Is the Unequal COVID–19 Burden in Canada Due to Unequal Levels of Citizen Discipline across Provinces?

JEAN-FRANÇOIS DAOUST
Politics and International Relations, University of Edinburgh, Edinburgh, Scotland, United Kingdom

ÉRIC BÉLANGER
Political Science, McGill University, Montreal, Quebec, Canada

RUTH DASSONNEVILLE
Science politique, Université de Montréal, Montreal, Quebec, Canada

ERICK LACHAPELLE
Science politique, Université de Montréal, Montreal, Quebec, Canada

RICHARD NADEAU
Science politique, Université de Montréal, Montreal, Quebec, Canada

L’inégalité des effets de la maladie du coronavirus 2019 (COVID-19) à travers les provinces canadiennes (notamment quant au taux d’infection et de décès) est importante et intrigante. Certains ont postulé que pour mieux comprendre les écarts dans les effets de la pandémie entre les provinces, il faudrait étudier les écarts dans l’application, par les citoyens, des mesures préventives de santé publique. Toutefois, aucun test empirique systématique n’a été effectué pour valider ce postulat. Dans cette recherche, nous utilisons un base de données de taille exceptionnelle, comprenant 23 vagues d’enquêtes (N= 22,610) réalisées sur 12 mois (avril 2020- avril 2021) pour répondre à la question « Existe-t-il une preuve de différences considérables entre les provinces dans l’application par les citoyens des mesures sanitaires de base en vue de prévenir la transmission de l’infection? » Nous constatons que les différences régionales dans le comportement autodéclaré sont très faibles, ce qui veut dire que l’écart des effets de la COVID-19 sur la santé entre les provinces n’avait pas grand-chose à voir avec l’application des mesures par les citoyens, du moins pendant la première année de la pandémie. Ces résultats ont des implications importantes. Même s’il est capital de continuer à étudier les variations régionales reliées au fléau de la COVID-19, les autorités publiques de la santé, les spécialistes et les politiciens, doivent être vigilants quand ils présentent l’application des mesures par les citoyens comme étant la première explication de l’écart des effets sur la santé entre les provinces.

Mots clés : application des mesures, Canada, COVID-19, mesures préventives, politique publique, régionalisme

The unequal burden of the coronavirus disease 2019 (COVID-19) crisis (e.g., in terms of infection and death rates) across Canadian provinces is important and puzzling. Some have speculated that differences in levels of citizen compliance with public health preventive measures are central to understanding cross-provincial differences in pandemic-related health outcomes. However, no systematic empirical test of this hypothesis has been conducted. In this research, we make use of an exceptionally large dataset that includes 23 survey waves (N = 22,610) fielded in Canada across 12 months (April 2020–April 2021) to answer the question “Is there evidence of substantial cross-provincial differences in citizen compliance with basic
public health measures designed to prevent the spread of infection?” We find that regional differences in self-reported behaviour are few and very modest, suggesting that interprovincial differences in COVID-19-related health outcomes have little to do with differences in citizen compliance, at least in the first year of the pandemic. These results have important implications. Although it is crucial that we continue to study regional variations related to the COVID-19 burden, public health agency officials, pundits, and politicians should be cautious when musing about the role of citizen compliance as the primary explanation of interprovincial pandemic health outcomes.

**Keywords:** Canada, compliance, COVID-19, preventive measures, public policy, regionalism

From the early stages of the coronavirus disease 2019 (COVID-19) pandemic, trends in daily infections, hospitalizations, and casualties across Canadian provinces followed very different trajectories. During the first wave, the province of Quebec was most severely hit by the disease in terms of infections and deaths. According to data from Bignami and van Assche (2020), regional differences between Quebec and the rest of Canada were already clear as of 31 May 2020. At that time, there were 228 cumulated positive COVID-19 cases per 100,000 people for the country as a whole. In Quebec, this ratio reached 534, whereas it was 200 in Ontario, 104 in the Prairie Provinces, and about 55 in both British Columbia and the Atlantic Provinces. Regional differences were even more pronounced when focusing on hospitalizations and mortality. For example, Quebec had a ratio of 52 cumulated deaths per 100,000 citizens compared with 16 in Ontario and 2 or 3 per 100,000 citizens in the other provinces.

Although such differences between Quebec and the rest of the country characterized the first wave, other regional differences emerged and became just as pronounced during what have been labeled the second and third waves. Data from the government of Canada (2021) on daily COVID-19–positive cases as well as COVID-19–related deaths (per 100,000 citizens), shown in Figure 1, depict the regional differences that emerged over time. As mentioned, Quebec was the most hard-hit province in the early stages, but things changed quite dramatically during summer 2020. In terms of COVID-19–positive cases, five provinces (British Columbia, Alberta, Saskatchewan, Ontario, and Manitoba) experienced a sharp increase beginning in July. Their slopes were so steep that by early 2021, all of these provinces but one (British Columbia) reported a number of daily new cases that was higher than what was recorded in Quebec. In terms of COVID-19–related deaths, it is worth noting that Quebec was hit hardest during the first months of the pandemic and that Manitoba experienced a steady rise that was more important than in other provinces and reached a peak in early 2021.

Understanding what caused these regional differences and their variation over time is of utmost importance. Such information is crucial not only to more effectively manage the pandemic in the short and medium term in Canada but also to learn and better prepare for future disease outbreaks.

Although the regional differences were widely reported and discussed in the popular media, the sources of these gaps have not—to the best of our knowledge—been analyzed in a systematic manner. In this article, we examine one specific explanation offered to account for interprovincial differences in pandemic-related health outcomes—namely, that the differences are due to different levels of citizen compliance with COVID-19 preventive measures. This potential explanation has been raised by several columnists, especially during the first wave of the pandemic—that is, when Quebec was an outlier and journalists from both anglophone and francophone media blamed Quebecers’ lack of discipline for rising infections; for examples, see articles published in the Globe and Mail (Andrew-Gee and Stone 2020), Le Devoir (David 2020), The Gazette (Brue 2020), and Le Journal de Montréal (Robitaille 2020). Among the more prominent voices offering such an explanation was the Quebec Minister of Health and Social Services, Christian Dubé. Speaking on one of the province’s most popular television programs (Tout le monde en parle on 27 September 2020), he suggested, “I think that we have a Latin side; we like to party.”

The policies, guidelines, and recommendations from government and public health agencies aimed at limiting social contacts were similar across provinces in the early stages of the pandemic (Breton and Tabbara 2020). Social distancing measures are widely considered to be effective in limiting the spread of COVID-19 (Haug et al. 2020); hence, there are good reasons to believe that lower levels of compliance with such measures would result in higher numbers of COVID-19 cases, hospitalizations, and deaths. Although this real possibility has been raised in the public discourse, it lacks rigorous systematic empirical investigation, which we provide here. We use the Imperial College London–YouGov dataset consisting of 23 waves (for Canada, the number of observations is 22,610), gathered from April 2020 to April 2021. This large data source allows us to compare citizens’ self-reported levels of compliance with public health preventive measures in Canadian provinces at different points in time during the pandemic. The breakdown of the data by province sheds light on the differences between Quebec and the rest of Canada.
Canada, but it also allows us to assess to what extent compliance varied among the other provinces.

Our findings reveal that differences in Canadian citizens’ levels of self-reported compliance across provinces are few and very modest. This conclusion is robust to alternative specifications and consistent with tracking data of citizens’ mobility during the pandemic. Although it is crucial to understand what happened during the COVID-19 crisis, our results suggest that regional differences in pandemic health-related outcomes cannot be attributed to different levels of compliance with preventive measures, at least not in the early stages of the pandemic. We should thus focus on other explanations, and we conclude by discussing these avenues for future research.

**COVID-19 in Canada: A Multi-Level Challenge for Public Policies**

Canada is a highly decentralized federation that is also characterized by a high level of regionalism. As Simeon and Elkins (1974) put it, “Canadian politics is regional politics; regionalism is one of the pre-eminent facts of Canadian life” (397). Hence, in Canada, the COVID-19 pandemic should be understood as taking place in a geographically large and culturally diverse setting. Regional variation in terms of political culture is of particular interest when examining government and citizen responses to the crisis. The seminal work by Simeon and Elkins (1974) and the more recent research by Henderson (2004) are striking for their analyses of political trust and efficacy, which vary substantially across regions within the country. Work in a similar vein by Montpetit, Lachapelle, and Kiss (2017) also shows consistently large cross-regional differences in political values and culture among Canadian citizens. More important, we know that variables such as political values and trust are linked to citizens’ levels of compliance with COVID-19 preventive measures and support for different public policies aiming to better respond to the pandemic (Bargain and Aminjonov 2020; Lachapelle et al. 2021), to support for law compliance even in non-pandemic times (Marien and Hooghe 2011), and to risk perceptions more generally (Kiss, Montpetit, and Lachapelle 2020).
All these studies draw attention to the presence of important regional differences in culture and values across Canada (see also Grabb and Curtis 2005; Schwartz 1974). Focusing on differences in political behaviour, Gidengil et al. (1999) also found evidence of important regional differences and concluded that these differences cannot be explained by socio-demographic compositional effects (e.g., if education or age varied substantially) across the country. What drives this variation in election outcomes between provinces are different political values, but also different basic priorities. Differences between Quebec and the rest of Canada, notably with the presence of the Bloc Québécois, are a key component of the regional divide in voting behaviour, but they are far from the only one (Nadeau and Bélanger 2012). For example, Bélanger and Nadeau (2005) showed that political trust (which, as mentioned earlier, varies across regions) is associated with higher levels of support for the Reform Party, which was particularly popular in the Prairie Provinces. Silver and Miller (2014) provide further evidence of cultural differences being key to explain regional differences in voting behaviour across the country. Using an impressive dataset of local amenities (e.g., cafés, churches), they showed that the cultural meaning of these amenities (tapping cultural scenes that are, e.g., linked to self-expression) can account for differences in geographical voting patterns as well as in political attitudes (Miller and Silver 2015).

Such geographical differences can, in turn, be relevant for understanding how citizens across the country responded to the strikingly similar set of measures governments implemented in the early stages to limit the spread of the COVID-19 virus. It is, however, worth noting that the literature is unclear about which territorial unit of analysis is most relevant and to what extent this choice affects observed differences in political attitudes and behaviours. For example, different levels of analysis have been put forward, such as the district or the municipal, provincial, or regional levels (see, among others, Cochrane and Perrella 2012; Henderson 2004; McGrane and Berdahl 2013; Mildenberger et al. 2016). Moreover, some have claimed that such provincial differences are at least as important as other variables, such as socio-demographics, whereas others have been more nuanced when attributing attitudinal and behavioural differences to geography alone (Anderson 2010; Héroux-Legault 2016).

Overall, Canada is thus characterized as a culturally diverse country with strong regionally based heterogeneity in political values, preferences, and behaviours. Combined with the highly decentralized power-sharing nature of Canadian federalism, this sometimes creates difficulties in coordinating public policies across levels of government, even around key issues such as a pandemic. The COVID-19 issue has been accurately described as a complex intergovernmental problem (Paquet and Schertzer 2020), and the challenges the federal structure poses for responding to the COVID-19 crisis in particular have become more apparent over time. Despite these challenges, it is worth noting that the public health recommendations (social distancing, etc.) from the different provincial governments were in fact quite similar, at least during the initial stages of the pandemic. For example, all ten provinces declared a state of emergency at around the same time between 14 March and 22 March. Moreover, by early March, all provinces were on the same page regarding key preventive measures, such as the closure of schools and bars or restrictions on restaurants and visits to long-term-care facilities (Breton, Sim, and Tabbara 2021).

Provincial governments in fact played a very important role at the start of the pandemic, notably with their own public health officials at the provincial level and by providing COVID-19 tests (Adeel et al. 2020; Kennedy, Sayers, and Alcantara 2021). The municipal level played a substantial role in the early stage of the pandemic as well. For example, the city of Montreal decided to send employees from its regional public health agency to the Montreal–Pierre Elliott Trudeau International Airport (which is under the jurisdiction of the federal government) a few days after a state of emergency was declared. Even though the decision-making power was far from centralized, however, local governments appear to have responded to the pandemic in “remarkably consistent ways” during the first wave (Armstrong and Lucas 2020, 237; Armstrong, Lebo, and Lucas 2020).

Given the seemingly consensual nature of government officials’ initial responses to the pandemic, it is rather puzzling that Canadian provinces followed such different trajectories in terms of public health outcomes. A number of explanations have been offered to explain these outcomes, including the timing of the March school break in Quebec, which has been shown to have played a limited role (Godin et al. 2020). Given the similarities in the measures that different provincial governments took to limit the spread of the COVID-19 virus, another explanation—echoed by Quebec health minister Dubé—is that regional and cultural differences in compliance with governments’ preventive measures are key to explaining the heterogeneity in health outcomes. However, a systematic analysis of this particular hypothesis to understand the causes of the regional differences is lacking. Among the few insights we have are those of Sheluchin, Johnston, and van der Linden (2020), who showed that Quebeckers were less likely than citizens from other provinces to wear a face mask in April and early May but that this difference disappeared in late May and early June. Moreover, Chan (2020) used Facebook data to estimate mobility reduction across small geographical units (census divisions) using pre- and post-lockdown measures (February vs. April 2020).
Contrary to what one might expect, the highest levels of mobility reductions were found in Quebec, which is at odds with the observed regional differences in health outcomes during that time. Although it is not clear what constitutes the cause or the consequence in this relationship (e.g., differences in mobility are likely endogenous to differences in health outcomes), it is inconsistent with the view that people in Quebec were less disciplined.

In this research, we systematically analyze regional differences in the extent to which citizens comply with preventive measures across Canadian provinces, and we do so for numerous behaviours that were similarly proscribed across the country. In the next section, we describe the dataset used to examine the potential role of citizen compliance in the unequal burden of the COVID-19 pandemic across the country.

Data and Indicators
We use data collected by the Institute of Global Health Innovation at Imperial College London and the polling firm YouGov (Jones 2020). These two organizations sought to gain insight into citizens’ perceptions of and responses to the COVID-19 pandemic in 29 countries. Our focus is on Canada, for which we make use of 23 waves of data. Each wave consists of answers to an online survey collected from a fresh sample of about 1,000 respondents, implying that the dataset has a cross-sectional time-series design. Quotas were used by YouGov to obtain a nationally representative sample in terms of age, gender, and region, this last characteristic being very useful for studies of our kind. We also weight the data (based on national census for age, gender, and region) to increase the sample’s representativeness. The data were collected from April 2020 to April 2021, for a time span of 12 months. Of all publicly available datasets that include measures of compliance with preventive measures, this is, to our knowledge, the one with the highest number of waves and the longest time coverage. Table 1 provides an overview of the timing of the fieldwork and the number of observations per wave. Figure A.1 in Appendix A shows the number of observations for each province; we excluded the three territories because they had an insufficient number of observations.

To measure citizens’ compliance with preventive measures, we rely on three different indicators. First, we use a measure of compliance with preventive measures during the past week. This particular question asked respondents, “Thinking about the last 7 days . . . how often have you taken the following measures to protect yourself or others from coronavirus (COVID-19)?” For each item, the answer options were always, frequently, sometimes, rarely, and not at all. We focus on seven key preventive measures for which public health guidelines were very similar (or identical) across the provinces (for more information, see the Canadian COVID-19 Stringency Index, compiled and made publicly accessible by Breton et al. 2021). These seven measures are

1. Avoided having guests to your home;
2. Avoided large-sized social gatherings (more than ten people);
3. Avoided crowded areas;
4. Worn a face mask outside your home (e.g., when on public transport, going to a supermarket, going to a main road);
5. Washed hands with soap and water;
6. Covered your nose and mouth when sneezing or coughing; and
7. Avoided contact with people who have symptoms or you think may have been exposed to the coronavirus

The items have high internal consistency (Cronbach’s $\alpha = 0.77$), and we combine them into an index of self-reported measures of compliance with public health guidelines. Because we do not have any theoretical expectation regarding the relative importance of the different items in the compliance scale, we assign each item the same weight (that is, 1/7) when computing the index, which is also in line with Al-Zubaidy et al. (2021), who attributed an equal weight to each behaviour. Descriptive statistics for each of the items are included in Table A.1 of the Appendix.

Table 1: Overview of the Dataset

| Wave | Fieldwork Dates   | No. of Observations |
|------|-------------------|---------------------|
| 1    | 2 Apr–6 Apr       | 1,005               |
| 2    | 29 Apr–3 May      | 1,002               |
| 3    | 15 May–20 May     | 1,002               |
| 4    | 3 June–9 June     | 1,001               |
| 5    | 9 June–22 June    | 1,001               |
| 6    | 24 June–8 July    | 1,005               |
| 7    | 14 July–22 July   | 1,001               |
| 8    | 22 July–05 Aug    | 975                 |
| 9    | 6 Aug–18 Aug      | 1,001               |
| 10   | 20 Aug–27 Aug     | 981                 |
| 11   | 2 Sept–9 Sept     | 904                 |
| 12   | 2 Oct–11 Oct      | 1,002               |
| 13   | 14 Oct–27 Oct     | 1,000               |
| 14   | 28 Oct–1 Nov      | 1,001               |
| 15   | 11 Nov–24 Nov     | 1,003               |
| 16   | 16 Dec–30 Dec     | 960                 |
| 17   | 6 Jan–13 Jan      | 1,003               |
| 18   | 13 Jan–27 Jan     | 968                 |
| 19   | 27 Jan–10 Feb     | 976                 |
| 20   | 10 Feb–23 Feb     | 999                 |
| 21   | 24 Feb–5 Mar      | 1,003               |
| 22   | 10 Mar–19 Mar     | 818                 |
| 23   | 24 Mar–6 Apr      | 999                 |

Source: Jones (2020).
Second, we rely on an indicator of citizens’ level of willingness to self-isolate if they were advised to do so, based on the following question: “If you were advised to do so by a healthcare professional or public health authority, to what extent are you willing or not to self-isolate for 7 days?” Answer choices were very willing, somewhat willing, neither willing nor unwilling, somewhat unwilling, and very unwilling. There was also a don’t know option, chosen by about 3 percent of the sample, that we excluded.

Third, we make use of a more specific and prospective question about self-isolation: “Thinking about the next 7 days . . . would you isolate yourself after feeling unwell or having any of the following new symptoms: a dry cough, fever, loss of sense of smell, loss of sense of taste, shortness of breath or difficulty breathing?” Answer choices were yes, no, and not sure. We dichotomized those who answered yes against the others (including the 7 percent who responded not sure).

As mentioned, compliance with COVID-19 preventive measures is an index of seven items. Each item was coded from 0 to 1, where 1 indicates the most disciplined (always); the resulting additive index thus has a range of 0 to 7. Answers to the willingness to self-isolate question were recoded as 0 and 1, where 1 corresponds to very willing. Finally, prospective self-isolation (if the respondent experiences one of the typical COVID-19 symptoms) is a dichotomous variable coded 1 when a respondent indicated they would self-isolate. The distribution of the variables is shown in Figure A.1 of Appendix A.

As with many topics in social science, such as those on sexual or health behaviour (Catania et al. 1996) or illicit behaviours such as shoplifting (Holtgraves, Eck, and Lasky 1997), it is possible that these questions induce a form of social desirability bias. Although the literature on COVID-19 is mixed, it is possible that our three outcomes of interest are overestimated. Although this is a limitation of self-reported measures of compliance, it would be a major concern only if the bias operates differently across provinces. However, there is little evidence of heterogeneous effects. Daoust et al. (2020) show, using Canadian data from 2020, that the bias is very similar across different genders, levels of education, and ideology. In the same vein but using data from a set of 12 different countries, Daoust et al. (2021) show that the bias was homogeneous across people of different age, gender, and educational characteristics. Most important for our research, Daoust et al. (2020) provide a very reassuring test: comparing francophone and anglophone respondents, they conclude that “the Canadian experience with multiculturalism (with more than a quarter of the population speaking French at home) provided an opportunity to show that our results are robust and very similar across these different cultures” (7). All in all, we believe that, although imperfect, self-reported measures of compliance with COVID-19 preventive measures can be used for the purpose of our inquiry.

Results
The first test is very simple: we examine the mean levels of the three indicators across all ten provinces, with the confidence intervals estimated with the ciplot package in Stata Version 16 (StataCorp, College Station, Texas). The results are shown in Figure 2. First, mean levels of compliance with COVID-19 preventive measures are remarkably similar across the country. On average, citizens from all provinces have a mean score of 6. There are no substantial differences, one way or another, between regions or between provinces. Second, citizens’ willingness to self-isolate is also very homogeneous across the country. It is worth noting, however, that the Atlantic Provinces are slightly more willing to self-isolate. Overall, the mean score is 0.9 in the Atlantic Provinces and 0.87 in the rest of the country—a small difference of 0.03 on a 0-to-1 scale. Third, the prospect of self-isolating (e.g., would someone self-isolate if they were told to do so) is the indicator showing the greatest level of variation, although it is still quite limited. The mean across the country is 0.76, but it reaches 0.87 in Prince Edward Island, and Manitoba has the lowest mean at 0.72. All in all, findings show that the extent to which citizens are disciplined across the provinces ranges from almost identical to slightly different. These figures do not offer support for the expectation that regional and cultural differences in compliance explain the different trajectories of the COVID-19 pandemic across Canadian provinces.

That said, it is possible that differences across provinces varied over time. The scope of our dataset (23 waves across 12 months) allows us to unpack this possibility. Figure 3 shows the mean for our three indicators in each of the 23 waves. From April 2020 to April 2021, there was at least one wave per month and a maximum of three (the norm was two survey waves per month). For the breakdown of levels of compliance over time, we include data from only four provinces because some provincial subsamples are too small in a given survey wave. That is, we focus on the four most populous provinces and those that make up the vast majority of COVID-19 cases in Canada. We do so because of the limited number of observations in each survey wave for the other six provinces. The results, presented in Figure 3, show that there is a high degree of stability in citizens’ self-reported level of compliance with COVID-19 preventive measures and their attitudes or prospective behaviour regarding self-isolation. Most important, this observation holds across each of the four provinces included in Figure 3. The differences overall are modest, but it is worth noting that Alberta, Quebec, and British Columbia display slightly lower levels of compliance (<0.5 point) than Ontario for the first nine waves of the dataset (from April to August 2020). However, citizens’
Figure 2: Citizens’ Discipline across Canadian Provinces

Note: $N = 22,610$. Mean levels of compliance are indicated. 95% confidence intervals included.
Source: Jones (2020).
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Figure 3: Citizens’ Levels of Compliance across Provinces Over Time

Note: Local regression of respondents’ compliance, using a kernel (epanechnikov) function and a bandwidth of 0.8. For the exact dates of the waves listed on the x-axis, see Table 1.

Source: Jones (2020).
levels of compliance increased and reached those of Ontario at the end of summer 2020. These over-time changes in compliance within provinces are not consistent with the cultural explanation mentioned previously – political culture in the different provinces most likely did not change during these few months.

All in all, despite the highly regionalized nature of Canadian politics, values, and political behaviours, our results are clear: we find no substantial differences in terms of citizens’ levels of compliance with COVID-19 preventive measures across provinces. Moreover, we do not find such differences when looking at the averages across survey waves (Figure 2), and we find little indication of heterogeneity when exploiting changes in citizens’ compliance over time. To increase confidence in our results, we conducted additional robustness checks.

First, it is worth recalling that the results in Figures 2 and 3 are from bivariate analyses. As such, one might prefer to control for factors such as age, gender, employment status, and having children at home, in case the social composition of people living in the provinces that we compare would mask the (lack of) differences. However, doing so does not alter our conclusions, as shown in Appendix Figures A.2 and A.3 (and Tables A.2 and A.3). Second, although we merged all seven items, combining key preventive measures into a single index, we can look at each item discretely to verify whether the lack of provincial variation is confirmed for each. Results from the individual analyses of the seven items are reported in Appendix Figure A.4. Again, we find very modest and non-significant differences in the means across provinces.

Discussion and Implications

In this research, we test the hypothesis that regional differences in COVID-19 pandemic health outcomes are due to different levels of citizen compliance with the similar set of public health guidelines implemented across provinces in the first year of the pandemic. Canada is a regionally and provincially diverse country in terms of its culture, values, and behaviours. During the pandemic, this heterogeneity may have expressed itself in distinct provincial patterns of compliance with governmental health measures, leading to differences in health outcomes. To test whether Canadian provinces differed in complying behaviour, we relied on Imperial College London–YouGov data, which, to our knowledge, provide the most comprehensive coverage among the publicly accessible datasets that measure compliance. This exceptional data source allowed us to study regional differences in compliance with COVID-19 preventive measures over a 12-month period.

We aimed to provide a clear answer to the important question of whether differences in citizen compliance with public health measures can account for provincial differences in pandemic-related health outcomes in Canada. That we have found little evidence of interprovincial and cross-regional differences in self-reported behaviours suggests that we can rule out this potential explanation. Differences in compliance, where they exist, appear very modest. The implication is that for explaining cross-provincial differences in pandemic-related health outcomes, we need to look elsewhere.

The results of this study are important for several reasons. First and foremost, our findings suggest that the cultural hypothesis cannot explain the significant differences in the number of cases and deaths across Canadian provinces, at least in the early days of the pandemic. This finding is important on its own and in light of prominent political, popular, and academic discourse. Indeed, several prominent voices publicly blamed differences in culture for the uneven burden of COVID-19 in Canada (Andrew-Gee and Stone 2020; Bruemmer 2020; David 2020; Robitaille 2020), yet we find at best very modest differences in self-reported compliance behaviour across the country. To be sure, other studies (e.g., Maaravi et al. 2021) argue that cultural variance across countries is crucial in understanding how susceptible a society is to the COVID-19 outbreak and more specifically conclude that “the more individualistic (vs. collectivist) a country was, the more COVID-19 cases and mortalities it had” (Maaravi et al. 2021, 1). We do not deny that cultural differences in individualism and collectivism might vary across Canadian regions and that such differences correlate with particular types of behaviours (e.g., vaccine uptake) or public policies (e.g., regional bubbles), which can in turn affect health outcomes. However, examining data collected between April 2020 and April 2021, our study provides strong evidence to suggest that rates of behavioural compliance across Canadian provinces had little to do with the unequal burden of COVID-19 experienced in the early stage (roughly the first year) of the pandemic in Canada.

Second, our results are strengthened by corroborating data compiled through other methods, including Google travel histories (Péloquin 2020; Rocha 2021). These data show that variations in mobility levels across provinces were modest overall and were directly related to the stringency of the measures implemented by various governments (Breton et al. 2021; Rocha 2021). These results therefore highlight the value of using different measures of compliance with public health guidelines in a complementary manner. Indeed, although analyses based on self-reported measures have their shortcomings, they also have their advantages in that they allow, for example, more detailed analyses of the profile of citizens who comply or do not comply with the measures put in place to limit the spread of COVID-19 (Daoust et al. 2020). We were also able to include more indicators than just mobility.

A third implication of our results follows from the first two. Although the cultural hypothesis deserves to be
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examined, and existing data (such as those examined here) make it possible to do so, this idea should be subjected to more careful empirical scrutiny before being touted in hot political commentary. For instance, at the beginning of the pandemic, before the very heavy toll of the first wave, Quebec Premier François Legault, commenting on Google mobility data, praised the discipline of Quebecers by noting that Quebec was the North American state “where people respect the order to stay home the most” (Péloquin 2020). A few months later, after a significant increase in cases at the beginning of the second wave, health minister Dubé, in a complete about-face, blamed the province’s “Latin spirit” for the increase in infections. On the basis of a rigorous review of policies and behaviours across Canada, Charles Breton of the Centre of Excellence on the Canadian Federation concluded of Dubé’s comments, “That was a convenient excuse . . . [but in fact] Quebecers were compliant” (quoted in Rocha 2021). Although potentially convenient, these kinds of excuses that blame citizens may also backfire ifas they can damage citizens’ levels of generalized trust, a disposition that other research has shown to play an important role in shaping patterns of collective action in response to the COVID-19 pandemic (Lachapelle et al. 2021). Although not offering a definitive test of the cultural hypothesis, little variation found in self-reported compliance with public health measures in the early stages of the pandemic suggests that more research is needed to explain the different pandemic-related health outcomes across Canadian provinces and unpack the different roles of and interactions among political culture, public policies, and citizens’ level of compliance.

Acknowledgement
YouGov provided the datasets pro bono to Imperial College London and the Institute of Global Health Innovation. The authors declare no conflict of interest.

Notes
1 There were, in fact, 24 waves, but we excluded the one from late September because it did not include all the questions that we needed. 2 For example, Munzert and Selb (2020) find evidence of a social desirability bias, whereas others, such as Larsen, Nyrop, and Petersen (2020) and Jensen (2020), do not. 3 For the exact dates corresponding to each wave, see Table 1. 4 For example, we included Prince Edward Island when pooling all the surveys for Figure 2 and ended up with about 100 observations, but this number dramatically decreases when we break down the averages by wave. 5 Interestingly, this result could have led to the conclusion that Quebecers, somewhat more collectivist (at least in terms of welfare state) than other Canadians, had higher levels of compliance in response to the health guidelines that were put in place.

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## Appendix

### Table A.1: Descriptive Statistics for Each of Seven Key Preventive Measures

| Preventive Measure                                                                 | Mean | SD  |
|-----------------------------------------------------------------------------------|------|-----|
| Avoided having guests to your home                                                  | 0.78 | 0.31|
| Avoided large-sized social gatherings (>10 people)                                 | 0.88 | 0.26|
| Avoided crowded areas                                                              | 0.85 | 0.25|
| Worn a face mask outside your home (e.g., when on public transport, going to a supermarket, going to a main road) | 0.78 | 0.36|
| Washed hands with soap and water                                                   | 0.91 | 0.18|
| Covered your nose and mouth when sneezing or coughing                              | 0.93 | 0.19|
| Avoided contact with people who have symptoms or you think may have been exposed to the coronavirus | 0.88 | 0.27|

Note: \( N = 22,610 \). All variables range from 0 to 1.

### Table A.2: Provincial Differences in Compliance, with Controls

|                      | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
|----------------------|---------|---------|---------|---------|---------|---------|
| Alberta              | −0.08   | 0.00    | −0.02   | 50–59   | 0.29    | 0.08    |
|                      | (0.04)  | (0.01)  | (0.07)  | (0.03)  | (0.01)  | (0.06)  |
| Saskatchewan         | −0.10   | −0.02   | −0.30   | 60–69   | 0.42    | 0.08    |
|                      | (0.06)  | (0.01)  | (0.10)  | (0.04)  | (0.01)  | (0.07)  |
| Manitoba             | −0.17   | −0.03   | −0.23   | ≥70     | 0.50    | 0.09    |
|                      | (0.05)  | (0.01)  | (0.09)  | (0.04)  | (0.01)  | (0.08)  |
| Ontario              | 0.23    | 0.01    | 0.00    | Children at home | −0.03 | −0.03 | −0.43 |
|                      | (0.03)  | (0.00)  | (0.05)  | (0.02)  | (0.00)  | (0.04)  |
| Quebec               | 0.05    | −0.02   | −0.11   | Full-time student | 0.22 | 0.02 | 0.23 |
|                      | (0.03)  | (0.01)  | (0.06)  | (0.05)  | (0.01)  | (0.09)  |
| New Brunswick        | −0.14   | −0.01   | −0.14   | Not working | −0.05 | 0.00 | −0.01 |
|                      | (0.06)  | (0.01)  | (0.12)  | (0.04)  | (0.01)  | (0.07)  |
| Nova Scotia          | −0.04   | 0.05    | 0.37    | Other    | 0.01    | −0.03   |
|                      | (0.05)  | (0.01)  | (0.12)  | (0.05)  | (0.01)  | (0.09)  |
| Prince Edward Island | −0.11   | 0.03    | 0.63    | Part-time employment | 0.03 | 0.00 | −0.02 |
|                      | (0.13)  | (0.02)  | (0.34)  | (0.04)  | (0.01)  | (0.07)  |
| Newfoundland & Labrador | −0.07   | 0.04    | 0.30    | Retired  | 0.04    | 0.03    |
|                      | (0.08)  | (0.01)  | (0.17)  | (0.04)  | (0.01)  | (0.07)  |
| Gender (female=1)    | 0.33    | 0.06    | 0.48    | Constant | 12.08   | 0.79    |
|                      | (0.02)  | (0.00)  | (0.03)  | (0.12)  | (0.01)  | (0.08)  |
| Age, y               |         |         |         | No. of observations | 12,880 | 12,880 | 12,880 |
| 30–39                | 0.12    | 0.02    | 0.06    |          |         |         |
|                      | (0.03)  | (0.01)  | (0.06)  |          |         |         |
| 40–49                | 0.26    | 0.05    | 0.29    |          |         |         |
|                      | (0.03)  | (0.01)  | (0.06)  |          |         |         |

Note: Regression coefficients are shown with standard errors in parentheses. For provinces, the reference category is British Columbia; for age, 18–29 years old; and for employment status, unemployed. Source: Jones (2020).
### Table A.3: Provincial Differences in Compliance Over Time, with Controls

|                                  | Model 1        | Model 2        | Model 3        | Model 1        | Model 2        | Model 3        |
|----------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| **Model 1**                      | 0.31           | 0.06           | 0.48           | 0.03           | –0.09          | –0.84          |
| **Model 2**                      | (0.02)         | (0.00)         | (0.04)         | (0.15)         | (0.03)         | (0.32)         |
| **Model 3**                      |                |                |                | (0.17)         | (0.03)         | (0.33)         |
| **Week = 9**                     |                |                |                | (0.13)         | (0.03)         | (0.33)         |
| **Week = 10**                    | –0.10          | –0.07          | –0.79          | (0.15)         | (0.02)         | (0.31)         |
| **Week = 11**                    | 0.25           | –0.05          | –0.60          | (0.15)         | (0.02)         | (0.32)         |
| **Week = 12**                    | 0.21           | –0.06          | –0.75          | (0.15)         | (0.02)         | (0.32)         |
| **Week = 13**                    | 0.17           | –0.05          | –0.72          | (0.15)         | (0.02)         | (0.32)         |
| **Week = 14**                    | 0.22           | –0.05          | –0.76          | (0.15)         | (0.02)         | (0.32)         |
| **Week = 15**                    | 0.39           | –0.08          | –0.59          | (0.14)         | (0.03)         | (0.33)         |
| **Children at home**             | –0.04          | –0.03          | –0.45          | (0.14)         | (0.03)         | (0.33)         |
| **Full-time employment**         | 0.06           | 0.02           | 0.18           | (0.16)         | (0.03)         | (0.34)         |
| **Full-time student**            | 0.22           | 0.03           | 0.31           | (0.14)         | (0.02)         | (0.33)         |
| **Not working**                  | –0.08          | 0.00           | 0.00           | (0.13)         | (0.03)         | (0.33)         |
| **Other**                        | 0.02           | –0.03          | –0.25          | (0.14)         | (0.03)         | (0.32)         |
| **Part-time employment**         | 0.02           | 0.00           | 0.01           | (0.13)         | (0.03)         | (0.33)         |
| **Retired**                      | –0.02          | 0.02           | 0.19           | (0.13)         | (0.03)         | (0.33)         |
| **Alberta**                      | 0.07           | –0.00          | 0.13           | (0.13)         | (0.03)         | (0.34)         |
| **Ontario**                      | 0.13           | 0.01           | –0.06          | (0.13)         | (0.03)         | (0.34)         |
| **Quebec**                       | –0.04          | –0.01          | –0.48          | (0.19)         | (0.03)         | (0.51)         |
| **Week = 2**                     | –0.00          | –0.04          | –0.11          | (0.18)         | (0.04)         | (0.47)         |
| **Week = 3**                     | 0.15           | –0.07          | –0.43          | (0.23)         | (0.04)         | (0.47)         |
| **Week = 4**                     | –0.13          | –0.06          | –0.41          | (0.23)         | (0.04)         | (0.47)         |
| **Week = 5**                     | –0.10          | –0.01          | –0.26          | (0.23)         | (0.04)         | (0.47)         |
| **Week = 6**                     | –0.20          | –0.01          | 0.02           | (0.23)         | (0.04)         | (0.47)         |
| **Week = 7**                     | –0.20          | –0.01          | 0.02           | (0.23)         | (0.04)         | (0.47)         |
| **Week = 8**                     | –0.29          | –0.08          | –0.42          | (0.23)         | (0.04)         | (0.49)         |
| **Week = 9**                     | –0.50          | 0.00           | 0.23           | (0.22)         | (0.04)         | (0.49)         |

(Continued)
Table A.3: Continued

| Week      | Model 1 | Model 2 | Model 3 | Week | Model 1 | Model 2 | Model 3 |
|-----------|---------|---------|---------|------|---------|---------|---------|
| Week = 10 | 0.01    | 0.02    | −0.28   | Week = 11 | −0.02 | −0.00 | 0.29 |
|           | (0.21)  | (0.04)  | (0.48)  |      | (0.15)  | (0.03)  | (0.39)  |
| Week = 11 | −0.36   | 0.01    | −0.47   | week = 12 | 0.14 | 0.00 | −0.01 |
|           | (0.20)  | (0.04)  | (0.48)  |      | (0.15)  | (0.03)  | (0.36)  |
| Week = 12 | −0.48   | −0.02   | −0.26   | Week = 13 | 0.17 | −0.00 | −0.00 |
|           | (0.20)  | (0.04)  | (0.46)  |      | (0.16)  | (0.03)  | (0.37)  |
| Week = 13 | −0.23   | 0.00    | −0.17   | Week = 14 | 0.11 | 0.00 | 0.07 |
|           | (0.20)  | (0.04)  | (0.47)  |      | (0.17)  | (0.03)  | (0.38)  |
| Week = 14 | −0.23   | −0.06   | 0.20    | Week = 15 | −0.02 | 0.01 | 0.03 |
|           | (0.21)  | (0.04)  | (0.49)  |      | (0.16)  | (0.03)  | (0.38)  |
| Week = 15 | −0.11   | 0.00    | −0.07   | Week = 16 | −0.06 | 0.03 | 0.07 |
|           | (0.18)  | (0.04)  | (0.48)  |      | (0.17)  | (0.03)  | (0.38)  |
| Week = 16 | 0.01    | 0.06    | −0.08   | Week = 17 | −0.01 | −0.00 | −0.14 |
|           | (0.20)  | (0.04)  | (0.48)  |      | (0.16)  | (0.03)  | (0.38)  |
| Week = 17 | 0.23    | 0.04    | 0.05    | Week = 18 | −0.03 | 0.02 | 0.17 |
|           | (0.17)  | (0.04)  | (0.50)  |      | (0.15)  | (0.03)  | (0.39)  |
| Week = 18 | 0.04    | −0.01   | 0.02    | Week = 19 | 0.15 | 0.01 | 0.21 |
|           | (0.17)  | (0.04)  | (0.49)  |      | (0.16)  | (0.03)  | (0.37)  |
| Week = 19 | −0.09   | 0.03    | −0.38   | Week = 20 | −0.02 | 0.01 | 0.02 |
|           | (0.20)  | (0.04)  | (0.47)  |      | (0.15)  | (0.03)  | (0.39)  |
| Week = 20 | −0.15   | 0.01    | −0.12   | Week = 21 | −0.13 | 0.00 | 0.05 |
|           | (0.18)  | (0.04)  | (0.50)  |      | (0.15)  | (0.03)  | (0.38)  |
| Week = 21 | −0.22   | 0.02    | 0.08    | Week = 22 | −0.12 | −0.01 | 0.49 |
|           | (0.19)  | (0.04)  | (0.49)  |      | (0.16)  | (0.03)  | (0.39)  |
| Week = 22 | −0.07   | 0.00    | 0.05    | Week = 23 | −0.01 | 0.01 | −0.27 |
|           | (0.20)  | (0.04)  | (0.51)  |      | (0.15)  | (0.03)  | (0.39)  |
| Week = 23 | −0.10   | 0.01    | −0.44   | Quebec | Week = 2 | −0.06 | −0.02 | −0.10 |
|           | (0.18)  | (0.04)  | (0.49)  |      | (0.17)  | (0.03)  | (0.41)  |
| Ontario   |         |         |         | Week = 3 | −0.07 | 0.01 | 0.33 |
| Week = 2  | 0.13    | 0.01    | 0.05    |      | (0.16)  | (0.04)  | (0.39)  |
|           | (0.16)  | (0.03)  | (0.39)  | Week = 4 | 0.13 | −0.04 | −0.01 |
| Week = 3  | −0.15   | 0.01    | −0.09   |      | (0.19)  | (0.03)  | (0.37)  |
|           | (0.15)  | (0.03)  | (0.37)  | Week = 5 | 0.14 | −0.02 | 0.04 |
| Week = 4  | 0.28    | 0.01    | 0.20    |      | (0.20)  | (0.03)  | (0.39)  |
|           | (0.17)  | (0.03)  | (0.38)  | Week = 6 | −0.22 | −0.05 | 0.37 |
| Week = 5  | 0.29    | 0.02    | −0.04   |      | (0.20)  | (0.03)  | (0.39)  |
|           | (0.18)  | (0.03)  | (0.38)  | Week = 7 | −0.10 | −0.05 | −0.08 |
| Week = 6  | 0.29    | −0.01   | 0.31    |      | (0.20)  | (0.03)  | (0.40)  |
|           | (0.18)  | (0.03)  | (0.37)  | Week = 8 | 0.13 | −0.08 | −0.01 |
| Week = 7  | 0.36    | −0.02   | −0.13   |      | (0.19)  | (0.03)  | (0.40)  |
|           | (0.19)  | (0.03)  | (0.38)  | Week = 9 | 0.16 | 0.02 | 0.49 |
| Week = 8  | 0.28    | −0.05   | −0.26   |      | (0.18)  | (0.03)  | (0.38)  |
|           | (0.17)  | (0.03)  | (0.38)  | Week = 10 | 0.20 | 0.01 | 0.44 |
| Week = 9  | 0.29    | 0.03    | 0.36    |      | (0.19)  | (0.03)  | (0.39)  |
|           | (0.17)  | (0.03)  | (0.37)  | Week = 11 | 0.01 | −0.00 | 0.42 |
| Week = 10 | 0.34    | 0.03    | 0.16    |      | (0.16)  | (0.03)  | (0.40)  |

(Continued)
|              | Model 1 | Model 2 | Model 3 |
|--------------|---------|---------|---------|
| Week = 12    | 0.36    | -0.01   | 0.86    |
|              | (0.16)  | (0.03)  | (0.39)  |
| Week = 13    | 0.32    | -0.03   | 0.72    |
|              | (0.17)  | (0.03)  | (0.39)  |
| Week = 14    | 0.33    | -0.04   | 0.78    |
|              | (0.17)  | (0.03)  | (0.40)  |
| Week = 15    | 0.12    | -0.00   | 0.20    |
|              | (0.16)  | (0.03)  | (0.39)  |
| Week = 16    | 0.05    | 0.01    | 0.62    |
|              | (0.18)  | (0.04)  | (0.40)  |
| Week = 17    | 0.18    | -0.00   | 0.62    |
|              | (0.16)  | (0.03)  | (0.41)  |
| Week = 18    | 0.03    | 0.00    | 0.55    |
|              | (0.16)  | (0.03)  | (0.40)  |
| Week = 19    | 0.15    | 0.01    | 0.70    |
|              | (0.17)  | (0.03)  | (0.39)  |

Note: Regression coefficients are shown with standard errors in parentheses. For provinces, the reference category is British Columbia; for age, 18–29 years old; and for employment status, unemployed.

Source: Jones (2020).
Figure A.2: Difference in Compliance, with Controls

Note: Estimations are computed from Table A.2; 95% confidence intervals are included.

Source: Jones (2020).
Figure A.2: (Continued)
Figure A.3: Differences in Compliance, Over Time, with Controls

Note: Estimations are computed from Table A.3; 95% confidence intervals are included.
Source: Jones (2020).
Figure A.4: Individual Items (a-g)
Note: 95% confidence intervals included.
Source: Jones (2020).