REVIEW ARTICLE

How can governments generate compliance in times of crisis? A review of the COVID-19 pandemic

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Abstract

The COVID-19 pandemic was, and continues to be, extraordinary in many ways, forcing governments around the world to implement equally extraordinary preventive measures, some of which were highly restrictive. However, such preventive measures were not sufficient per se to contain the spread of the virus through non-pharmaceutical (e.g., stay-at-home orders, recommendations about face-mask usage) or even pharmaceutical (i.e., a vaccine) interventions: to be effective, citizens had to comply with the guidelines implemented by the state. Social scientists, in particular behavioralists, have thus been playing a prominent role in the management of the pandemic. How have the governments around the world generated compliance with COVID-19 preventive measures? In this article, I first review who was more prompted to comply with preventive measures. I then move to presenting the commonly used explanations to make sense of levels of compliance. These explanations revolve around human predispositions, (political) attitudes, partisanship, ideology, cues, and institutional factors. I conclude by highlighting the role of social sciences in providing the best data and analyses on the relationship between citizens and the state in times of crisis, for the COVID-19 pandemic and beyond.

Keywords COVID-19 · Preventive measures · Compliance · Political behaviour · Public opinion · Comparative politics

The first wave of the COVID-19 pandemic was an extraordinary time of crisis that called for an equally extraordinary response from governments around the world. In this context, the relationship between citizens and the state became redefined, as governments abruptly implemented special measures, which required citizens' immediate attention. Indeed, most governments around the world implemented exceptional preventive measures to reduce the spread of this highly contagious and

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deadly virus. Many behaviours were prohibited (e.g., the opening of non-essential shops) or restricted (e.g., non-essential travels), while some public health preventive measures were encouraged (e.g., regular handwashing). In most cases, the goal of these non-pharmaceutical interventions was to "flatten the curve" (of the number of cases and thus hospitalizations) and prevent an overload of the health care systems.[1]

The stakes of the governments' interventions were of remarkable importance as the outcomes were a matter of saving or losing a massive number of lives.[2] However, these interventions were not sufficient per se to contain the spread of the virus through non-pharmaceutical interventions (e.g., stay-at-home orders, recommendations about face-mask usage) or even a pharmaceutical tool (i.e., a vaccine): To be effective, citizens had to comply with the—often costly and, at times, highly restrictive—preventive measures implemented by the state. Social scientists, in particular behavioralists, have thus been playing a prominent role in the management of the pandemic (Van Bavel et al. 2020).

How have the governments around the world generated compliance with COVID-19 preventive measures? Do we know who and why some complied while others did not? In this article, I first detail *who* complied with preventive measures, focusing on the sociodemographic profiles of compliers and non-compliers. I then move to prevailing explanations that seek to make sense of citizens' levels of compliance. Why did some citizens comply while others did not? These explanations revolve around human predispositions (e.g., personality traits, risk aversions, conspiracy mentality), (political) attitudes, like institutional trust, partisanship, ideology, and cues, as well as institutional factors (e.g., decentralization). I conclude by highlighting the role of social sciences in providing the best data and analyses on the relationship between citizens and the state in times of crisis, for the COVID-19 pandemic and beyond.

Who complied?

A thorough description is necessary (even if not sufficient in itself) to provide a good explanation. Hence, before getting into potential explanations of citizens' compliance with COVID-19 preventive measures, I first begin by reviewing what we know about who complied. When asking "*who* complied," the 'who' refers to sociodemographic characteristics of compliers and non-compliers. Moreover, I pool all sorts of COVID-19 preventive measures instead of focusing, for example, on a single measure (e.g., the vaccination). The dependent variables studied usually refer to compliance with social and physical distancing, vaccine behaviour, stay-at-home orders, face-mask usages, etc. Different measures are used including self-reported measures

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[1] There was much more variation in the strategies' objectives in the subsequent waves, from a strict "COVID-zero" strategy to a "learning to live with COVID" approach.

[2] For example, the number of infected citizens in the United States would have been much larger without stay-at-home orders, and the mandatory face mask policy itself saved between 19,000 and 47,000 lives (Chernozhukov et al. 2021).

from survey data, as well as data tapping citizens' mobility (used as a proxy for physical and social distancing).

Age

The literature has mostly focused on age and sex. While social scientists intuitively include sociodemographic factors to predict many outcomes of interest, they had a very strong argument to do so for the COVID-19 preventive measures. That is, age was the single most important factor dramatically increasing someone's likelihood of dying from a COVID-19 infection, especially if one reached 65 years and older (Jordan et al. 2020; Zhou et al. 2020). Given the uneven risk distributions among the population (I come back to risk perceptions as a key mechanism in the next section), it is reasonable to expect older people to comply to a greater extent with governments' measures. Moreover, a good deal of the targeted communication from governments and health agencies revolved around elderly people to make sure that they were aware of the exceptional new rules. During the first wave, the strategy was aimed at minimizing the number of deaths, but the focus on elderly people was still in the air in the subsequent waves when youth were encouraged to get their COVID-19 vaccines not only for themselves, but also to protect the elderlies.[3]

The first studies on compliance found a great deal of evidence suggesting that age was related to higher levels of compliance with preventive measures. Brouard et al. (2020), Solomou and Constantinidou (2020), and Engle et al. (2020), focusing respectively on France, Greece, and the United States, all showed that age was associated with higher levels of compliance. However, most research, even more recent ones (Gerber et al. 2021), assumed a linear relationship between age and compliance, or dichotomized age at an arbitrary cut-off, which is very puzzling from a theoretical perspective. Indeed, the risks of heavily suffering from COVID are not evenly distributed and non-linear: as mentioned above, they rapidly increase after the age of 65. If the mechanism is risk perception, then we should not expect a linear relationship. Moreover, elderly people, especially those who suffer from loneliness, might strive for social connectedness (e.g., have a coffee in the local restaurant, etc.) and thereby risk COVID-19 exposure, by not complying with the guidelines. Daoust (2020) tested this potential non-linear relationship in an exploratory fashion and provided the first comparative study (27 countries/territories) focusing on age and compliance with preventive measures. The key contribution was showing that things are more complex, and that there is some evidence of non-linear relationships. In particular, citizens' compliance seems to plateau at around 60 years old. Lin et al. (2021) confirmed this pattern using an even more impressive dataset of 66 countries/territories with more variance in contextual features.

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[3] It is worth noting that, as older citizens' vulnerability was part of the discourse supporting the legitimacy of the restrictive preventive measures, ageism and intergenerational conflicts emerged (Sutter et al. 2022).

Sex

The literature on sex and compliance with COVID-19 preventive measures is quite consensual. That is, there is clear evidence that women display higher levels of compliance with COVID-19 preventive measures. First, early studies by Brouard et al. (2020), Solomou and Constantinidou (2020) suggested that women's levels of compliance was higher, although they were confined to a few case studies. Second, Galasso et al. (2020) showed with panel data from eight OECD countries that the gender gap remained important. Third, Lin et al. (2021) showed that the differences held in a variety of context. More specifically, the authors showed a sex gap in countries with low, medium and high score on the Human Development Index.

Although the evidence systematically suggests that women comply to a greater extent than men with COVID-19 preventive measures, there is a major methodological concern about the validity of this conclusion. There might be a social desirability bias at play with a greater effect on women. To put it simply: Regardless of their actual behaviour, do we find that women are more compliant merely because they are more prompted to say so when responding to a survey? This is a serious issue for research on citizens' behaviour toward COVID-19. While there is evidence of a social desirability bias in such questions, research using a vignette or a list experiment design suggests that the bias does not differ across age, sex, and education (Daoust et al. 2020, 2021; Galasso et al. 2020). Overall, we can be quite confident with the key conclusion that women comply with preventive measures to a greater extent than men. This finding may explain why more men died from COVID-19, which again, highlights the role of social sciences in managing the pandemic, as generating compliance from men seems to be key to minimizing the burdens of the pandemic.

Other sociodemographic factors

Age and sex were not the only sociodemographic variables examined, but due to space limitation, I will focus on just two additional factors before moving to the explanations of citizens' compliance. First, education has been included in several studies, but the relationship seems unclear. For example, Abeya et al. (2021) found a positive association between education and compliance with COVID-19 preventive measures in Ethiopia, while Brouard et al. (2020) do not find any of such pattern in France. Among students, a great deal of variance has been found regarding their levels of compliance (Rabacal et al. 2022). Second, parenthood has also been studied a great deal (Avery and Park 2021), especially once the vaccines became accessible to children (Khatatbeh et al. 2022). Indeed, parents' hesitancy to vaccinate their children has been framed as crucial, especially to keep schools open as much as possible. Borau et al.'s (2022) findings suggest that the effect of parenthood might be at least partially explained by one's marital status.

However, it seems plausible to consider these factors as being confounded with religion and religiosity, which was not taken into account in the study.

Overall, we know quite a lot about who complies. Older people followed to a greater extent the new measures implemented by governments, although this relationship plateau around 60 years old. Women are more likely to comply with preventive measures, and this relationship does not seem to be driven by a social desirability bias. The association between education and compliance with COVID-19 preventive measures is, however, less clear. Other sociodemographic variables such as parenthood could be important factors to consider when examining who complies, but more research on these variables needs to be done.

To comply or not to comply? Understanding citizens' behaviour

In this section, I review some of the key factors that have been linked to citizens' compliance with COVID-19 preventive measures and that enhance our understanding of the underlying reasons behind (non)-compliance. Given the stakes at play and the importance to understanding citizens' response to the implementation of COVID-19 preventive measures, the literature has grown rapidly (Raynaud et al. 2021; Yu et al. 2020). It is a very challenging task to make sense of the vast amount of research; choosing which studies to include is equally challenging.[4] Below, I focus on factors related to human predispositions and political attitudes, partisanship and polarization, institutional factors, and the role of cues from politicians and public health experts.

Predispositions and attitudes

Although predispositions are mobilized quite a lot in political science, researchers in psychology clearly dominate this strand of research for which, among others, personality and traits are key. Miguel et al. (2021) studied many antisocial traits and showed that they play a substantial role in explaining citizens' compliance with preventive measures in Brazil, where empathy was linked to higher levels of compliance. This pattern seems robust and has been shown to hold true in other countries, like Germany (Christner et al. 2020), Switzerland (Petrocchi et al. 2021) and the United States (Heffner et al. 2021).

Risk aversion also figures among the prominent, deeply rooted, predispositions that have been studied. A general measure of worriness about the consequences of the pandemic has been shown to positively predict citizens' compliance in eight countries (Jørgensen et al. 2021). However, unlike many other studies, this general measure does not differentiate between the health risks and economic risks. For example, Gerber et al. (2021) did so. The authors showed that in Chile, both economic and health risks were important factors in explaining citizens' compliance

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[4] For a different but relevant review of the field, see Ruggeri et al. (2022), who survey the claims (some focusing on citizens' compliance) made by social scientists during the early stages of the pandemic.

with preventive measures, as higher perceived risks were associated with higher levels of compliance. In a study including 24 countries, Nisa et al. (2021) estimated the effect of both economic and health risk. The authors showed that they both matter, that is, greater (perceived) risks were associated with higher levels of compliance, but the impact of economic risks (i.e., the perceived likelihood to suffer economic consequences due to the coronavirus) had greater weight in citizens' decision compared to the impact of health risks.

Conspiracy mentality was also identified as being key, and is intimately linked to the literature on misinformation, disinformation, and propaganda.[5] This factor is so important that the World Health Organization warned the world about the fight against an "infodemic" that accompanied the COVID-19 pandemic. False beliefs can have a spiral effect on citizens' behaviour, as they may affect other factors shaping citizens' willingness to comply with public health preventive measures.[6] Without much surprise, Marinthe et al. (2020) showed that conspiracy mentality was linked to non-compliance with preventive measures in France. The same pattern emerged in Poland and Finland, as shown by Oleksy et al. (2021) and Soveri et al. (2021) who uncovered a positive relationship between believing in conspiracy theories and citizens' compliance. This relationship has been replicated in many places around the world. More work needs to be done on how we can attenuate the impact of false beliefs and conspiracy mentality. Fact-checkers do not seem to be a promising venue in the long run as their beneficial effects appear to be short lived (Carey et al. 2022).

Different types of trust play a significant role in the state-citizens relationship. In fact, high levels of trust from citizens have been seen as a very important condition for the state to implement restrictive policies (Van Bavel et al. 2020: 466). Devine et al. (2021) provided an early review of the work on trust and, among other things, citizens' compliance with COVID-19 preventive measures. The authors suggest that institutional trust is positively linked to compliance, although this may be conditional on trust in the actors delivering the orders. Subsequent research has provided mixed findings overall. Some case studies have displayed a positive relationship, such as Yuan et al. (2022), Bargain and Aminjonov (2020) and Min et al. (2020), who focused on the United States and China respectively. Others, such as Jørgensen et al.'s (2021) comparative framework, which includes eight different countries, found very limited evidence of a positive effect of both interpersonal and institutional trust. On the bright side, however, interpersonal trust seems to attenuate the effects of a pandemic fatigue (leading itself to less compliance over time due to feelings of exhaustion) that many countries are experiencing (Petherick et al. 2021).

Very few studies indicate to what extent different types of trust correlate with each other (e.g., social trust and trust in science), but some studies find heterogenous effects, which suggests that they tap different things. For example, trust in science seems to be a more powerful type of trust when it comes to explaining compliance

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[5] I treat conspiracy mentality as a general predisposition, but it is sometimes understood as more specific political attitude.

[6] These factors include several types of trust and perceptions of government transparency (Lavigne et al. 2022; Pavela Banai et al. 2022).

with COVID-19 preventive measures, especially when compared to trust in the government (Bicchieri et al. 2021; Merkley and Loewen 2021). That said, Devine et al. (2023: Fig. 4) provided a meta-analysis of the impact of trust on several outcomes including compliance with COVID-19 preventive measures, and the association between different types of trust and compliance was fairly homogenous.

National identity, also conceived as deeply rooted and stable among citizens, has been shown to be linked to citizens' compliance with COVID-19 preventive measures. In a massive collaborative effort, Van Bavel et al. (2022) gathered impressive datasets, which included 67 countries/territories and identified a positive association between national identity and citizens' compliance. Yet, the mechanisms put forward, including their discussion on the role of ideology, are far from convincing. The idea that "national identity plays an important role in motivating civic involvement" (Van Bavel et al. 2022: 2) comes from Huddy and Khatib (2007: 65), who highlight that "highly identified group members are most likely to conform to ideal or prescriptive norms." Hence, people with higher scores on a given measure of national identity may simply be more prompted to adhere to several views regarding civic duties. And indeed, believing that it is a civic duty to follow the public health preventive measures enacted by the government is a strong predictor of compliance (Bourgeois et al. 2020; Murphy et al. 2020)—just like citizens' sense of civic duty to vote in elections neatly explains their decision to participation in elections Blais and Daoust (2020).

Partisanship and ideology

As for a very large proportion of the literature in political science, partisanship is an important consideration in the literature on compliance with COVID-19 preventive measures. Unsurprisingly, however, this factor is quite US-centric. Focusing on the US, which is characterized by a bipartisan party system, Roberts and Utych (2021), Goldstein and Wiedemann (2022), Grossman et al. (2020), and Baxter-King et al. (2022) have found that several public health preventive measures were more effective (or more followed) in Democratic-leaning counties compared to Republican-leaning ones. Painter and Qiu (2021) showed that this main conclusion is very robust. The partisan divide in the US seems to stand out compared to other countries. Even countries that share similar cultural features, such as being an Anglo-Saxon democracy, do not seem to be similar to the US when it comes to the role of partisanship. In Canada, Merkely et al. (2020) found very little differences in citizens' compliance with preventive measures across partisan divides. In the United Kingdom, Anderson and Hobolt (2022) also observed very little differences among partisan lines. Moving beyond English-speaking democracies, Anderson (2022) found relatively limited partisan effects in France. That is, feeling close to the party of the president (i.e., Macron) did predict higher levels of compliance with preventive measures, but only before his address to the nation in March 2020. The speech of the president was widely seen, especially given that news consumption was very high in France (Neihouser et al. 2022). A plausible interpretation put forward by Anderson is that the speech provided a strong crisis signal to citizens by the highest

level of political authority (i.e., the President) and raised the emergency alarmed, eliminating partisan divides in compliance. Anderson (2022: 18) speculates that this effect might be less likely to be found in more polarized contexts (citing the US as an example).

Research on ideology focused on the political left–right continuum. As for partisanship, an extensive number of studies focuses on the United States. The big picture is that, in the US, citizens leaning to the right of the political spectrum are less likely to comply with COVID-19 preventive measures (Becher et al. 2021; Brosowsky et al. 2021; Stroebe et al. 2021; Van Fossen et al. 2022). This pattern replicates elsewhere, but not systematically, and the magnitude of the effect of ideology seems to be less important. For example, Becher et al. (2021) studied nine OECD countries and found a great deal of heterogeneity in the effect of ideology. This conclusion is consistent with Stroebe et al. (2021) who also find that the connection between ideology and compliance with preventive measures is stronger in the US. In France, Anderson (2022) included ideological extremism (both left and right) in his study and showed that it did not seem to influence citizens' behaviour. These findings are consistent with Becher et al. (2021: Fig. 2), who demonstrate a flat relationship between ideology and compliance with preventive measure in France. In Brazil, a highly polarized case, right-wing citizens are said to be less prompted to comply, but the evidence presented is rather weak and often confused concepts like partisanship and political (i.e., presidential) support (Farias and Pilati 2021: Fig. 4; Farias and Pilati 2022: Table 2). Overall, there seems to be a general association between ideology and citizens' compliance with COVID-19 preventive measures, but the evidence is not yet solid and seems to vary across contexts.

The role of cues

Another strand of research, for which scholars of communication were key, focused on the role of cues. This work often combined theoretical frameworks related to priming and framing effects, but I focus on the evidence related to the impact of source cues and especially whether the convenor of a message (i.e., *who* provides the message?) plays a role in citizens' response to governments' guidelines. Survey experiments randomizing the person or the organization delivering the message were, for very good reasons, the main research design used. In particular, whether this person is associated with one's political party or ideology has been the focus of much research. Pink et al. (2021) provided concerning findings: When receiving a cue by an in-group member of the elite (i.e., President Trump), Republicans were more willing to get the vaccine, but there was a backlash effect when they were exposed to a cue from a Democrat. This, of course, is insightful to make sense of the partisan divide in US citizens' compliance with COVID-19 preventive measures. Most importantly, Pink et al.'s (2021) findings are concerning in the sense that Democrat elites encouraging citizens to get vaccinated may be counterproductive in their endeavours (given the backlash effect among Republicans). Does this mean that co-partisan messaging is not worth it? On the one hand, Sylvester et al. (2022) found that the effectiveness of co-partisan messaging was limited and only

beneficial to "middle-of-the-road" partisans, which is a bit strange, as it suggests a non-linear effect across one's intensity of partisanship. On the other hand, Flores et al. (2022) suggest that public policies enacted by a bipartisan coalition (and non-partisans) would benefit from greater support (compared to partisan policies) across seven countries, including the US. That said, the authors do not measure compliance with preventive measures but rather attitudes toward public health policies.

Given the politicization of the pandemic and citizens' response to COVID-19 preventive measures, the possibility that non-partisan public health experts might play a crucial role has also been examined. One of the most fascinating studies was conducted by Kuipers et al. (2021), who compared political figures to religious authorities in Malaysia. In a preregistered study, they examined how source cues affect citizens' intentions to self-quarantine instead of going to public, communal prayer sessions. They concluded that religiously-affiliated authorities were not more effective than politicians (e.g., minister, president), with the exception of Muslim populations, who are supportive of the sitting president and for whom the cue was more effective.

In the US, Case et al. (2022) found that experts (e.g., physicians) did not benefit from greater leverage in moving citizens' attitudes toward self-quarantine compared to an ordinary citizen. Moreover, Juen et al. (2021) conducted a survey experiment in Germany and concluded that a cue from an expert increased support for vaccinations, but that this impact was not greater than an in-party cue. In the UK, the effectiveness of cues from a (conservative) minister and public health experts were equally effective, although the effect was somewhat greater among conservative partisans (Anderson and Hobolt 2022: Fig. 6). Finally, Anderson (2022) compared citizens surveyed before and after being exposed to an important cue in France, that is, president Macron's speech aired during television prime time. Citizens' mobility (based on Google Mobility data measuring citizens' geographical movements and visits to some locations like grocery stores, train stations, etc.) seems to have shapely decreased after the speech.

Institutional factors

Thinking about institutional factors, the level of decentralization of a country seems intuitively key to understanding citizens' levels of compliance with COVID-19 preventive measures. Anecdotally, my travels from Edinburgh (Scotland, UK) to Montréal (Québec, Canada) in March 2020, neatly highlighted the COVID-19 multilevel politics at play. The frontiers and airports are managed by the federal government, yet, upon landing in Québec, the provincial (i.e., state) government of Québec was the one providing the most important guidelines. Moreover, the local government (of the City of Montréal) got involved, as it was dissatisfied with the management of the Montréal international airport by the federal government, even going as far as sending civil servants to the airports to provide information to travelers coming home. Clearly, there is a risk that citizens will be more confused if they have to follow several levels of governments instead of a single authority.

This risk begs to question: How do federal political institutions shape (multi-level) governments' capacity to generate compliance? Greer et al. (2022) studied Germany, Spain, and the US, concluding that the coordination of institutions allows for more effective alignment between different levels of governments (e.g., federal and state governments), which can affect citizens' responses to the crisis (see also Hegele and Schnabel 2021). They particularly contrast Germany to Spain, arguing that the coordinating institutions were more successful in the former country. In the US, party polarization seems to have been a key factor affecting its federalism's capacity (Kincaid and Leckrone 2020), although it is not the only country for which federal structures were identified as a burden. India has been qualified as a "dysfunctional federation", as highlighted by mobility data suggesting that the countrywide lockdown was a limited success due to high levels of regional variation in the extent that it was followed (Choutagunta et al. 2021). In contrast, political systems, like Australia and Canada (on top of Germany mentioned above), have been described as successful federations (i.e., well-coordinated) during the initial stage of the pandemic (Rozell and Wilcox 2020) with similar responses from citizens across a country as vast and diverse as Canada (Daoust et al. 2022). Finally, France was studied by Vampa (2021), who concluded that the COVID-19 pandemic reinforced France's "dirigisme," which tends to subordinate the regions to the national government.

Other institutional factors can shape citizens' compliance with COVID-19 preventive measures, but ultimately, the risk that the guidelines from governments of different orders on what citizens should or must do are not aligned is likely the key mechanism to understanding their effect. This is consistent with the fact that the perceived clarity of communication about the virus is linked to citizens' compliance with COVID-19 preventive measures (Schumpe et al. 2022). Decentralization (or more precisely the presence of several elected governments) is thus likely the most important institutional feature to focus on. Among other things, research on the local level of governance is needed (Armstrong et al. 2020), and is perhaps even more relevant now that the management of the pandemic will become more localized with targeted measures instead of, for example, national lockdowns. Guan et al.'s (2021) research on citizens' responses across 86 Chinese cities with varying degrees of authoritarianism represents a promising venue for further research.

Overall, many explanations of citizens' compliance with COVID-19 preventive measures have been tested and I have tried to summarize some the most important ones above. We are not well equipped yet to provide a big picture regarding the relative impact of these variables, and we also know little about the conditions under which one factor might prevail over another one. The issue of the comparability of the measures across studies is a strong obstacle to such inquiry. However, research should strive to provide large-N comparative studies assessing the relative importance of the most important mechanisms explaining citizens' compliance. In that regard, Devine et al. (2023), who focus on trust and provided a meta-analysis of 67 studies, is inspiring.

Discussion and conclusion

The COVID-19 pandemic triggered a rush in academic publications on the topic, and indeed, the scientific community responded to the call very early (Raynaud et al. 2021; Yu et al. 2020). Three years later, we know quite a lot about various aspects of the pandemic. In this article, I have reviewed some key findings about how governments and public health agencies around the world have managed to generate exceptional levels compliance among citizens, despite the unusual clash with fundamental rights and liberties of some preventive measures. It is challenging to simplify such an important strand of research, and things can always be more complexified (for example, the findings presented in this review could be broken down by the type of preventive measures), but I believe that some of the key findings presented previously are among the most insightful ones.

Social scientists have played a prominent role in our understanding of the relationship between the state and citizens. It might seem trivial to say so to an academic audience, but it is a constant fight to recall public authorities that they should continuously strive towards acquiring the best scientific advices. In the case of COVID-19 and potential similar crises that may arise in the future, the best advices must include the perspective of social scientists, who are well equipped to understand citizens' behaviours. Among the implications from the research on COVID and citizens' compliance, governments and agencies should be aware of the importance of the risk perceptions that they generate through their communication, and they should keep in mind that initiatives that would negatively impact citizens' trust can affect their willingness to comply. Trust and clear communication could also be key in shaping a 'virtuous circle' given that they might affect other factors that are important to generate compliance among citizens. For example, we know that trust is related to conspiracy mentality; citizens who trust the government will be more prompted to believe in the seriousness of a crisis and thus perceive more risks; etc.

Looking at the future, several avenues appear fruitful for the next steps. First, we need to learn more about contextual effects. For example, Marinthe et al.'s (2020) study showed that perceptions of risk moderated the impact of conspiracy mentality on compliance with preventive measures. Trust can also be a key moderating variable in many ways (e.g., Lachapelle et al. 2021; Petherick et al. 2021). Second, the multilevel nature of COVID-19 politics has been studied by some scholars (see the institutional factors reviewed in the previous section), but remains overlooked. Cases where guidelines and/or discourses were not well aligned across levels of governance are particularly relevant to study. It can also clarify some relationships, such as trust and compliance. Many research focuses on political trust as measured by trust in government. But which government should we refer to? In many contexts (e.g., Scotland, Québec, Catalonia, etc.), the public opinion across the governance levels may display different relationships with compliance and should therefore be taken into account.

Finally, one of the most important challenges will be to conduct analyses on citizens' compliance with COVID-19 preventive measures that will be maintained

for a while (e.g., face mask usage when one presents COVID-19 symptoms, vaccination) over a broad time span. The pandemic is far from over. We need to keep being updated on what generates compliance among citizens and not simply rely on what we know about studies using data that was recently collected (although defining what 'recent' means might be tricky). To do so, we will also need to ensure that the data and measures are comparable over time. Maintaining a dynamic strand of research over time will allow researchers to get a sense of a basic but fundamental relationship, that is, how time itself affects citizens' levels of compliance with key preventive measures. Indeed, we are already experiencing a "pandemic fatigue," with citizens being less prompted to follow the state guidelines as dutifully as during the earlier stages of the pandemic due to feelings of exhaustion (Du et al. 2022; Haktanir et al. 2022; Jørgensen et al. 2022; Petherick et al. 2021). But this fatigue might worsen, and public authorities may need to respond by implementing new preventive measures or guidelines, whether it is to contain the COVID-19 pandemic or a new one. Within this context, social scientists should be ready to provide crucial insights based on the best data possible.

Declarations

Conflict of interest None.

References

Abeya, S.G., S.B. Barkesa, C.G. Sadi, D.D. Gemeda, F.Y. Muleta, A.F. Tolera, D.N. Ayana, S.A. Mohammed, E.B. Wako, M.B. Hurisa, and D.A. Bayisa. 2021. Adherence to COVID-19 preventive measures and associated factors in Oromia regional state of Ethiopia. *PLoS ONE* 16(10): e0257373.

Anderson, C.J. 2022. Citizens and the state during crisis: Public authority, private behaviour and the Covid-19 pandemic in France. *European Journal of Political Research* 6: 66.

Anderson, C.J., and S.B. Hobolt. 2022. Creating compliance in crisis: Messages, messengers, and masking up in Britain. *West European Politics* 46(2): 300–323.

Armstrong, D.A., M.J. Lebo, and J. Lucas. 2020. Do covid-19 policies affect mobility behaviour? Evidence from 75 Canadian and American cities. *Canadian Public Policy* 46(S2): S127–S144.

Avery, E.J., and S. Park. 2021. Perceived knowledge as [protective] power: Parents' protective efficacy, information-seeking, and scrutiny during COVID-19. *Health Communication* 36(1): 81–88.

Bargain, O., and U. Aminjonov. 2020. Trust and compliance to public health policies in times of COVID-19. *Journal of Public Economics* 192: 104316.

Baxter-King, R., J.R. Brown, R.D. Enos, A. Naeim, and L. Vavreck. 2022. How local partisan context conditions prosocial behaviors: Mask wearing during COVID-19. *Proceedings of the National Academy of Sciences* 119(21): e2116311119.

Becher, M., D. Stegmueller, S. Brouard, and E. Kerrouche. 2021. Ideology and compliance with health guidelines during the COVID-19 pandemic: A comparative perspective. *Social Science Quarterly* 102(5): 2106–2123.

Bicchieri, C., E. Fatas, A. Aldama, A. Casas, I. Deshpande, M. Lauro, C. Parilli, M. Spohn, P. Pereira, and R. Wen. 2021. In science we (should) trust: Expectations and compliance across nine countries during the COVID-19 pandemic. *PLoS ONE* 16(6): e0252892.

Blais, A., and J.F. Daoust. 2020. *The motivation to vote: Explaining electoral participation*. UBC Press.

Borau, S., H. Couprie, and A. Hopfensitz. 2022. The prosociality of married people: Evidence from a large multinational sample. *Journal of Economic Psychology* 92: 102545.

Bourgeois, L.F., A. Harell, and L.B. Stephenson. 2020. To follow or not to follow: Social norms and civic duty during a pandemic. *Canadian Journal of Political Science/revue De Science Politique* 53(2): 273–278.

Brosowsky, N.P., W. Van Tilburg, A.A. Scholer, J. Boylan, P. Seli, and J. Danckert. 2021. Boredom proneness, political orientation and adherence to social-distancing in the pandemic. *Motivation and Emotion* 45(5): 631–640.

Brouard, S., P. Vasilopoulos, and M. Becher. 2020. Sociodemographic and psychological correlates of compliance with the Covid-19 public health measures in France. *Canadian Journal of Political Science/revue De Science Politique* 53(2): 253–258.

Carey, J.M., A.M. Guess, P.J. Loewen, E. Merkley, B. Nyhan, J.B. Phillips, and J. Reifler. 2022. The ephemeral effects of fact-checks on COVID-19 misperceptions in the United States, Great Britain and Canada. *Nature Human Behaviour* 6(2): 236–243.

Case, C., C. Eddy, R. Hemrajani, C. Howell, D. Lyons, Y.H. Sung, and E.C. Connors. 2022. The effects of source cues and issue frames during COVID-19. *Journal of Experimental Political Science* 9(3): 369–378.

Chernozhukov, V., H. Kasahara, and P. Schrimpf. 2021. Causal impact of masks, policies, behavior on early covid-19 pandemic in the US. *Journal of Econometrics* 220(1): 23–62.

Choutagunta, A., G.P. Manish, and S. Rajagopalan. 2021. Battling COVID-19 with dysfunctional federalism: Lessons from India. *Southern Economic Journal* 87(4): 1267–1299.

Christner, N., R.M. Sticker, L. Söldner, M. Mammen, and M. Paulus. 2020. Prevention for oneself or others? Psychological and social factors that explain social distancing during the COVID-19 pandemic. *Journal of Health Psychology* 6: 66.

Daoust, J.F. 2020. Elderly people and responses to COVID-19 in 27 Countries. *PLoS ONE* 15(7): e0235590.

Daoust, J.F., É. Bélanger, R. Dassonneville, E. Lachapelle, and R. Nadeau. 2022. Is the unequal COVID–19 burden in canada due to unequal levels of citizen discipline across provinces? *Canadian Public Policy* 48(1): 124–143.

Daoust, J.F., É. Bélanger, R. Dassonneville, E. Lachapelle, R. Nadeau, M. Becher, S. Brouard, M. Foucault, C. Hönnige, and D. Stegmueller. 2021. A guilt-free strategy increases self-reported non-compliance with COVID-19 preventive measures: Experimental evidence from 12 countries. *PLoS ONE* 16(4): e0249914.

Daoust, J.F., R. Nadeau, R. Dassonneville, E. Lachapelle, É. Bélanger, J. Savoie, and C. van der Linden. 2020. How to survey citizens' compliance with COVID-19 public health measures: Evidence from three survey experiments. *Journal of Experimental Political Science* 8(3): 310–317.

Devine, D., J. Gaskell, W. Jennings, and G. Stoker. 2021. Trust and the coronavirus pandemic: What are the consequences of and for trust? An early review of the literature. *Political Studies Review* 19(2): 274–285.

Devine, D., V. Valgarðsson, J. Smith, W. Jennings, M. Scotto di Vettimo, H. Bunting, and L. McKay. 2023. Political trust in the first year of the COVID-19 pandemic: a meta-analysis of 67 studies. *Journal of European Public Policy* 66: 1–23.

Du, Z., L. Wang, S. Shan, D. Lam, T.K. Tsang, J. Xiao, H. Gao, B. Yang, S.T. Ali, S. Pei, and I.C. Fung. 2022. Pandemic fatigue impedes mitigation of COVID-19 in Hong Kong. *Proceedings of the National Academy of Sciences* 119(48): e2213313119.

Engle, S., J. Stromme, and A. Zhou. 2020. Staying at home: mobility effects of covid-19. *COVID Economics*, 4. https://iris.unibocconi.it/bitstream/11565/4026151/1/CovidEconomics4.pdf#page=107. Accessed January 3 2023.

Farias, J., and R. Pilati. 2021. COVID-19 as an undesirable political issue: Conspiracy beliefs and intolerance of uncertainty predict adhesion to prevention measures. *Current Psychology* 66: 1–11.

Farias, J., and R. Pilati. 2022. Violating social distancing amid the COVID-19 pandemic: Psychological factors to improve compliance. *Journal of Applied Social Psychology* 52(4): 233–245.

Flores, A., J.C. Cole, S. Dickert, K. Eom, G.M. Jiga-Boy, T. Kogut, R. Loria, M. Mayorga, E.J. Pedersen, B. Pereira, and E. Rubaltelli. 2022. Politicians polarize and experts depolarize public support for COVID-19 management policies across countries. *Proceedings of the National Academy of Sciences* 119(3): e2117543119.

Galasso, V., V. Pons, P. Profeta, M. Becher, S. Brouard, and M. Foucault. 2020. Gender differences in COVID-19 attitudes and behavior: Panel evidence from eight countries. *Proceedings of the National Academy of Sciences* 117(44): 27285–27291.

Gerber, M.M., C. Cuadrado, A. Figueiredo, F. Crispi, G. Jiménez-Moya, and V. Andrade. 2021. Taking care of each other: How can we increase compliance with personal protective measures during the COVID-19 pandemic in Chile? *Political Psychology* 42(5): 863–880.

Goldstein, D.A., and J. Wiedemann. 2022. Who do you trust? The consequences of partisanship and trust for public responsiveness to COVID-19 orders. *Perspectives on Politics* 20(2): 412–438.

Greer, S.L., K.A. Dubin, M. Falkenbach, H. Jarman, and B.D. Trump. 2022. Alignment and authority: Federalism, social policy, and COVID-19 response. *Health Policy* 6: 66.

Grossman, G., S. Kim, J.M. Rexer, and H. Thirumurthy. 2020. Political partisanship influences behavioral responses to governors' recommendations for COVID-19 prevention in the United States. *Proceedings of the National Academy of Sciences* 117(39): 24144–24153.

Guan, B., G. Bao, Q. Liu, and R.G. Raymond. 2021. Two-way risk communication, public value consensus, and citizens' policy compliance willingness about COVID-19: Multilevel analysis based on a nudge view. *Administration & Society* 53(7): 1106–1149.

Haktanir, A., N. Can, T. Seki, M.F. Kurnaz, and B. Dilmaç. 2022. Do we experience pandemic fatigue? current state, predictors, and prevention. *Current Psychology* 41(10): 7314–7325.

Heffner, J., M.L. Vives, and O. FeldmanHall. 2021. Emotional responses to prosocial messages increase willingness to self-isolate during the COVID-19 pandemic. *Personality and Individual Differences* 170: 110420.

Hegele, Y., and J. Schnabel. 2021. Federalism and the management of the COVID-19 crisis: Centralisation, decentralisation and (non-) coordination. *West European Politics* 44(5–6): 1052–1076.

Huddy, L., and N. Khatib. 2007. American patriotism, national identity, and political involvement. *American Journal of Political Science* 51(1): 63–77.

Jordan, R.E., P. Adab, and K. Cheng. 2020. Covid-19: risk factors for severe disease and death. *BMJ* 368: 66.

Jørgensen, F., A. Bor, and M.B. Petersen. 2021. Compliance without fear: Individual-level protective behaviour during the first wave of the COVID-19 pandemic. *British Journal of Health Psychology* 26(2): 679–696.

Jørgensen, F., A. Bor, M.S. Rasmussen, M.F. Lindholt, and M.B. Petersen. 2022. Pandemic fatigue fueled political discontent during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences* 119(48): e2201266119.

Juen, C.M., M. Jankowski, R.A. Huber, T. Frank, L. Maaß, and M. Tepe. 2021. Who wants COVID-19 vaccination to be compulsory? The impact of party cues, left-right ideology, and populism. *Politics* 6: 66.

Khatatbeh, M., S. Albalas, H. Khatatbeh, W. Momani, O. Melhem, O. Al Omari, Z. Tarhini, A. A'aqoulah, M. Al-Jubouri, A.J. Nashwan, and G. Adwan. 2022. Children's rates of COVID-19 vaccination as reported by parents, vaccine hesitancy, and determinants of COVID-19 vaccine uptake among children: A multi-country study from the Eastern Mediterranean Region. *BMC Public Health* 22(1): 1–11.

Kincaid, J., and J.W. Leckrone. 2020. Partisan fractures in US federalism's COVID-19 policy responses. *State and Local Government Review* 52(4): 298–308.

Kuipers, N., S. Mujani, and T. Pepinsky. 2021. Encouraging Indonesians to Pray from home during the COVID-19 pandemic. *Journal of Experimental Political Science* 8(3): 211–222.

Lachapelle, E., T. Bergeron, R. Nadeau, J.F. Daoust, R. Dassonneville, and É. Bélanger. 2021. Citizens' willingness to support new taxes for COVID-19 measures and the role of trust. *Politics & Policy* 49(3): 534–565.

Lavigne, M., É. Bélanger, R. Nadeau, J.F. Daoust, and E. Lachapelle. 2022. *Hide and seek: The connection between false beliefs and perceptions of government transparency*.

Lin, T., E.A. Harris, A. Heemskerk, J.J. Van Bavel, and N.C. Ebner. 2021. A multi-national test on self-reported compliance with COVID-19 public health measures: The role of individual age and gender demographics and countries' developmental status. *Social Science & Medicine* 286: 114335.

Marinthe, G., G. Brown, S. Delouvée, and D. Jolley. 2020. Looking out for myself: Exploring the relationship between conspiracy mentality, perceived personal risk, and COVID-19 prevention measures. *British Journal of Health Psychology* 25(4): 957–980.

Merkley, E., and P.J. Loewen. 2021. Anti-intellectualism and the mass public's response to the COVID-19 pandemic. *Nature Human Behaviour* 5(6): 706–715.

Miguel, F.K., G.M. Machado, G. Pianowski, and L. de Francisco Carvalho. 2021. Compliance with containment measures to the COVID-19 pandemic over time: Do antisocial traits matter? *Personality and Individual Differences* 168: 110346.

Min, C., F. Shen, W. Yu, and Y. Chu. 2020. The relationship between government trust and preventive behaviors during the COVID-19 pandemic in China: Exploring the roles of knowledge and negative emotion. *Preventive Medicine* 141: 106288.

Murphy, K., H. Williamson, E. Sargeant, and M. McCarthy. 2020. Why people comply with COVID-19 social distancing restrictions: Self-interest or duty? *Australian & New Zealand Journal of Criminology* 53(4): 477–496.

Neihouser, M., G. Sandri, F. Von Nostitz, and T. Haute. 2022. Political information consumption and electoral turnout during COVID: The case of the 2020 municipal elections. *French Politics* 20(2): 182–209.

Nisa, C.F., J.J. Bélanger, D.G. Faller, N.R. Buttrick, J.O. Mierau, M.M. Austin, B.M. Schumpe, E.M. Sasin, M. Agostini, B. Gützkow, and J. Kreienkamp. 2021. Lives versus livelihoods? Perceived economic risk has a stronger association with support for COVID-19 preventive measures than perceived health risk. *Scientific Reports* 11(1): 1–12.

Oleksy, T., A. Wnuk, D. Maison, and A. Łyś. 2021. Content matters. Different predictors and social consequences of general and government-related conspiracy theories on COVID-19. *Personality and Individual Differences* 168: 110289.

Painter, M., and T. Qiu. 2021. Political beliefs affect compliance with government mandates. *Journal of Economic Behavior & Organization* 185: 688–701.

Pavela Banai, I., B. Banai, and I. Mikloušić. 2022. Beliefs in COVID-19 conspiracy theories, compliance with the preventive measures, and trust in government medical officials. *Current Psychology* 41(10): 7448–7458.

Petherick, A., R. Goldszmidt, E.B. Andrade, R. Furst, T. Hale, A. Pott, and A. Wood. 2021. A worldwide assessment of changes in adherence to COVID-19 protective behaviours and hypothesized pandemic fatigue. *Nature Human Behaviour* 5(9): 1145–1160.

Petrocchi, S., S. Bernardi, R. Malacrida, R. Traber, L. Gabutti, and N. Grignoli. 2021. Affective empathy predicts self-isolation behaviour acceptance during coronavirus risk exposure. *Scientific Reports* 11(1): 1–11.

Pink, S.L., J. Chu, J.N. Druckman, D.G. Rand, and R. Willer. 2021. Elite party cues increase vaccination intentions among Republicans. *Proceedings of the National Academy of Sciences* 118(32): e2106559118.

Rabacal, J.S., S.M. Lausa, R.A. Egcas, R.M.F. Oducado, J.V. Cleofas, and K.A. Tamdang. 2022. More than a year into the pandemic: Do higher education students still practice protective behaviors against COVID-19? *Journal of Education and Health Promotion* 11(1): 155.

Raynaud, M., H. Zhang, K. Louis, V. Goutaudier, J. Wang, Q. Dubourg, Y. Wei, Z. Demir, C. Debiais, O. Aubert, and Y. Bouatou. 2021. COVID-19-related medical research: a meta-research and critical appraisal. *BMC Medical Research Methodology* 21(1): 1–11.

Roberts, D.C., and S.M. Utych. 2021. Polarized social distancing: Residents of Republican-majority counties spend more time away from home during the COVID-19 crisis. *Social Science Quarterly* 102(6): 2516–2527.

Rozell, M.J., and C. Wilcox. 2020. Federalism in a time of plague: How federal systems cope with pandemic. *The American Review of Public Administration* 50(6–7): 519–525.

Ruggeri, K., F. Stock, S.A. Haslam, V. Capraro, P. Boggio, N. Ellemers, A. Cichocka, K. Douglas, D.G. Rand, M. Cikara, and E. Finkel. 2022. Evaluating expectations from social and behavioral science about COVID-19 and lessons for the next pandemic. *OSF*. https://doi.org/10.31234/osf.io/58udn.

Schumpe, B.M., C.J. Van Lissa, J.J. Bélanger, K. Ruggeri, J. Mierau, C.F. Nisa, E. Molinario, M.J. Gelfand, W. Stroebe, M. Agostini, and B. Gützkow. 2022. Predictors of adherence to public health behaviors for fighting COVID-19 derived from longitudinal data. *Scientific Reports* 12(1): 1–12.

Solomou, I., and F. Constantinidou. 2020. Prevalence and predictors of anxiety and depression symptoms during the COVID-19 pandemic and compliance with precautionary measures: Age and sex matter. *International Journal of Environmental Research and Public Health* 17(14): 4924.

Soveri, A., L.C. Karlsson, M. Antfolk, M. Lindfelt, and S. Lewandowsky. 2021. Unwillingness to engage in behaviors that protect against COVID-19: The role of conspiracy beliefs, trust, and endorsement of complementary and alternative medicine. *BMC Public Health* 21(1): 1–12.

Stroebe, W., M.R. vanDellen, G. Abakoumkin, E.P. Lemay Jr., W.M. Schiavone, M. Agostini, J.J. Bélanger, B. Gützkow, J. Kreienkamp, A.M. Reitsema, and J.H. Abdul Khaiyom. 2021. Politicization of COVID-19 health-protective behaviors in the United States: Longitudinal and cross-national evidence. *PLoS ONE* 16(10): e0256740.

Sutter, A., M. Vaswani, P. Denice, K.H. Choi, J. Bouchard, and V.M. Esses. 2022. Ageism toward older adults during the COVID-19 pandemic: Intergenerational conflict and support. *Journal of Social Issues* 6: 66.

Sylvester, S., M. Motta, K.L. Trujillo, and T. Callaghan. 2022. Vaccinating across the aisle: using co-partisan source cues to encourage COVID-19 vaccine uptake in the ideological right. *Journal of behavioral medicine* 66: 1–13.

Vampa, D. 2021. COVID-19 and territorial policy dynamics in Western Europe: Comparing France, Spain, Italy, Germany, and the United Kingdom. *Publius: The Journal of Federalism* 51(4): 601–626.

Van Bavel, J.J., K. Baicker, P.S. Boggio, V. Capraro, A. Cichocka, M. Cikara, M.J. Crockett, A.J. Crum, K.M. Douglas, J.N. Druckman, and J. Drury. 2020. Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour* 4(5): 460–471.

Van Bavel, J.J., A. Cichocka, V. Capraro, H. Sjåstad, J.B. Nezlek, T. Pavlović, M. Alfano, M.J. Gelfand, F. Azevedo, M.D. Birtel, and A. Cislak. 2022. National identity predicts public health support during a global pandemic. *Nature Communications* 13(1): 1–14.

Van Fossen, J.A., J.W. Ropp, K. Darcy, and J.A. Hamm. 2022. Comfort with and willingness to participate in COVID-19 contact tracing: The role of risk perceptions, trust, and political ideology. *Social Science & Medicine* 306: 115174.

Yu, Y., Y. Li, Z. Zhang, Z. Gu, H. Zhong, Q. Zha, L. Yang, C. Zhu, and E. Chen. 2020. A bibliometric analysis using VOSviewer of publications on COVID-19. *Annals of Translational Medicine* 8(13): 66.

Yuan, H., Q. Long, G. Huang, L. Huang, and S. Luo. 2022. Different roles of interpersonal trust and institutional trust in COVID-19 pandemic control. *Social Science & Medicine* 293: 114677.

Zhou, F., T. Yu, R. Du, G. Fan, Y. Liu, Z. Liu, J. Xiang, Y. Wang, B. Song, X. Gu, and L. Guan. 2020. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet* 395(10229): 1054–1062.