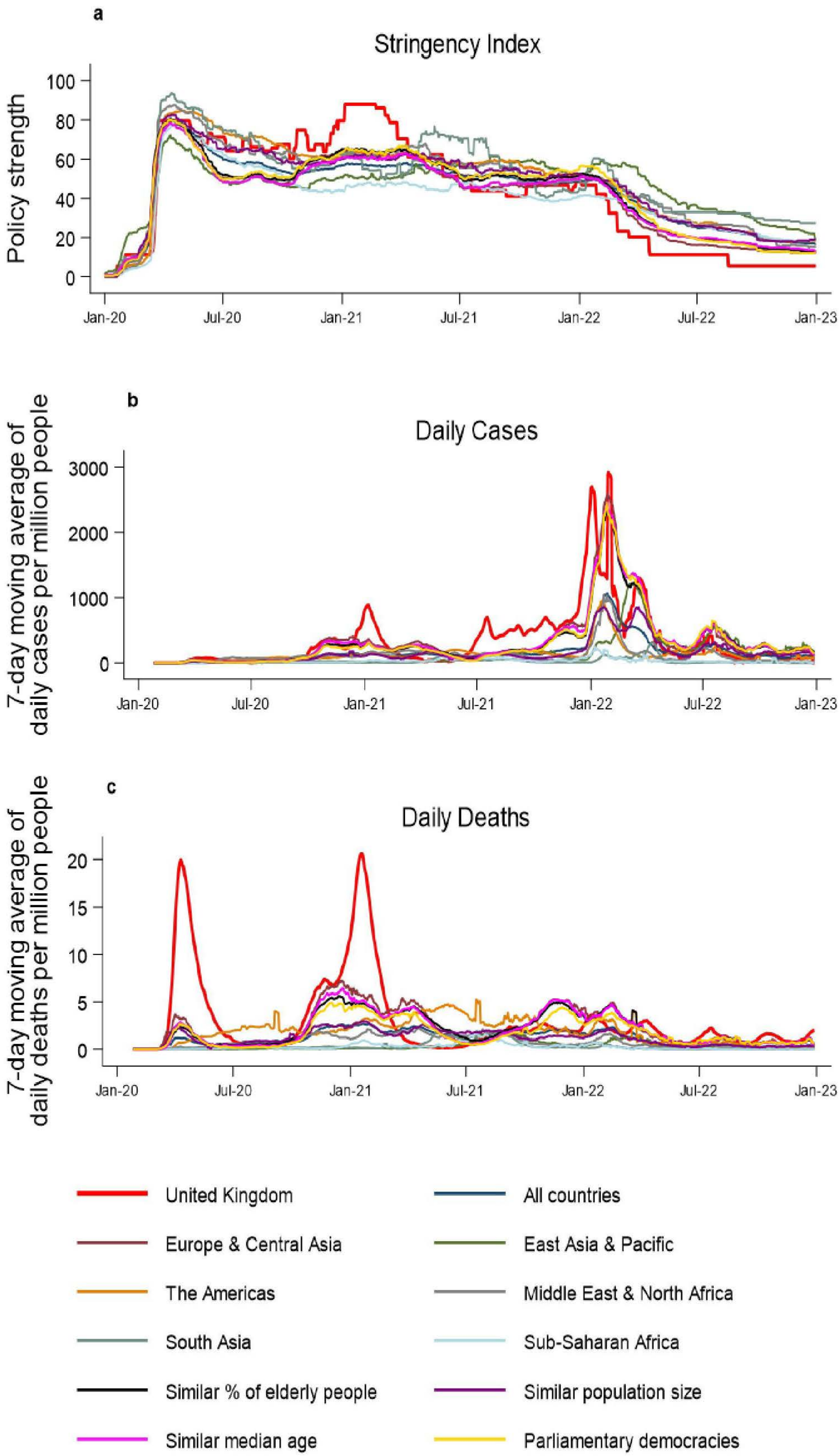
Restrictions on Gatherings
e
Close Public Transport
f
Stay-at-home Requirements
g
Restrictions on Internal Movement
h
International Travel Controls
Policy Strength
100
80
60
40
20
0
Jan-20
Jan-21
Jan-22
Jan-23
United Kingdom
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies

50. **Figure 4 headlines:** The United Kingdom enacted international travel controls relatively late compared to other countries. Moreover, the United Kingdom's additional restrictions of different kinds at the beginning of 2021 were not mirrored across comparator groups at the aggregate level – for instance workplace closures in the beginning of 2021 across comparator countries were not significantly more common than they had been in late 2020.

51. Third, we assess both the timing and stringency of the UK's responses to others, while also considering the relative spread of the disease as measured by cases and deaths (**Figure 5**). Figures A6a-A6d in the appendix show analogous information for each devolved nation, while **Figures A3a-A3k** in the appendix display the Stringency Index, daily new cases, and daily deaths for different groups of comparator countries. Overall, we see less stringency and more health impacts in the UK during the initial spread of COVID-19 in Winter-Spring 2020. Then in late 2020 to early 2021, both health impacts and stringency are very high in the UK compared to other countries, though increases in stringency lag health indicators, meaning that measures were reactive, not preventative. As discussed above, this reactive pattern is associated both with higher health impacts and with longer periods of restrictions than more rapid responses that prioritise limiting community transmission. Later in 2021 and into 2022, both stringency and deaths are lower in the UK than in most comparators, though cases remain significantly higher, likely driven by the rapid rollout of vaccines.

Figure 5 (below). Average aggregated Stringency Index and pandemic intensity over time. The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each grey line represents the average aggregated stringency, number of cases, and number of deaths by each group of comparison countries.

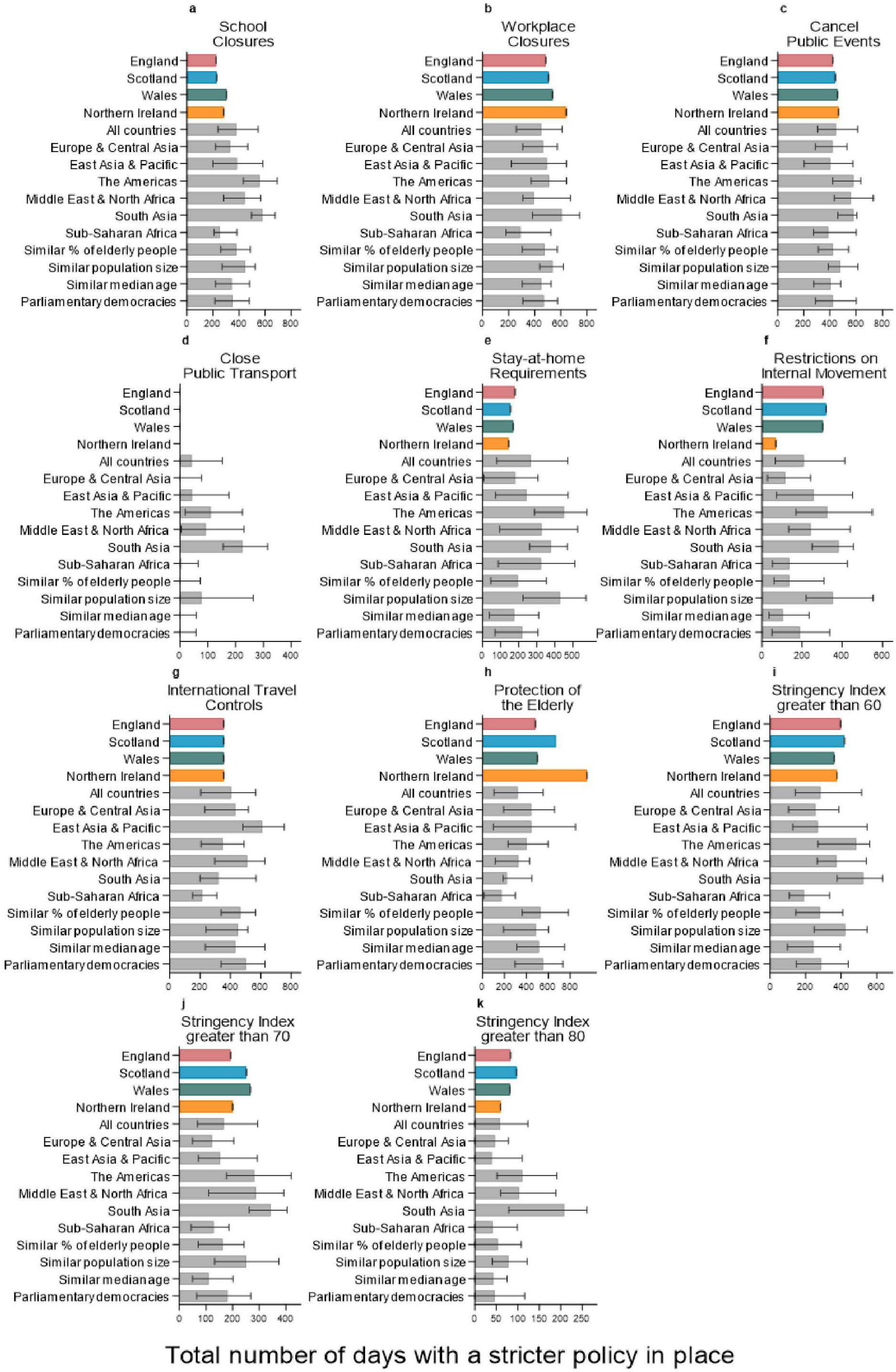

a
Stringency Index
Policy strength
100
80
60
40
20
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
b
Daily Cases
7-day moving average of daily cases per million people
3000
2000
1000
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
c
Daily Deaths
7-day moving average of daily deaths per million people
20
15
10
5
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
United Kingdom
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies

52. **Figure 5 headline:** From 2020 until the start of 2021, the UK's policy restrictions track the rise and fall of cases and, particularly, deaths, a pattern observed in most other countries. In aggregate, the UK's policy responses are relatively more moderate compared to most comparators in Spring 2020, but then more stringent in Autumn and Winter 2020 and into the start of 2021. After this period, and especially after Spring 2021, the UK's responses are significantly less stringent than comparators'.

3.3 Policy responses over the course of the pandemic

53. Fourth, we compare the total number of days the four UK nations and comparator jurisdictions had restrictive policies in place during the entire period of analysis (**Figure 6**). Over a three year period, the UK experienced significantly fewer days of school closures, stay-at-home requirements, international travel controls, and public transport closures than most other countries. In other dimensions, notably workplace closures, the UK had more days of restrictions. In most other respects the UK was broadly similar to comparator countries in terms of the total number of days during which restrictive measures were in place, though these often varied widely across groups. Looking at overall stringency levels, the UK experienced a greater than average period of time under stringent measures than most other relevant comparator groups. **Figures A4a-A4j** in the appendix provide a further breakdown of individual policies by each country across the globe.

Figure 6 (below). Total number of days with restrictive policies in place. 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. 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 canceling) 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. Rather than including bars for 185 countries, they are grouped by geographic regions. Whiskers (error bars) above and below the bar indicate the 75th and 25th percentiles; this range is often quite wide, demonstrating that even within geographic regions there was a significant diversity of approaches.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Protection of the Elderly
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Stringency Index greater than 60
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Stringency Index greater than 70
k
Stringency Index greater than 80
England
Scotland
Wales
Northern Ireland
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies
Total number of days with a stricter policy in place

54. **Figure 6 headline:** Compared to other groups of countries, the UK had fewer days of school closures, stay-at-home requirements, international travel controls, and public transport closures and more days of workplace closures. In most other respects the UK was broadly similar to comparator countries in terms of the total number of days during which restrictive measures were in place. Still, in terms of aggregate stringency, the UK experienced a greater than average period of time under stringent measures than most other relevant comparator groups.

55. Finally, we seek to provide an overall assessment of the UK's performance relative to other economies with respect to four key outcomes of interest: the excess number of deaths, the level of stringency, economic performance, and vaccine uptake. **Figure 7** shows this combination of outcomes for the UK (all four nations combined) and the 50 largest economies during 2020, 2021, and 2022. The UK had a difficult 2020. Its economic and health outcomes were worse than the majority of other countries, though it endured restrictive measures for about the same duration of time as the median comparator. In 2021 the UK made excellent progress on vaccination and the economy performed quite well compared to others. However, the total number of excess deaths and days spent with stringent policies were close to the median values. In 2022, total excess deaths, economic growth, and days spent at a high degree of stringency remained similar to most other countries, though the rate of vaccination continued to be higher than many others.

56. Overall, the UK experienced a combination of relatively high health impacts (here measured in deaths per capita), economic impacts, and long periods of restrictive policies.

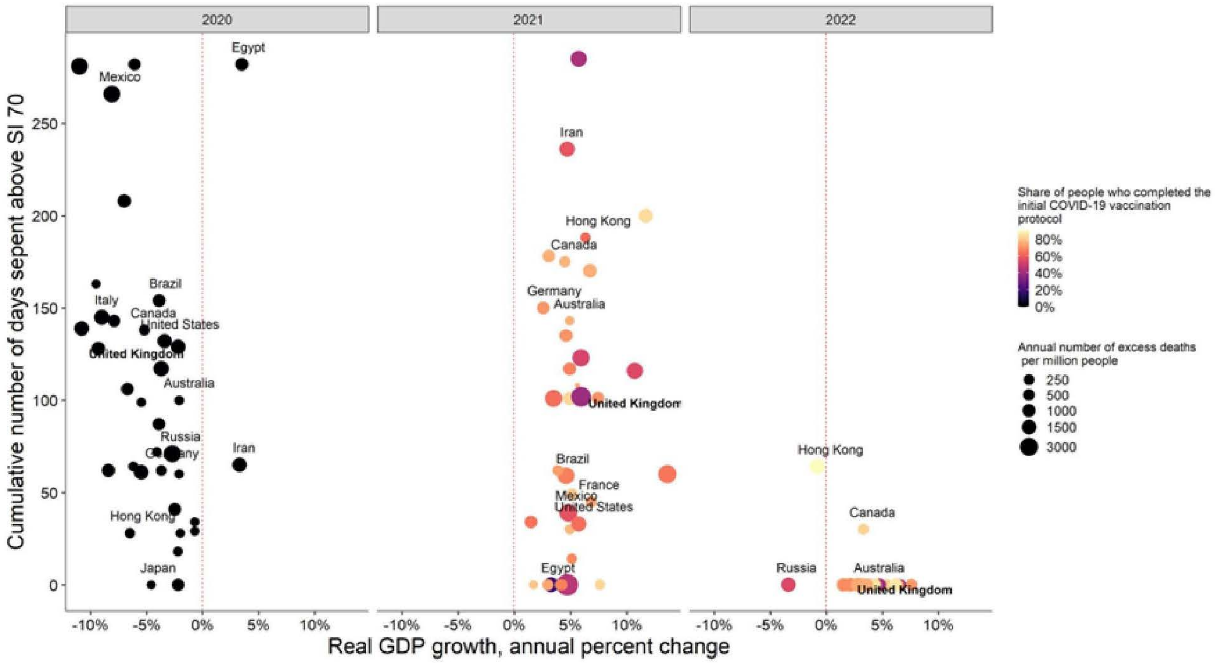
56.1. **Health**: Over the three-year period from 2020 to 2022, England experienced the 19th-highest number of deaths per capita on a global scale, placing it at the 15th position among European nations. In comparison, Northern Ireland fared relatively better in terms of the pandemic's impact, securing the 52nd position worldwide and ranking 34th in Europe. Scotland followed closely, positioning itself at 38th globally and 27th among European countries. Similarly, Wales achieved the 30th global rank and stood at 21st in Europe.

56.2. **Restrictions**: England occupied the 85th position globally in terms of the total number of days spent under stringency index greater than 70. Among European countries, it held the 18th position. Northern Ireland, on the other hand, experienced a slightly higher number of days under such stringent measures, ranking 82nd globally and 15th in Europe. In contrast, among the devolved nations Wales had the highest number of days with a stringency index above 70, securing the 57th global rank and placing 6th among European countries. Scotland followed closely, ranking 66th globally and 10th in Europe.

56.3. **Economic growth**: Real GDP growth data for the devolved nations are not included in the World Economic Outlook published by the IMF, which we draw on for this study. However, for the United Kingdom, available data indicates a significant impact on economic performance relative to other countries. In 2020, the UK ranked 169th out of 193 countries with available data, and 43rd out of 46 European countries.

Subsequently, there has been some recovery in the following years. In 2021, the UK improved its global ranking to 47th and stood at 14th in Europe. By 2022, the UK's global ranking was 93rd, and it held the 20th position in Europe.

Figure 7. How the world's largest economies have performed across four dimensions



57. **Figure 7 headline:** The United Kingdom suffered worse economic and health outcomes in 2020 than most other countries, despite a relatively middle-of-the-pack use of stringent policy measures. Outcomes were closer to the global median in 2021 and 2022, with much better-than-average results for vaccine uptake.

4. Comparing government responses within the UK

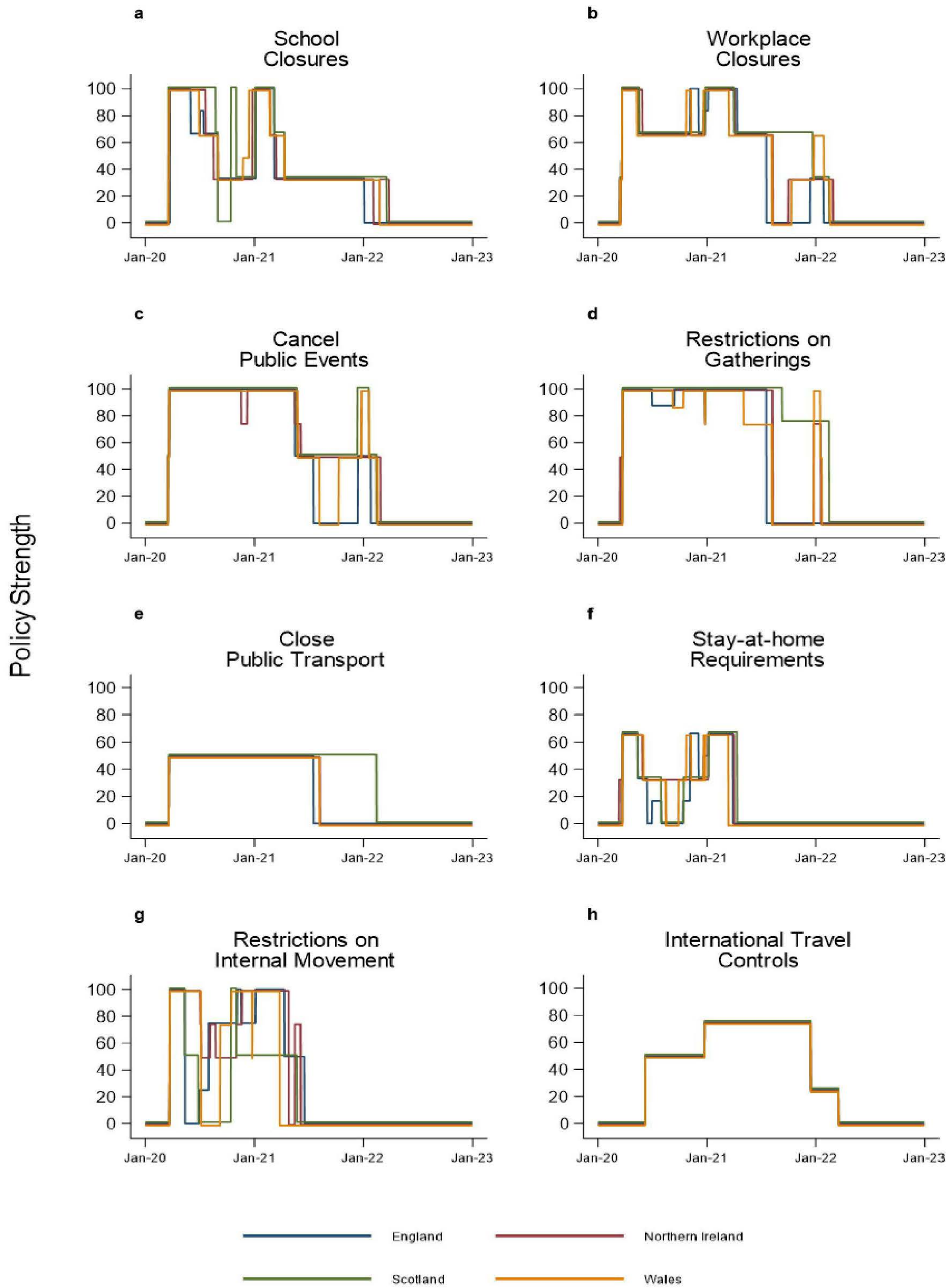
58. While the policy responses of the four UK nations are more similar than not, in part reflecting the limits of authority of the devolved nations, some notable differences emerge.[4] Westminster tended to lift restrictions in England in advance of other nations (e.g. school and workplace closures) and at certain points had less stringent policy responses than other nations (e.g. public events, workplace closures, and stay-at-home requirements) (**Figure 8**). England and Northern Ireland tend to have less stringent policies than Scotland and Wales during the second half of 2020 (**Figure 9**). For the latter part of 2021, Northern Ireland had the most stringent measures whereas England had the least stringent measures of the four nations. Considering the importance of quick and strong policy responses, it is then perhaps

[4] The OxCGRT dataset records and reports these policy responses using a framework of general policy types described in the appendix (eg. school closures, border restrictions, stay-at-home orders). This allows comparison between all countries in the world, however it does not map neatly against government's self-described tiers/levels/stages.

unsurprising that England had also clearly higher peaks in population-adjusted daily deaths across the pandemic. Across the UK nations, the most variation in policies is seen with respect to workplace closures, public events, gatherings, and internal movement. Variation across the UK nations instead is relatively weak in terms of public transport closures. There are no differences among the four UK nations in terms of international travel controls.

59. The differences in policy adoption and relaxation among the four UK nations are reflected in the cumulative number of days during which they maintained restrictive measures in place during the period of analysis (**Figure 6**). Across the UK nations, England had the lowest number of cumulative days with restrictions regarding school closures, workplace closures, and public event cancellations, but the highest number of cumulative days with restrictions regarding stay-at-home requirements. Northern Ireland had the lowest number of cumulative days with restrictions regarding stay-at-home requirements and restrictions on internal movement, but the highest number of cumulative days regarding workplace closures and public event cancellations. Wales had the highest number of cumulative days with restrictions regarding school closures. More generally, Scotland had the highest number of cumulative days with an overall stringency greater than 80, whereas Wales had the highest number of cumulative days with an overall stringency greater than 70. Northern Ireland instead had the lowest number of cumulative days with an overall stringency greater than 80, whereas England had the lowest number of cumulative days with an overall stringency greater than 70. Interestingly, if we consider the cumulative days with an overall stringency greater than 60, we find less variation among the four UK nations — Wales is the one with the lowest number cumulative days with a stringency index greater than 60, whereas Scotland is the UK nation with the highest number of cumulative days with an overall stringency greater than 60.

Figure 8 (below). Policy strength by indicator and UK nation over time. This picture depicts how policy strength evolved for each of the devolved administrations of the UK.



Policy Strength
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School Closures
b
Workplace Closures
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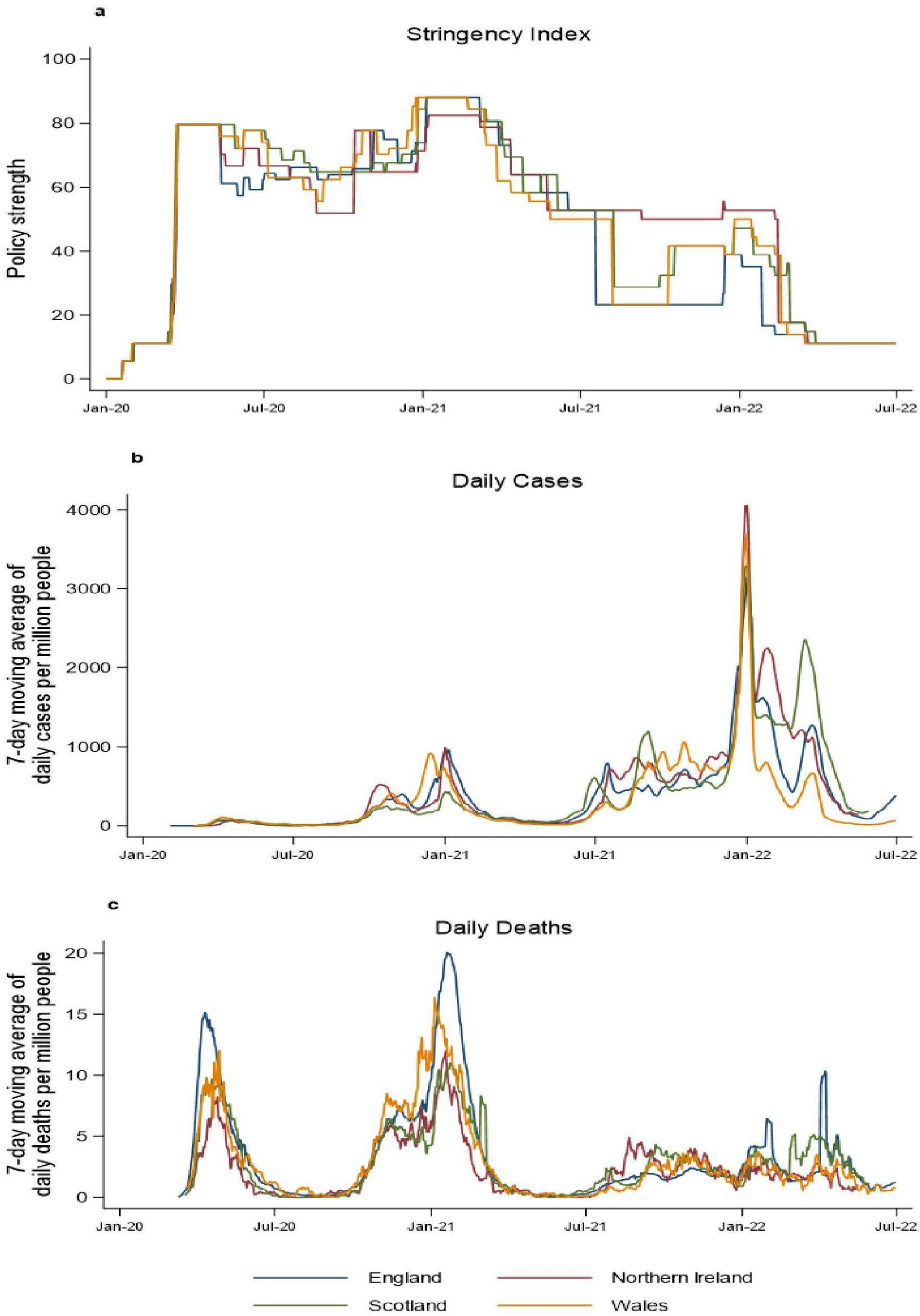
Cancel Public Events
d
Restrictions on Gatherings
e
Close Public Transport
f
Stay-at-home Requirements
g
Restrictions on Internal Movement
h
International Travel Controls
100
80
60
40
20
0
Jan-20
Jan-21
Jan-22
Jan-23
England
Northern Ireland
Scotland
Wales

60. **Figure 8 headline:** For many policy areas, there is remarkable consistency between different parts of the UK, particularly in the first wave of the pandemic. The most variation is in the use of internal restrictions of movement between cities and counties. Towards the second half of the pandemic (mid-2021 onwards) it is clear that Scotland, Wales and Northern Ireland were more likely to use stringent policy measures than England.

Figure 9 (below). Stringency Index and pandemic intensity by country of the UK over time. This figure depicts how stringency (panel a), cases (panel b), and deaths (panel c) evolved for each of the devolved administrations of the UK.



a
Stringency Index
Policy strength
100
80
60
40
20
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
b
Daily Cases
7-day moving average of daily cases per million people
4000
3000
2000
1000
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
c
Daily Deaths
7-day moving average of daily deaths per million people
20
15
10
5
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
England
Northern Ireland
Scotland
Wales

61. **Figure 9 headline:** For the first half of the pandemic, until July 2021, the responses of all four devolved nations were of a relatively similar degree of stringency. Despite this, England consistently recorded more daily deaths per capita during each wave of the pandemic.

62. A comparison of Northern Ireland and the Republic of Ireland is given in the appendix (A5), echoing the comparisons in **Figures 3a and 3b** above. Overall, we do not observe major differences between the two jurisdictions during the initial months of the pandemic, except for the fact that Northern Ireland was particularly slower to impose restrictions on public transportation, while the Republic of Ireland took longer to impose restrictions on workplaces (**Figures A7a and A7b**). As observed for all the UK nations, the Republic of Ireland was particularly slow to adopt international travel restrictions in comparison to other countries. Although the Republic of Ireland and Northern Ireland did not differ substantially in the speed of adoption when one looks at each indicator individually, they differed in the time it took to reach certain thresholds of the Stringency Index. Notably, the Republic of Ireland took significantly longer to reach stringency greater than both 60 and 70, and Northern Ireland was quicker to reach stringency greater than 80 compared to Ireland.

5. Lessons for the UK looking forward

63. Looking at government responses to COVID-19 in the UK in a comparative perspective provides a vital reference point for efforts to learn lessons that can improve readiness and response to infectious diseases or other threats in the future.

- Overall, the UK can point to some important areas of success. Highlights include:
- The speed and scope of genetic sequencing, which allowed the UK to monitor the emergence of new variants.
- The speed and consistency of testing a sample of the overall population through the ONS COVID-19 Infection Survey, which provided a clear, up-to-date measure of the pandemic's spread.
- The speed of vaccine deployment.

64. However, the UK's use of non-pharmaceutical interventions, particularly restrictions and contact tracing, shows significant scope for improvement. As described in the previous section (figure 7), in aggregate, the UK has experienced a trifecta of 1) high numbers of excess deaths and other health impacts, 2) long periods of closure and containment policies, 3) a significant economic toll. In 2020 and 2021, especially, the country followed a "rollercoaster" pattern. As a new wave arose, restrictive measures were often introduced only when it became apparent that the health system as a whole would be at risk, not earlier, when there might still have been potential to prevent a wave from rising in the first place. Moreover, because restrictions only came in once COVID-19 was highly prevalent, it became necessary to keep them in place for a longer period of time to bring community transmission back down. In turn, perhaps because of the difficulty of enduring long periods of restrictions,

measures were often relaxed after a wave had peaked, but while COVID-19 remained prevalent, creating the conditions for a new wave to arise.

65. In this way, government responses to COVID-19 ramped up and down following the spread of the virus in a reactive fashion, consistent with the strategies of other countries that pursued a "mitigation" approach. Looking ahead, it is important to see restrictive measures not as "solutions" to a pandemic, but rather as strategies to buy time as other protections are put in place, for example by developing stronger testing and contact tracing systems, increasing vaccination, etc.

66. On this point it is relevant to note that the UK was less successful than many other countries in using testing, contact tracing, and isolation and support measures to prevent small scale spread of the virus from growing into significant waves. While it is difficult to find comparable information across countries on, for example, the time required to trace a close contact, or the percentage of close contacts traced, at now point was the UK able to achieve a level of testing, contact tracing, and isolation and support at which it could be confident that these light intervention measures would have a chance of preventing new waves from arising.

67. This strategy contrasts with that of governments like South Korea, Japan, Australia, New Zealand, Singapore, Taiwan, Vietnam, and a number of Caribbean nations that instead adopted an "elimination" approach. While there are differences across these jurisdictions, they broadly followed a pattern of 1) crushing any initial wave of infection with restrictive policies; 2) developing testing and contact tracing systems to minimize community transmission; 3) enjoying relative openness, with fast, short, stringent, localized restrictions immediately coming into place to prevent small outbreaks from becoming big outbreaks; 4) stringent international travel controls to prevent seeding from other jurisdictions. These countries then enjoyed the envious position of experiencing widespread COVID-19 transmission only *after* a high-level of vaccination had been achieved (though some, notably Hong Kong, failed to achieve sufficient vaccination rates to benefit in this way). Overall, jurisdictions that adopted this strategy saw the best health and economic outcomes, and endured the fewest restrictions.

68. In our view there is not any *a priori* reason why any country with reasonable testing and contact tracing capacity and control over international borders would not have been able to follow the model described above. Indeed, it is significant that a wide diversity of jurisdictions with different political systems and various cultural and socio-economic characteristics – a number of them very similar to the UK – did so. However, many other countries, including the UK, either made the deliberate choice not to pursue this strategy, or, having begun down a different path, found it too difficult to later fundamentally change their approach. Our analysis of these countries does not extend to modeling counterfactuals – for example, we cannot quantify what would have happened if the UK followed an "elimination" approach. But it is reasonable to assume that the UK would have enjoyed similar benefits to the countries that did pursue such an approach.

69. Learning effectively from the COVID-19 pandemic requires a reassessment of what types of strategies are feasible in the UK, informed by the best practices seen around the world. Specifically, the evidence highlights a need to consider:

- Using restrictions more quickly to prevent widespread community transmission that then necessitates longer, more stringent restrictions in the future once the health system is threatened.
- Greater reliance on testing, contact tracing, isolation, and support measures to keep community transmission under control.
- A capacity to nimbly pivot to new approaches when evidence, including from what works in other countries, becomes available

Appendix

A1. PHSM Trackers

70. "Research groups around the world have invested considerable work to collect data on government policies aimed at preventing transmission of the SARS-CoV-2 virus" (Kubinec *et al.* 2021). "Without previous work to guide them, starting from March 2020, more than 40 distinct public health and social measures (PHSM) trackers have taken on the challenge of organising governmental policies into structured databases that are both understandable to non-experts and available for use in rigorous research" (Cheng *et al,* 2022)."PHSM trackers are largely associated with the underlying data they process", but they should be also understood as research groups that produce taxonomies as well as the organisational infrastructures for documenting PHSM data (Cheng *et al,* 2022).

71. "Despite their differences, existing pandemic policy tracking projects seek to measure de jure policies, recording, specifically, on day t in country or jurisdiction c, the set of policies governments put in place to combat COVID-19"(Kubinec *et al.* 2021). "Each of these de jure policies represents a discrete commitment by a policymaker within a given policy domain, such as encouraging mask wearing or promoting social distancing"(Kubinec *et al.* 2021).

Table A1. List of Trackers that responded to the CoronaNet survey (Cheng et al, 2022).

Dataset	Survey Participation	Geographic Scope	Active	Categories
ACAPS	YES	Worldwide	NO	NPIs[5], Econ
CCCSL	YES	Worldwide	NO	NPIs
CDC[6]	NO	Worldwide	NO	NPIs, Econ
CIHI	YES	Canada	YES	NPIs, Vaccines
CMMP	YES	Worldwide	NO	NPIs
COBAP	NO	Worldwide	NO	NPIs
CoronaNet	YES	Worldwide	NO	NPIs, Vaccines
COVID-19 EU Policy Watch	YES	EU+[7]	YES	Econ
COVID-19 Food Trade Policy Tracker	YES	Worldwide	NO	Econ

[5] Non-pharmaceutical intervention
[6] The US Centers for Disease Control and Prevention (CDC) is only available through the WHO PHSM database.
[7] EU+ refers to the European Union plus Norway.

COVID-19 Health System Response Monitor	YES	Worldwide	YES	NPIs, Econ, Vaccines
Covid-19 Law Lab	YES	Worldwide	YES	NPIs, Vaccines
COVID-19 State Policy Project	NO	USA	NO	NPIs
COVID-AMP	NO	Worldwide	YES	NPIs, Vaccines
HIT-COVID	YES	Worldwide	NO	NPIs
INGSA	NO	Worldwide	NO	NPIs
OxCGRT	YES	Worldwide	YES	NPIs, Econ, Vaccines
Oxford Supertracker[8]	YES	—	YES	—
Response2covid19	YES	Worldwide	NO	NPIs, Econ
THF	NO	England	NO	NPIs
NPI B	NO	Brazil	NO	NPIs
UNDP	NO	Worldwide	NO	NPIs, Econ
WHO Euro [9]	NO	Worldwide	YES	NPIs, Econ, Vaccines
WHO PHSM Dataset	YES	Worldwide	NO	NPIs, Econ, Vaccines
Yale State and Local COVID Restriction Database	YES	USA	YES	NPIs, Econ

72. It is worth noticing that though each tracker contributed by developing their PHSM datasets and novel taxonomies, OxCGRT managed to become one of the biggest trackers with the broadest up-to-date coverage throughout the pandemic (Kubinec *et al.* 2021). The OxCGRT has a panel structure that categorises policies along 21 broader policy categories in more than 180 countries starting from March 2020 up to the end of 2022. Most of the existing PHSM trackers gathered less data over a shorter period of time. This broad approach, taking into consideration a wide variety of policies, makes OxCGRT unique.

73. PHSM trackers have made significant achievements, including:

- Tracking PHSM data from the beginning of the pandemic to the present day providing worldwide coverage at both the national and subnational levels. "To date, they have

[8] The Oxford Supertracker is a directory of different COVID-19 projects, so many of the columns are not applicable to it.
[9] WHO Euro is only publicly available through the WHO PHSM database.

collectively coded more than 365,000 policy responses in their databases, and have created original organisational frameworks and infrastructure to process raw data and information into curated PHSM datasets" (Kubinec *et al.* 2021).

- "Building significant global networks of data collectors united to document PHSM. They have accumulated considerable experience and knowledge as part of what is arguably one of the largest efforts ever attempted to collect public health data in real time" (Kubinec *et al.* 2021).

- "Making PHSM data openly accessible and available in (close to) real time as a public good for researchers, the public, and stakeholders to utilise". Public access to PHSM data has helped to develop an understanding of the ways the pandemic influenced our society (Kubinec *et al.* 2021).

- Building "remarkable and readily accessible historical records for future generations of scientists, policy experts, and the public to learn from" (Kubinec *et al.* 2021).

- "Providing an important foundation for evidence-based policymaking and scientific research on the pandemic. For example, data from PHSM trackers have been utilised in research to evaluate the impact of PHSM on COVID-19 transmission (Prakash *et al*, 2022), mortality (Amuedo-Dorantes, Kaushal & Muchow, 2021), human rights (Hong, Hwang & Park, 2020), food prices (Akter, 2020), health policy and pandemic fatigue (Petherick *et al,* 2021; Kubinec *et al.* 2021)".

- Providing PHSM data that "can further be used to communicate accurate scientific knowledge to the public, improve data transparency, hold media outlets accountable for misinterpretation, and avoid misinformation around COVID-19 PHSM and their impact as well as their potential consequences" (Kubinec *et al.* 2021).

A1.1 Tracker Limitations

74. "PHSM trackers initiated their efforts without the benefit of well established procedures or patterns for real-time policy data collection. At the beginning of the pandemic, trackers also worked without knowledge of each other's efforts."(Kubinec *et al.* 2021)

75. Challenges that PHSM trackers face included:

- Different strategies for building taxonomies. Trackers struggled "to develop a standard taxonomy that can capture the nuances and peculiarities of a given country's PHSM rollout while also allowing for cross-country comparisons". (Kubinec *et al.* 2021) "Ensuring that taxonomies remain relevant over time by including periodic updates remains an ongoing challenge" (Kubinec *et al.* 2021).
- Data standardisation. "Lack of data standardisation on the national, state/provincial, and local levels represents a major hindrance for data collection and makes it difficult to compare or identify the multitude of e.g., socioeconomic and health consequences of the pandemic, especially with regards to the most vulnerable populations". (Kubinec *et al.* 2021)

- Reliance on volunteers. Most trackers use the labour of hundreds of volunteers. "So recruitment, training, engagement, and organisation present enormous challenges" (Kubinec *et al.* 2021).
- The reliance on unpaid work also raises questions of research ethics and sustainability" (Kubinec *et al.* 2021).

76. "PHSM trackers face challenges not only as individual actors, but also as a collective ecosystem" (Kubinec *et al.* 2021). These challenges included:

- Parallel data collection efforts. PHSM trackers emerging without knowledge of each other in the beginning of the pandemic led to the "duplication of data, multiple taxonomy strategies across trackers, gaps in data coverage and variation in data quality" (Kubinec *et al.* 2021).

- Even after an increase in trackers' collaboration the data overlaps and gaps persist (Kubinec *et al.* 2021).

- Differences in data coverage (many trackers have unique data coverage in specific domains, such as public health, economic policy, and human rights) might lead to difficulties in data utilisation (Kubinec *et al.* 2021).

- "The benefits of diversity must be continuously balanced against the costs of data collection, completeness, and quality" (Kubinec *et al.* 2021).

- Necessity of local knowledge. Trackers have learned that local knowledge and/or language skills are essential for data quality and accuracy (Kubinec *et al.* 2021).

A2. OxCGRT Methodology

A2.1 National and Subnational Data Collection

77. OxCGRT collates and records data on 187 countries. "Additionally, it records subnational policy data from the UK (the four devolved nations), US (all states plus Washington, DC and a number of territories), Brazil (all states, the Federal District, state capitals, and the next largest city not geographically connected to the state capital), Canada (all provinces and territories), China (all provincial level administrations), Australia (all states and territories), India (all states and union territories), and Italy (21 regions)" (Hale, *et al.* 2022). The full list is illustrated below in **Table A2**.

Table A2. Currently available OxCGRT data across different levels of government and types of observations (Hale, *et al.* 2022)

	Total	**Wide**	**Gov**
National	187+ countries	N/A	• USA federal • Brazil federal

			• Canada federal • UK central • China central • Australia federal
State/province	• USA: 50 states and Washington, D.C. • Brazil: 26 states and Federal District • UK: 4 devolved nations • Canada: 13 provinces/territories • China: 31 provinces • Australia: 8 states/territories • India: 28 states and 8 union territories • Italy: 21 regions	• USA: 50 states and Washington, D.C. • Brazil: 26 states and federal district • Australia: 8 states/territories	• Brazil: 26 states and Federal District • Australia: 8 states/territories
City	• Brazil: 27 state capital cities and 27 second cities • Australia: 7 state/territory capital cities and 7 rest of states and territories	• Brazil: 26 capital cities, Brasilia, and 26 second cities • Australia: 7 state/territory capital cities and 7 rest of states/territories	N/A

78. While it is nearly impossible or at least challenging to gather subnational data for all the countries included in the dataset, we chose to focus on the subnational jurisdictions in these countries based on their ability to provide the most relevant variation in policies and rich potential for research. For example, the extent and heterogeneity of responses within the US and India present valuable cases for us to track and compare the differences in these responses at the subnational level which would not be possible when simply comparing the national-level data of these countries. An additional and practical justification for collecting subnational data in other countries, such as Australia, was the existence of pre-established research networks that made it possible to facilitate subnational data collection.

79. The subnational data largely follows that which is collected at the national level. However, national-level data, in some cases, does not present an accurate depiction of what is experienced on the ground within a given country, due to the heterogeneity of policies across its subnational jurisdictions. To capture policies implemented at varying levels, “OxCGRT data include three types of observation:

- Those that describe all policies that apply to a given jurisdiction
- Those that describe policies put in place by a given level and lower levels of government

- Those that describe only those instigated at a given level of government" (Hale *et al*, 2021)

80. "Policies that apply only to a subunit of the given jurisdiction (for example, a single state of a country being coded) are flagged as targeted, while policies that apply to the whole jurisdiction are flagged as general. When both general and targeted policies exist simultaneously, OxCGRT always records whichever has the stricter policy. This choice may make the data more useful for evaluating the effect of policies on the spread of disease (since it records the stronger targeted measures that probably exist where there is a local outbreak) while reducing their ability to describe the overall state of policy across the country. For example, if a jurisdiction with many subunits has weak general policies and strong policies targeted at a single subunit, its overall coding will be high. In cases where this is frequently an issue, such as Brazil and the United States, OxCGRT has also comprehensively coded subunit jurisdictions." (Hale *et al*, 2021) "We encourage users to consider this granularity issue carefully when making cross-national comparisons, and to consider using subnational information for large, heterogenous jurisdictions where available." (Hale *et al*, 2021).

A2.2 Data Reviewing

81. Following data collection, "quality is then ensured through a multi-step review process. First, after each allocation round, a small team will perform quick spot checks to ensure that the data have been entered and there are no gross errors (for example, accidental deletion of a whole column can be noticed and fixed during this quick review). The provisional data are then queued for attention by a more thorough review team. This review team will examine the data entry and the original source and either confirm its veracity or flag the data entry for escalation." (Hale *et al*, 2021). The ultimate objective is to ensure there are two sets of eyes reviewing each data point.

82. One of the advantages of relying on a globally distributed team of volunteer data collectors and reviewers is that they can be both 1) trained in the measurement system OxCGRT uses and 2) highly aware of the local contexts they are collecting data for. This combination increases our confidence that policy data collected in one jurisdiction will be comparable via our taxonomy with policy data collected in another jurisdiction.

A2.3 OxCGRT Indicators

83. As briefly described in the background section of this document, OxCGRT indicators are quantitative interpretations of qualitative policy information. OxCGRT records data across 21 indicators that are segmented by specific policy domains. In addition to indicators that assess vaccination responses and economic aid, the majority of OxCGRT indicators primarily track non-pharmaceutical interventions (NPIs). We considered NPIs to be efforts to control the spread of COVID-19 using interventions such as "school closings, travel restrictions, bans on public gatherings, and stay-at-home orders, to name a few." (Hale *et al*, 2021). The policies themselves were those "aimed at creating physical distancing or otherwise slowing the

spread of COVID-19, often in concert with testing and contact tracing regimes of varying robustness." (Gostin & Wiley, 2020; Viner *et al.*, 2020; Wang, Ng & Brook, 2020; Chu *et al*, 2020). NPIs are reflected in the following OxCGRT indicators:

- C1 – school closing
- C2 – workplace closing
- C3 – cancel public events
- C4 – restrictions on gathering size
- C5 – close public transport
- C6 – stay-at-home requirements
- C7 – restrictions on internal movement
- C8 – restrictions on international travel
- H1 – public information campaign
- H2 – testing policy
- H3 – contact tracing
- H6 – facial coverings
- H8 – protection of elderly people

84. The NPIs captured within the OxCGRT indicators include policies requiring or recommending face coverings (H6), and social distancing measures (a vague term that has been used differently in different jurisdictions), captured within indicators such as C1 (school closing), C2 (workplace closing), C3 (cancel public events), and C5 (close public transport). Additional social distancing guidelines identified within a given jurisdiction may influence the interpretation and coding of these indicators. For example, in C3, if public events are allowed to take place but with social distancing guidelines in place for attendees, it would be coded as the same ordinal value as a 'recommended cancellation' rather than a 'required cancellation'. Similarly, in C5, if public transportation is operating but with limited capacity to allow for social distancing, it would also be recorded in the same ordinal value a 'recommended closing' rather than a 'required closing'. In such cases, the notes accompanying the numerical value of the indicator clarify the exact policies in place. These points are included in the interpretation guide so that users of the data are aware of these distinctions.

85. The continuous fluctuation of policies over the course of the pandemic, in some cases, led to new OxCGRT indicators being incorporated and others being retired. For example, as face coverings became more widespread and established as a mandated or recommended NPI, the H6 (facial coverings) indicator was added to capture this starting in October 2020.

Likewise in December 2021, as vaccination programmes rolled out across the world, the vaccine indicators were added to capture:

85.1. The prioritisation plans determined by eligibilities such as age, vulnerable status, or occupational exposure (V1);

85.2. The real-time availability for certain groups receiving the vaccine, regardless of whether this corresponded to the prioritisation plan (V2);

85.3. Whether these vaccines were provided free of charge or otherwise (V3);

85.4. The V4 indicator was subsequently added in March 2022 to capture any occupational groups that fell under a vaccine mandate.

86. Data was updated in July 2022 to record differentiated policies based on vaccination status across ten indicators (C1-8, H6, H8). Since that date, these "indicators have been split into separate variables for non-vaccinated (NV) and vaccinated (V) where policies differ between these groups. We define differentiated policies to mean policies where vaccinated people can access greater freedoms due to their vaccination status, and are subject to less stringent restrictions. (Hale, *et al,* 2022)"

87. The diversity and degree of NPIs also presented notable economic consequences, which led many governments to implement "economic support policies which, aside from facial coverings, tended to be established later than closure and containment and health policies. OxCGRT includes two economic policy response indicators:

87.1. • "**Income Support (E1)** – Recorded if the government is covering the salaries or providing direct cash payments, universal basic income, or similar, of people who lose their jobs or cannot work. This includes payments to firms if explicitly linked to payroll or salaries.

87.2. • **Debt/Contract Relief (E2)** – Recorded if the government is freezing financial obligations (e.g., stopping loan repayments, preventing services like water from stopping, or banning evictions). (Hale, *et al*, 2021)"

88. Furlough and compensation schemes are recorded in the first indicator. These are summarised in the Economic Support Index, as described below. The index does not include support to firms or businesses, and does not take into account the total fiscal value of economic support."(Hale, *et al,* 2022)

89. Finally, examples of indicators that were retired in 2022 include the following:

89.1. E3 (fiscal measures), which tracked government fiscal support for certain groups or programmes;

89.2. E4 (providing support to other countries), which tracked government support to other countries;

89.3. H4 (emergency investment in healthcare), which tracked emergency investments in healthcare.

90. The complete list of OxCGRT indicators, including the retired legacy indicators (which are shown with a strikethrough) can be found below in **Table A3**. A more comprehensive look at the data is available online through our primary Github repository which can be found by following this link: https://github.com/OxCGRT/covid-policy-tracker/tree/master/data

Table A3. OxCGRT Indicators (Hale, *et al,* 2022)

ID	Name	Type	General or Targeted	Vaccinated Differentiation
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~~	-
~~E4~~	~~Giving international support~~	~~Numeric~~	~~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~~	-
H5	Investment in Covid-19 policies	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

A2.4 Developing the Scope of Indicators

91. While no dataset can be comprehensive, OxCGRT aimed to cover all widely used NPIs. Practically speaking, resource constraints require researchers to design datasets that involve some trade-offs between:

- Depth of coverage
- Breadth of coverage (both jurisdictions and types of policies)
- Speed of data collection and publishing

92. Moreover, the OxCGRT methodology created two further scope conditions:

- The policies had to be specified in a way that trained but non-expert volunteers could understand, and
- Information about the policies needed to be available in the public domain.

93. Given these constraints, examples of the types of policies OxCGRT considered including, but in the end did not prioritise, included:

- Judicial or martial enforcement
- Laws preventing people from leaving a country
- The repurposing of hospitals to accommodate an influx of patients
- Restrictions on democratic processes

94. The OxCGRT regularly deliberated internally and with our external advisors and users of the data on which topics to prioritise within these constraints.

A2.5 Limitations

95. Comparative policy data is a vital tool for research and policymaking, but also faces limitations. One key trade-off for any research project is deciding how to balance "thick" description of a policy that allows for contextualization, with a "thin" measurement that pulls out key data points to facilitate comparison – a balance that depends on the purpose of the research project. As outlined in the background section of this document, composite measures, like the indices used by OxCGRT, facilitate systematic cross-national comparisons. Yet in doing so, they also mask the social and political nuances that are found in the policy responses of a given jurisdiction – be it at the national or sub-national level. For example, an indicator that captures protections in care homes may be useful in societies where a significant share of the elderly population lives in care homes, but less helpful in contexts in which elderly people live in multi-generational households. In short, the tradeoff is one of comparability versus context. Where context is lost in the process of coding data into standardised indicators, a record of it is maintained in the notes section of each recorded policy to justify its designation.

96. While accounting for context is important for designing and measuring policy data, it matters even more when using that data for analysis. In particular, researchers must account for context when seeking to make general findings regarding the relationship between policies and outcomes. Like any policy intervention, the effect of the responses we measured is likely to be highly contingent on local political and social contexts.

A2.6 Considering Waves of the Pandemic

97. OxCGRT data do not include general information on when "waves" have occurred. Such designations must instead be made by analysts looking at epidemiological data. "While there is no precise definition of a pandemic 'wave', there is broad consensus that a wave is a phase of disease that is more substantial than a 'sporadic outbreak', and comprises a rising phase and a subsequent falling phase." (Zhang, Marioli & Gao, 2021; Jefferson & Heneghan, 2021). In an OxCGRT analysis of government responses across pandemic waves in early 2021, "a first step in identifying waves was to locate peaks and troughs for each wave in each country and split waves between troughs accordingly. Within individual countries, waves often have substantially different peaks, troughs, and slopes. We consider waves distinct if their troughs are more than approximately one month apart, otherwise we include this together as one wave. We chose this threshold to correspond to the lag we hypothesise between NPIs and deaths. In addition, we only count a wave if more than 20 cases occurred in that given wave (to distinguish a wave from a sporadic outbreak). Given the lack of consensus on how to define a wave, we believe the approach selected is transparent and simple, facilitating analysis, but we do not claim it is the only or best way to divide the phases of the pandemic."(Hale *et al*, 2021). This analysis, however, did not take into account the

different variants of the virus or their transmissibility because it was written before significant new spread of new variants of COVID-19. Research looking at longer time periods would certainly need to consider variant type.

A3. Stringency Index

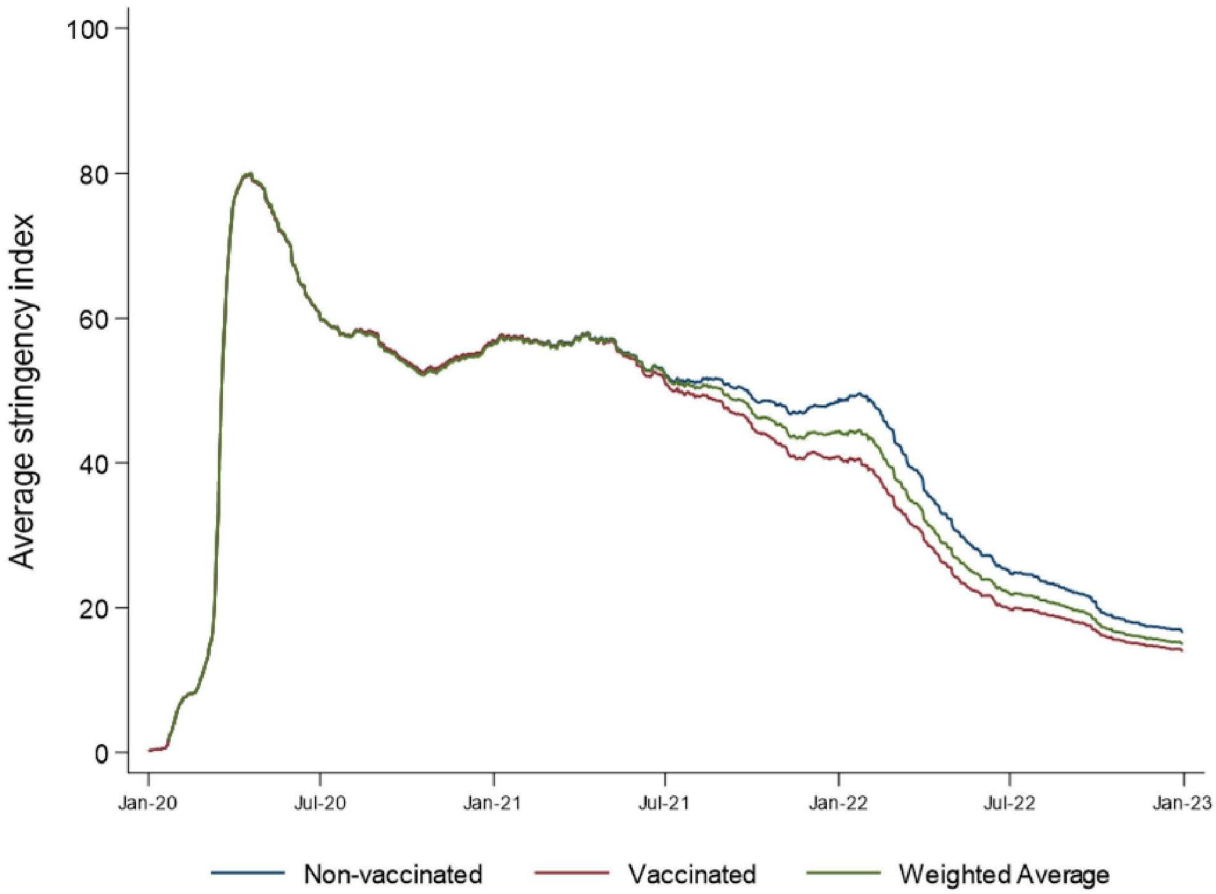
98. It is critical to separate the construction of the stringency index from the analysis of the effect of government policies on outcomes of interest, such as the spread of the disease and its impacts on health. Here, we explain the construction of the OxCGRT Stringency Index (SI) and how it should be interpreted.

99. To provide a quick and comparable summary of the level of responses, the SI offers a composite measure of multiple indicators of policy stringency. It brings together the containment and closure indicators (C1-C8) with one additional health indicator which records public information campaigns (H1). "The SI is published in four different versions:" (Hale *et al*, 2022)

- "Non-vaccinated index (the policies that apply to non-vaccinated people)
- Vaccinated index (the policies that apply to vaccinated people)
- Simple average index (arithmetic mean of Vaccinated + Non-vaccinated / 2)
- Population-weighted average index (weighted by the proportion of population fully vaccinated)" (Hale *et al*, 2022)

100. The chart in **Figure A1** is an example of how the SI values are visualised when comparing the global stringency of policies of the vaccinated versus non-vaccinated populations over time. The stringency of differentiated policies begins to diverge in the third quarter of 2021 when "most developed countries had universal access to vaccines"(Hale *et al*, 2022) and measures such as vaccine passports became more widely implemented.

Figure A1. Global mean Stringency Index values for vaccinated and non-vaccinated people, across 185 countries over time (Hale *et al*, 2022). **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.



101. **Figure A1 headline:** In the third quarter of 2021, with an increasing availability of vaccines in most developed nations, a discernible trend emerged in the form of divergent policies aimed at vaccinated and non-vaccinated individuals. This divergence became increasingly pronounced, primarily driven by the widespread implementation of vaccine passports as a means of verification and facilitation.

102. As with the other OxCGRT indices, through the SI we "create a score by taking the ordinal value and subtracting half a point if the policy is targeted rather than general, if applicable. We then rescale each of these by their maximum value to create a score between 0 and 100, with a missing value contributing 0. These scores are then averaged to obtain the composite indices. This calculation is described in the equation below, where k is the number of component indicators in an index and I_j is the subindex score for an individual indicator." (Hale *et al*, 2021)

103. "We use a conservative assumption to calculate the indices. Where a datum for one of the component indicators is missing, it contributes 0 to the index. An alternative assumption would be to not count missing indicators in the score, essentially assuming they are equal to the mean of the indicators for which we have data. Our conservative approach therefore

punishes countries for which less information is available, but also avoids the risk of over-generalising from limited information."(Hale *et al*, 2021)

$$\text{Index} = \frac{1}{k}\sum_{j=1}^{k} I_j$$

103.1.1.1.1.1.

104. "The OxCGRT indices, including the SI, "should not be interpreted as a measure of appropriateness or effectiveness of a government's response. They do not provide information on how well policies are enforced, nor do they capture demographic or cultural characteristics that may affect the spread of COVID-19. Furthermore, they are not comprehensive measures of policy. They only reflect the indicators measured by the OxCGRT, and thus may miss important aspects of a government response. The value and purpose of the indices is instead to allow for efficient and simple cross-national comparisons of government interventions.." (Hale *et al*, 2022). Indices like the Stringency Index, however, can be associated with other relevant "indicators to investigate economic, social, and epidemiological questions of interest." (Hale *et al*, 2021). "Because we have not designed the indices for any specific analytic usage, we aim to make them as simple and transparent as possible. Those using the data to study the effect of government policies on outcomes of interest will therefore probably wish to modify the indices to suit the exact research questions they are seeking to answer. In other words, we offer the indices as a convenient prix fixe menu option, but we urge users to tailor the data to their specific needs by ordering a la carte."(Hale *et al*, 2021).

A4. Additional figures

Figure A2a. School closures by groups of countries over time. This picture depicts how school closure policies evolved over time. The red line indicates the school closure policies enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the UK school closure policies compared to all countries. Panel b shows the UK school closure policies compared to European and Central Asian countries. Panel c shows the UK school closure policies compared to East Asian and Pacific countries. Panel d shows the UK school closure policies compared to countries in the Americas. Panel e shows the UK school closure policies compared to the Middle East and North African countries. Panel f shows the UK school closure policies compared to South Asian countries. Panel g shows the UK school closure policies compared to Sub-Saharan African countries. Panel h shows the UK school closure policies compared to countries with similar percentage of elderly people. Panel i shows the UK school closure policies compared to countries with population size. Panel j shows the UK school closure policies compared to countries with similar median population age. Panel k shows the UK school closure policies compared to parliamentary democratic countries.

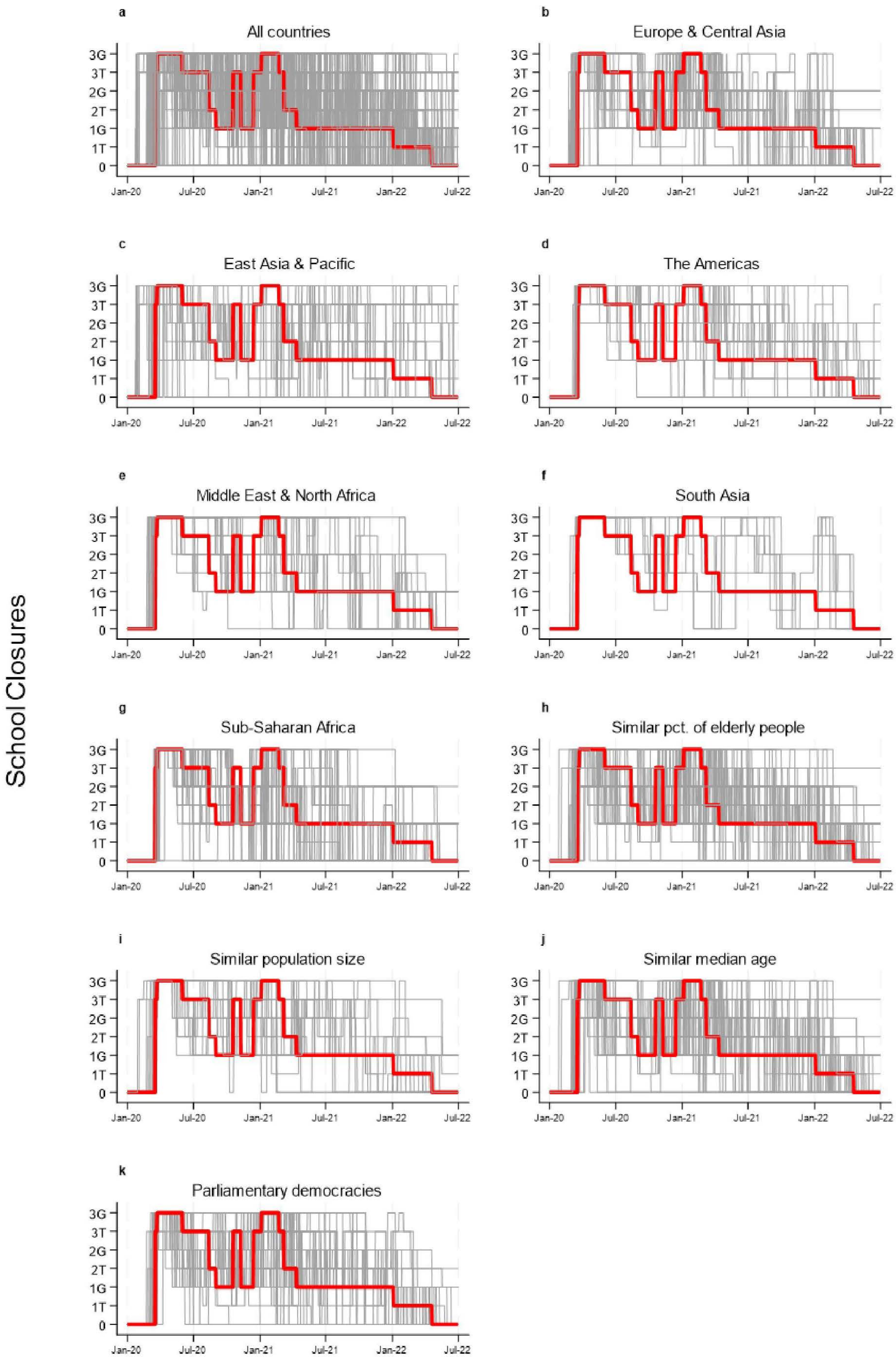
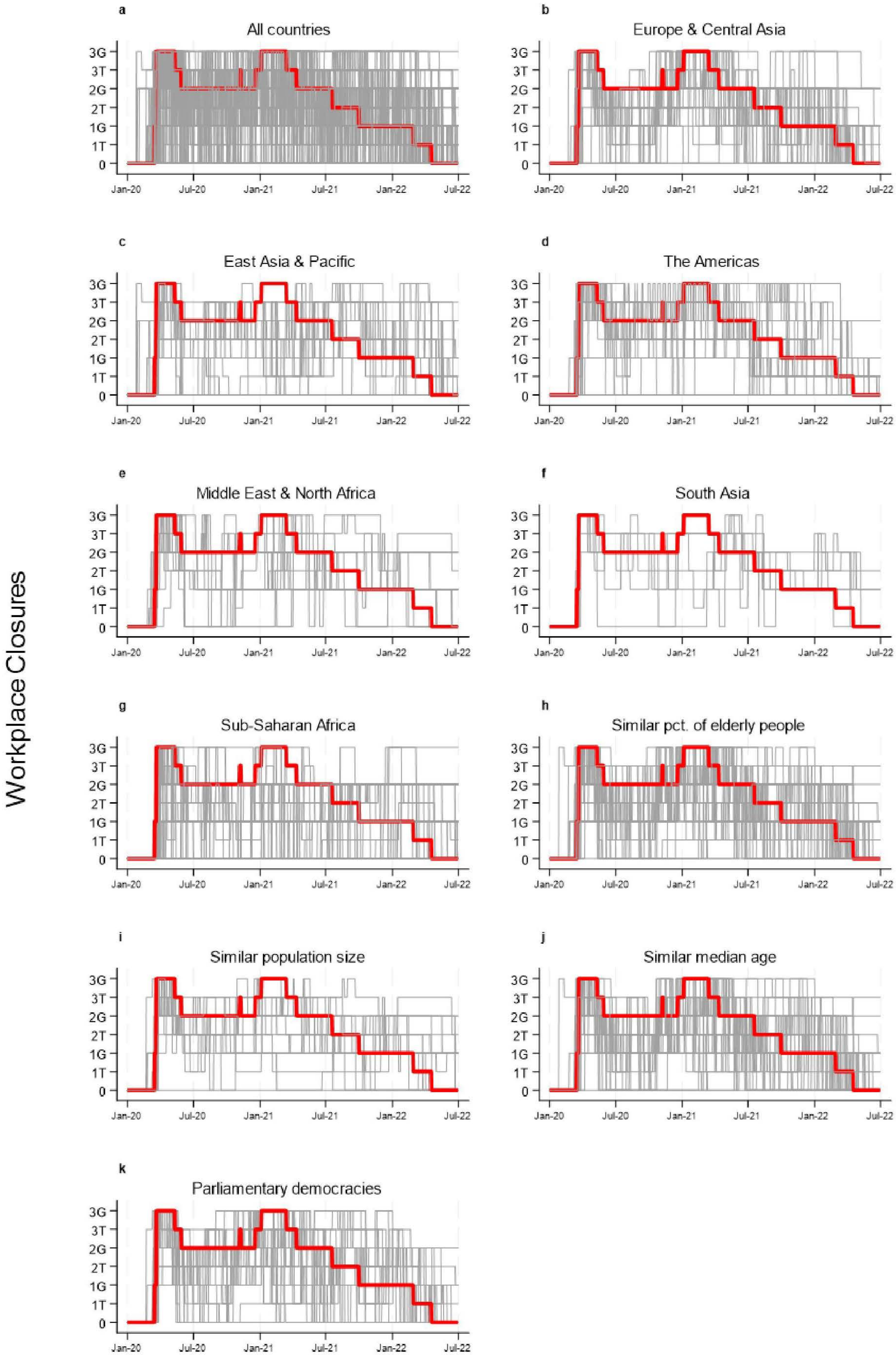

School Closures
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
3G
3T
2G
2T
1G
1T
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2b. Workplace closures by groups of countries over time. This picture depicts how workplace closure policies evolved over time. The red line indicates the workplace closure policies enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the UK workplace closure policies compared to all countries. Panel b shows the UK workplace closure policies compared to European and Central Asian countries. Panel c shows the UK workplace closure policies compared to East Asian and Pacific countries. Panel d shows the UK workplace closure policies compared to countries in the Americas. Panel e shows the UK workplace closure policies compared to the Middle East and North African countries. Panel f shows the UK workplace closure policies compared to South Asian countries. Panel g shows the UK workplace closure policies compared to Sub-Saharan African countries. Panel h shows the UK workplace closure policies compared to countries with similar percentage of elderly people. Panel i shows the UK workplace closure policies compared to countries with similar population size. Panel j shows the UK workplace closure policies compared to countries with similar median population age. Panel k shows the UK workplace closure policies compared to parliamentary democratic countries.


Workplace Closures
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
3G
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1T
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Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2c. Cancellation of public events by groups of countries over time. This picture depicts how cancellation of public events evolved over time. The red line indicates the policies for cancelling public events enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the UK cancellation of public events compared to all countries. Panel b shows the UK cancellation of public events compared to European and Central Asian countries. Panel c shows the UK cancellation of public events compared to East Asian and Pacific countries. Panel d shows the UK cancellation of public events compared to countries in the Americas. Panel e shows the UK cancellation of public events compared to the Middle East and North African countries. Panel f shows the UK cancellation of public events compared to South Asian countries. Panel g shows the UK cancellation of public events compared to Sub-Saharan African countries. Panel h shows the UK cancellation of public events compared to countries with similar percentage of elderly people. Panel i shows the UK cancellation of public events compared to countries with similar population size. Panel j shows the UK cancellation of public events compared to countries with similar median population age. Panel k shows the UK cancellation of public events compared to parliamentary democratic countries.

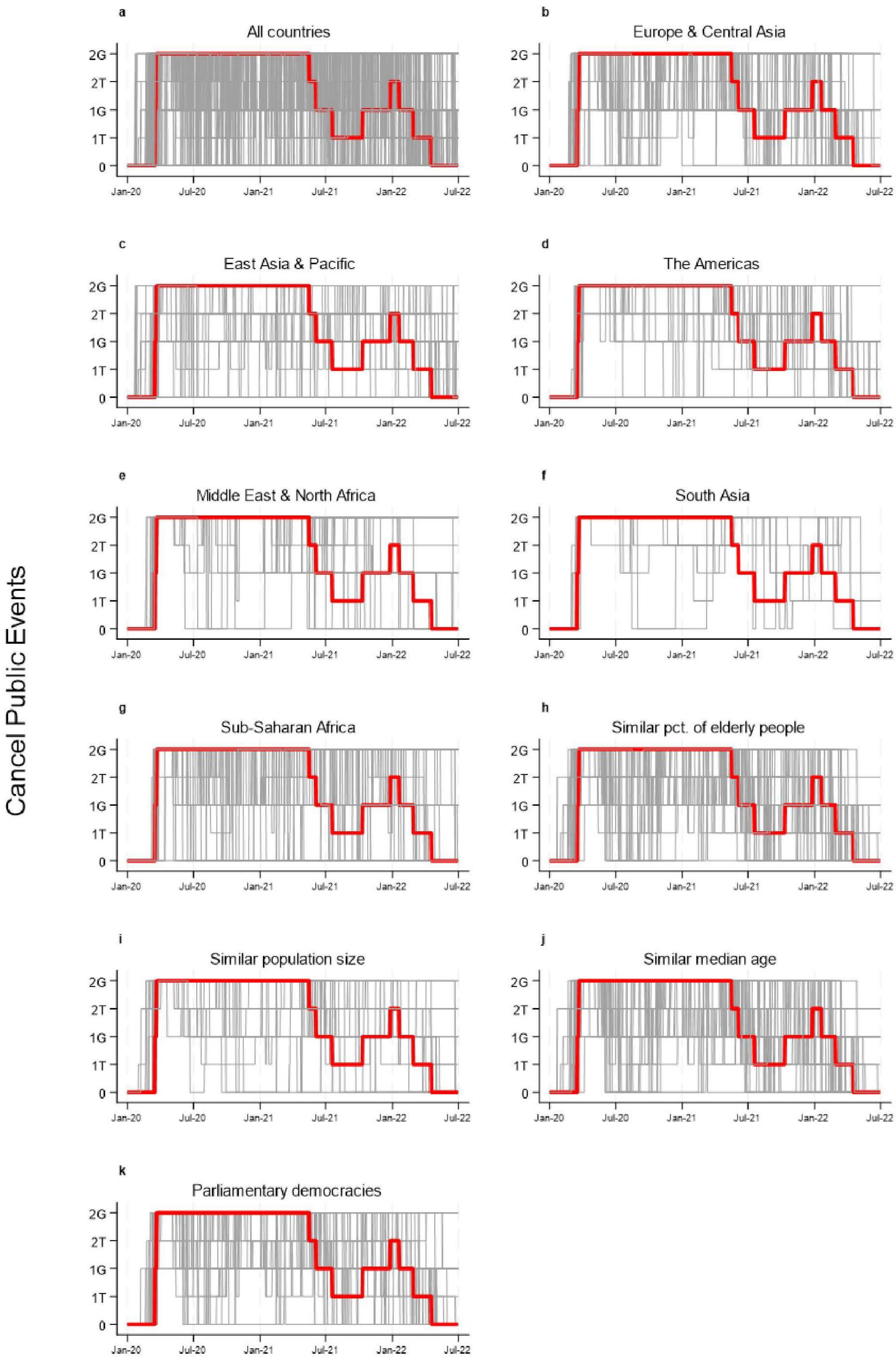
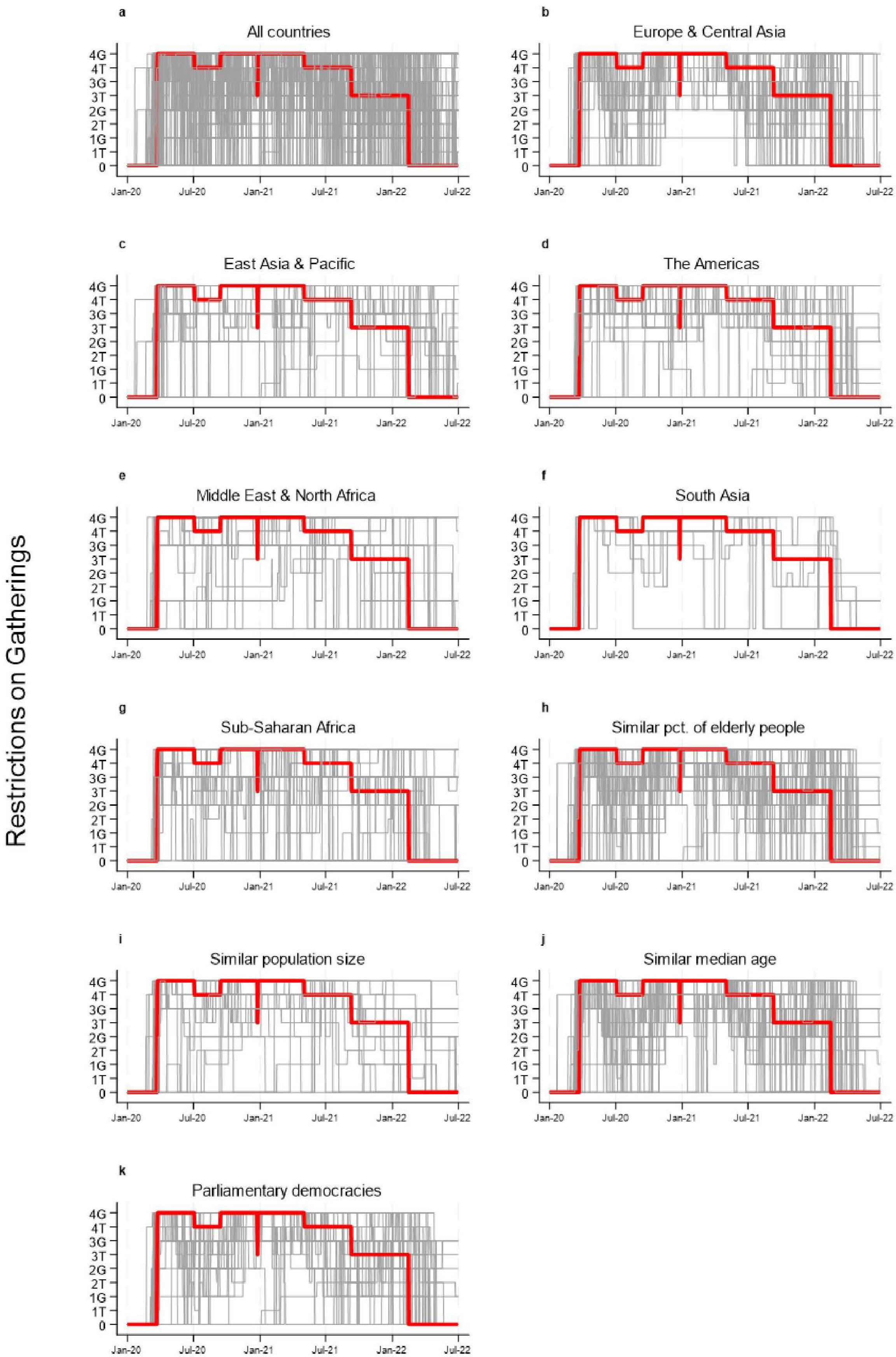

Cancel Public Events
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
2G
2T
1G
1T
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2d. Restrictions on gatherings by groups of countries over time. This picture depicts how restrictions on gatherings evolved over time. The red line indicates the policies for restricting gatherings enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the restrictions on gatherings compared to all countries. Panel b shows the UK restrictions on gatherings compared to European and Central Asian countries. Panel c shows the UK restrictions on gatherings compared to East Asian and Pacific countries. Panel d shows the UK restrictions on gatherings compared to countries in the Americas. Panel e shows the UK restrictions on gatherings compared to the Middle East and North African countries. Panel f shows the UK restrictions on gatherings compared to South Asian countries. Panel g shows the UK restrictions on gatherings compared to Sub-Saharan African countries. Panel h shows the UK restrictions on gatherings compared to countries with similar percentage of elderly people. Panel i shows the UK restrictions on gatherings compared to countries with similar population size. Panel j shows the UK restrictions on gatherings compared to countries with similar median population age. Panel k shows the UK restrictions on gatherings compared to parliamentary democratic countries.


Restrictions on Gatherings
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
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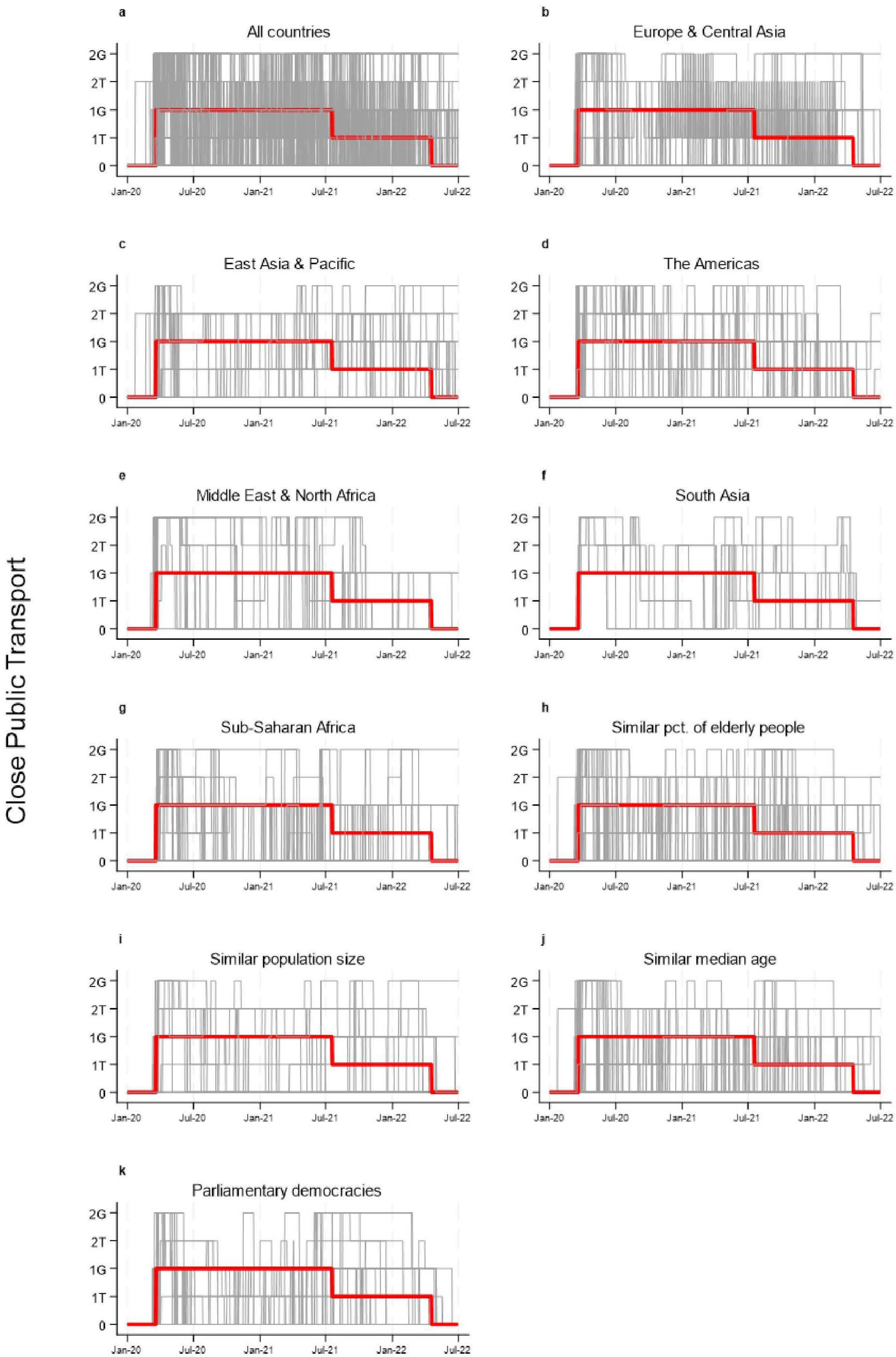
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2e. Public transport closures by groups of countries over time. This picture depicts how public transport closure policies evolved over time. The red line indicates the public transport closure policies enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the UK public transport closure policies compared to all countries. Panel b shows the UK public transport closure policies compared to European and Central Asian countries. Panel c shows the UK public transport closure policies compared to East Asian and Pacific countries. Panel d shows the UK public transport closure policies compared to countries in the Americas. Panel e shows the UK public transport closure policies compared to the Middle East and North African countries. Panel f shows the UK public transport closure policies compared to South Asian countries. Panel g shows the UK public transport closure policies compared to Sub-Saharan African countries. Panel h shows the UK public transport closure policies compared to countries with similar percentage of elderly people. Panel i shows the UK public transport closure policies compared to countries with similar population size. Panel j shows the UK public transport closure policies compared to countries with similar median population age. Panel k shows the UK public transport closure policies compared to parliamentary democratic countries.


Close Public Transport
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
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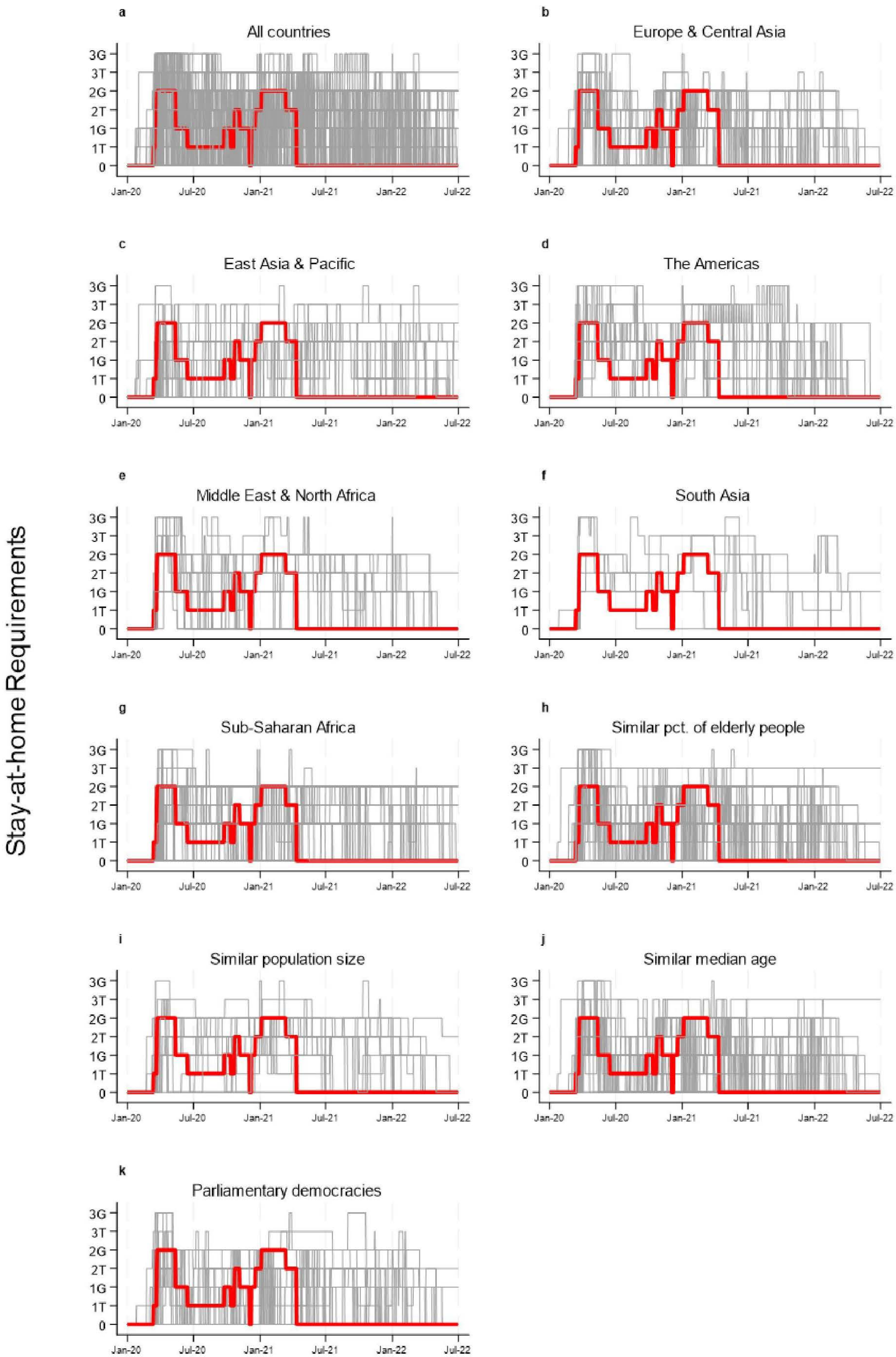
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
2G
2T
1G
1T
0
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2f. Stay-at-home requirements by groups of countries over time. This picture depicts how stay-at-home policies evolved over time. The red line indicates the stay-at-home policies enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the UK stay-at-home policies compared to all countries. Panel b shows the UK stay-at-home policies compared to European and Central Asian countries. Panel c shows the UK stay-at-home policies compared to East Asian and Pacific countries. Panel d shows the UK stay-at-home policies compared to countries in the Americas. Panel e shows the UK stay-at-home policies compared to the Middle East and North African countries. Panel f shows the UK stay-at-home policies compared to South Asian countries. Panel g shows the UK stay-at-home policies compared to Sub-Saharan African countries. Panel h shows the UK stay-at-home policies compared to countries with similar percentage of elderly people. Panel i shows the UK stay-at-home policies compared to countries with similar population size. Panel j shows the UK stay-at-home policies compared to countries with similar median population age. Panel k shows the UK stay-at-home policies compared to parliamentary democratic countries.


Stay-at-home Requirements
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
3G
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2G
2T
1G
1T
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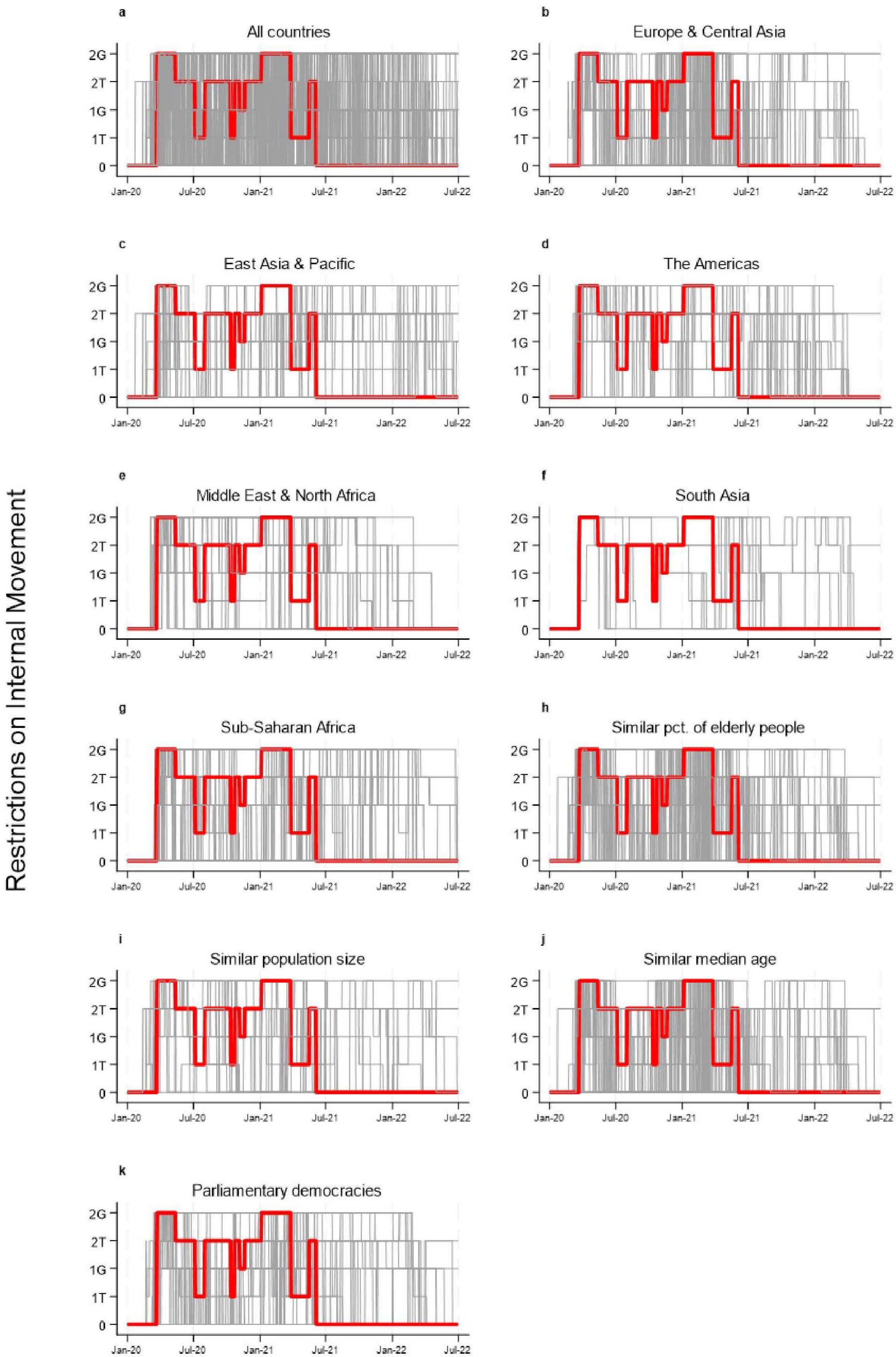
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2g. Restrictions on internal movement by groups of countries over time. This picture depicts how restrictions on internal movement evolved over time. The red line indicates the policies for restricting internal movement enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the restrictions on internal movement compared to all countries. Panel b shows the UK restrictions on internal movement compared to European and Central Asian countries. Panel c shows the UK restrictions on internal movement compared to East Asian and Pacific countries. Panel d shows the UK restrictions on internal movement compared to countries in the Americas. Panel e shows the UK restrictions on internal movement compared to the Middle East and North African countries. Panel f shows the UK restrictions on internal movement compared to South Asian countries. Panel g shows the UK restrictions on internal movement compared to Sub-Saharan African countries. Panel h shows the UK restrictions on internal movement compared to countries with similar percentage of elderly people. Panel i shows the UK restrictions on internal movement compared to countries with similar population size. Panel j shows the UK restrictions on internal movement compared to countries with similar median population age. Panel k shows the UK restrictions on internal movement compared to parliamentary democratic countries.


Restrictions on Internal Movement
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
2G
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Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22

Figure A2h. International travel controls by groups of countries over time. This picture depicts how international travel controls evolved over time. The red line indicates the policies for controlling international travels enacted by the UK government, and each gray line represents the policies for each country in the comparison group. Panel a shows the UK international travel controls compared to all countries. Panel b shows the UK international travel controls compared to European and Central Asian countries. Panel c shows the UK international travel controls compared to East Asian and Pacific countries. Panel d shows the UK international travel controls compared to countries in the Americas. Panel e shows the UK international travel controls compared to the Middle East and North African countries. Panel f shows the UK international travel controls compared to South Asian countries. Panel g shows the UK international travel controls compared to Sub-Saharan African countries. Panel h shows the UK international travel controls compared to countries with similar percentage of elderly people. Panel i shows the UK international travel controls compared to countries with similar population size. Panel j shows the UK international travel controls compared to countries with similar median population age. Panel k shows the UK international travel controls compared to parliamentary democratic countries.

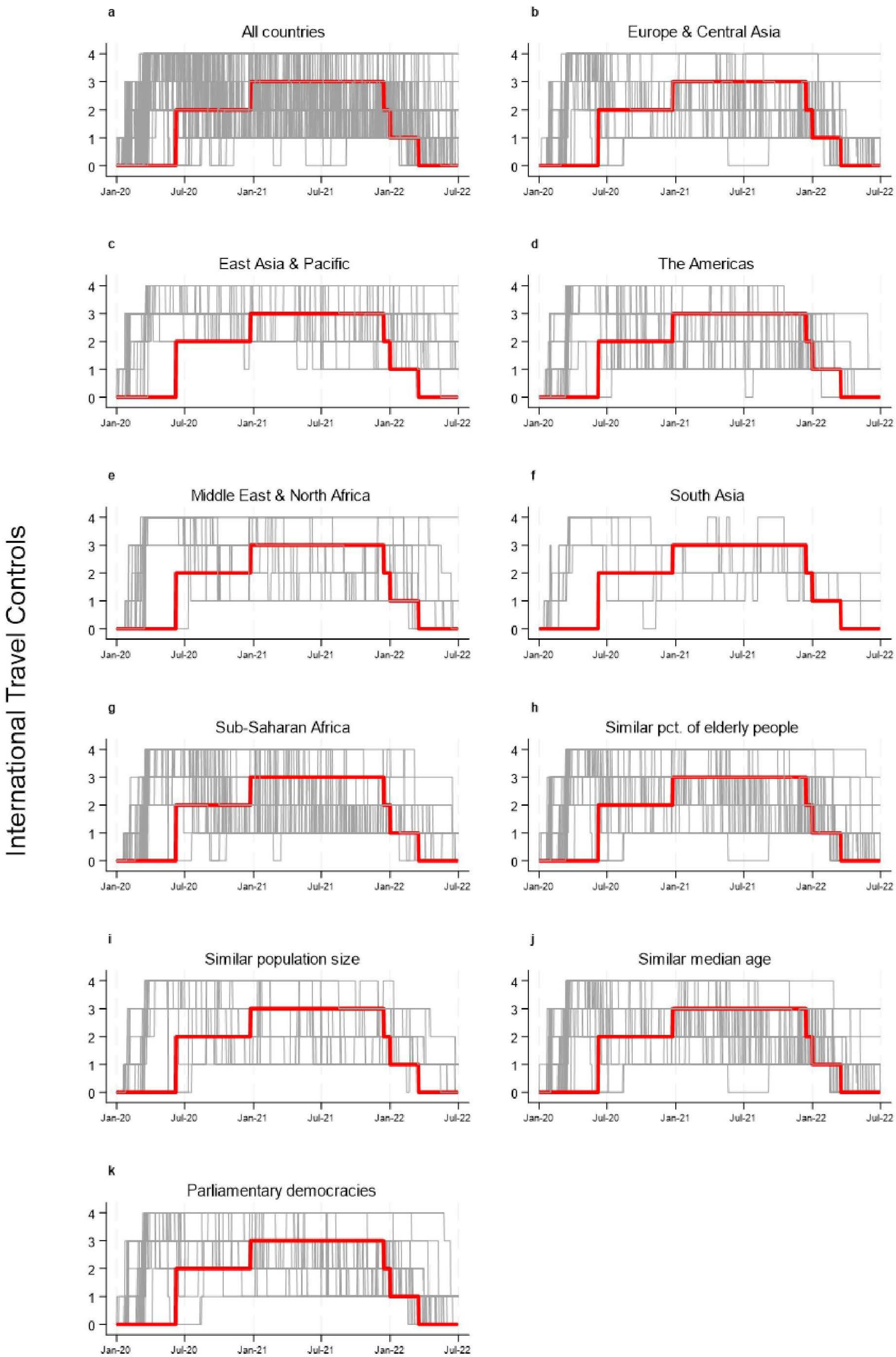

International Travel Controls
a
All countries
b
Europe & Central Asia
c
East Asia & Pacific
d
The Americas
e
Middle East & North Africa
f
South Asia
g
Sub-Saharan Africa
h
Similar pct. of elderly people
i
Similar population size
j
Similar median age
k
Parliamentary democracies
0 1 2 3 4
Jan-20 Jul-20 Jan-21 Jul-21 Jan-22 Jul-22

Figure A3a. Stringency Index and pandemic intensity over time (UK vs. all countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each country analysed.

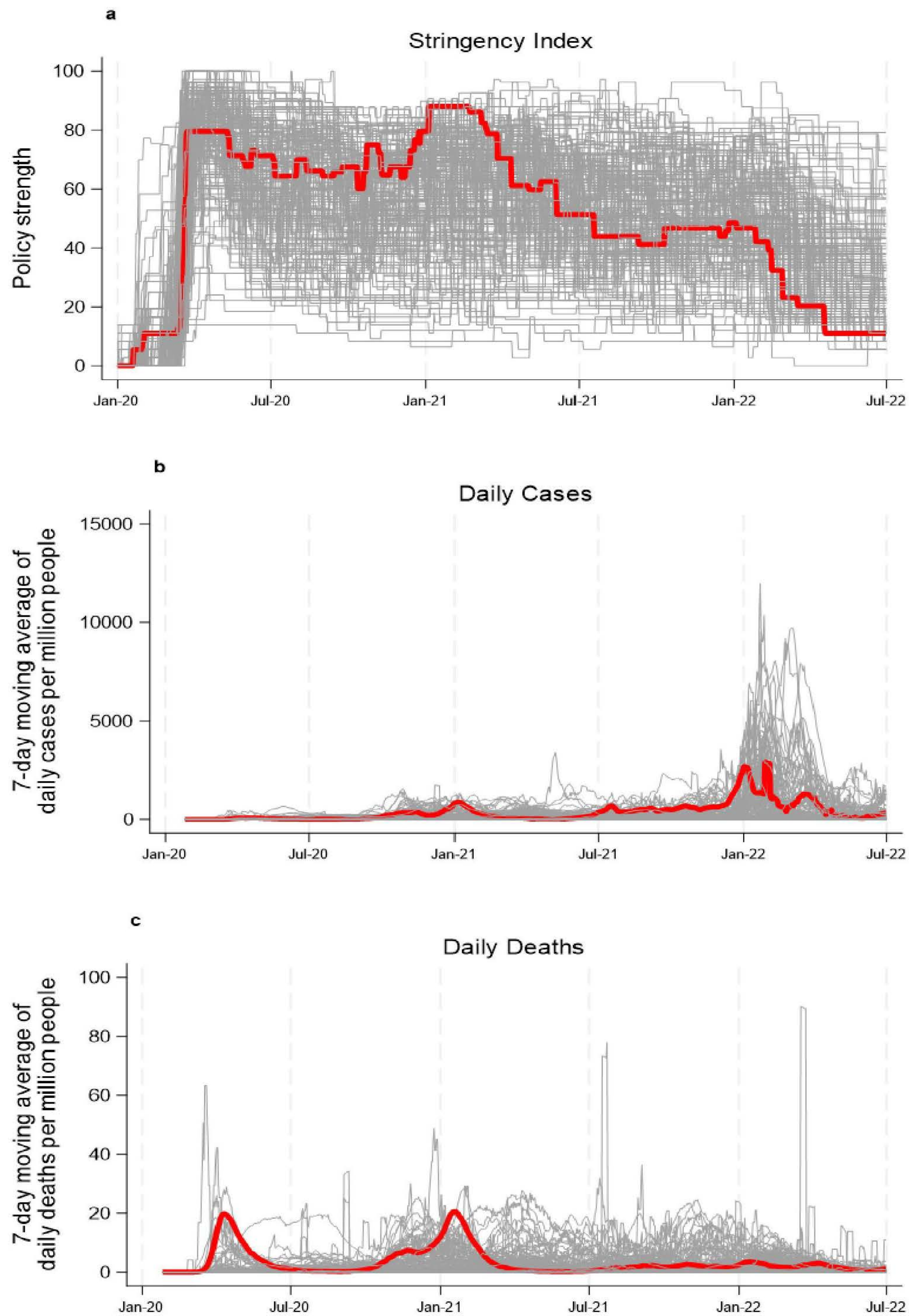


Figure A3b. Stringency Index and pandemic intensity over time (UK vs. European and Central Asian countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each European and Central Asian country.

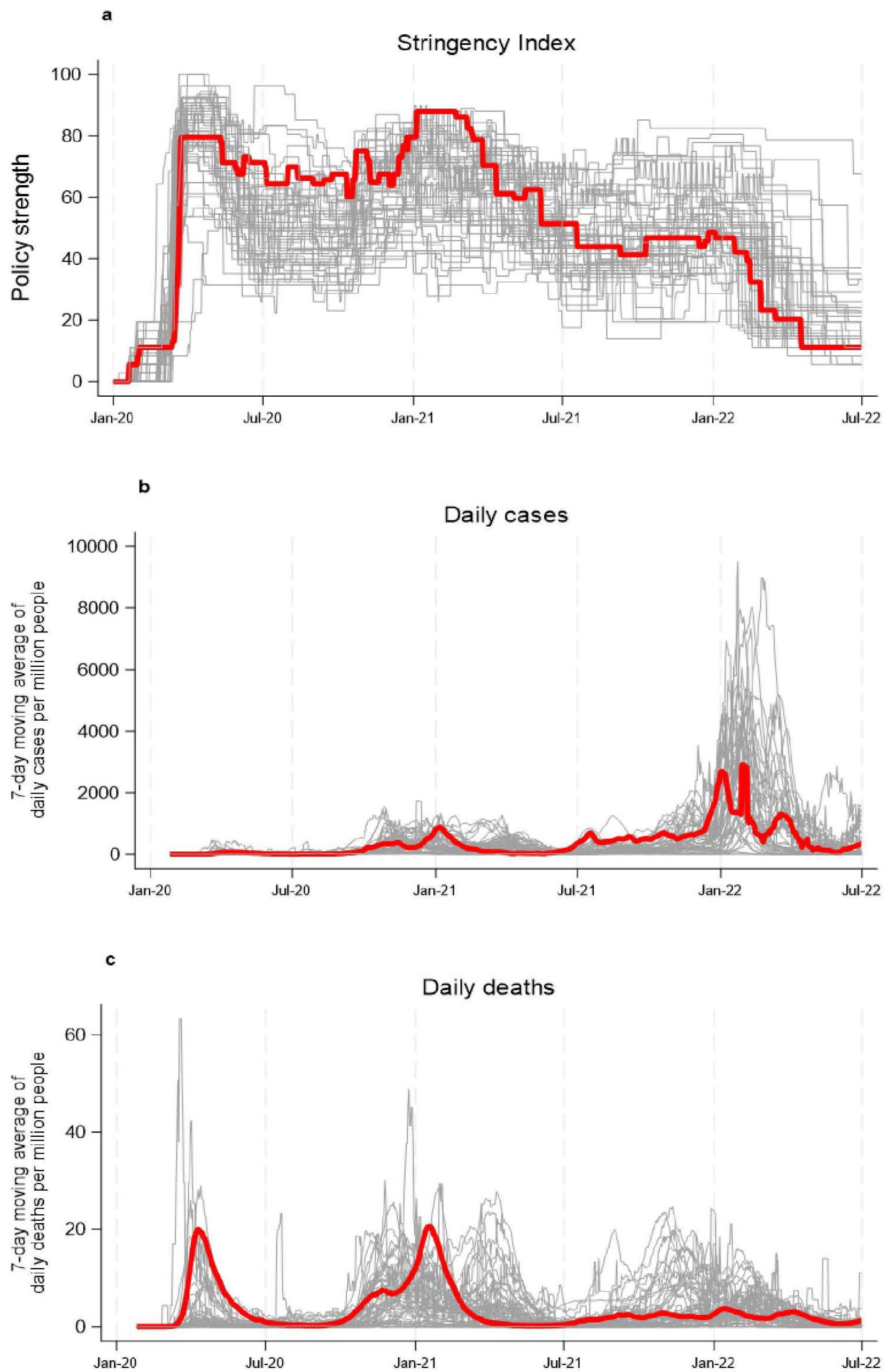


Figure A3c. Stringency Index and pandemic intensity over time (UK vs. East Asian and Pacific countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each East Asian and Pacific country.

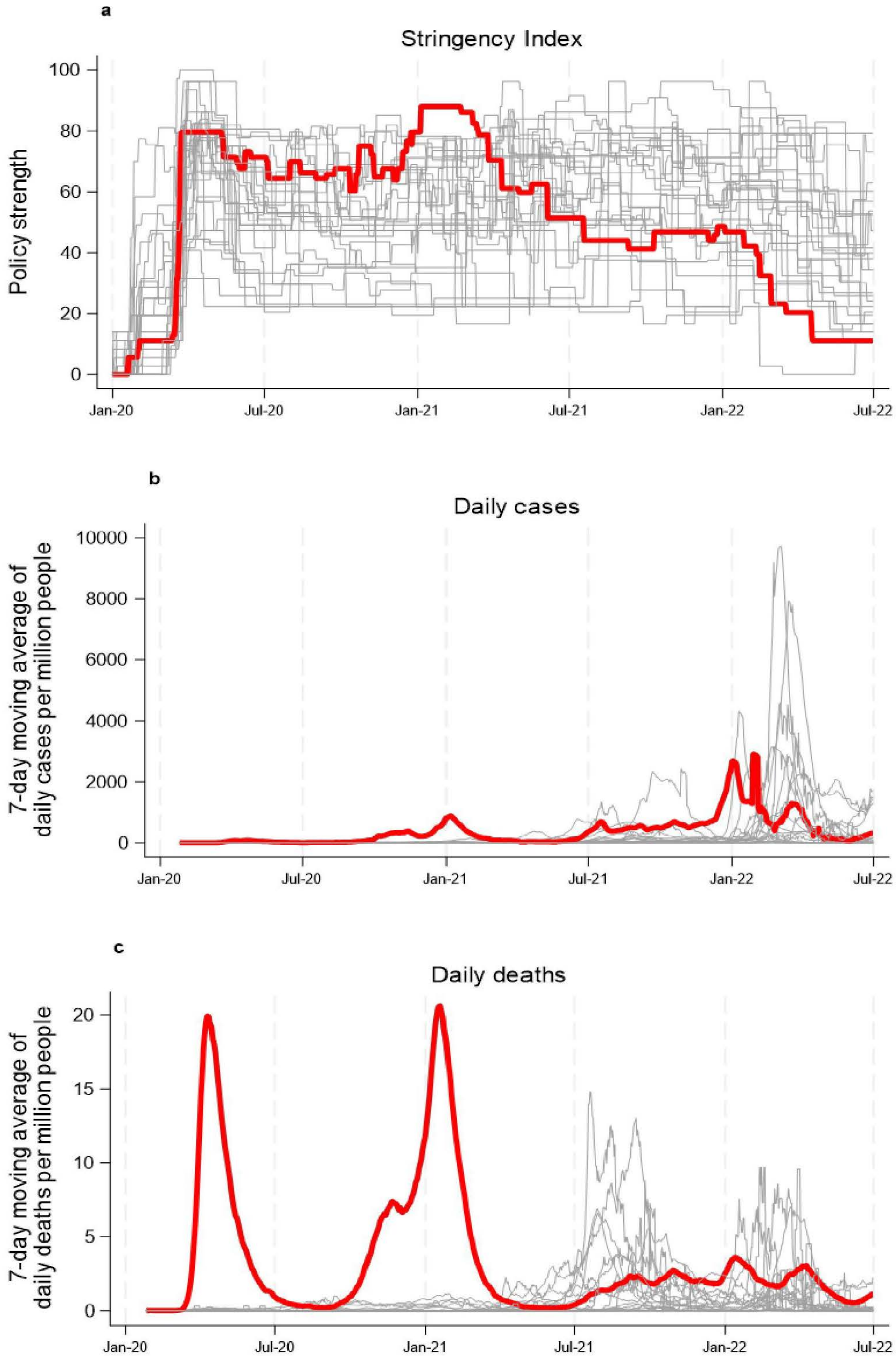


Figure A3d. Stringency Index and pandemic intensity over time (UK vs. countries in the Americas). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each country in the Americas.

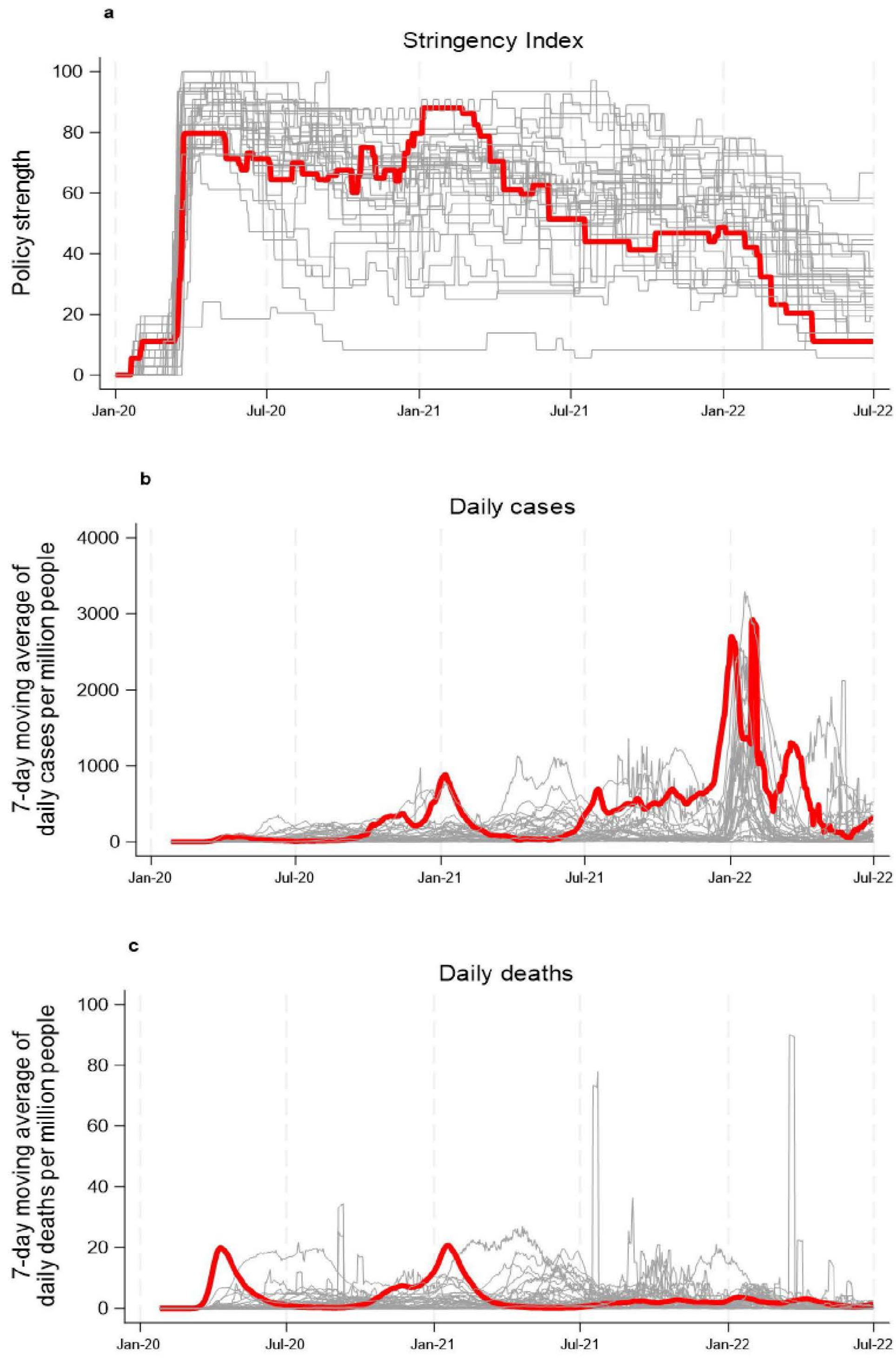


Figure A3e. Stringency Index and pandemic intensity over time (UK vs. the Middle East and North African countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each the Middle East and North African country.

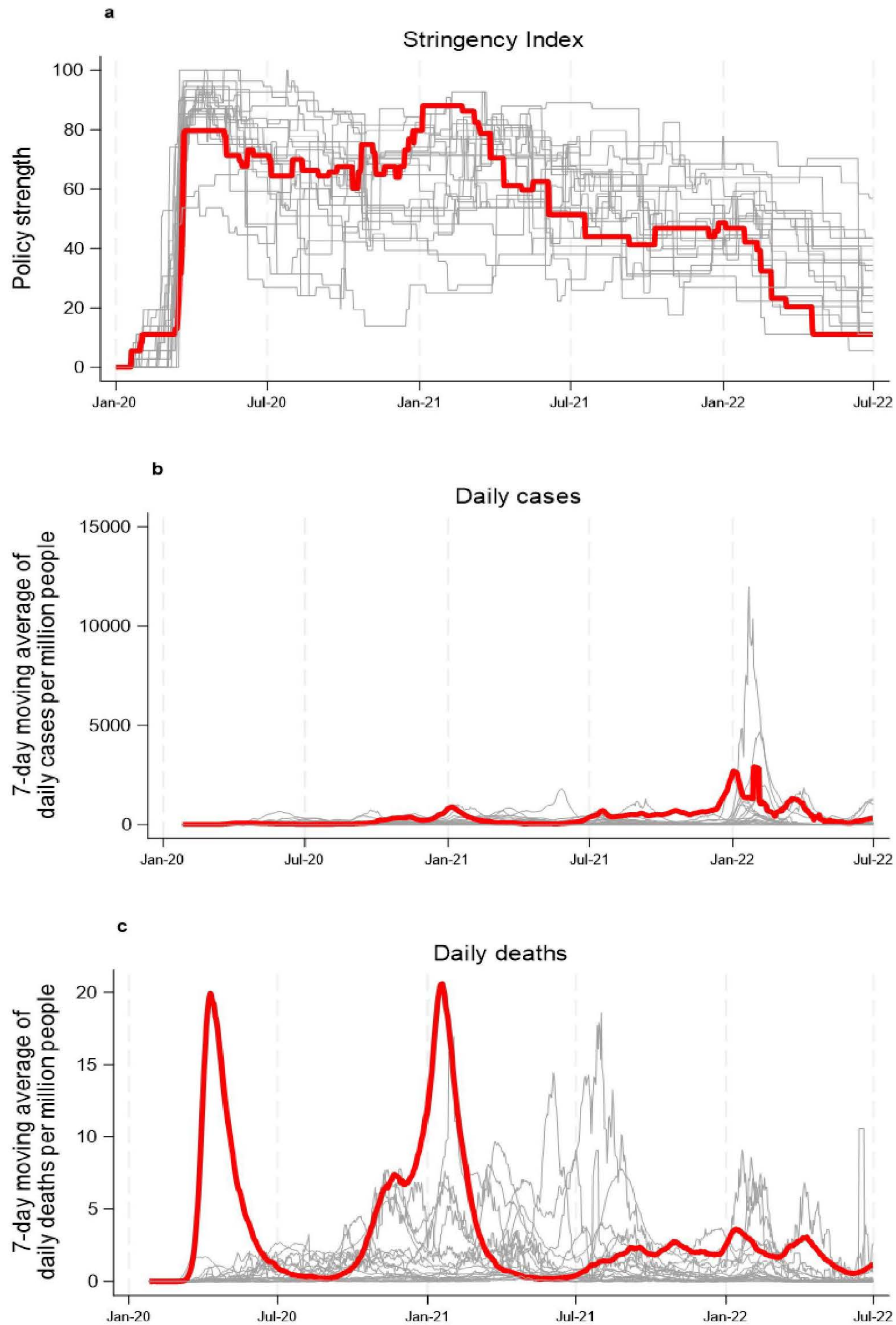


Figure A3f. Stringency Index and pandemic intensity over time (UK vs. South Asian countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each South Asian country.

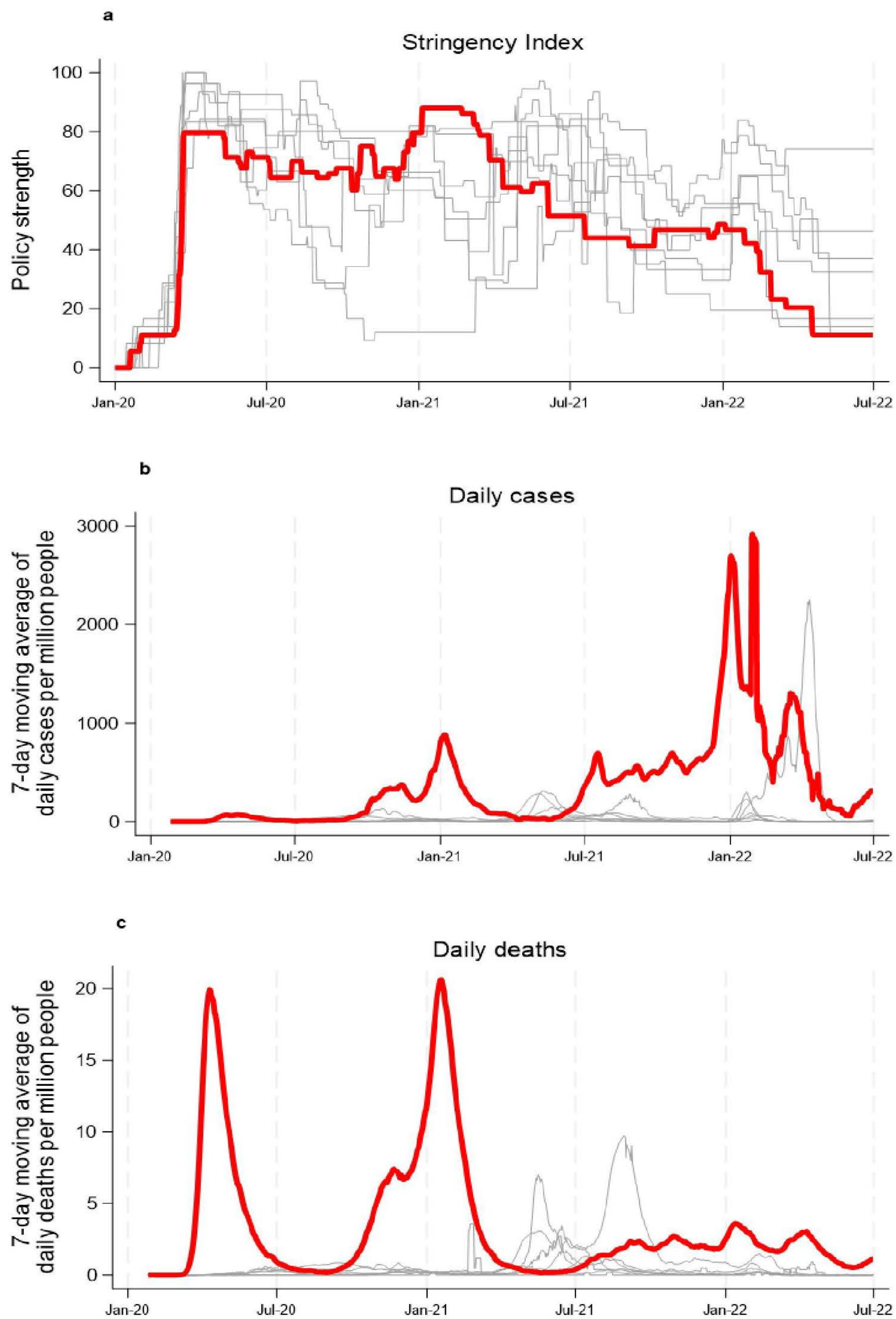


Figure A3g. Stringency Index and pandemic intensity over time (UK vs. Sub-Saharan African countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each Sub-Saharan African country.

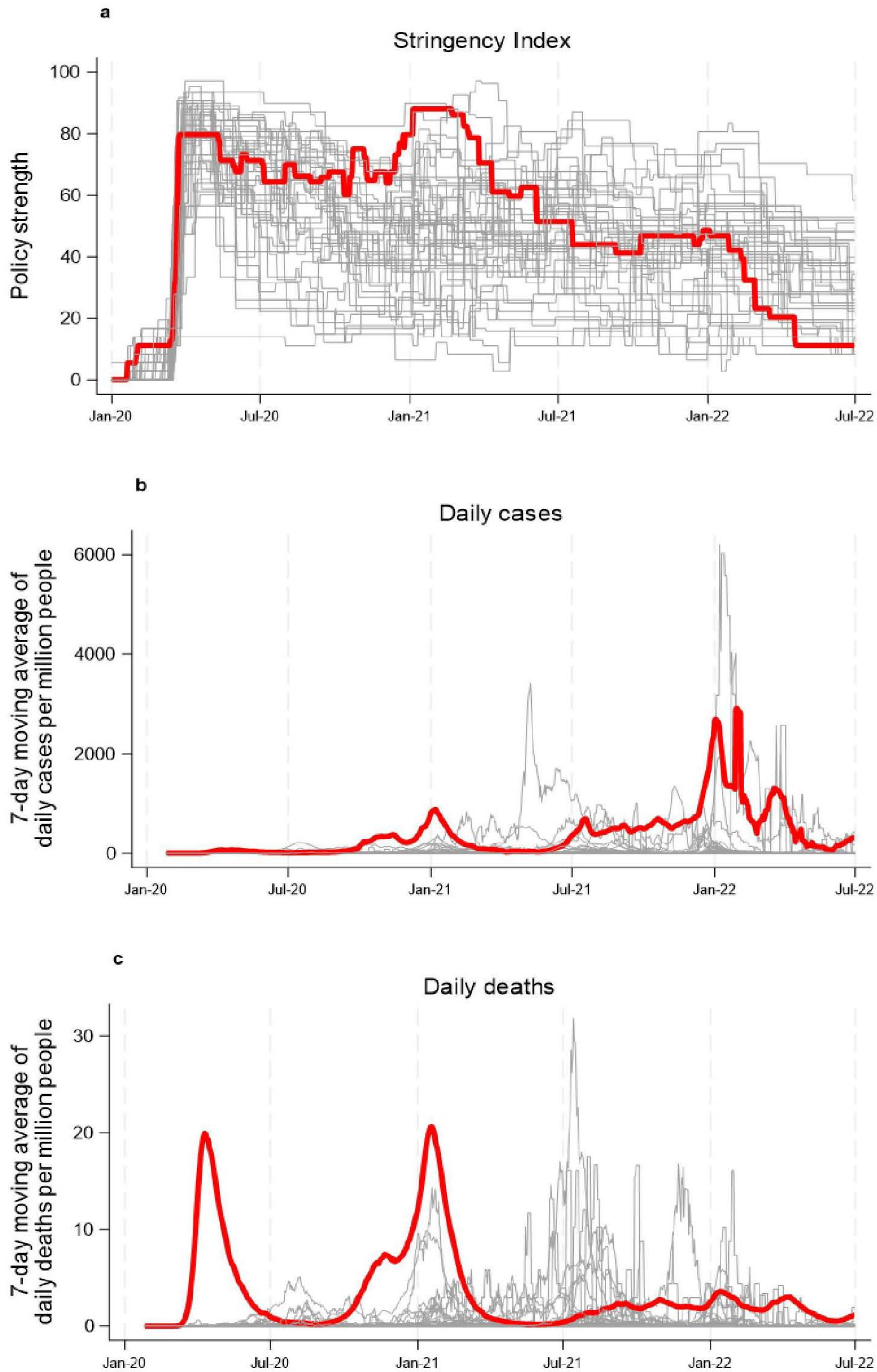


Figure A3h. Stringency Index and pandemic intensity over time (UK vs. countries with similar percentage of elderly people). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each country with similar percentage of elderly people.

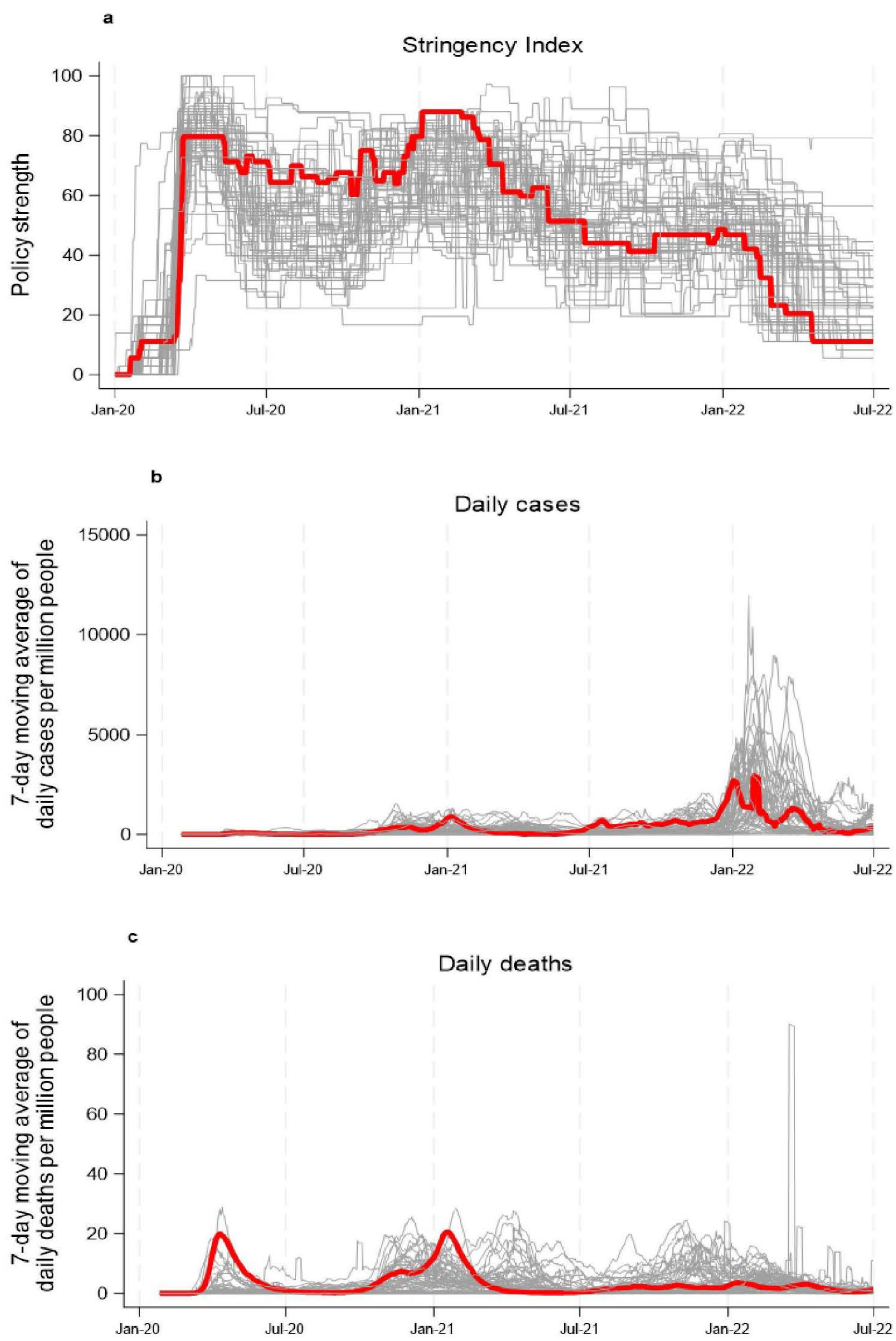


Figure A3i. Stringency Index and pandemic intensity over time (UK vs. countries with similar population size). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each country with similar population size.

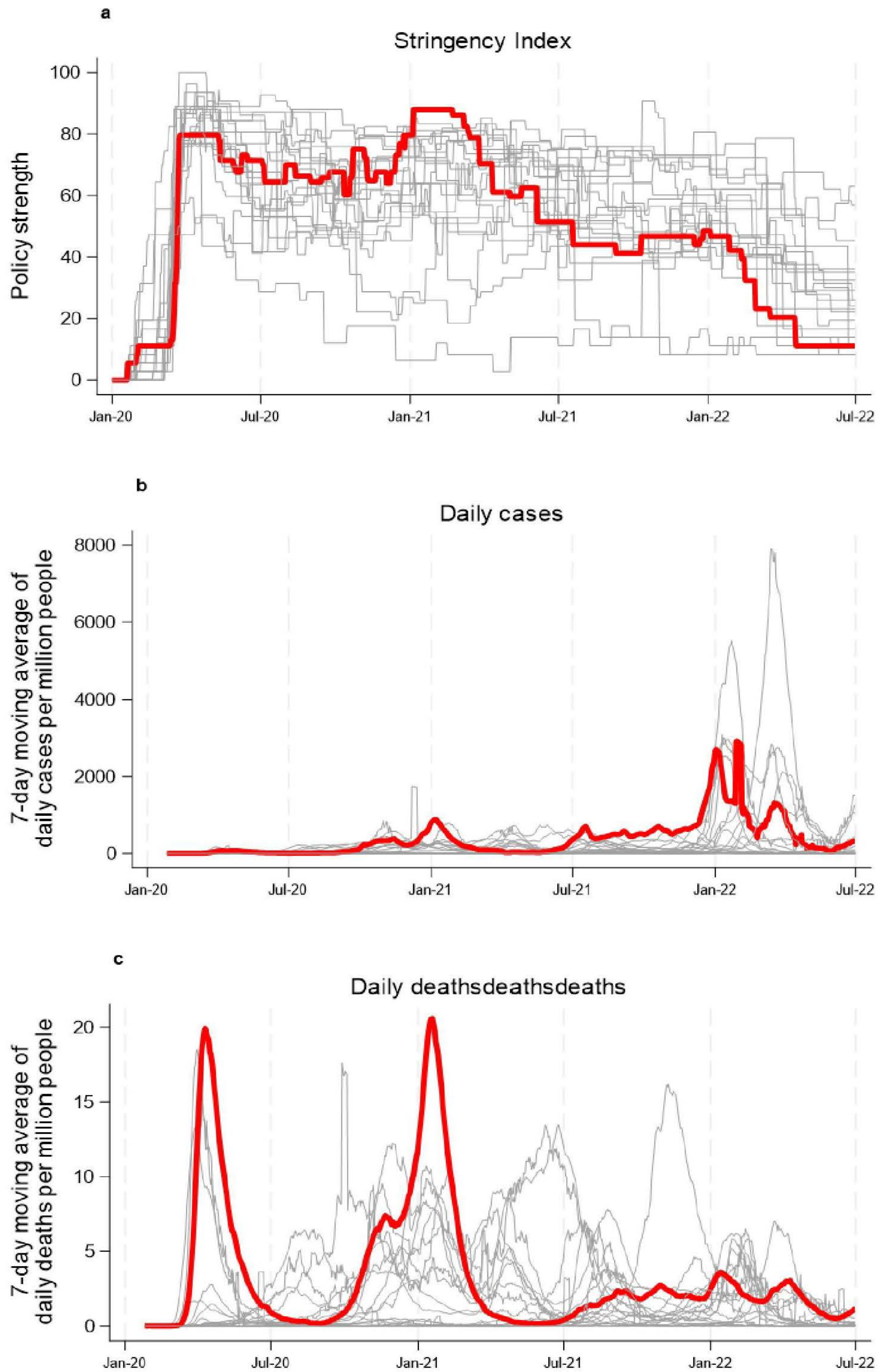


Figure A3j. Stringency Index and pandemic intensity over time (UK vs. countries with similar median population age). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each country with similar median population age.

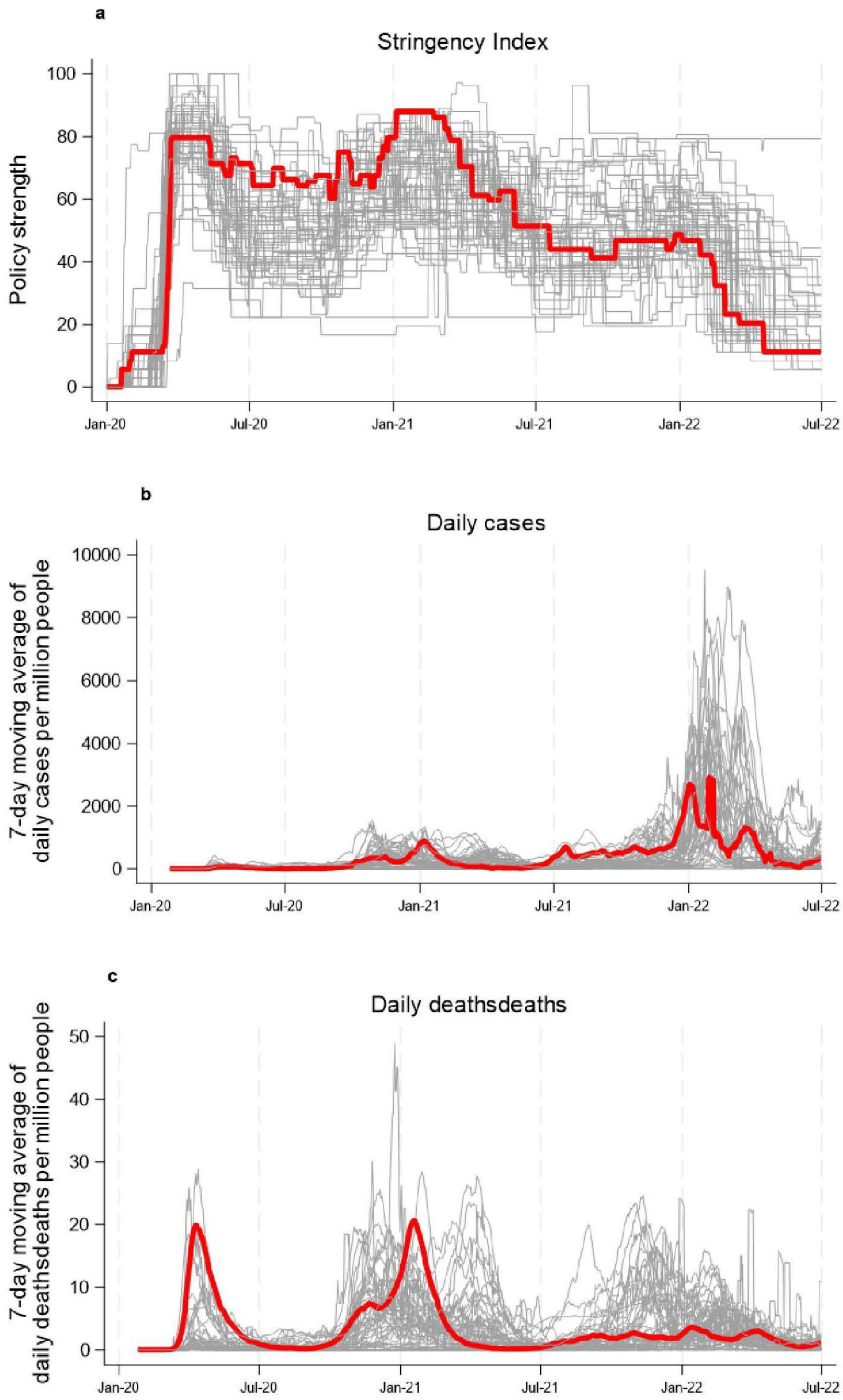


Figure A3k. Stringency Index and pandemic intensity over time (UK vs. Parliamentary democratic countries). The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in the UK, and each gray line represents each parliamentary democratic country.

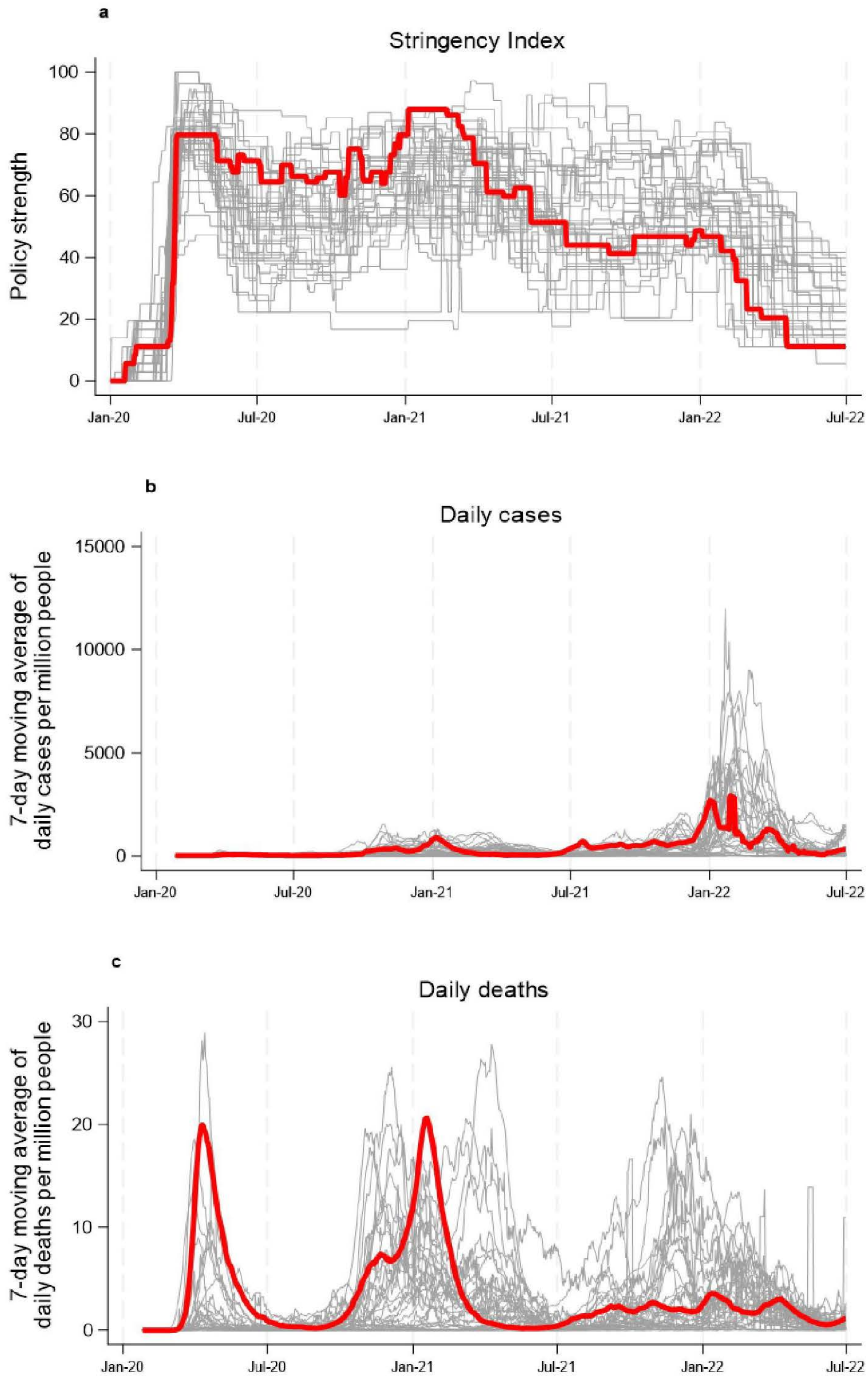


Figure A4a. Number of school closure days. This figure depicts the total number of partial (some levels) or full (all levels) school closure days over the whole territory or in at least one subnational region of a country. This includes periods of school holidays if the schools were closed on either side of the holidays.

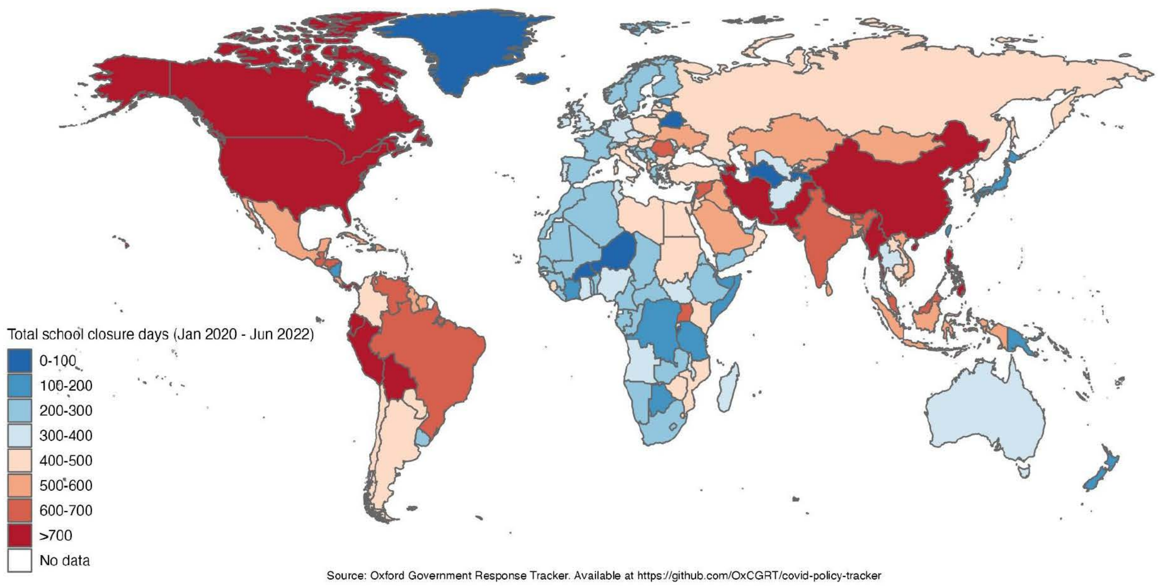


Figure A4b. Number of workplace closure days. This figure depicts the total number of partial (some sectors) or full (all-but essential) workplace closure days over the whole territory or in at least one subnational region of a country.

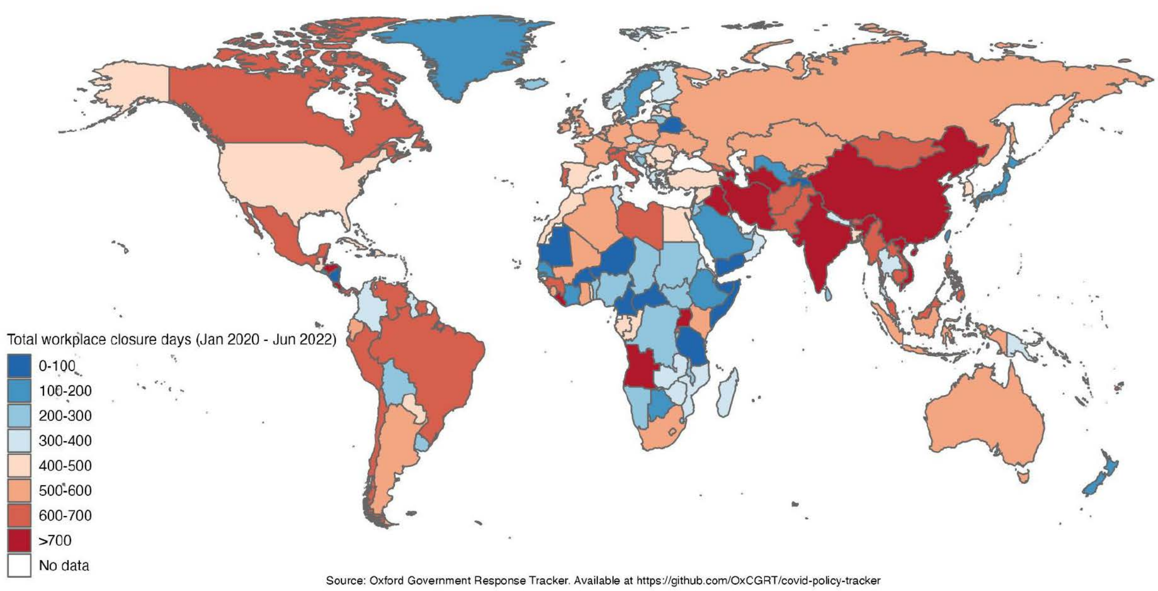


Figure A4c. Number of days with public events canceled. This figure depicts the total number of days with public events canceled over the whole territory or in at least one subnational region of a country.

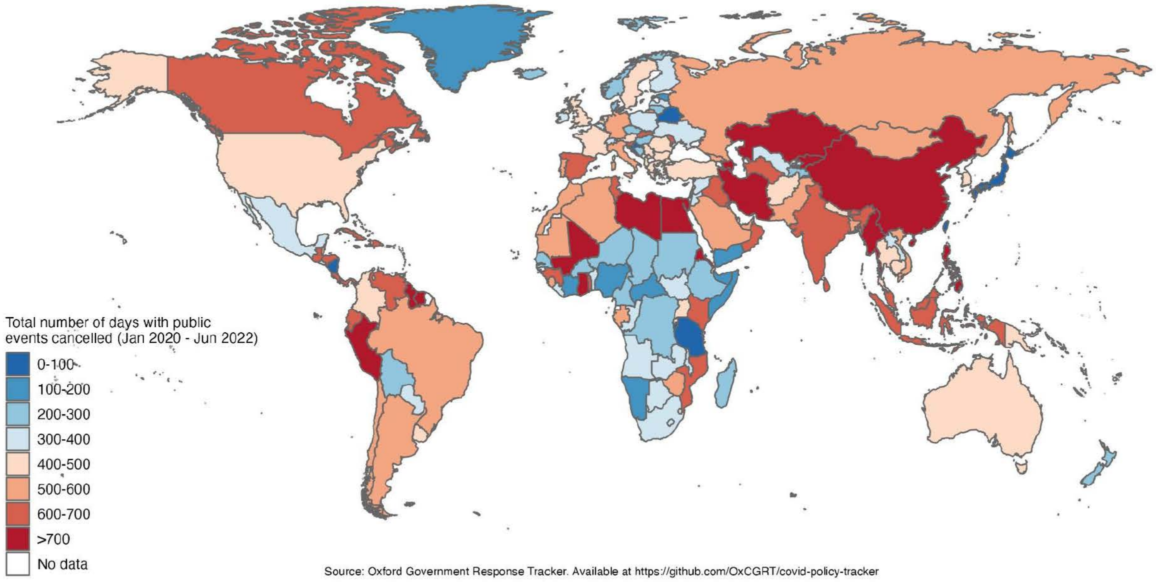


Figure A4d. Number of days with public transport closed. This figure depicts the total number of days with public transport closed (or prohibiting most citizens from using it) over the whole territory or in at least one subnational region of a country.

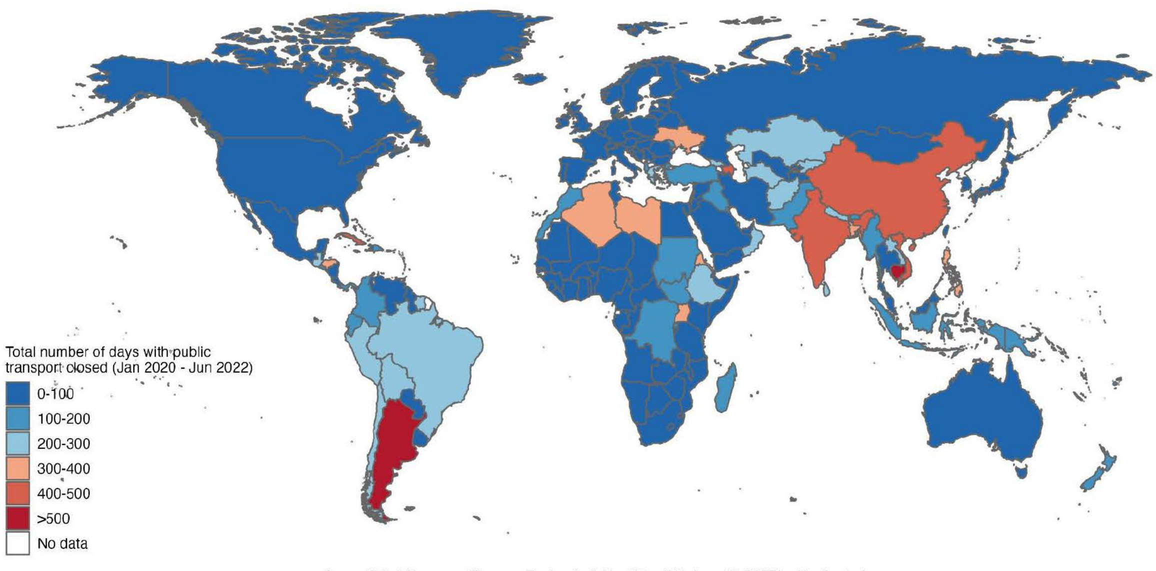


Figure A4e. Number of days with stay-at-home requirements. This figure depicts the total number of days with stay-at-home requirements (leaving the house with minimal exceptions) over the whole territory or in at least one subnational region of a country.

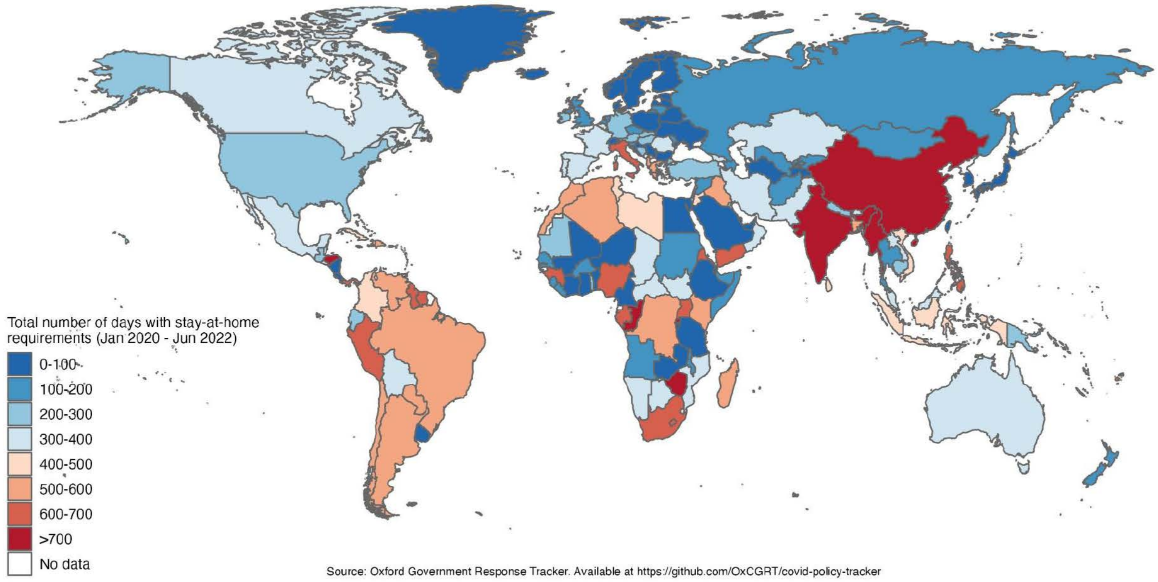


Figure A4f. Number of days with restrictions on internal movement. This figure depicts the total number of days with restrictions on internal movement over the whole territory or in at least one subnational region of a country.

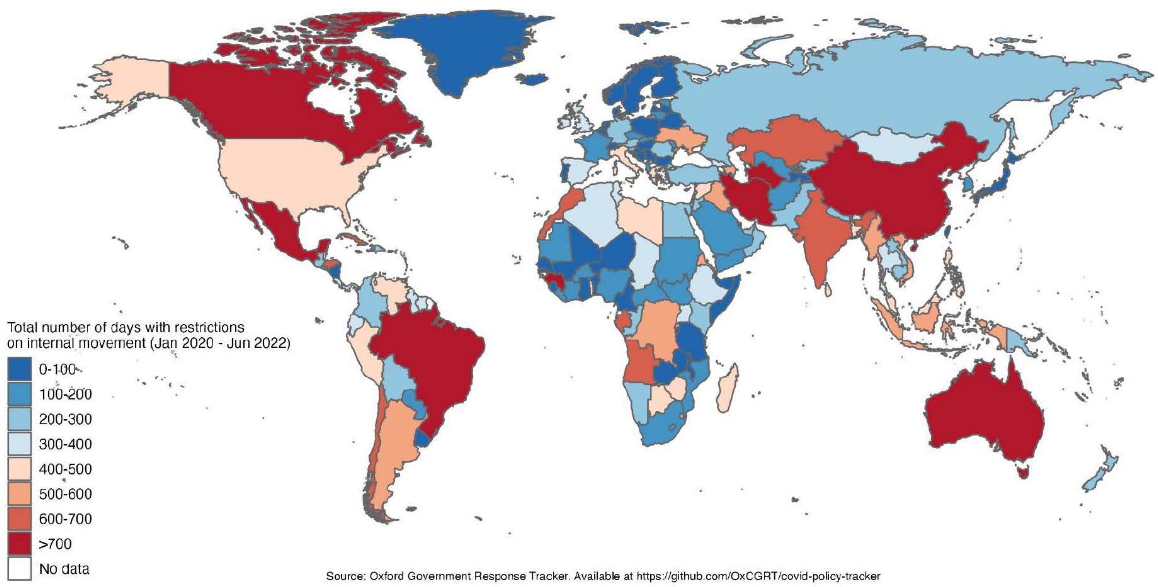


Figure A4g. Number of days with restrictions on international travel. This figure depicts the total number of days with ban arrivals from some or all regions (total border closure).

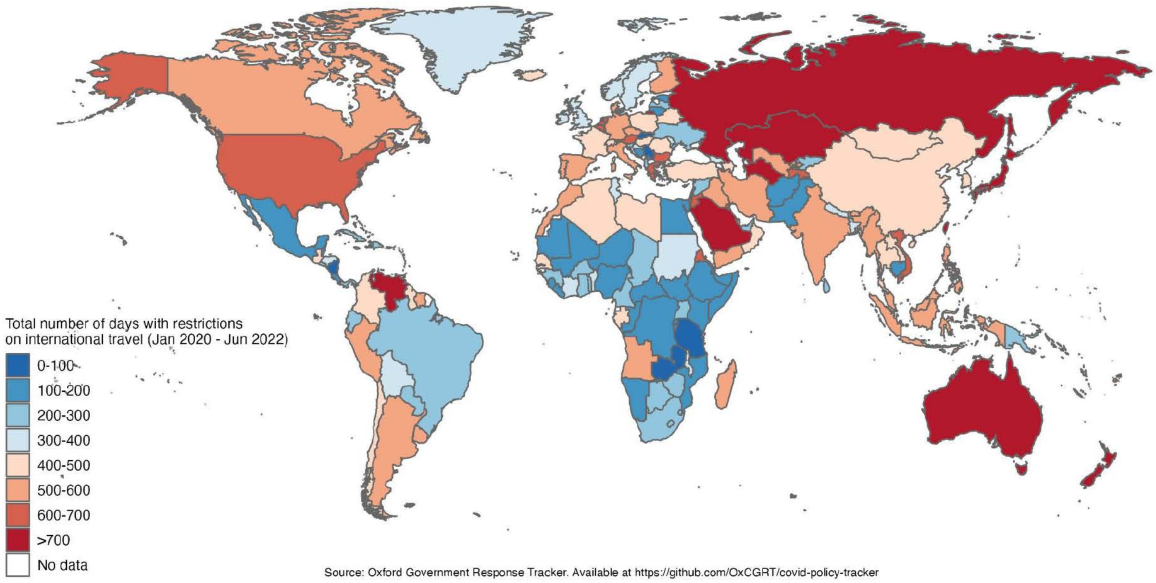


Figure A4h. Number of days with Stringency Index greater than 60.

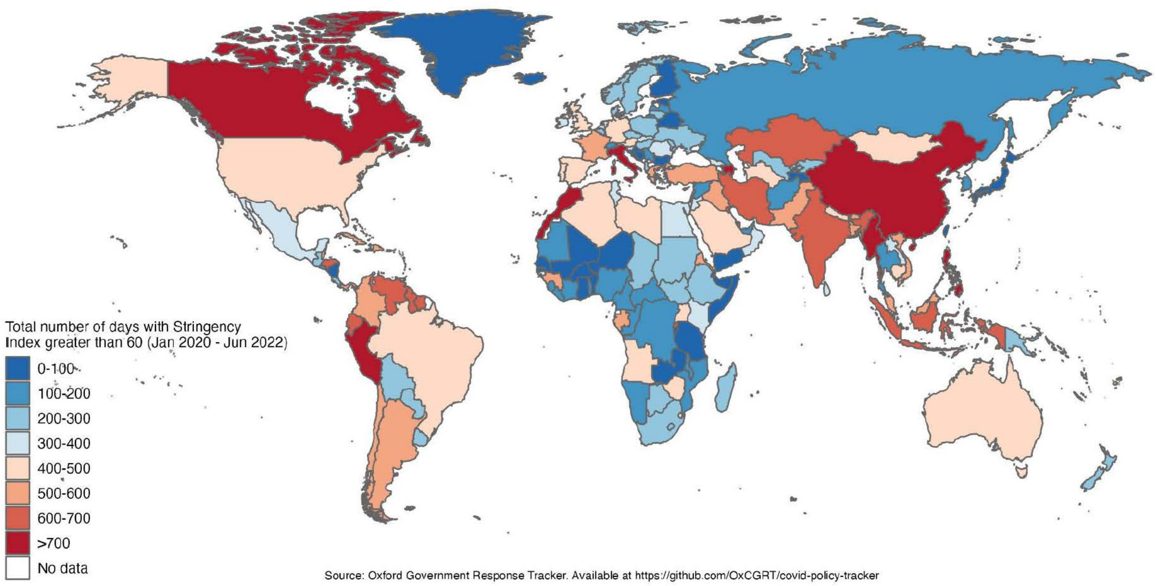


Figure A4i. Number of days with Stringency Index greater than 70.

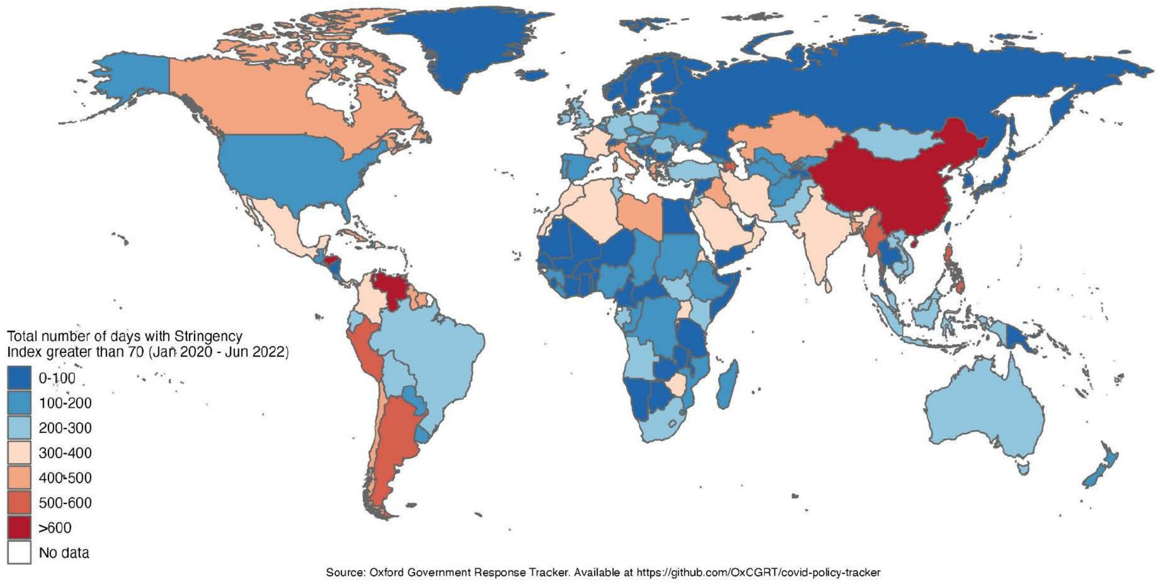


Figure A4j. Number of days with Stringency Index greater than 80.

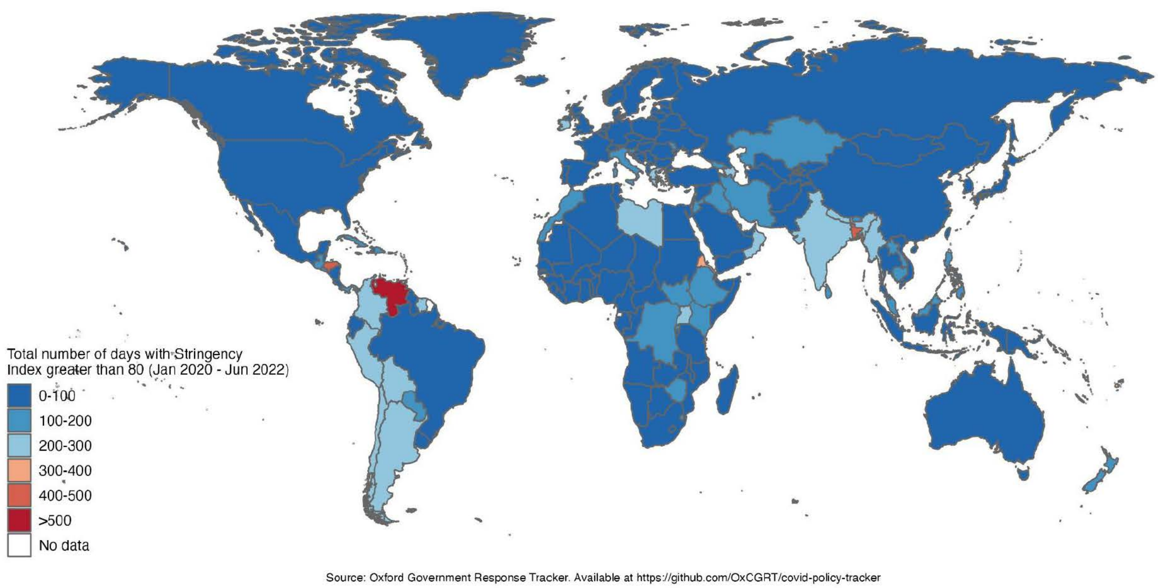


Figure A5a: Average aggregated policy strength by indicator over time in England and globally. This picture depicts how policy strength evolved over time. The red line indicates the containment closure policies applying to England, and each coloured line represents the average aggregated policy strength by a group of comparison countries.

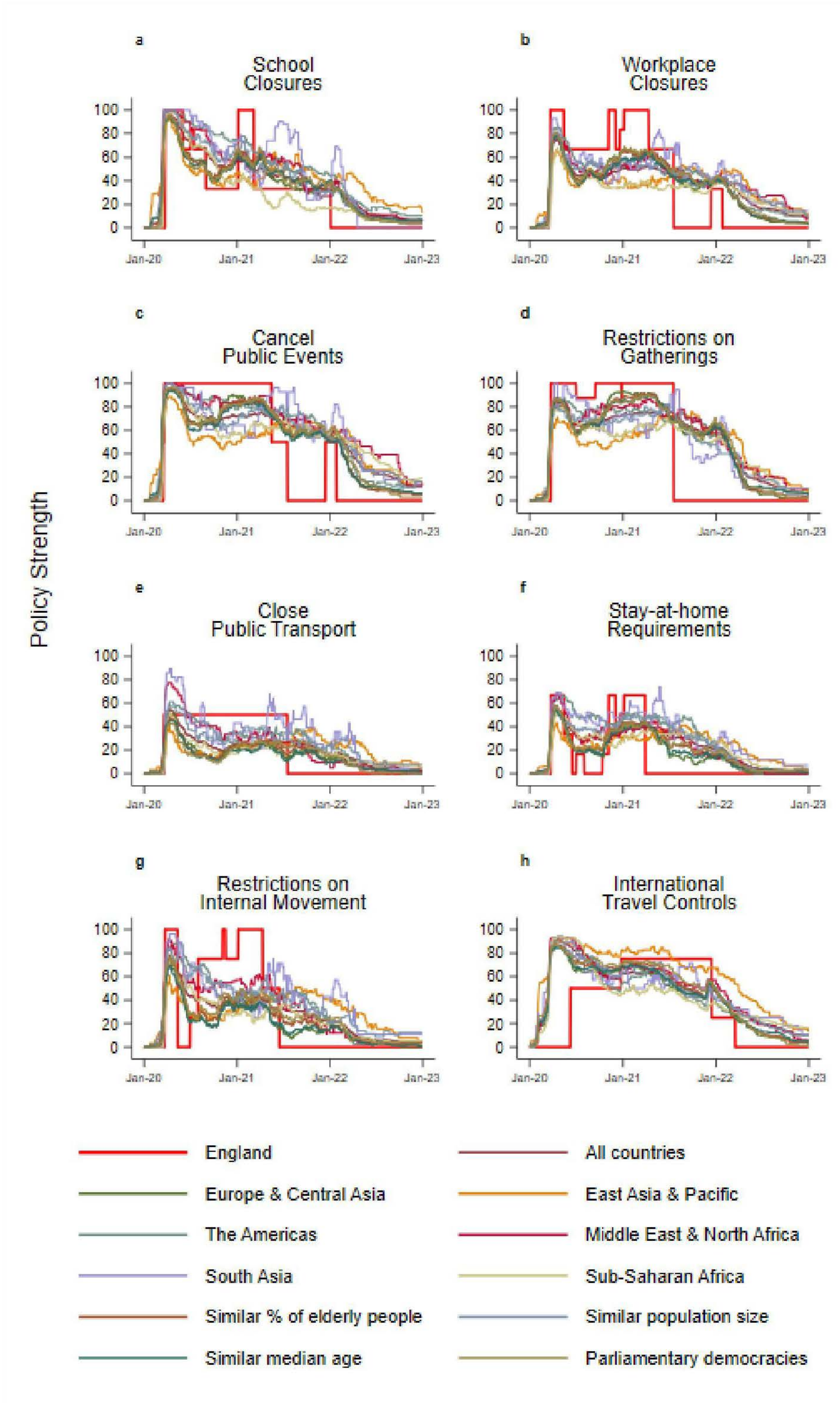


Figure A5b: Average aggregated policy strength by indicator over time in Northern Ireland and globally. This picture depicts how policy strength evolved over time. The red line indicates the containment and closure policies applying to Northern Ireland, and each coloured line represents the average aggregated policy strength by a group of comparison countries.

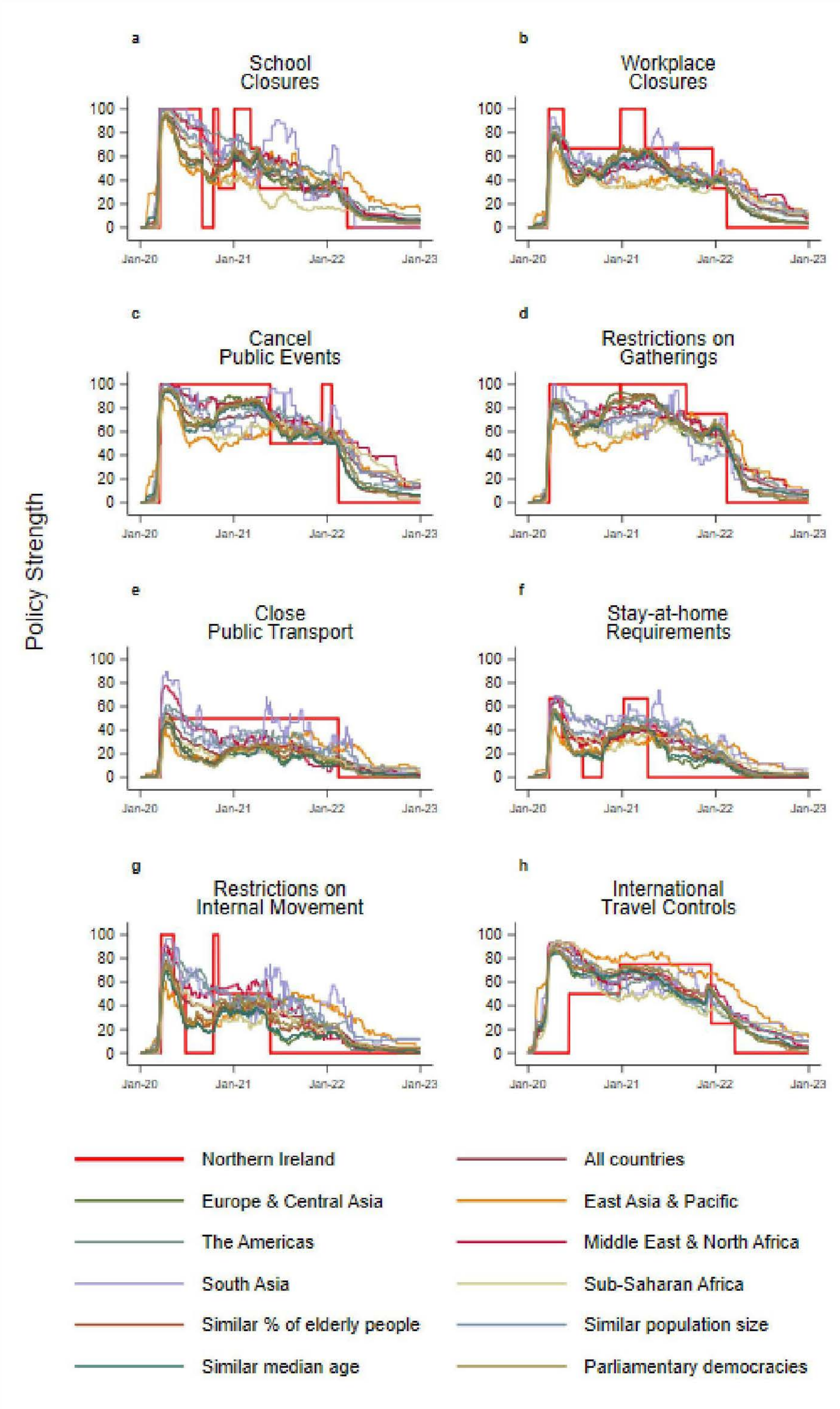


Figure A5c: Average aggregated policy strength by indicator over time in Scotland and globally. This picture depicts how policy strength evolved over time. The red line indicates the containment closure policies applying to Scotland, and each coloured line represents the average aggregated policy strength by a group of comparison countries.

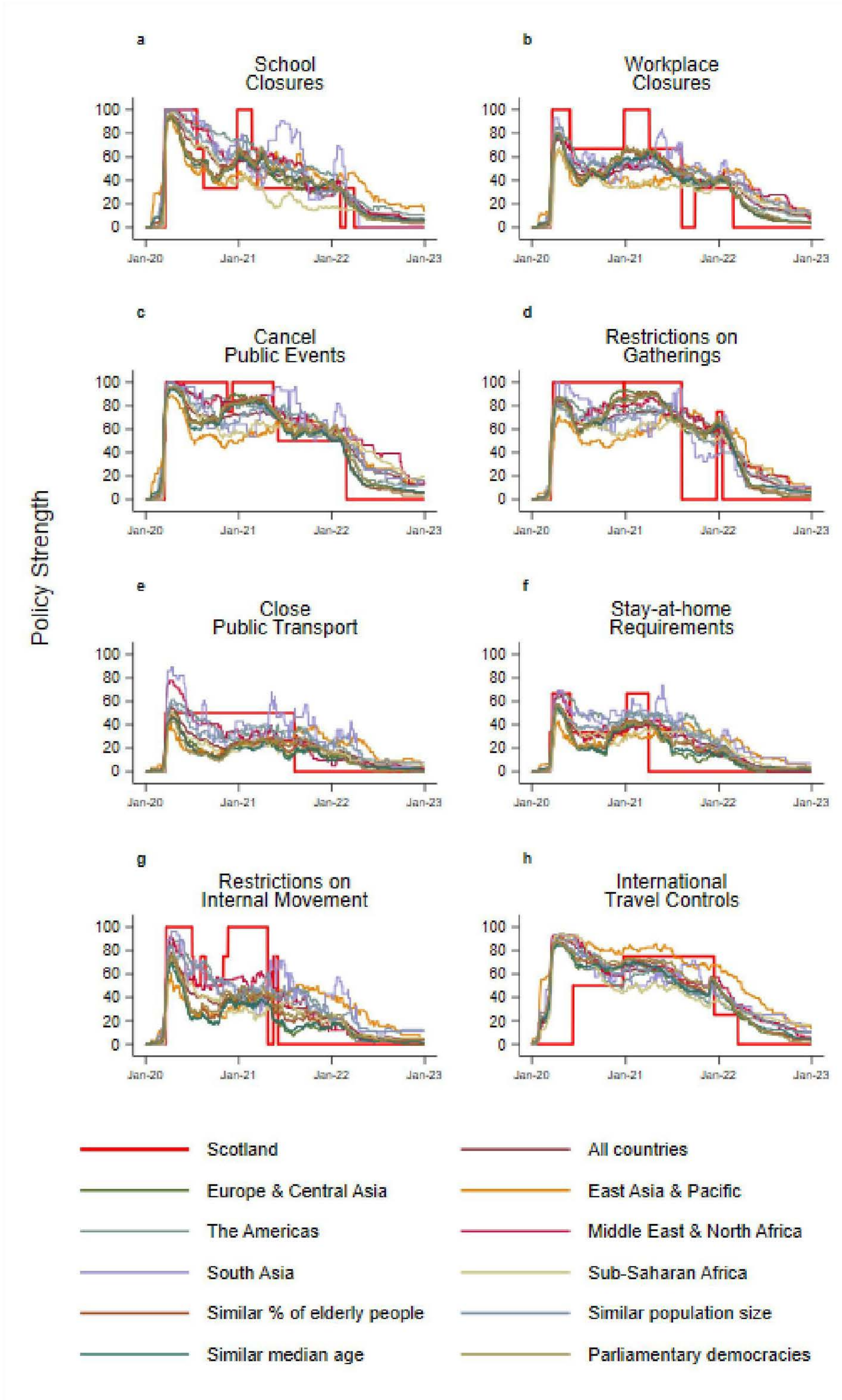


Figure A5d: Average aggregated policy strength by indicator over time in Wales and globally. This picture depicts how policy strength evolved over time. The red line indicates the containment closure policies applying to Wales, and each coloured line represents the average aggregated policy strength by a group of comparison countries.

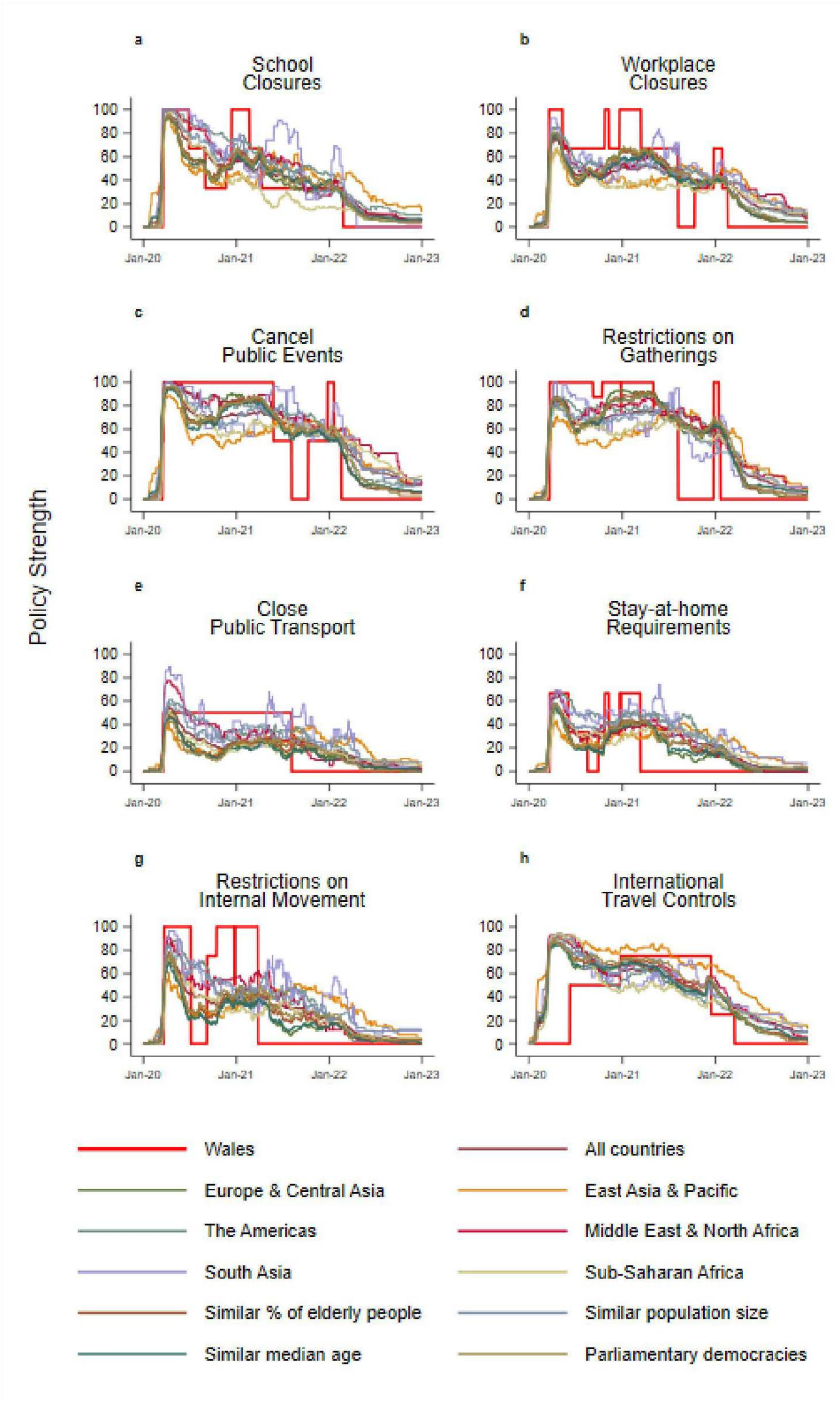


Figure A6a. Average aggregated Stringency Index and pandemic intensity over time in England and globally. The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in England, and each grey line represents the average aggregated stringency, number of cases, and number of deaths by each group of comparison countries.

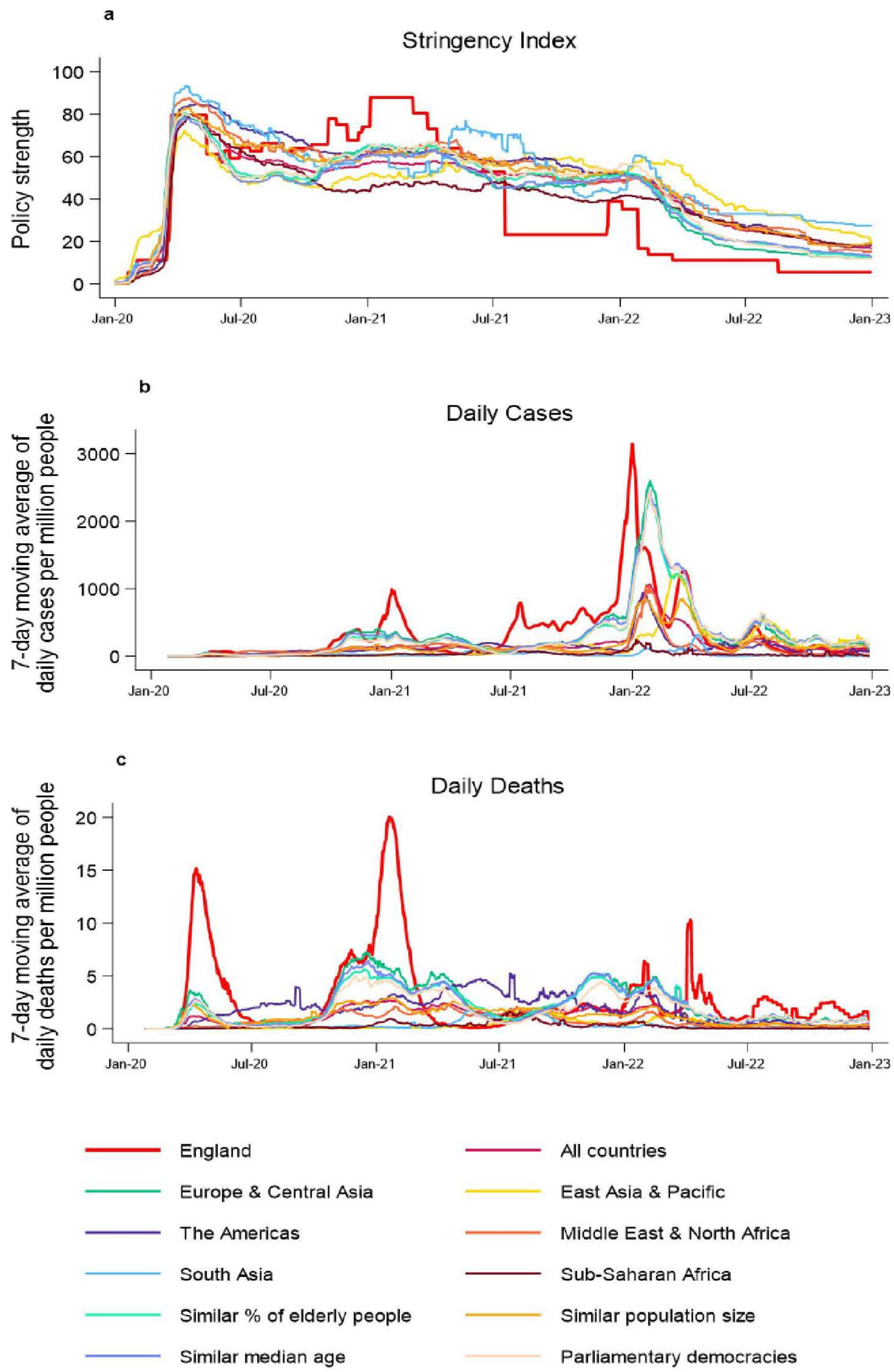


Figure A6b. Average aggregated Stringency Index and pandemic intensity over time in Northern Ireland and globally. The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in Northern Ireland, and each gray line represents the average aggregated stringency, number of cases, and number of deaths by each group of comparison countries.

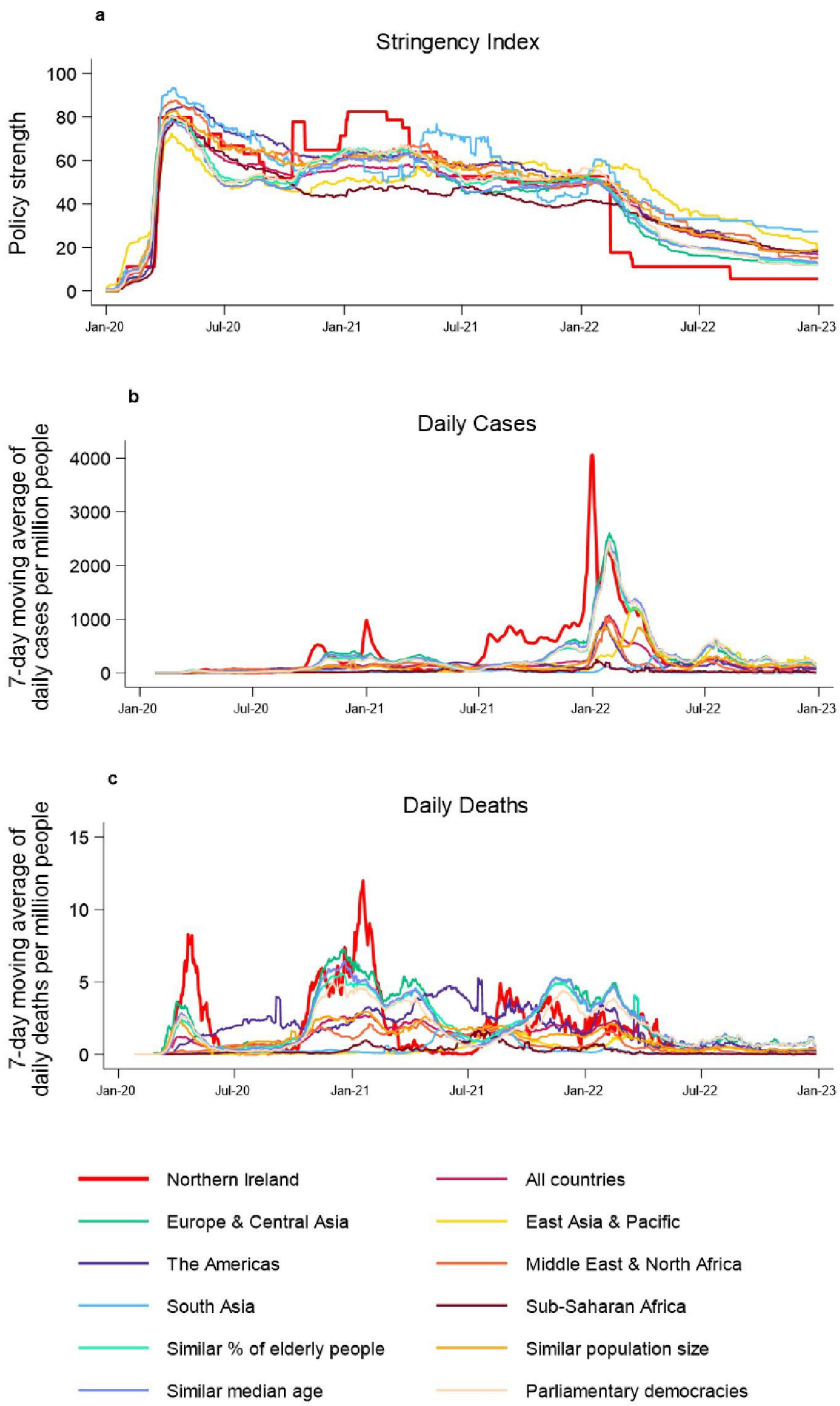


Figure A6c. Average aggregated Stringency Index and pandemic intensity over time in Scotland and globally. The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in Scotland, and each gray line represents the average aggregated stringency, number of cases, and number of deaths by each group of comparison countries.

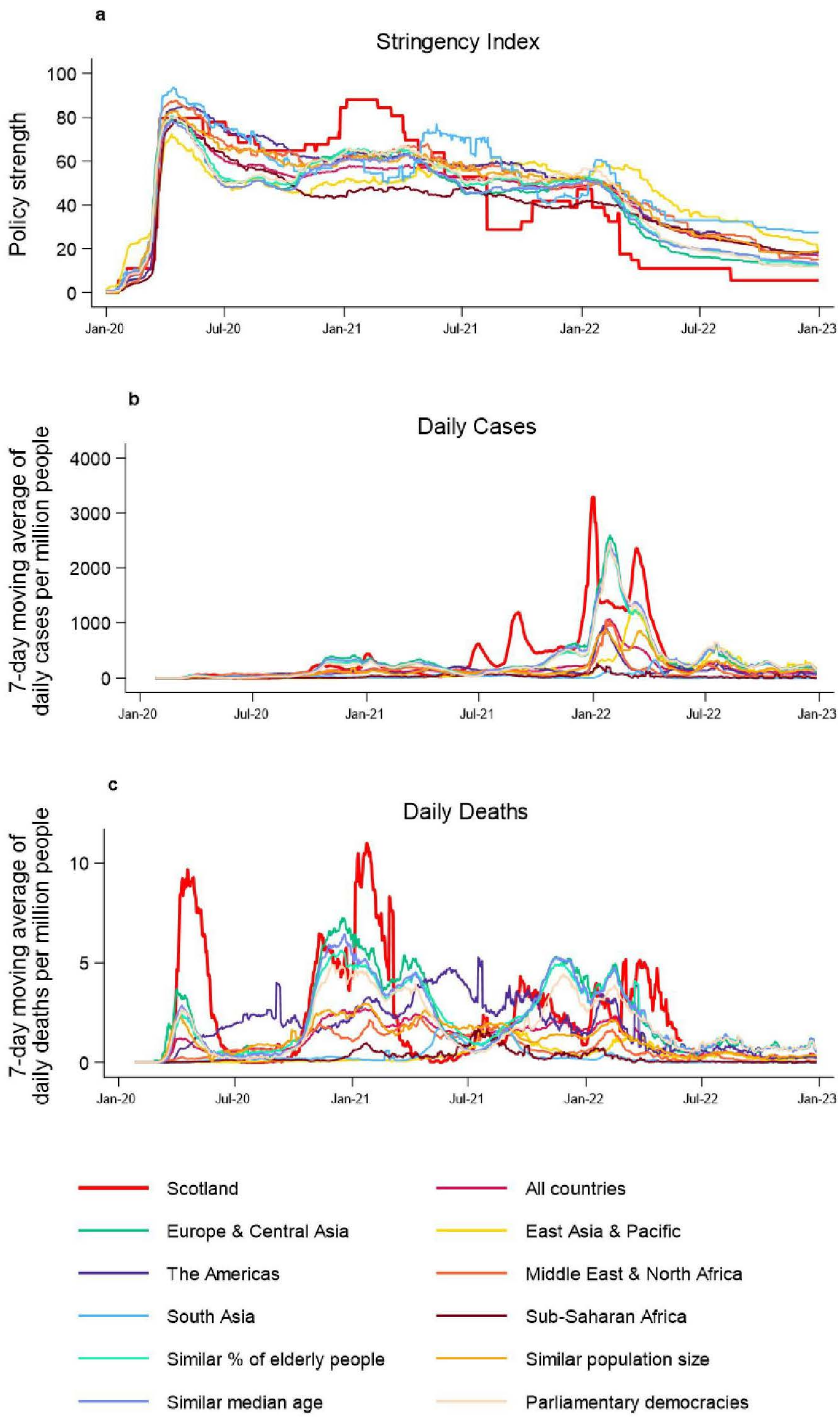
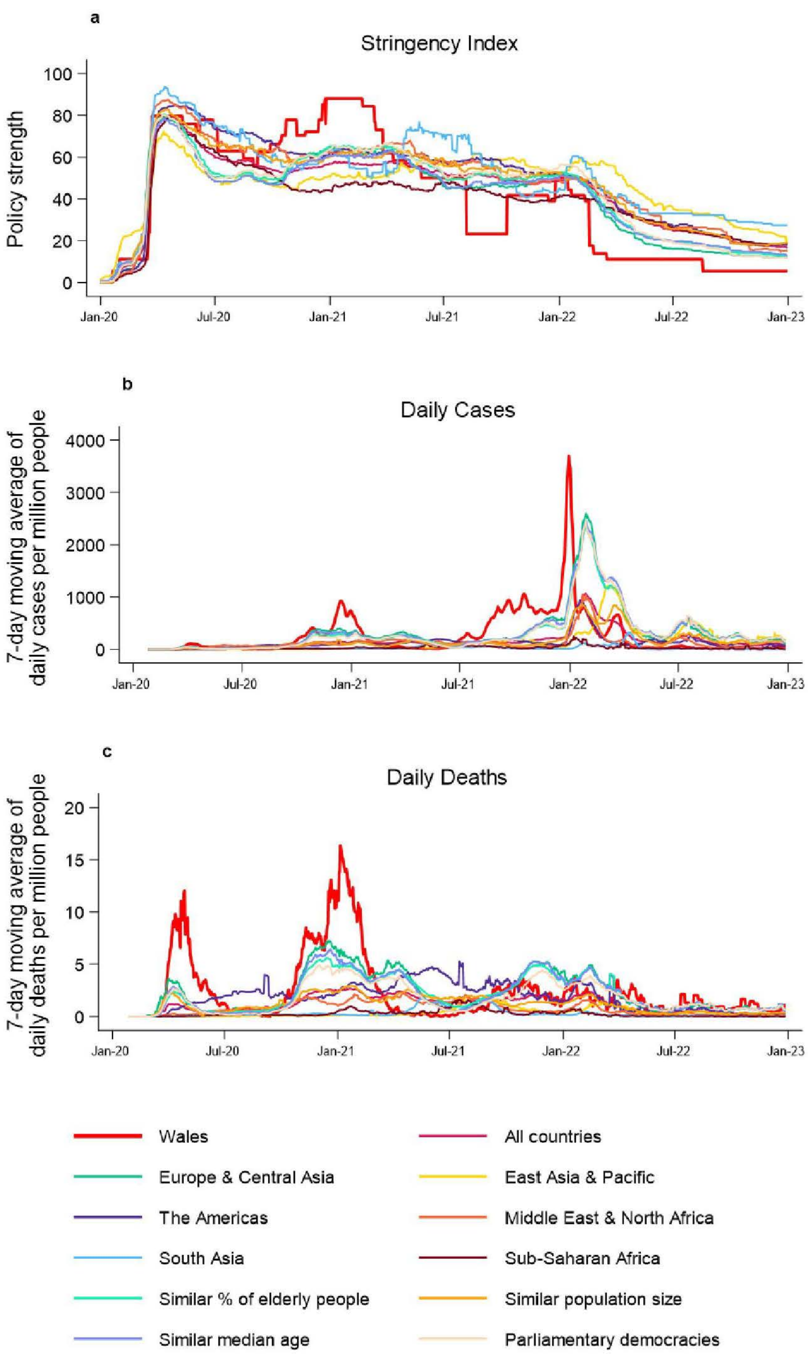


Figure A6d. Average aggregated Stringency Index and pandemic intensity over time in Wales and globally. The red line indicates how stringency (panel a), cases (panel b), and deaths (panel c) evolved in Wales, and each gray line represents the average aggregated stringency, number of cases, and number of deaths by each group of comparison countries.



A5. Comparing Northern Ireland and the Republic of Ireland

Figure A7a. Time since the 1st confirmed COVID-19 case to adopt a more stringent COVID-19 policy across containment and closure indicators and levels of stringency. This figure depicts the median number of days between the 1st confirmed COVID-19 case and the adoption of a more stringent policy by groups of countries. 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 canceling) 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.

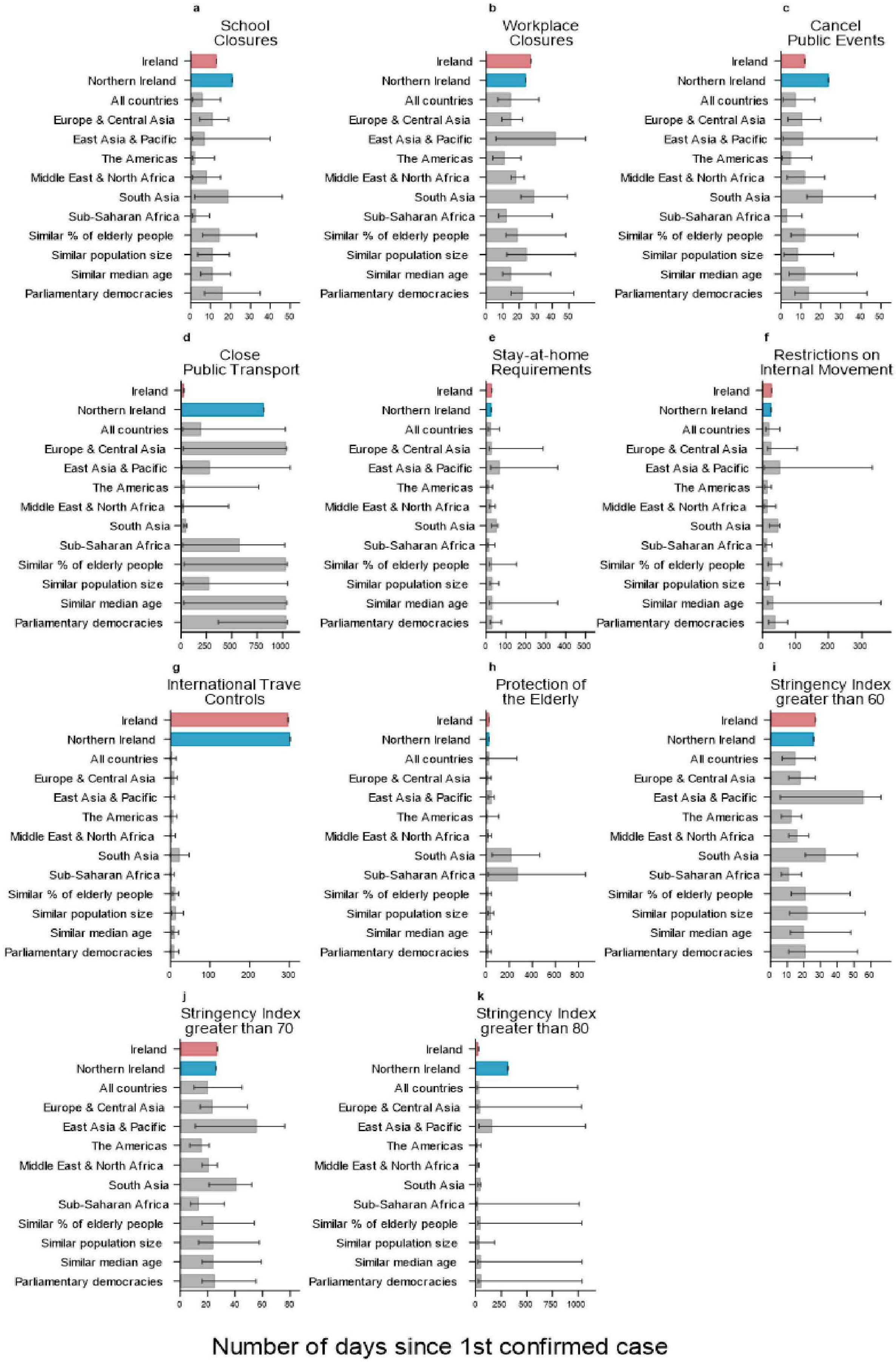
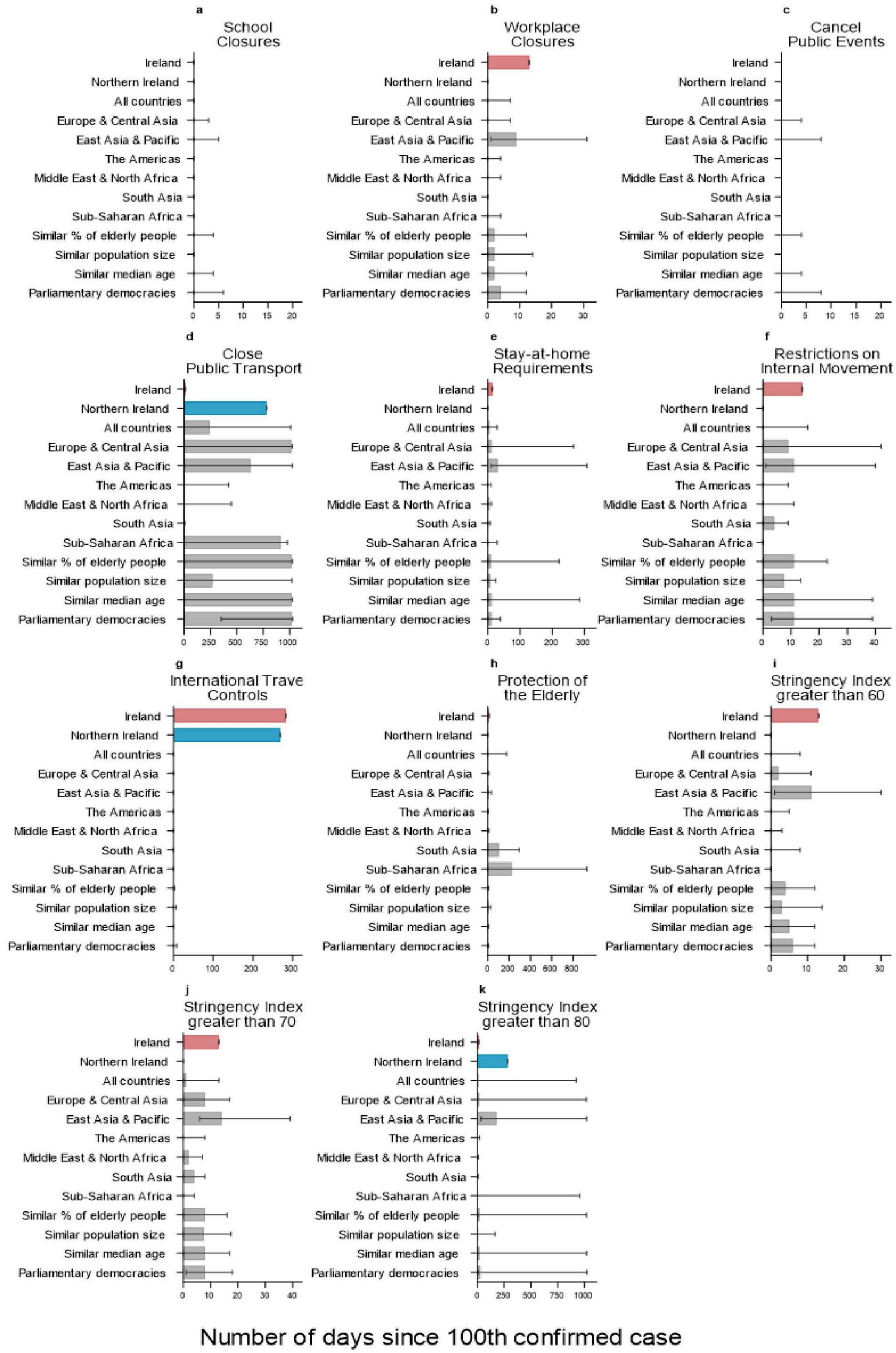

a
School Closures
b
Workplace Closures
c
Cancel Public Events
d
Close Public Transport
e
Stay-at-home Requirements
f
Restrictions on Internal Movement
g
International Trave Controls
h
Protection of the Elderly
i
Stringency Index greater than 60
j
Stringency Index greater than 70
k
Stringency Index greater than 80
Ireland
Northern Ireland
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies
Number of days since 1st confirmed case

Figure A7b. 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. This figure depicts the median number of days between the 100th confirmed COVID-19 case and the adoption of a more stringent policy by groups of countries. 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.


a
School Closures
b
Workplace Closures
c
Cancel Public Events
d
Close Public Transport
e
Stay-at-home Requirements
f
Restrictions on Internal Movement
g
International Trave Controls
h
Protection of the Elderly
i
Stringency Index greater than 60
j
Stringency Index greater than 70
k
Stringency Index greater than 80
Ireland
Northern Ireland
All countries
Europe & Central Asia
East Asia & Pacific
The Americas
Middle East & North Africa
South Asia
Sub-Saharan Africa
Similar % of elderly people
Similar population size
Similar median age
Parliamentary democracies
Number of days since 100th confirmed case

References

Adams-Prassl, A. et al. (2022) 'The impact of the coronavirus lockdown on mental health: evidence from the United States', Economic Policy, 37(109), pp. 139–155. Available at: https://doi.org/10.1093/epolic/eiac002.

Agüero, J.M. (2021) 'COVID-19 and the rise of intimate partner violence', World Development, 137, p. 105217. Available at: https://doi.org/10.1016/j.worlddev.2020.105217.

Aknin, L.B. et al. (2022) 'Policy stringency and mental health during the COVID-19 pandemic: a longitudinal analysis of data from 15 countries', The Lancet Public Health, 7(5), pp. e417–e426. Available at: https://doi.org/10.1016/S2468-2667(22)00060-3.

Akter, S. (2020) 'The impact of COVID-19 related "stay-at-home" restrictions on food prices in Europe: findings from a preliminary analysis', Food Security, 12(4), pp. 719–725. Available at: https://doi.org/10.1007/s12571-020-01082-3.

Alfano, V. and Ercolano, S. (2020) 'The Efficacy of Lockdown Against COVID-19: A Cross-Country Panel Analysis', Applied Health Economics and Health Policy, 18(4), pp. 509–517. Available at: https://doi.org/10.1007/s40258-020-00596-3.

Allel, K., Tapia-Muñoz, T. and Morris, W. (2020) 'Country-level factors associated with the early spread of COVID-19 cases at 5, 10 and 15 days since the onset', Global Public Health, 15(11), pp. 1589–1602. Available at: https://doi.org/10.1080/17441692.2020.1814835.

Altindag, O., Erten, B. and Keskin, P. (2020) 'Mental Health Costs of Lockdowns: Evidence from Age-Specific Curfews in Turkey'. Rochester, NY. Available at: https://doi.org/10.2139/ssrn.3765838.

Amuedo-Dorantes, C., Kaushal, N. and Muchow, A.N. (2021) 'Timing of social distancing policies and COVID-19 mortality: county-level evidence from the U.S.', Journal of Population Economics, 34(4), pp. 1445–1472. Available at: https://doi.org/10.1007/s00148-021-00845-2.

Arenas-Arroyo, E., Fernandez-Kranz, D. and Nollenberger, N. (2021) 'Intimate partner violence under forced cohabitation and economic stress: Evidence from the COVID-19 pandemic', Journal of Public Economics, 194, p. 104350. Available at: https://doi.org/10.1016/j.jpubeco.2020.104350.

Askitas, N., Tatsiramos, K. and Verheyden, B. (2021) 'Estimating worldwide effects of non-pharmaceutical interventions on COVID-19 incidence and population mobility patterns using a multiple-event study', Scientific Reports, 11(1), p. 1972. Available at: https://doi.org/10.1038/s41598-021-81442-x.

Azevedo, J.P. et al. (2022) 'The Unequal Impacts of COVID-19 on Student Learning', in F.M. Reimers (ed.) Primary and Secondary Education During Covid-19: Disruptions to Educational Opportunity During a Pandemic. Cham: Springer International Publishing, pp. 421–459. Available at: https://doi.org/10.1007/978-3-030-81500-4_16.

Bandyopadhyay, A. et al. (2022) 'Testing and isolation to prevent overloaded healthcare facilities and reduce death rates in the SARS-CoV-2 pandemic in Italy', Communications Medicine, 2(1), p. 75. Available at: https://doi.org/10.1038/s43856-022-00139-y.

Banholzer, N. et al. (2021) 'Estimating the effects of non-pharmaceutical interventions on the number of new infections with COVID-19 during the first epidemic wave', PLOS ONE. Edited by S. Lolli, 16(6), p. e0252827. Available at: https://doi.org/10.1371/journal.pone.0252827.

Bargain, O. and Aminjonov, U. (2020) 'Trust and compliance to public health policies in times of COVID-19', Journal of Public Economics, 192, p. 104316. Available at: https://doi.org/10.1016/j.jpubeco.2020.104316.

Besley, T. and Dray, S. (2022) 'Pandemic responsiveness: Evidence from social distancing and lockdown policy during COVID-19', PLOS ONE. Edited by S.K.S. Patel, 17(5), p. e0267611. Available at: https://doi.org/10.1371/journal.pone.0267611.

Bodas, M. and Peleg, K. (2020) 'Income assurances are a crucial factor in determining public compliance with self-isolation regulations during the COVID-19 outbreak – cohort study in Israel', Israel Journal of Health Policy Research, 9(1), p. 54. Available at: https://doi.org/10.1186/s13584-020-00418-w.

Brauner, J.M. et al. (2021) 'Inferring the effectiveness of government interventions against COVID-19', Science, 371(6531), p. eabd9338. Available at: https://doi.org/10.1126/science.abd9338.

Brodeur, A., Grigoryeva, I. and Kattan, L. (2021) 'Stay-at-home orders, social distancing, and trust', Journal of Population Economics, 34(4), pp. 1321–1354. Available at: https://doi.org/10.1007/s00148-021-00848-z.

Buffel, V. et al. (2022) 'Depressive symptoms in higher education students during the COVID-19 pandemic: the role of containment measures', European Journal of Public Health, 32(3), pp. 481–487. Available at: https://doi.org/10.1093/eurpub/ckac026.

Carlitz, R.D. and Makhura, M.N. (2021) 'Life under lockdown: Illustrating tradeoffs in South Africa's response to COVID-19', World Development, 137, p. 105168. Available at: https://doi.org/10.1016/j.worlddev.2020.105168.

Caselli, F. et al. (2022) 'Mobility Under the COVID-19 Pandemic: Asymmetric Effects Across Gender and Age', IMF Economic Review, 70(1), pp. 105–138. Available at: https://doi.org/10.1057/s41308-021-00149-1.

Cheng, C. et al. (2022) 'Capturing the COVID-19 Crisis through Public Health and Social Measures Data Science', Scientific Data, 9(1), p. 520. Available at: https://doi.org/10.1038/s41597-022-01616-8.

Chirico, I. et al. (2023) 'The impact of COVID-19 restrictions and care home strategies on residents with dementia as experienced by family carers in Italy', Aging & Mental Health, 27(3), pp. 512–520. Available at: https://doi.org/10.1080/13607863.2022.2056137.

Chu, D.K. et al. (2020) 'Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis', The Lancet, 395(10242), pp. 1973–1987. Available at: https://doi.org/10.1016/S0140-6736(20)31142-9.

Chung, E. and Yi, J. (2021) 'Pandemic Priorities: The Impact of South Korea's COVID-19 Policies on Vulnerable Populations', International Journal of Public Administration, 44(11–12), pp. 1028–1038. Available at: https://doi.org/10.1080/01900692.2021.1922440.

CMMID COVID-19 Working Group et al. (2021) 'The impact of non-pharmaceutical interventions on SARS-CoV-2 transmission across 130 countries and territories', BMC Medicine, 19(1), p. 40. Available at: https://doi.org/10.1186/s12916-020-01872-8.

Dang, H.-A.H., Malesky, E. and Nguyen, C.V. (2022) 'Inequality and support for government responses to COVID-19', PLOS ONE. Edited by S. Kumar, 17(9), p. e0272972. Available at: https://doi.org/10.1371/journal.pone.0272972.

Deiana, C. et al. (2022) 'Can relief measures nudge compliance in a public health crisis? Evidence from a kinked fiscal policy rule', Journal of Economic Behavior & Organization, 202, pp. 407–428. Available at: https://doi.org/10.1016/j.jebo.2022.08.020.

Demirgüç-Kunt, A., Lokshin, M. and Torre, I. (2021) 'The sooner, the better: The economic impact of non-pharmaceutical interventions during the early stage of the COVID-19 pandemic', Economics of Transition and Institutional Change, 29(4), pp. 551–573. Available at: https://doi.org/10.1111/ecot.12284.

Dergiades, T. et al. (2022) 'Effectiveness of government policies in response to the first COVID-19 outbreak', PLOS Global Public Health. Edited by H.H. Farooqui, 2(4), p. e0000242. Available at: https://doi.org/10.1371/journal.pgph.0000242.

Dergiades, T. et al. (2023) 'COVID-19 anti-contagion policies and economic support measures in the USA', Oxford Economic Papers, 75(3), pp. 613–630. Available at: https://doi.org/10.1093/oep/gpac031.

Dey, T. et al. (2021) 'Lag time between state-level policy interventions and change points in COVID-19 outcomes in the United States', Patterns, 2(8), p. 100306. Available at: https://doi.org/10.1016/j.patter.2021.100306.

Engzell, P., Frey, A. and Verhagen, M.D. (2021) 'Learning loss due to school closures during the COVID-19 pandemic', Proceedings of the National Academy of Sciences, 118(17), p. e2022376118. Available at: https://doi.org/10.1073/pnas.2022376118.

Etheridge, B. and Spantig, L. (2022) 'The gender gap in mental well-being at the onset of the Covid-19 pandemic: Evidence from the UK', European Economic Review, 145, p. 104114. Available at: https://doi.org/10.1016/j.euroecorev.2022.104114.

Flaxman, S. et al. (2020) 'Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe', Nature, 584(7820), pp. 257–261. Available at: https://doi.org/10.1038/s41586-020-2405-7.

Fountoulakis, K.N. et al. (2020) 'Factors determining different death rates because of the COVID-19 outbreak among countries', Journal of Public Health, 42(4), pp. 681–687. Available at: https://doi.org/10.1093/pubmed/fdaa119.

Fuller, J.A. et al. (2021) 'Mitigation Policies and COVID-19–Associated Mortality — 37 European Countries, January 23–June 30, 2020', MMWR. Morbidity and Mortality Weekly Report, 70(2), pp. 58–62. Available at: https://doi.org/10.15585/mmwr.mm7002e4.

García-Prado, A., González, P. and Rebollo-Sanz, Y.F. (2022) 'Lockdown strictness and mental health effects among older populations in Europe', Economics & Human Biology, 45, p. 101116. Available at: https://doi.org/10.1016/j.ehb.2022.101116.

Giebel, C. et al. (2021) 'Impact of COVID-19 related social support service closures on people with dementia and unpaid carers: a qualitative study', Aging & Mental Health, 25(7), pp. 1281–1288. Available at: https://doi.org/10.1080/13607863.2020.1822292.

Gostin, L.O. and Wiley, L.F. (2020) 'Governmental Public Health Powers During the COVID-19 Pandemic: Stay-at-home Orders, Business Closures, and Travel Restrictions', JAMA, 323(21), p. 2137. Available at: https://doi.org/10.1001/jama.2020.5460.

Grimes, A. (2022) 'Measuring Pandemic and Lockdown Impacts on Wellbeing', Review of Income and Wealth, 68(2), pp. 409–427. Available at: https://doi.org/10.1111/roiw.12585.

Hale, T., Angrist, N., Goldszmidt, R., et al. (2021) 'A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)', Nature Human Behaviour, 5(4), pp. 529–538. Available at: https://doi.org/10.1038/s41562-021-01079-8.

Hale, T., Angrist, N., Hale, A.J., et al. (2021) 'Government responses and COVID-19 deaths: Global evidence across multiple pandemic waves', PLOS ONE. Edited by H. Seale, 16(7), p. e0253116. Available at: https://doi.org/10.1371/journal.pone.0253116.

He, W., Yi, G.Y. and Zhu, Y. (2020) 'Estimation of the basic reproduction number, average incubation time, asymptomatic infection rate, and case fatality rate for COVID-19: Meta-analysis and sensitivity analysis', Journal of Medical Virology, 92(11), pp. 2543–2550. Available at: https://doi.org/10.1002/jmv.26041.

Ho, F.K. et al. (2020) 'Is older age associated with COVID-19 mortality in the absence of other risk factors? General population cohort study of 470,034 participants', PLOS ONE. Edited by Y.-M. Feng, 15(11), p. e0241824. Available at: https://doi.org/10.1371/journal.pone.0241824.

Hong, S.-H., Hwang, H. and Park, M.-H. (2020) 'Effect of COVID-19 Non-Pharmaceutical Interventions and the Implications for Human Rights', International Journal of Environmental Research and Public Health, 18(1), p. 217. Available at: https://doi.org/10.3390/ijerph18010217.

Hsiang, S. et al. (2020) 'The effect of large-scale anti-contagion policies on the COVID-19 pandemic', Nature, 584(7820), pp. 262–267. Available at: https://doi.org/10.1038/s41586-020-2404-8.

Ivandić, R., Kirchmaier, T. and Linton, B. (2020) Changing patterns of domestic abuse during Covid-19 lockdown. 1729. Centre for Economic Performance.

Jacobsen, G.D. and Jacobsen, K.H. (2020) 'Statewide COVID-19 Stay-at-Home Orders and Population Mobility in the United States', World Medical & Health Policy, 12(4), pp. 347–356. Available at: https://doi.org/10.1002/wmh3.350.

Jefferson, T. and Heneghan, C. (2020) Covid 19 - Epidemic 'Waves', The Centre for Evidence-Based Medicine. Available at: https://www.cebm.net/covid-19/covid-19-epidemic-waves/.

Kaur, R., Boobna, T. and Kallingal, P. (2022) 'Effect of Covid-19 lockdown on indian children with autism', Research in Developmental Disabilities, 125, p. 104230. Available at: https://doi.org/10.1016/j.ridd.2022.104230.

Khataee, H. et al. (2021) 'Effects of social distancing on the spreading of COVID-19 inferred from mobile phone data', Scientific Reports, 11(1), p. 1661. Available at: https://doi.org/10.1038/s41598-021-81308-2.

Koh, W.C., Naing, L. and Wong, J. (2020) 'Estimating the impact of physical distancing measures in containing COVID-19: an empirical analysis', International journal of infectious diseases: IJID: official publication of the International Society for Infectious Diseases, 100, pp. 42–49. Available at: https://doi.org/10.1016/j.ijid.2020.08.026.

Kondilis, E. et al. (2021) 'The impact of the COVID-19 pandemic on refugees and asylum seekers in Greece: A retrospective analysis of national surveillance data from 2020', eClinicalMedicine, 37, p. 100958. Available at: https://doi.org/10.1016/j.eclinm.2021.100958.

König, C. and Frey, A. (2022) 'The Impact of COVID-19-Related School Closures on Student Achievement—A Meta-Analysis', Educational Measurement: Issues and Practice, 41(1), pp. 16–22. Available at: https://doi.org/10.1111/emip.12495.

Kourti, A. et al. (2023) 'Domestic Violence During the COVID-19 Pandemic: A Systematic Review', Trauma, Violence, & Abuse, 24(2), pp. 719–745. Available at: https://doi.org/10.1177/15248380211038690.

Kretzschmar, M.E. et al. (2020) 'Impact of delays on effectiveness of contact tracing strategies for COVID-19: a modelling study', The Lancet Public Health, 5(8), pp. e452–e459. Available at: https://doi.org/10.1016/S2468-2667(20)30157-2.

Kubinec, R. et al. (2021) Cross-National Measures of the Intensity of COVID-19 Public Health Policies. preprint. SocArXiv. Available at: https://doi.org/10.31235/osf.io/rn9xk.

Laajaj, R. et al. (2022) 'Understanding how socioeconomic inequalities drive inequalities in COVID-19 infections', Scientific Reports, 12(1), p. 8269. Available at: https://doi.org/10.1038/s41598-022-11706-7.

Linka, K., Peirlinck, M. and Kuhl, E. (2020) 'The reproduction number of COVID-19 and its correlation with public health interventions', Computational Mechanics, 66(4), pp. 1035–1050. Available at: https://doi.org/10.1007/s00466-020-01880-8.

Luijten, M.A.J. et al. (2021) 'The impact of lockdown during the COVID-19 pandemic on mental and social health of children and adolescents', Quality of Life Research, 30(10), pp. 2795–2804. Available at: https://doi.org/10.1007/s11136-021-02861-x.

Marmot, M. and Allen, J. (2020) 'COVID-19: exposing and amplifying inequalities', J Epidemiol Community Health, 74(9), pp. 681–682. Available at: https://doi.org/10.1136/jech-2020-214720.

Martinez-Valle, A. (2021) 'Public health matters: why is Latin America struggling in addressing the pandemic?', Journal of Public Health Policy, 42(1), pp. 27–40. Available at: https://doi.org/10.1057/s41271-020-00269-4.

McCrary, J. and Sanga, S. (2021) 'The Impact of the Coronavirus Lockdown on Domestic Violence', American Law and Economics Review, 23(1), pp. 137–163. Available at: https://doi.org/10.1093/aler/ahab003.

Mendez-Brito, A., El Bcheraoui, C. and Pozo-Martin, F. (2021) 'Systematic review of empirical studies comparing the effectiveness of non-pharmaceutical interventions against COVID-19', Journal of Infection, 83(3), pp. 281–293. Available at: https://doi.org/10.1016/j.jinf.2021.06.018.

Mendez-Lopez, A. et al. (2022) 'The mental health crisis during the COVID-19 pandemic in older adults and the role of physical distancing interventions and social protection measures in 26 European countries', SSM - Population Health, 17, p. 101017. Available at: https://doi.org/10.1016/j.ssmph.2021.101017.

Mendolia, S., Stavrunova, O. and Yerokhin, O. (2021) 'Determinants of the community mobility during the COVID-19 epidemic: The role of government regulations and information', Journal of Economic Behavior & Organization, 184, pp. 199–231. Available at: https://doi.org/10.1016/j.jebo.2021.01.023.

Misra, M. et al. (2022) 'Exit strategies from lockdowns due to COVID-19: a scoping review', BMC Public Health, 22(1), p. 488. Available at: https://doi.org/10.1186/s12889-022-12845-2.

Moore, G. et al. (2022) 'Police referrals for domestic abuse before and during the first COVID-19 lockdown: An analysis of routine data from one specialist service in South Wales', Journal of Public Health, 44(2), pp. e252–e259. Available at: https://doi.org/10.1093/pubmed/fdab343.

Neece, C., McIntyre, L.L. and Fenning, R. (2020) 'Examining the impact of COVID-19 in ethnically diverse families with young children with intellectual and developmental disabilities', Journal of Intellectual Disability Research, p. jir.12769. Available at: https://doi.org/10.1111/jir.12769.

Niermann, L. and Pitterle, I. (2020) The COVID-19 crisis: what explains cross-country differences in the pandemic's short-term economic impact? 174. DESA Working Papers. Available at: https://www.un.org/en/file/121511/download?token=V1rKidlv.

Nouvellet, P. et al. (2021) 'Reduction in mobility and COVID-19 transmission', Nature Communications, 12(1), p. 1090. Available at: https://doi.org/10.1038/s41467-021-21358-2.

'OUP accepted manuscript' (2021) The World Bank Research Observer [Preprint]. Available at: https://doi.org/10.1093/wbro/lkab003.

Pan, D. et al. (2020) 'The impact of ethnicity on clinical outcomes in COVID-19: A systematic review', EClinicalMedicine, 23, p. 100404. Available at: https://doi.org/10.1016/j.eclinm.2020.100404.

Panovska-Griffiths, J. et al. (2020) 'Determining the optimal strategy for reopening schools, the impact of test and trace interventions, and the risk of occurrence of a second COVID-19 epidemic wave in the UK: a modelling study', The Lancet Child & Adolescent Health, 4(11), pp. 817–827. Available at: https://doi.org/10.1016/S2352-4642(20)30250-9.

Petherick, A. et al. (2021) 'A worldwide assessment of changes in adherence to COVID-19 protective behaviours and hypothesized pandemic fatigue', Nature Human Behaviour, 5(9), pp. 1145–1160. Available at: https://doi.org/10.1038/s41562-021-01181-x.

Piovani, D. et al. (2021) 'Effect of early application of social distancing interventions on COVID-19 mortality over the first pandemic wave: An analysis of longitudinal data from 37 countries', Journal of Infection, 82(1), pp. 133–142. Available at: https://doi.org/10.1016/j.jinf.2020.11.033.

Pozo-Martin, F. et al. (2023) 'Comparative effectiveness of contact tracing interventions in the context of the COVID-19 pandemic: a systematic review', European Journal of Epidemiology, 38(3), pp. 243–266. Available at: https://doi.org/10.1007/s10654-023-00963-z.

Prakash, N. *et al.* (2022) 'Effectiveness of social distancing interventions in containing COVID-19 incidence: International evidence using Kalman filter', *Economics & Human Biology*, 44, p. 101091. Available at: https://doi.org/10.1016/j.ehb.2021.101091.

Proto, E. and Quintana-Domeque, C. (2021) 'COVID-19 and mental health deterioration by ethnicity and gender in the UK', PLOS ONE. Edited by G.A. Picone, 16(1), p. e0244419. Available at: https://doi.org/10.1371/journal.pone.0244419.

Quintana-Domeque, C. and Proto, E. (2022) 'On the Persistence of Mental Health Deterioration during the COVID-19 Pandemic by Sex and Ethnicity in the UK: Evidence from Understanding Society', The B.E. Journal of Economic Analysis & Policy, 22(2), pp. 361–372. Available at: https://doi.org/10.1515/bejeap-2021-0394.

Ratto, M.C. et al. (2021) 'The effectiveness of government measures during the first wave of the outbreak', Social Science Quarterly, 102(5), pp. 2088–2105. Available at: https://doi.org/10.1111/ssqu.13043.

Recch, F. et al. (2023) 'Education data needs and challenges for building back from COVID-19', Epidemics, 43, p. 100673. Available at: https://doi.org/10.1016/j.epidem.2023.100673.

Reme, B.-A., Wörn, J. and Skirbekk, V. (2022) 'Longitudinal evidence on the development of socioeconomic inequalities in mental health due to the COVID-19 pandemic in Norway', Scientific Reports, 12(1), p. 3837. Available at: https://doi.org/10.1038/s41598-022-06616-7.

Santomauro, D.F. et al. (2021) 'Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic', The Lancet, 398(10312), pp. 1700–1712. Available at: https://doi.org/10.1016/S0140-6736(21)02143-7.

Serrano-Alarcón, M. et al. (2022) 'Impact of COVID-19 lockdowns on mental health: Evidence from a quasi-natural experiment in England and Scotland', Health Economics, 31(2), pp. 284–296. Available at: https://doi.org/10.1002/hec.4453.

Shin, S.H., Ji, H. and Lim, H. (2021) 'Heterogeneity in preventive behaviors during COVID-19: Health risk, economic insecurity, and slanted information', Social Science & Medicine, 278, p. 113944. Available at: https://doi.org/10.1016/j.socscimed.2021.113944.

Shoshani, A. and Kor, A. (2022) 'The mental health effects of the COVID-19 pandemic on children and adolescents: Risk and protective factors.', Psychological Trauma: Theory, Research, Practice, and Policy, 14(8), pp. 1365–1373. Available at: https://doi.org/10.1037/tra0001188.

Smyth, B. (2022) 'The fading impact of lockdowns: A data analysis of the effectiveness of Covid-19 travel restrictions during different pandemic phases', PLOS ONE. Edited by S. Wang, 17(6), p. e0269774. Available at: https://doi.org/10.1371/journal.pone.0269774.

Spiliopoulos, L. (2022) 'On the effectiveness of COVID-19 restrictions and lockdowns: Pan metron ariston', BMC Public Health, 22(1), p. 1842. Available at: https://doi.org/10.1186/s12889-022-14177-7.

Steinbrook, R. (2020) 'Contact Tracing, Testing, and Control of COVID-19—Learning From Taiwan', JAMA Internal Medicine, 180(9), p. 1163. Available at: https://doi.org/10.1001/jamainternmed.2020.2072.

Viner, R.M. et al. (2020) ‘School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review’, The Lancet Child & Adolescent Health, 4(5), pp. 397–404. Available at: https://doi.org/10.1016/S2352-4642(20)30095-X.

Wang, C.J., Ng, C.Y. and Brook, R.H. (2020) ‘Response to COVID-19 in Taiwan: Big Data Analytics, New Technology, and Proactive Testing’, JAMA, 323(14), p. 1341. Available at: https://doi.org/10.1001/jama.2020.3151.

Wood, R. et al. (2022) ‘Resisting Lockdown: The Influence of COVID-19 Restrictions on Social Unrest’, International Studies Quarterly, 66(2), p. sqac015. Available at: https://doi.org/10.1093/isq/sqac015.

Wright, A.L. et al. (2020) ‘Poverty and economic dislocation reduce compliance with COVID-19 shelter-in-place protocols’, Journal of Economic Behavior & Organization, 180, pp. 544–554. Available at: https://doi.org/10.1016/j.jebo.2020.10.008.

Yalaman, A. et al. (2021) ‘Cross-country evidence on the association between contact tracing and COVID-19 case fatality rates’, Scientific Reports, 11(1), p. 2145. Available at: https://doi.org/10.1038/s41598-020-78760-x.

Yang, B. et al. (2021) ‘Effect of specific non-pharmaceutical intervention policies on SARS-CoV-2 transmission in the counties of the United States’, Nature Communications, 12(1), p. 3560. Available at: https://doi.org/10.1038/s41467-021-23865-8.

Zhang, H. et al. (2022) ‘Empirical Study of Monthly Economic Losses Assessments for “Standard Unit Lockdown” Due to COVID-19’, Frontiers in Public Health, 10, p. 859751. Available at: https://doi.org/10.3389/fpubh.2022.859751.

Zhang, S.X. et al. (2021) ‘A Second Wave? What Do People Mean by COVID Waves? – A Working Definition of Epidemic Waves’, Risk Management and Healthcare Policy, Volume 14, pp. 3775–3782. Available at: https://doi.org/10.2147/RMHP.S326051.

Bau, N. *et al.* (2022) ‘Women’s well-being during a pandemic and its containment’, *Journal of Development Economics*, 156, p. 102839. Available at: https://doi.org/10.1016/j.jdeveco.2022.102839.

Hale, T. *et al.* (2022) ‘Variation in Government Responses to COVID-19” Version 14.1.’, *Blavatnik School of Government Working Paper*, BSG-WP-2020/032. Available at: https://www.bsg.ox.ac.uk/sites/default/files/2022-08/BSG-WP-2020-032-v14.1.pdf.

Lewis, D. (2022) ‘What scientists have learnt from COVID lockdowns’, *Nature*, 609(7926), pp. 236–239. Available at: https://doi.org/10.1038/d41586-022-02823-4.

Mukumbang, F.C., Ambe, A.N. and Adebiyi, B.O. (2020) ‘Unspoken inequality: how COVID-19 has exacerbated existing vulnerabilities of asylum-seekers, refugees, and undocumented migrants in South Africa', *International Journal for Equity in Health*, 19(1), p. 141. Available at: https://doi.org/10.1186/s12939-020-01259-4.

Palomino, J.C., Rodríguez, J.G. and Sebastian, R. (2020) 'Wage inequality and poverty effects of lockdown and social distancing in Europe', *European Economic Review*, 129, p. 103564. Available at: https://doi.org/10.1016/j.euroecorev.2020.103564.

Savulescu, J. and Cameron, J. (2020) 'Why lockdown of the elderly is not ageist and why levelling down equality is wrong', *Journal of Medical Ethics*, 46(11), pp. 717–721. Available at: https://doi.org/10.1136/medethics-2020-106336.

Sharma, M. *et al.* (2021) 'Understanding the effectiveness of government interventions against the resurgence of COVID-19 in Europe', *Nature Communications*, 12(1), p. 5820. Available at: https://doi.org/10.1038/s41467-021-26013-4.

Viero, A. *et al.* (2021) 'Violence against women in the Covid-19 pandemic: A review of the literature and a call for shared strategies to tackle health and social emergencies', *Forensic Science International*, 319, p. 110650. Available at: https://doi.org/10.1016/j.forsciint.2020.110650.