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Do Brazil's COVID-19 government response measures meet the WHO's criteria for policy easing?

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OxCGRT Brazil subnational coders

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Abstract

This paper brings together information about Brazil's federal, state and state-capital Covid-19 response policies, mobile-phone mobility data, and original survey data, to assess whether the World Health Organization's six criteria for evaluating readiness for easing response policies are met. We find that this is broadly not the case. Using OxCGRT for federal, state and some city governments, we report that subnational governments have enacted many of these policies, and that state-government policies have significantly affected behaviour (they impact all three available measures of citizens' mobility). Although shifts in mobility have waned over time, during the period when policy stringency has been high (from mid-March until the end of May), these shifts have remained significant.

Our survey of 1,654 people identified shortcomings in citizens' understandings of how self-isolating people should behave: 95% of the populations of eight state-capital cities mistakenly believed that self-isolation means that you can leave the house to buy essential items. Correspondingly, recently symptomatic people were more likely than those who were unlikely to be contagious to leave home only once or twice within a fortnight. As reported elsewhere, testing and contact-tracing has been limited in Brazil (even though citizens have good knowledge of how to recognise Covid-19 symptoms), and economically vulnerable groups have seen the largest income reductions. We also find indications that having a high income predicts timely access to testing, and that income support has made up for at least half of the income losses of many of those receiving it. Privately schooled children and teenagers have received higher quality home education than their publicly schooled contemporaries. At the end of the paper we provide summaries reporting policy environments and survey results for eight state capitals – Fortaleza, Goiânia, Manaus, Porto Alegre, Recife, Rio de Janeiro, Salvador, and São Paulo

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Data presented in this paper is available via GitHub: https://github.com/OxCGRT/Brazil-covid-policy

Introduction

This paper is intended to provide policymakers in Brazil with information as they face difficult choices about easing social distancing policies. Since late February, when the authorities confirmed Brazil's first case of Covid-19, subnational governments have taken on much of the fraught task of forming and implementing policies to respond to the outbreak. They have done this under manifold resource constraints, including informational constraints. Governors and mayors have ordered workplaces to close, occasionally brought in curfews, cancelled public events, restricted movement between cities, and even prohibited non-residents from entering certain neighbourhoods.[1] Yet the outbreak has grown rapidly. Currently, Brazil has the second largest number of confirmed cases and confirmed deaths from Covid-19 in the world, after the United States.[2] The public health costs of policy responses that are slow or insufficiently strict, or that have limited effect on actual behaviour, are large. At the same time, there are educational costs to keeping schools closed, economic costs to preventing firms from operating, and other public health concerns, including worsening mental health and domestic violence indicators that are associated with prolonged and strict social distancing. The task of deciding how and when to relax Covid-19 response policies is an incredibly difficult one, especially with insufficient data on which to base decisions.

In acknowledgement of the responsibility and complexity of this task, we bring together different kinds of information to support evidence-based decision-making. We aim to clarify the strength of policies that have been put in place, where they are in force, and, while we cannot claim to do so comprehensively, we also seek to illuminate some of the impacts of these policies. Drawing on the Oxford COVID-19 Government Response Tracker (OxCGRT) coding system[3], we provide a systematic and objective account of the strength of Covid-19 response policies that have been instigated by Brazil's federal, state, and some state-capital governments. Alongside this information, we present analyses of mobile-phone mobility data, as well as the original results of a survey of 1,654 citizens across eight state capitals. The mobility data are disaggregated into different kinds of movement, and show whether people are staying at home all day, changes in the distances people travel and changes in the number of non-essential trips they make. Our survey was designed to ascertain if reality on the ground meets the World Health Organization's (WHO) list of recommendations of the measures that should be put in place before Covid-19 response policies can be safely relaxed. It was conducted over the phone between 6 to 27 May, and uses randomised stratified sampling by age, sex, income and education level.

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1 See the state-capital summaries for more details. Curfews were adopted in some cities in Bahia, and in Salvador and Rio de Janeiro certain neighbourhoods have been closed off.

2 Dong, E., Du, H. & Gardner, L. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect Dis* (2020)

3 Hale, Thomas, Noam Angrist, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster. "Variation in Government Responses to COVID-19" Version 6.0. Blavatnik School of Government Working Paper. 25 May 2020. Available: www.bsg.ox.ac.uk/covidtracker.

The WHO's six recommendations of 14 April have not been widely discussed in Brazil. The WHO's guidance document explaining them states that, "without careful planning, and in the absence of scaled up public health and clinical care capacities, the premature lifting of physical distancing measures is likely to lead to an uncontrolled resurgence in COVID-19 transmission and an amplified second wave of cases"[4]. These recommendations include, for example, specific advice for testing, tracing, and isolating new cases; for physically adapting workplaces, schools and retirement homes to make them safe; and advice around the importance of ensuring public understanding of a staged process of easing closure and containment policies. The recommendations are not tailored to specific socioeconomic vulnerabilities of different populations, but they were put forward in acknowledgement of the sharper trade-offs that poorer settings face in establishing and maintaining strict social distancing policies.

Our survey questions aim to probe the extent to which these measures had been realised by 6 to 27 May. In addition, several questions ask about the severity of some costs of Covid-19 response policies. And we investigate certain replacement behaviours, such as what materials children and teenagers who are not going to school are using to study. On this point, we find that fewer public-school students compared to private-school students, and fewer boys than girls, are studying at home, and that there are differences in the proportions of students who are using materials likely to be appropriate to their level of learning. Private school students are more likely than public school students to be using study materials provided by their teacher.

Overall, the coding of subnational government policies and our analysis of mobile-phone mobility data find that government response policies affect behaviour in the direction intended. While people do indeed start moving around more the longer that restrictive regulations are in place, mobility does not revert to its pre-policy response level even after two or three months of widespread and strict social distancing. Our survey results add to these findings by suggesting that people living in eight urban centres—Fortaleza, Goiânia, Manaus, Porto Alegre, Recife, Rio de Janeiro, Salvador and São Paulo—have similar (though not identical) behaviours, irrespective of the probability that they are contagious. Those who had at least one symptom of Covid-19 in the prior week, with symptom onset within a period that suggested possible infectiousness, and those who have been in contact with a symptomatic person within a similarly sensitive period, were no more likely to stay at home during the two weeks before their survey interview than people who had far less reason to suspect they were contagious. We see differences, however, in the frequency with which people have gone out. Symptomatic, potentially contagious people left home on fewer days overall than probably non-contagious people, but were more likely to go out on just one or two days in the previous fortnight.

Alongside these results, we find that citizens living in all eight capitals have good knowledge of the symptoms of Covid-19, and that people consider the disease to be serious. But there was substantial confusion around whether someone who is 'self-isolating' should leave the house, suggesting that messaging around physical, home-

[4] World Health Organization. COVID-19 Strategy update 14 April 2020, p3. Available at: https://www.who.int/publications/i/item/strategic-preparedness-and-response-plan-for-the-new-coronavirus

bound distancing might be less ambiguous—and might lead to more compliance among potentially contagious people than current public information campaign messages. Encouragingly, we find that citizens have been supporting each other. People who were not leaving home were, on the whole, receiving food deliveries, support calls and messages from others.

Importantly for outbreak control efforts, our survey also finds that testing was infrequent, even among potentially infected people. Among people reporting to have had at least one Covid-19 symptom, and who, if indeed infected, would have been likely to have had detectable viral loads, 13% reported being tested for coronavirus, and 7% said they had tried to get tested but without success. Indeed, the only significant predictor of getting tested among this group was having a monthly income of at least 10 times the minimum wage. Meanwhile, the incomes of the poorest, of informal workers and formal microentrepreneurs, have been hit hardest since February[5]. Workplaces that have remained open have not done as much as supermarkets and hospitals to establish distancing protocols, such as rearranging seating to keep workers or visitors two metres apart.

We chose to focus our survey on large cities because these environments are where the outbreak is now most acute. Large cities are particularly valuable foci of Covid-19 research because they tend to have high population densities, which facilitate disease virus transmission[6]. They serve as transport hubs for their regions, with transport networks extending out into surrounding towns. They also provide the big hospitals and health system management on which these satellite settlements depend. The eight cities selected for our survey are either capitals of the state with the highest population in their region (that is, of the five geographic regions established by the Brazilian Institute of Geography and Statistics), or they are state capitals that have witnessed significant Covid-19 outbreaks.

The paper proceeds by first providing an overview of the WHO's six recommendations. It then describes policies enacted by the federal government and presents analyses of country-wide patterns in mobility, as associated with state government policies. Subsequently, we present the results of the survey for the eight state capitals combined, and, following a discussion, provide short summary sections on each of these cities one by one. The paper is an initial analysis of the data that we have. With more time to analyse the results, we aim to publish further insights, and we encourage others to use our subnational policy coding and survey data in the service of evidence-based policymaking. Moreover, we do not claim our results to be comprehensive, and we encourage their consideration alongside other reliable sources of information, particularly around health system capacity. While our primary intention is to assist those setting

[5] A recent survey by the Brazilian Institute of Geography and Statistics reported similar findings. IBGE. Pesquisa Nacional por Amostra de Domicílios - PNAD COVID19. May 2020. Available at: https://covid19.ibge.gov.br/pnad-covid/

[6] World Health Organization. Strengthening Preparedness for COVID-19 in Cities and Urban Settings. 28 April 2020. Available at: https://www.who.int/publications/i/item/strengthening-preparedness-for-covid-19-in-cities-and-urban-settings

government policy, some of our conclusions can be acted on by the private sector and by civil society.

International Public Health Advice

The collection of WHO technical guidance on Covid-19 has evolved over time. As the disease spread around the world, the list of recommended measures for governments to put in place has grown longer, and become more specific to countries at different stages of Covid-19 outbreaks. On 11 March, with cases confirmed in 113 countries and territories around the world, the WHO officially declared Covid-19 a pandemic. As countries ramped up their responses, WHO guidelines were constantly updated and tailored to four transmission scenarios: countries with no cases; countries with one or more cases, imported or locally detected (sporadic cases); countries experiencing cases clusters in time, geographic location and/or common exposure (clusters of cases); and countries experiencing larger outbreaks of local transmission (community transmission).

On 14 April, as discussions about how and when to relax government response measures started to grow more prominent, the WHO updated its Covid-19 strategy document to provide guidance to governments on this issue[7]. It advised governments to assess their situation against six criteria, presented as a list of recommended policies and scenarios that countries should ensure are established before reducing the strictness of response policies. These criteria remain the main advice that the WHO has issued to policymakers faced with difficult decisions about how and when to roll back Covid-19 response measures[8]. The six criteria are:

1. The number of new Covid-19 cases should be reduced to a level that the health system can manage. Ideally, transmission should be controlled to the level of sporadic cases and clusters of cases. This could be assessed through the continuous decline in the number of cases over a 14-day period, or longer.

2. There should be sufficient public health workers and sufficient health-system capacity to detect and isolate all cases, irrespective of the severity of these cases and whether they arise through local transmission or are imported from elsewhere. This requires monitoring the health system, for example, keeping tabs on the number of available ICU beds, so that capacity is not exceeded.

3. In highly vulnerable settings such as hospitals and residential care homes, the main drivers of transmission should be identified and appropriate distancing measures should be put in place to minimise the risk of new outbreaks.

[7] World Health Organization. COVID-19 Strategy update 14 April 2020. Available at: https://www.who.int/publications/i/item/strategic-preparedness-and-response-plan-for-the-new-coronavirus

[8] Since then, the WHO has published further operational guidance to support country preparedness and response, and updated its monitoring and evaluation framework, but the document published on 14 April remains the main guidance on recommended public health measures.

4. Standard prevention measures should be established in workplaces, including directives and, where needed, additional capacity to promote distancing of two metres, hand washing, and respiratory etiquette. These measures include teleworking, staggered shifts, and other practices to reduce crowding.

5. Measures should be put in place to reduce the risk of import and export of cases. This requires analysis of the likely origin and routes of imported cases and establishing the means to rapidly detect and manage suspected cases among both departing and arriving travellers. Relevant measures include entry screening and the isolation of sick travellers, and quarantining individuals arriving from places with community transmission.

6. Communities should be fully engaged and understand the 'new normal' that follows a step-wise transition away from strict restrictions, in which behavioural prevention measures are maintained, and everyone has a role to play. This could be assessed through community surveys.

The recommendations of the Pan American Health Organization (PAHO) have complemented those of the WHO. PAHO's guidance points out that lifting measures is a more complex process than putting them in place and adds detail to how the gradual restriction-easing process should be planned. Ideally, it suggests that each step of the process should be taken at least 14 days after the prior step to allow for the identification of epidemiological changes over time.[9] PAHO's guidelines have also recognised that, especially in large countries such as Brazil, there may be different transmission scenarios in non-contiguous geographical areas, which require the adoption of geographically differentiated policies responses.[10]

The OxCGRT project has published a 'Lockdown Rollback Checklist', drawing on the policy indicators in its dataset, epidemiological data from the European Centre for Disease Control on cases and deaths, and mobile phone mobility data from Apple and Google. The checklist "roughly describes how close countries are to achieving four of the six current WHO recommendations".[11] The description is rough because for the four recommendations that these data can go some way towards assessing, there are areas

[9] Pan American Health Organization. Considerations on the adjustments of social distancing and travel related measures. 27 April 2020. Available at: https://www.paho.org/en/documents/considerations-adjustments-social-distancing-and-travel-related-measures

[10] PAHO has therefore argued that if the measures are not regionally tailored to the different epidemiological scenarios, measures across countries and at the first subnational level (in the case of large countries such as Brazil) should be driven by the scenario corresponding to the highest rate of transmission.

[11] Hale, Thomas, Noam Angrist, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster. "Lockdown Rollback Checklist" Version 4.0. Blavatnik School of Government Working Paper. 1 June 2020. Available at: https://www.bsg.ox.ac.uk/research/publications/lockdown-rollback-checklist

of uncertainty, as explained in a box in the Checklist document. For example, in assessing the WHO's sixth recommendation, a rollback readiness score of 0 to 1 is based on OxCGRT coding of whether the country has a public information campaign, as well as the degree of mobility reduction in the country, which is weighted by the level of transmission risk. These data certainly indicate whether communities are likely to understand the 'new normal' of a stepwise policy rollback, but they cannot directly assess engagement. The two WHO recommendations that this checklist does not assess are 3. and 4. —whether measures are established in vulnerable settings (hospitals and care homes), and in workplaces.

Because of difficulties in gathering data about all six recommendations as relevant to a large country like Brazil, we decided to extend the OxCGRT coding to subnational governments in the country, and to design a survey pertaining to the WHO criteria. The survey questions directly ask citizens about testing availability, about their knowledge of symptoms and self-isolation behaviours, and whether they anticipate that Covid-19 response policies will be removed all at once. To respondents who have visited hospitals and care homes, and to those going to work, we ask about the preventative measures that have been established in those places. While our survey cannot assess the healthcare system's capacity as authoritatively as would a survey of medical professionals, we ask citizens about their impressions and worries pertaining to how well the regional health system is likely to cope with demand.

Before we report the survey's findings, the next section describes the trajectory of Covid-19 in Brazil, and policies that have been enacted to combat disease spread. It also presents analyses of the effects of state-government response policies on the movement of citizens who own smart phones.

The Brazilian Context

Since the first case of Covid-19 was recorded in Brazil on 26 February[12], the virus that causes it, SARS-CoV-2, has spread to all 27 states of the country and to many of its municipalities. In Brazil, the number of deaths has been rising dramatically, and is still rising[13]. As we explain further in this and subsequent sections, most attempts to bring the country's outbreak under control have been undertaken by subnational governments. We show that, encouragingly, these have clearly been associated with whether people are leaving home each day, with how far they travel, and whether they are making non-essential trips. However, the evidence taken together suggests that current measures have not brought the disease under control.

The maps in Figures 1 and 2 show the rise in weekly averages of the number of deaths in each state, and the rise in weekly averages of the number of deaths per 100,000 people in each state, respectively. Although more deaths in total have occurred in the state of São Paulo than anywhere else, Figure 2 shows the intensity of the outbreak that has emerged since mid-April in the north of the country, especially in the states of Amazonas and Pará in the North, and in Ceará and Pernambuco in the Northeast.

[12] The lab results came out positive on 25 February, but it entered the official statistics on February 26. See: Souza, W. M. de *et al. Epidemiological and clinical characteristics of the early phase of the COVID-19 epidemic in Brazil*. doi:10.1101/2020.04.25.20077396 http://medrxiv.org/lookup/doi/10.1101/2020.04.25.20077396 (2020)

[13] The rise in the number of confirmed deaths where testing is limited is considered a more reliable indication of the extent of disease spread than confirmed cases.

Figure 1. The total number of confirmed deaths per week for each state. The darkest state in the final map is São Paulo.

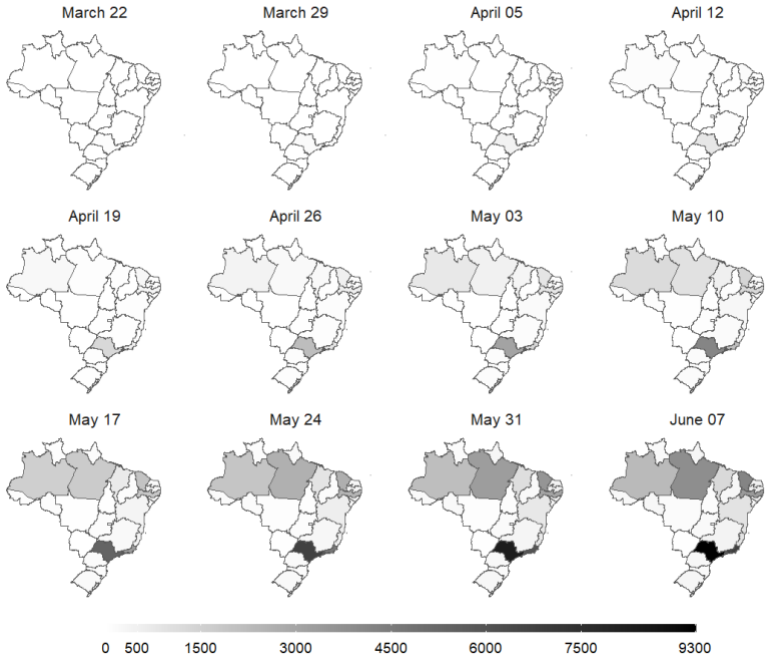
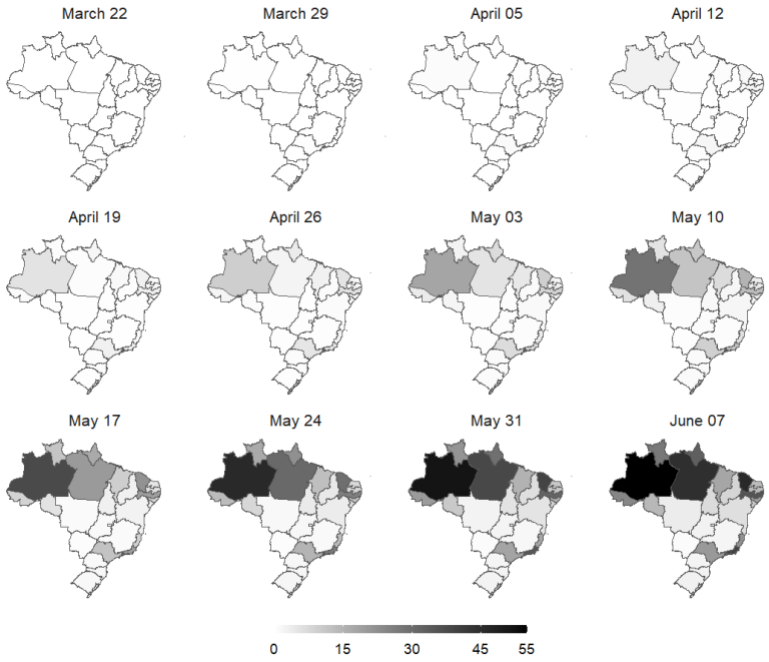


Figure 2. The number of confirmed deaths per week, per 100,000 people. The darkest state in the final map is Amazonas and the second darkest is Pará.



Data source: Epidemiological bulletins released by health secretariats of the Brazilian states. The data were collected on 8 June based on the compilation collected by Wesley Cota: https://raw.githubusercontent.com/wcota/covid19br/master/cases-brazil-states.csv

In the language of epidemiological modelling, the aim of government response policies is to reduce the effective reproduction number, *R*, to below 1. This is the average number of people that an infected person goes on to infect. When *R* dips and remains below a value of 1, the virus will gradually fade out in the population. Epidemiologists at the MRC Centre for Global Infectious Disease Analysis, Imperial College London, currently estimate SARS-CoV-2 to be spreading quite rapidly in Brazil: on 15 June they placed *R* for the whole of the country at 1.39 (with 95% confidence intervals of 1.34 to 1.42)[14]. However, there is substantial variation in how fast the outbreak is accelerating in different parts of the country. Transmission models based on mobile-phone mobility data from different technology companies suggested that, in early June, in the cites of São Paulo and Rio de Janeiro, *R* was between 1 and 1.30[15]. A report published on 8 May[16] estimated *R* to be 1.90 (95% CIs: 1.57 - 2.31) in the state of Pará, and 1.16 (95% CIs: 0.95 -1.39) in the state of Paraná, which borders São Paulo to the south.

Government Response Policies

On 8 April, a Justice of the Brazilian Supreme Court initially ruled that state governments, in the exercise of their powers and within their territories, have the authority to adopt and maintain restrictive measures to respond to Covid-19[17]. According to the ruling, municipal governments can supplement federal and state legislation, as long as there is local interest in the measures adopted. As we describe more fully in the city summaries at the end of this report, some states and state capitals have decided to prolong physical distancing measures already in place. Other cities have decided to implement even stricter measures. Yet others are starting to lift restrictions.

Our three teams of coders, associated with FGV-EBAPE in Rio de Janeiro, the University of São Paulo and the University of Oxford have coded government response policies for the Brazilian federal government, state governments, and (to date) eight state-capital municipal governments, from 1 January to 31 May, using the OxCGRT coding system. OxCGRT collects systematic, comparable information on policies to Covid-19 across a standardised series of 17 indicators[18]. In this way, it aims to provide a reliable record of what governments have done in response to the disease. At the global level, this database allows policy analysts to draw cross-temporal and cross-national comparisons to understand how governments' responses have evolved over time. At the subnational level it fulfils the same role, but for variation in policy choices across subnational units

[14] Situation Report for COVID-19: Brazil, 2020-06-09. Accessed 16 June 2020. Available at: https://mrc-ide.github.io/global-lmic-reports/BRA/

[15] Darlan S. Candido et al. Evolution and epidemic spread of SARS-CoV-2 in Brazil. medRxiv 2020.06.11.20128249; doi: https://doi.org/10.1101/2020.06.11.20128249

[16] Thomas A Mellan, Henrique H Hoeltgebaum, Swapnil Mishra et al. Estimating COVID-19 cases and reproduction number in Brazil. Imperial College London (08-05-2020), doi: https://doi.org/10.25561/78872

[17] Claim of non-compliance with a fundamental precept (ADPF) No. 672. Available at: http://www.stf.jus.br/arquivo/cms/noticiaNoticiaStf/anexo/ADPF672liminar.pdf. A similar decision was taken by the plenary of Brazilian Supreme Court when deciding on the Direct Unconstitutionality Action (ADI) No. 6341, on 15 April 2020.

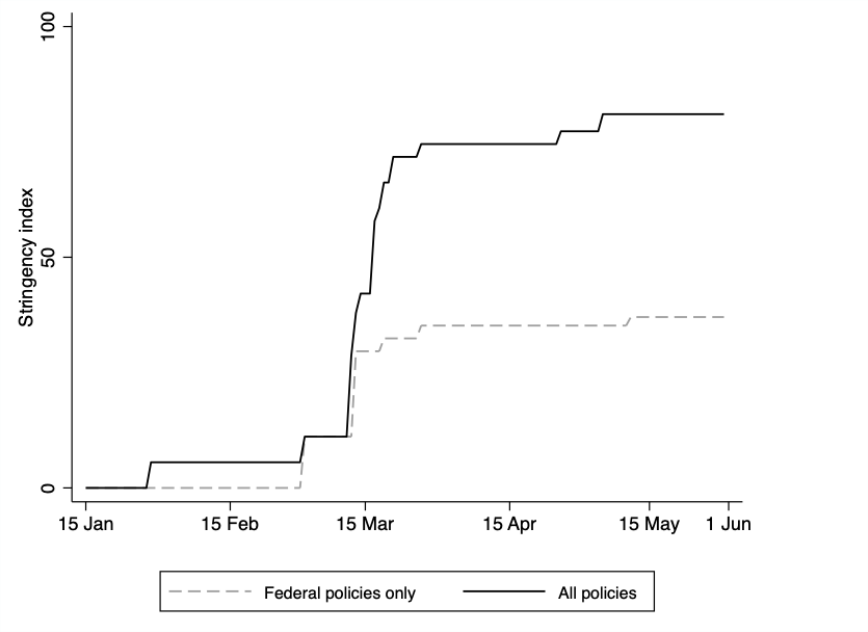
[18] Codebook for the Oxford Covid-19 Government Response Tracker. Available at: https://github.com/OxCGRT/covid-policy-tracker/blob/master/documentation/codebook.md

within the same country, and for hierarchical variation, by different levels of government. The OxCGRT codebook developed for the country level can be applied to the subnational level with only a few adjustments. We considered policies limiting the free flow of people or vehicles coming in and out a state as a restriction in internal movement for that state, and we coded policies restricting intercity transportation as limitation in public transport at the state level. These small changes do not affect the calculation of the stringency index, as described below.

Country-level coding in the OxCGRT international dataset records the strictest level of each indicator that is found within a country (whatever level of government enacts it) on an ordinal scale, alongside a binary coding system that assigns a 0 to policies that apply to only some parts of the country, and a 1 to policies that apply across the whole country. The stringency index for country-level coding is calculated by adding together the ordinal indicator score and this binary score for each indicator, scaling this to a score out of 100, and finding the average across those indicators that compose the comprehensive stringency index that also ranges from 0 to 100 (a full description is available on GitHub[19]). The federal government stringency index and state and city government stringency indices reported elsewhere in this paper, are calculated in the same way. Placing country-level stringency index scores for Brazil alongside those of federal government policies, as in Figure 3, illustrates that subnational governments have contributed a great deal to Brazil's country-level stringency scores.

[19] OxCGRT Stringency Index Methodology. Available at: https://github.com/OxCGRT/Brazil-covid-policy/blob/master/documentation/stringency_index_methodology.md

Figure 3. Country-level stringency and the stringency of federal government policies in Brazil over time. The gap between the two indicates that the lion's share of Covid-19 response policies in Brazil has been undertaken by states and cities.



Federal Government Policies

Since early in the outbreak, the federal government has been active in developing public information campaigns to educate citizens about how to prevent the spread of the virus. Since early March, information about hand hygiene and respiratory etiquette (covering the mouth and nose when coughing, and coughing into a tissue that is immediately disposed of, for example), were available online on the Ministry of Health's website. The federal government also launched a mobile phone application to inform the public about the symptoms of Covid-19, about prevention measures, and to answer citizens' questions.

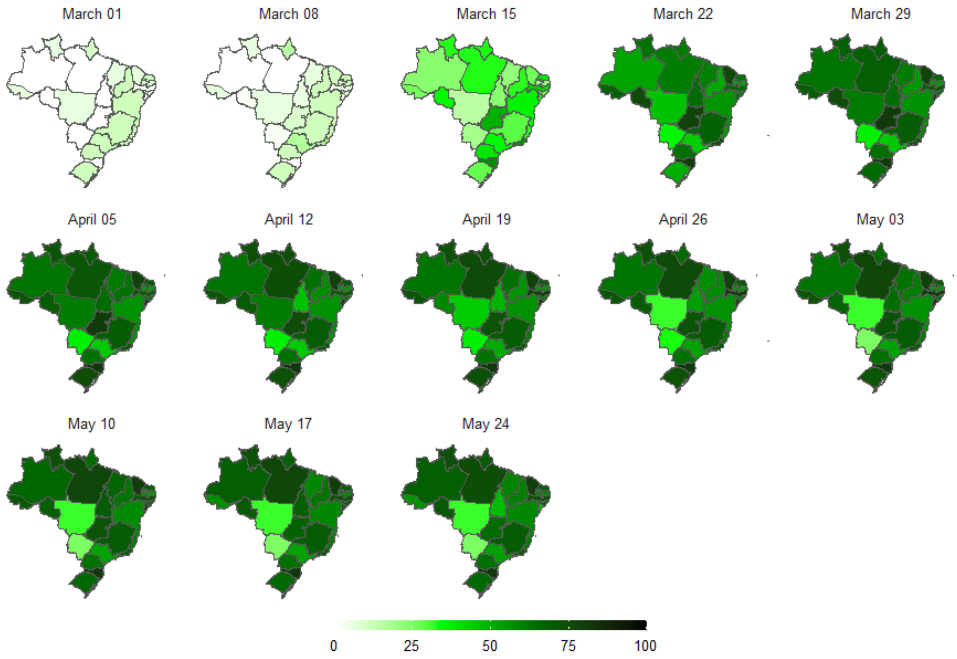
Federal authorities have promoted some closure and containment measures. From mid-March the Ministry of Health recommended the cancellation of public events, and the postponement or cancellation of private events with more than 100 people. It also recommended that people should avoid leaving their homes and should work from home when possible in areas of the country with community transmission. The Ministry of Justice brought in international travel controls, initially closing Brazil's borders with neighbouring countries, and, on 27 March, completely shutting the borders to foreigners flying into Brazil from all over the world (though Brazilian nationals were allowed to return home).

The federal government did not require workplaces to close. However, in light of the measures adopted by states and municipalities to close non-essential businesses, it

published a decree (Decree No. 10282/2020, signed by the president and the main ministries) listing the services and activities that it considered essential. Following this decree, many legal cases taking issue with differences between the list of essential services and activities defined by the federal government, and the ones classed as essential by states and municipalities, have been brought before Brazilian courts. For example, a decree issued by the federal government (Decree No. 10344/2020) included gyms and beauty parlours in the list of essential services and activities, yet policies implemented by the city of Osasco, in São Paulo state, and by the state of Goiás have required gyms to close. The Brazilian Supreme Court, when judging cases like these, has decided that states and municipalities do not need authorisation from the federal government to adopt closure and containment measures, and that in cases of a conflict between policies established by different levels of government, local policy should prevail when there is a clear local interest.

Figure 4 summarises the strictness of policy responses over time by Brazil's state governments. The depth of colour indicates the weekly average stringency index score of state government policies. The week begins on a Sunday and ends on a Saturday. Thus, the first map is for the week commencing Sunday, 1 March and ending on Saturday, 7 March 2020. The last map in the figure represents the average data from Sunday, 24 May to Saturday, 30 May.

Figure 4. The development of state government polices over time, as measured by the stringency index.



Source: Dataset of Brazilian sub-national Covid-19 government response policies, available at: https://github.com/OxCGRT/Brazil-covid-policy

Government Response Policies and Mobility

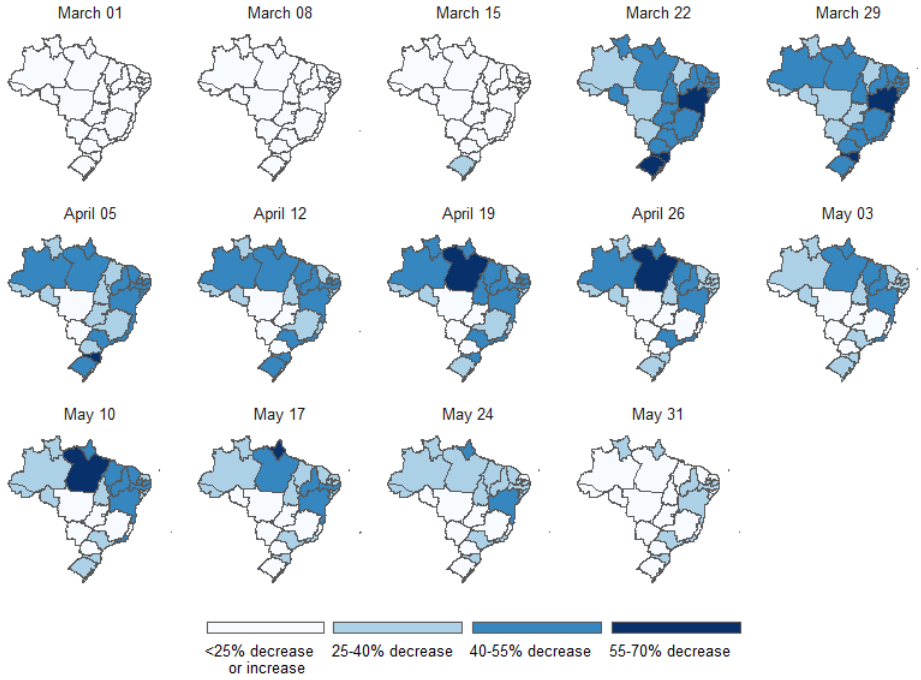
One way of analysing the impact of government policies on citizens' behaviour is to follow the spatial movement of smart phones with certain applications installed. In Figures 5 and 6, and in Table 1, we use mobility data from InLoco, a location analysis company, which tracks approximately 60 million smartphone users across Brazil. These data can be disaggregated so that they indicate different aspects of travel away from home.

We use three measures of mobility. The first is the percentage of mobile phones that remain at the same geographical location during the day (6am to 10pm) as during the night (10pm to 6am). We aggregate this measure for each state. The second measure is the change in the number of kilometres travelled each day relative to the first five weeks of the year. The third measure is the change in the number of non-essential trips each day (also compared to the first five weeks of the year). These second and third measures are averaged for users across a state. InLoco considers non-essential trips to include journeys to a wide range of establishments from bars to spas.[20] The average number of

[20] The list includes bars, bakeries, restaurants, hairdressers, bike shops, bookstores, malls, butchers, coffee shops, dealerships, chocolate shops, clothing and cosmetics, department stores, food courts, electronics stores, gyms, computer stores, hotels, household goods stores, cinema, shoe stores, shopping centres, real estate agencies, fast food outlets, theatres and spas.

kilometres and the average number of non-essential trips are measured relative to a baseline established during a five-week period including all four weeks in January and the first week of February 2020[21]. Figures 5 and 6 show average weekly changes relative to this baseline period for all states. These mobility data are regarded as precise, with a location-measurement estimated standard error of 2.8 metres.

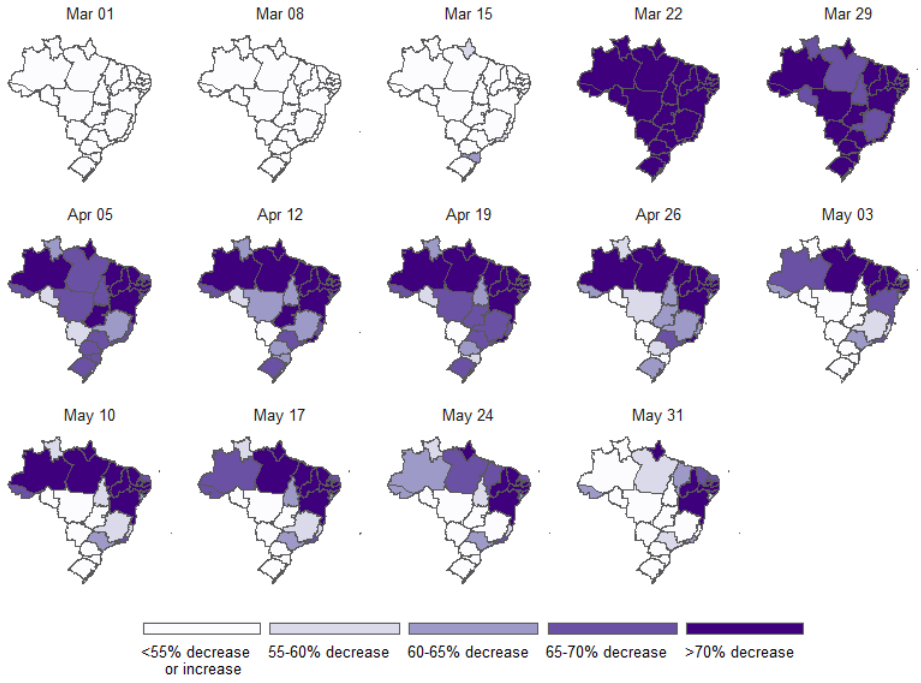
Figure 5. Weekly average changes relative to baseline in the daily distances travelled by smart phone users.



Data source: InLoco.

[21] January and February are (summer) holiday months in Brazil. Data for last year for the same months (March, April, and May) are not available.

Figure 6. Weekly average changes relative to baseline in the daily number of non-essential trips made by smart phone users.



Data source: InLoco.

To assess the association between state government response policies and mobility we estimated state-level fixed-effects linear regression models. We employ the three aforementioned mobility measures as dependent variables and OxCGRT indicators as explanatory variables, either aggregated into the stringency index or as measures of the strictness of restrictions in individual policy areas. In the Models 4, 5 and 6 (that consider individual policies), we excluded international travel controls and public transportation closures (as international travel controls are unlikely to affect outcomes, and because according to the Brazilian constitution, public transportation is largely the responsibility of municipal governments[22]). All models in Table 1 include dummy variables representing days of the week and calendar-weeks, and dummy variables representing the individual states. The week-day controls are to account for normal variation in home permanence, non-essential trips and distance moved between weekend days and the rest of the week. The calendar-week dummies account for trends over time such as the willingness or capacity of people to stay at home, and events that are not directly related to government responses across all states. Finally, the state dummies control for all characteristics of the states that do not change in the observed period of time, such as the level of economic development. The effects of policies implemented simultaneously in all states will be mostly captured by these calendar-week dummies. Policy effects will

[22] According to the Federal Constitution of 1988, municipalities are responsible for legislating on the provision of public services of local interest, there included public transport (article 30, I and V).

be estimated mainly based on policies implemented in different moments or in different intensities across states. Thus, this approach leads to a conservative estimate of policy impact on mobility. Robustness checks with dichotomised policy levels, with calendar-month (instead of calendar-week fixed effects), and checks using a first-order auto-regressive term can be found in the Appendix.

The results in Table 1 indicate that the strength of policies overall, as indicated by the OxCGRT stringency index, significantly increased how much people were staying at home during the daytime (home permanence). An increase of 10 points of stringency on a scale out of 100 is associated with individuals spending on average 0.9% more days at home (Model 1). Model 2 shows that the same increase in the stringency index is associated with a 3.2% reduction in the number of non-essential trips per day compared to the first five weeks of 2020. Model 3 shows that this change in policy strength is associated with a 3.3% reduction in the daily distance travelled, compared to the first five weeks of 2020.

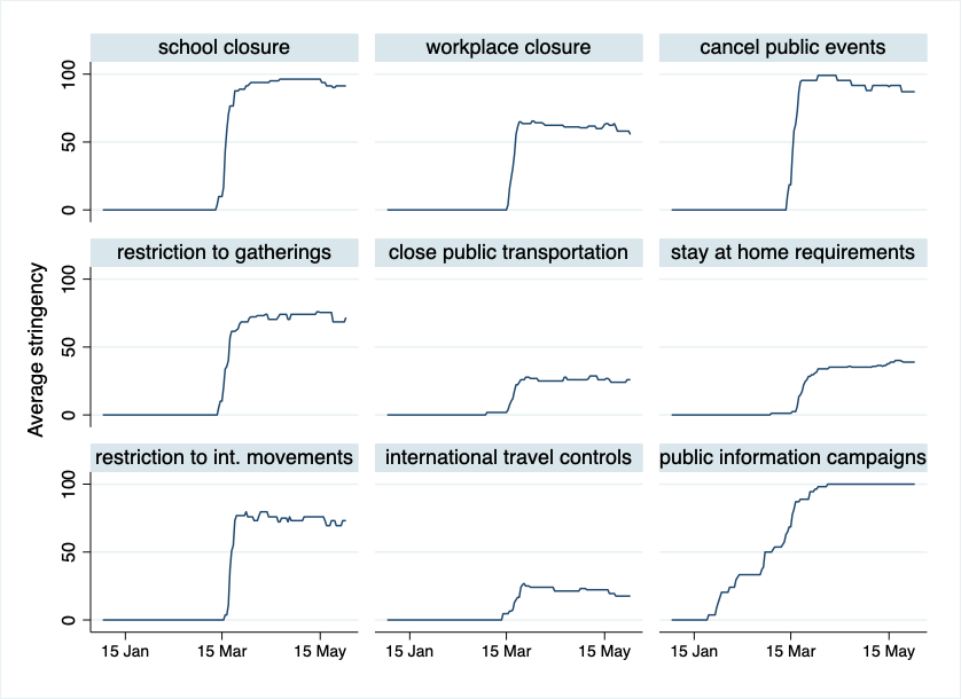
The link between individual policies and mobility is examined by Models 4, 5 and 6. The effects of each policy as reported in these models should be interpreted as the effects when all the other policies listed in Table 1 are fixed. These models suggest that workplace closures had significant effects on all three measures of mobility, while cancellation of public events and school closures reduced non-essential trips. All else equal, stay at home requirements increased home permanence. Although they do not appear to have had significant effects on the other measures of mobility, the relevant coefficients are negative, as per the policies' intention. Restrictions on internal movements significantly reduce average daily distances travelled (Model 6), which was expected as these policies generally restrict movement between states and therefore, longer journeys. In Models 4 to 6, all individual policies record some significant effects on mobility, in the expected direction, except for public information campaigns and restrictions on gatherings of people. However, the results of Models 4 to 6 should be interpreted with caution, compared to those of Models 1 to 3, which show clear effects of government-response policies on mobility. Disentangling the effect of individual policies in this way is difficult because many individual policies were enacted at roughly the same time. Because of this, we do not recommend policymakers make decisions about individual policies solely based on the results of Models 4 to 6.

Table 1. The predicted effects of state government response policies on mobility.

	Model 1 Home perman. (%)	**Model 2** Change in non-essential trips (%)	**Model 3** Change in distance (%)	**Model 4** Home perman. (%)	**Model 5** Change in non-essential trips (%)	**Model 6** Change in distance (%)
Stringency Index	0.088***	-0.321***	-0.326***			
	(0.017)	(0.092)	(0.093)			
School closing				0.018	-0.089***	-0.025
				(0.012)	(0.028)	(0.038)
Workplace closing				0.039***	-0.096**	-0.115***
				(0.011)	(0.045)	(0.040)
Cancel public events				0.013	-0.105***	-0.060
				(0.008)	(0.030)	(0.037)
Restr. on gatherings				-0.010	0.041	0.013
				(0.006)	(0.026)	(0.025)
Stay at home requirem.				0.080***	-0.114	-0.089
				(0.024)	(0.080)	(0.072)
Restr. on int. movement				0.009	-0.029	-0.066*
				(0.009)	(0.025)	(0.033)
Public info. campaigns				-0.001	-0.005	0.003
				(0.006)	(0.026)	(0.028)
Cal.-week fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Week-day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3078	3078	3078	3078	3078	3078
States	27	27	27	27	27	27
R-squared	0.858	0.902	0.780	0.865	0.906	0.791

Clustered standard errors in parentheses
* p<.10 ** p<.05 *** p<.01

Figure 7. Average scores for all state government policies combined on each indicator that comprises the stringency index.



Source of data: Dataset of Brazilian sub-national Covid-19 government response policies, available at: https://github.com/OxCGRT/Brazil-covid-policy

When we consider the evolution of mobility over time, by examining the coefficients of calendar-week dummies without controlling for stringency, we find that all three measures of mobility change dramatically at exactly the time when many Covid-19 response policies were introduced, in mid-March. We also find that these changes in mobility remain significant throughout the entire period examined (that is, at least until the end of May). Figure 8 shows these sudden changes in mobility when state-government policies were introduced in large measure (the horizontal red line signals the moment in which most policies were implemented). Specifically, Figure 8A shows the sudden increase in home permanence. Sudden decreases in the average number of daily non-essential trips and in average daily distances travelled are shown in Figure 8B, relative to the first five weeks of the year. Note that citizens' behaviour did shift slightly before state governments brought introduced many response policies. At the end of February and in early March, when cases of Covid-19 had been found in Brazil yet there were limited policies in place to reduce the spread of disease, there were small changes in mobility by all three measures.

In Figure 8, the lines expanding out from each dot (each coefficient estimate) indicate 95% confidence intervals. Although the extent of changes in mobility has ebbed over time since the policies' widespread introduction, at no point afterwards have the confidence intervals of the coefficients crossed the black, dotted zero line. Neither have

the coefficient estimates from the most recent weeks come close to lining up with those from weeks before mid-March, when citizens' mobility changed slightly prior to the introduction of many state-government policies. These two points indicate that the policies have been effective throughout the period examined.

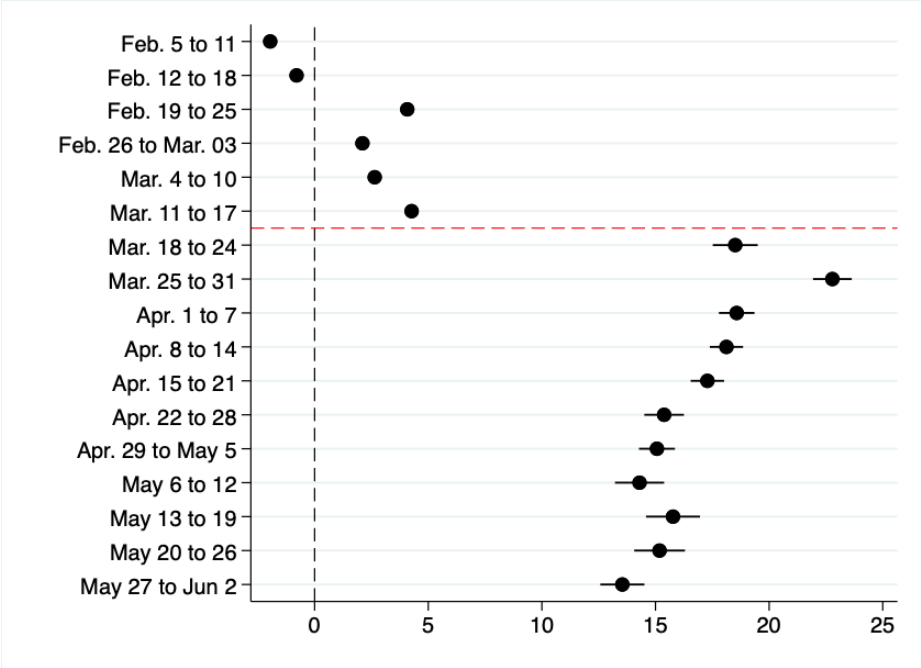
The percentage of people staying at home all day increased by 22% at the end of March compared to the first week of February. In the last week of May, there remained an increase in home permanence relative to this baseline, but it had dropped to a 14% increase. An analogous pattern is observed for the change in the average number of non-essential trips (now in this case compared to the first five weeks of 2020). This measure of mobility is reduced by 84% at the end of March compared to that baseline, and 65% two months later. The average daily distance travelled (also compared to the first five weeks of 2020) was 58% reduced in late March, and 35% down in the last week of May (see corresponding models in the Appendix).

In summary, Figure 8 suggests that people have responded strongly to Covid-19 response policies, and although citizens do move around more over time when the rules have remained largely unchanged, these policies never cease to be effective.

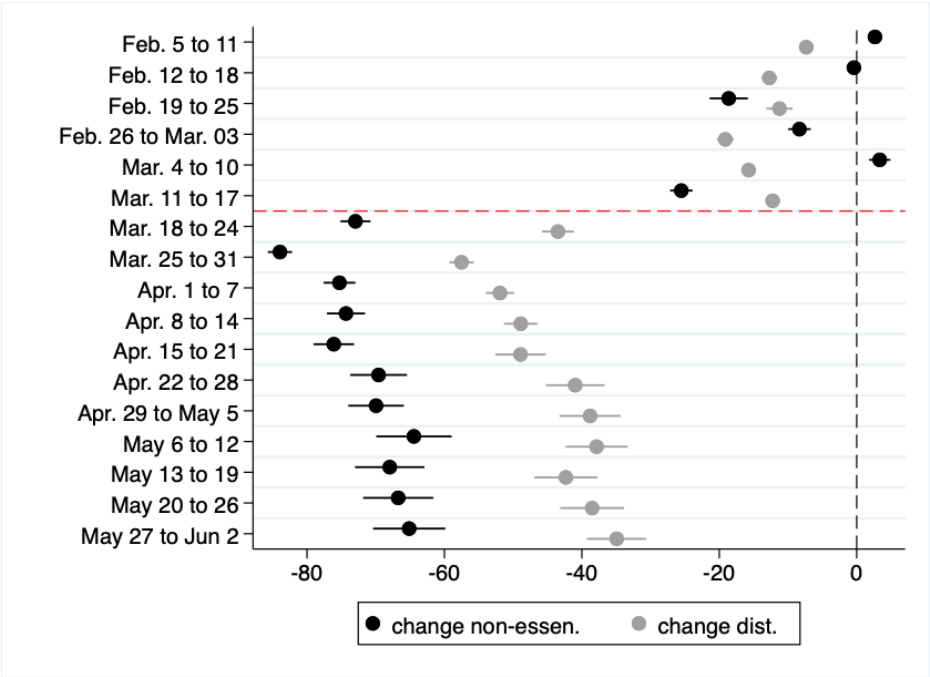
In the next section of this paper, we move on from discussing mobility data to examining the results of our survey. Although valuable as an objective indicator of behaviour, mobility data can only describe the movements of individuals who own smart phones. As these data are averages of this population, they do not provide information about who is moving around—for example, whether the people making many non-essential trips are those who are likely to be contagious. Our survey results provide insights into these matters.

Figure 8. Changes in mobility.

A. Home permanence (as an average of states compared to the first week of February).



B. Change in non-essential trips and change in distance (average of states compared to the first five weeks of the year).



Source of data: InLoco and dataset of Brazilian sub-national Covid-19 government response policies, available at: https://github.com/OxCGRT/Brazil-covid-policy.

A Survey of Eight State Capitals

The Survey Design

The survey was designed to probe how citizens behave during a period of widespread Covid-19 government response policies. It includes questions to assess the extent of citizens' understanding of the disease, to gather information about what citizens have observed in their environment (such as whether hospitals and nursing homes that interviewees visited have taken precautions to reduce the risk of viral transmission), and questions about citizens' wider experiences and opinions. As explained further below, many questions directly relate to the WHO's advice regarding measures that should be in place before easing government response policies. A list of survey questions can be found on GitHub.

The survey was conducted over the phone by a survey company, which ran a training session for employees who would be interviewing respondents, and pre-tested the questionnaire for duration and clarity of questions (after which the final version was adjusted). Where appropriate, the order of response options for each question was randomised. Oxford University's ethical review body, CUREC, approved the study[23].

The Survey Sample

We restricted our sample to landline and mobile phone numbers registered in eight state capitals, which together are home to 18% of Brazil's urban population. Five of these cities are the capitals of the states with the largest populations in each of Brazil's five geographic regions: São Paulo, Manaus, Salvador, Porto Alegre and Goiânia. The other three cities, Rio de Janeiro, Recife and Fortaleza, are the capitals of those states that had the largest number of total confirmed Covid-19 when the survey was designed[24]. Phone numbers were randomly selected for each city from a sampling frame of hundreds of thousands of landline and cell phone numbers, and the survey company was instructed to call non-respondents back at least twice more before moving on to another randomly selected telephone number. Calls were also made at different times of day and at the weekend to guard against bias in the sample that could have arisen if respondents picking up the phone during the daytime were more risk adverse than others who went out. The sample for each city was stratified by age, sex, education level and income[25]. The final sample included at least 200 interviews with residents of each city, and slightly more (250 interviews) in São Paulo, yielding a total of 1,654 responses. Interviews took

[23] CUREC approval reference: SSD/CUREC1A/BSG_C1A-20-20.
[24] Since then, the outbreak in the state of Para has grown to exceed that of Pernambuco.
[25] The following categories were used to establish quotas: age groups (18 to 24, 25 to 40, 40 to 60, and 60 or older), sex (male, female - though non-binary responses were recorded), education (illiterate/primary education, middle education and higher education) and monthly income (up to 1 minimum wage, from 1 to 2 minimum wages, from 2 to 5 minimum wages, from 5 to 10 minimum wages, and 10 minimum wage or more).

place between 6 to 27 May 2020. Therefore, when survey questions asked about behaviour in the previous two weeks, this referred to a fortnight period between 22 April and 13 May, depending on the date of the interview.

The final sample was similar to the combined population of the eight capitals. Descriptive statistics by city can be found in the Appendix. Overall, 18% of respondents were between 18 and 25 years of age, 36% were 25 to 40 years old, 32% were 40 to 60 years old, and 14% were over 60. Women made up 54% of the sample. Based on the level of income in February, just over a third (35%) of respondents received less than 2 minimum wages per month, 44% received 2 to 5 minimum wages, 12% received 5 to 10 minimum wages, and 8% more than 10. Most had either some primary school (36%) or middle school (35%) education, and 29% had enrolled in or graduated from a higher education establishment. Private company employees made up 29% of the sample, followed by informal entrepreneurs (21%), formal entrepreneurs (11%), civil servants or public company employees (10%), unemployed (9%), retired (6%), home-makers (6%) and students (3%). Most formal entrepreneurs were MEIs, which stands for 'Microempreendedor Individual' (individual microentrepreneur). These are members of a large, subsidised, federal-government programme in Brazil, which aims to formalise micro-businesses (defined as those with up to one employee). Almost a quarter (22%) of private company employees were informal (defined by not having a signed work card, or 'carteira assinada').

In order to evaluate potential non-response biases, the survey company called 500 numbers that did not respond in the first three call attempts a further 10 times and during different hours of three days at the end of the survey. These calls yielded only 10 interviews, a number too small for an adequate analysis of non-response bias.

Survey Results

Here we report survey results relevant to the WHO recommendations followed by findings that describe the social and economic realities of government response policies to Covid-19. All descriptive results are weighted so that they may be generalised to the combined populations of the eight cities studied, using frequency weights based on the population of each city. This is the population to which we refer when we discuss 'people' and 'citizens' in the paragraphs below[26]. We then compare the responses of groups with different characteristics.

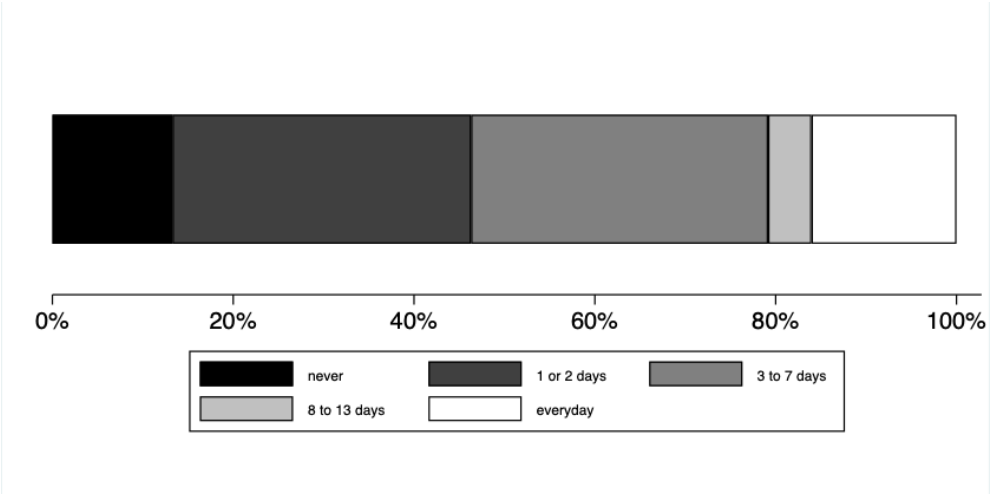
Covid-19 Response Policies and the WHO's Recommendations

[26] 95% confidence intervals for these estimates are displayed in some figures, though not reported in the body text. They are available for all estimates on request from the authors.

We initially assessed citizen behaviours, knowledge and testing frequency as these are fundamental to several of the WHO's six criteria. Figure 9A shows on how many days during the two weeks prior to interview people in the eight state capitals tended to leave home. Of the total population studied, approximately 13% of people reported not leaving the house at all during the two weeks prior to interview, slightly fewer than the 16% who left home every day. Those who left did so on average on 5.5 days during that period.

Figure 9: Distancing, knowledge about Covid-19D and testing by exposure to the virus

A. Number of days that people reported leaving home in the previous two weeks



B. Testing, knowledge, mask use, and reasons for leaving home (with 95% confidence intervals)

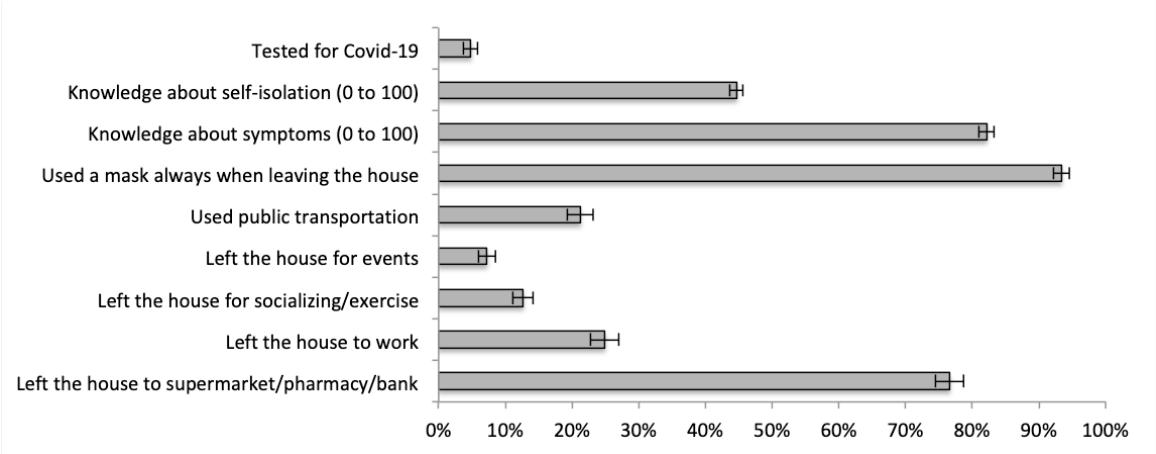


Figure 9B shows how common testing was among the eight capitals' combined populations, the reasons why people left home, and levels of understanding of Covid-19.

It shows that testing was infrequent: only 5% of people reported being tested for Covid-19 at any time. Indeed, on average, test results took 5.9 days, which exceeds the WHO's recommendation of a one-day turnaround[27]. Of those who had been tested, 18% were positive for SARS-CoV-2. Only 15% of those who tested positive were re-tested (whereas the WHO recommends this as routine for establishing the absence of viral load[28]).

Figure 9B also shows that the most common reason for leaving home was to make essential trips, to the supermarket, pharmacy or bank. Around 25% of people left their residence most days to go to work; 65% usually left home to work in February. These proportions vary by sector of the economy. Among those who had a remunerated activity in February, going out to work during the prior two weeks was more common among those construction workers (57% of people who work in the sector) and industrial workers (35%) than among those employed in commerce or services (28%). During the period examined in the survey it was normal to wear a mask on the street. Those who left their home in the previous 14 days perceived that 76% of others, on average, were wearing masks when out and about [29].

We also find limited public transport use in line with closures of various kinds of public transport in different cities. On average, 22% of individuals used public transportation in the prior to weeks, compared to 56% during the month of February. Reduced public transport services were only an impediment to going about intended activities for 13% of people. Responses to questions not reported in Figure 9B show that people did not travel far. Fewer than 1% journeyed to another state, and 7% to another city during the fortnight prior to interview.

When the survey results are examined more closely, there were clear differences in how often people left the house according to their individual risk from Covid-19. Among the over-60s and those with comorbidities (one or more of diabetes, cardiac disease, chronic respiratory disease and cancer), 20% remained at home without leaving during the prior two weeks, compared to 11% of under-60s who did not report having any of those conditions. The WHO recommends that monitoring systems be established for those who need to self-isolate[30]. Our survey suggests that people who did not leave the house in the previous two weeks were generally supported: 58% received food from others, and 60% received daily calls or messages.

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[27] World Health Organization. Laboratory testing strategy recommendations for COVID-19. 21 March 2020. Available at: https://apps.who.int/iris/bitstream/handle/10665/331509/WHO-COVID-19-lab_testing-2020.1-eng.pdf

[28] World Health Organization. Laboratory testing of human suspected cases of novel coronavirus (nCoV) infection. 10 January 2020. Available at: https://apps.who.int/iris/bitstream/handle/10665/330374/WHO-2019-nCoV-laboratory-2020.1-eng.pdf

[29] The vast majority of these people (94%) reported always wearing a mask when they left the house. This suggests some social desirability bias among respondents, as our sample is representative of the population.

[30] World Health Organization. Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19). 19 March 2020. Available at: https://www.who.int/publications/i/item/considerations-for-quarantine-of-individuals-in-the-context-of-containment-for-coronavirus-disease-(covid-19)

We created scores out of 100 for 'knowledge about Covid-19 symptoms' and 'knowledge about self-isolation'. For the knowledge of symptoms index, the respondents had to identify which symptoms from a list with two correct items (fever and dry-cough) and four incorrect items (rash, ear pain, itch and joint pain) are common symptoms of Covid-19. The score out of 100 is the percentage of correctly spotted symptoms[31]. The score for 'knowledge about self-isolation' was calculated in the same way. In this case, respondents were asked whether a series of behaviours were each consistent with recommended self-isolation practices. One described practice was correct (not leaving the house and asking people to bring things you need), and four behaviours listed were incorrect. The incorrect items included self-isolation means 'you should not talk to anyone', and 'you can behave like people who are not self-isolating except that you should wear a mask'. The score for knowledge about self-isolation is the percentage of correct yes or no answers across the five behaviours. Knowledge of Covid-19 symptoms (with an average score of 82 out of 100) was stronger than knowledge about the meaning and recommended practices associated with self-isolation (44 out of 100).

Most respondents answered correctly on only two of these yes/no items: 80% indicated said that, no, 'not talking to other people' is not a self-isolation practice, and 64% correctly identified that, yes, 'not leaving the house and asking other people to bring things you need' is a self-isolation practice. However, 95% of people incorrectly thought that self-isolation means 'you may leave the house to buy essential items', 57% incorrectly thought it means 'you may behave as non-isolated people and should just avoid touching other people', and 69% incorrectly stated that self-isolation means 'you may behave as non-isolated people and should just wear a mask'. These findings about behaviours understood to be associated with self-isolation may be instructive for improving public information campaigns.

Fica em Casa (Stay at home)

To further assess citizen behaviour, knowledge, and testing frequency, we divide the sample into three strata according to *probable* contagion risk. Figure 10 compares those who did not report any Covid-19 symptoms during the week prior to their interview; those who reported experiencing at least one Covid-19 symptom unlinked to a pre-existing medical condition in the previous seven days (one of fever, dry cough, and shortness of breath); and those who did not themselves have symptoms but who reported having had personal contact with at least one symptomatic person[32].

[31] Such that a respondent who only selected the two correct items would receive a score of 100 out of 100, and a respondent who selected the two correct items and one incorrect item would receive a score of 83 out of 100.

[32] For simplicity of having short names to refer to, we label these three groups 'non-contagious', 'probably contagious with symptoms', and 'probably contagious through contact'. As noted in the text, these names reflect that information that we have, rather than a more rigorous diagnostic, and the non-contagious category is highly likely to comprise asymptomatic people.

These strata are inevitably imperfect. We cannot be sure who was contagious among the respondents during the two weeks prior to interview, which is the period when we ask about behaviours. For one thing, many people infected with SARS-CoV-2 show no signs of infection, and the survey is not able to identify everyone in this group. In the survey, respondents who state that in the past seven days they have experienced at least one Covid-19 symptom that is not linked to a pre-existing condition are then asked when their symptom(s) began, and what the result was if they were tested[33]. To date, studies show that the infectious period tends to begin two-three days before symptoms[34]. People with the virus are considered most infectious the day before symptoms appear, and their viral load remains high during the first week of symptoms[35]. Thereafter, infectiousness declines. There is variation across individuals for all of these periods, however, and occasionally people have been found to have significant viral loads for up to 25 days after the onset of symptoms[36].

Taking this evidence together, we include in the category '(probably) contagious with symptoms' responses from people who stated that their symptoms began between 10 and 20 days before the interview. Those for whom symptoms started 10 days prior to interview are likely to have already been infectious at least during days 2-11 of the prior 14 days, and from day 11 onwards their viral load would have been decreasing. To include only individuals whose symptoms started on or very close to this day would have meant a very small sample for comparison with the rest, so we extended the relevant days of symptom onset. Those for whom symptoms began 20 days ago would have been most infectious in the first day or two of the fortnight prior to interview if patterns for median viral loads among all infected people are to apply to them. However, because we only probe the date of symptom onset among respondents who have (still) been experiencing symptoms during the week before their interview, it is likely that these individuals are struggling more than most to shake off the virus, and may, therefore, have more steady declines in viral load than the median. While it is certainly true that these people may no longer have been infectious for the full two weeks prior to the survey, this concern should be considered alongside the fact that infected people whose symptoms started less than 10 days before their interview are likely to have been infectious for some of the previous two weeks. This latter group is not included in the category '(probably) contagious with symptoms'. We exclude from the '(probably) contagious with symptoms' group anyone who was tested and received a negative result. See Appendix for the results using an alternative period of symptom onset, from 6 to 16 days prior to interview. (The results are similar: while the coefficients go into the same direction, they lose statistical significance, but the subsample is small.)

The survey asks respondents whether they have been in contact with someone with either a fever, dry cough, or shortness of breath, and if this person has been tested, what the result was to the best of their knowledge. After catching SARS-CoV-2, the median

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33 The question does not specify the type of test. It asks "Have you been tested for coronavirus?"

34 He, X., Lau, E.H.Y., Wu, P. *et al.* Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nat Med* 26, 672–675 (2020). https://doi.org/10.1038/s41591-020-0869-5

35 Ibid.

36 To, K. K.-W. *et al.* Temporal profiles of viral load in posterior oropharyngeal saliva samples and serum antibody responses during infection by SARS-CoV-2: an observational cohort study. *The Lancet Infectious Diseases* 20, 565–574 (2020).

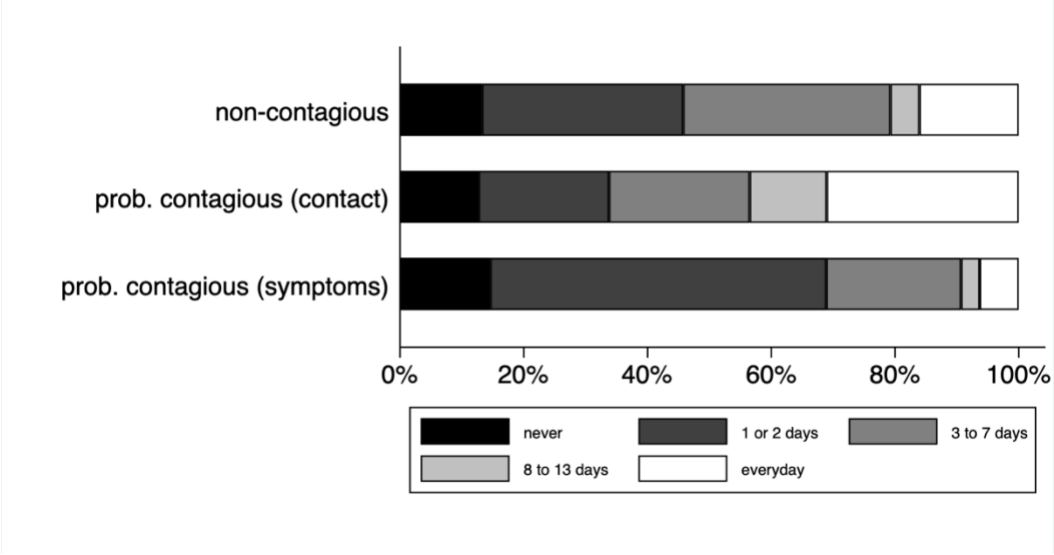
incubation period (the period before symptoms begin) is estimated to be 5.2 days[37]. Thus, the category '(probably) contagious for contact' includes responses from those who reported being in the same place as someone with fever, dry cough or shortness of breath, and whose symptoms had recently started, between 15 and 25 days before their interview. Those in contact with a symptomatic person 15 days previously are therefore equivalent in terms of timing to those described above whose own symptoms started 10 days prior. Those who were in contact with a symptomatic person 25 days previously are similarly equivalent to those described above whose symptoms began 20 days prior. We exclude from the '(probably) contagious with contact' group anyone who said that their symptomatic contact was tested and received a negative result. See Appendix for the results using an alternative period of contact with a symptomatic person, from 11 to 21 days prior to interview. There are no substantive differences.

Approximately 10% of the sample had at least one of the main symptoms of Covid-19 in the week prior to interview (6% fever, 7% dry cough and 3% shortness of breath). Given reported timings of symptom onset, 6% were probably contagious with symptoms. Another 12% reported having had contact with at least one symptomatic person. Given the reported timings of these contacts, just 2% were probably contagious due to contact. Four-fifths of this small group did not live in the same household as the symptomatic person.

[37] Li, Q. *et al.* Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. *N Engl J Med* 382, 1199–1207 (2020).

Figure 10: Social distancing, knowledge about Covid-19 and testing by the three strata

A. Number of days that people left home in the previous two weeks



B. Testing, knowledge, mask use, and reasons for leaving home

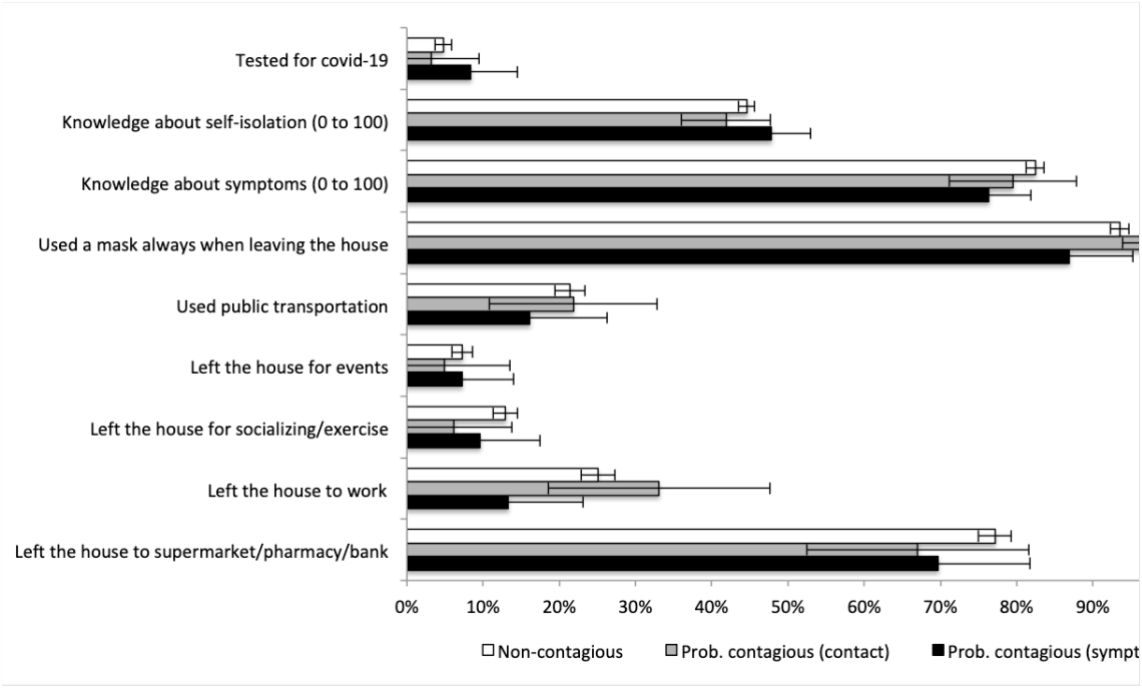


Figure 10A shows that there were no large differences between the number of days that people who were probably contagious with symptoms and those unlikely to be infectious left house during the two weeks prior to interview. Those who were probably contagious with symptoms were more likely to leave home on fewer than two days (69%) compared to those in the non-contagious group (45%). Figure 10A also shows that people who were

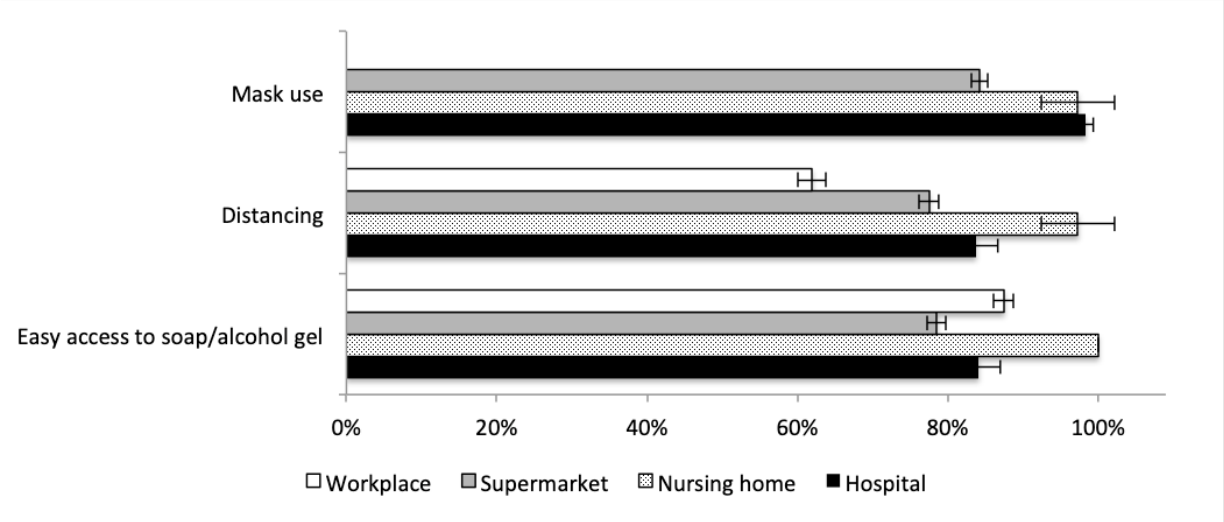
probably contagious through contact with symptomatic people were more likely to leave the house everyday compared to other groups. This pattern is discussed further in the context of Table 2's regression results.

Figure 10B shows that there were no statistically significant differences (at the 5% significance level) between the three strata in terms of their understanding of Covid-19, their tendency to wear a mask when leaving home, nor their reasons for leaving the house, as demonstrated by the overlapping confidence intervals of the three strata for each item.

Compared to the 5% of people overall who reported having been tested, among all those who had symptoms (regardless of symptom onset), 13% had been tested and 7% had sought a test without success. Four percent of the small proportion considered to be probably contagious through contact had been tested.

The results also suggest that public contact-tracing programmes were not well established prior to the survey. People who reported having had at least one symptom of Covid-19 during the previous week, regardless of symptom onset, did not routinely report these symptoms to a medical professional or public employee: only 47% did. Among those who reported having had contact with at least one symptomatic individual, 9% found out about the symptoms through a doctor or public employee, whereas the majority (79%) observed the symptoms or were informed by the symptomatic person herself.

Figure 11: Hand hygiene, distancing and mask use



Few people had visited a hospital (12%) or a nursing home (just 1%) during the fortnight prior to interview, compared to the proportion who had been to a supermarket (81%) or to their place of work (39%). Rather than omit our findings about additional public health protections reported by visitors to hospitals and nursing homes, we cautiously report these results in Figure 11, acknowledging the small subsample size. Distancing, mask use by employees, and hand hygiene appears to be well established in hospitals and nursing homes. However, only 62% action to increase social distancing by, for example, making[38].

Knowledge and Public Information Campaigns

Overall, the main source of information about Covid-19 was TV news (59%), and newspapers and newspaper websites (18%). Even though all state and city governments and the federal government have been running public information campaigns about Covid-19, these are not reaching everyone. Most of the population (65%) claimed to have seen at least one government campaign, via diverse means— among this group most had seen them via TV (82%), followed by newspapers (32%), radio (26%), blogs (23%), Twitter/Facebook (30%) and WhatsApp (19%). The majority of these people (65%) recalled seeing a public information campaign from the state government; fewer said they had seen one from the federal government (36%) or the municipal government (34%).

The survey shows that citizens take the risk presented by Covid-19 seriously, with 80% considering it to be much more serious than a common cold. Moreover, most people consider the government response measures that apply to them, given their location, to be adequate (52%). More than a third (37%) consider them to be less stringent than necessary, and 11% view them as more stringent than necessary. Only 21% of people reported believing that the public health system in their region is either well prepared (11%) or very well prepared (10%) for Covid-19, and 86% said they were either worried (12%) or very worried (74%) about the possibility of medical equipment, hospital beds, or the number of doctors in their region failing to meet demand.

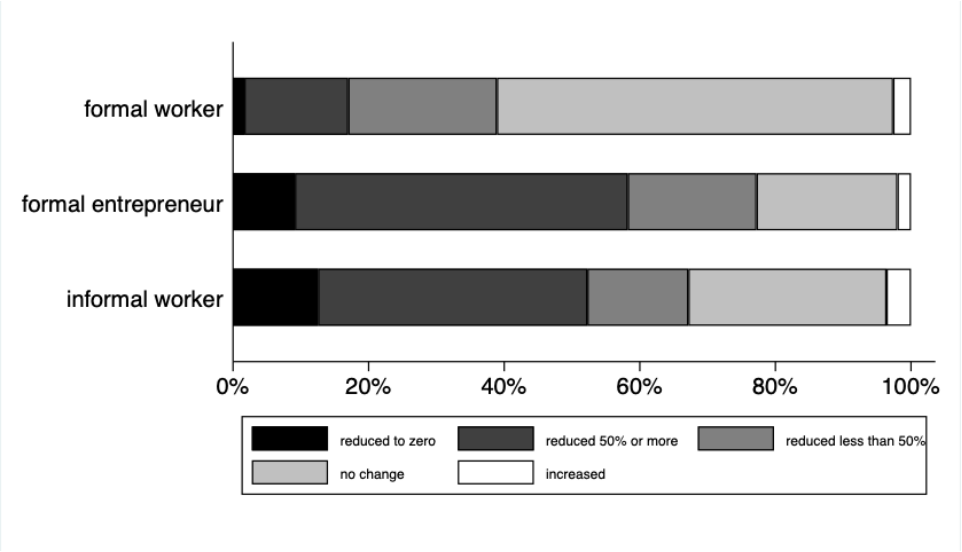
The most common reason given for why respondents think that others comply with social distancing policies was the fear of them being infected (60%), followed by the desire to do the right thing (28%). As per the WHO's recommendation of staggered, or stage-wise easing of social distancing policies[39], three quarters of people stated that they expect that policies to fight Covid-19 will not be removed at once. On average, respondents estimated the time until these policies are completely removed to be 4.7 months.

[38] Data about mask use in the workplace were not collected.
[39] World Health Organization. Considerations in adjusting public health and social measures in the context of COVID-19: interim guidance. 15 April 2020. Available at: https://www.who.int/publications/i/item/considerations-in-adjusting-public-health-and-social-measures-in-the-context-of-covid-19-interim-guidance

Impacts of Government Response Policies on Income and Education

The survey was undertaken nearly two months after the widespread introduction of social distancing policies in mid-March, and confirms that individuals have experienced large changes in income since February. These reductions have been more acute for the poor. Overall, 53% of people reported a reduction in household income. Among those who saw their income decrease, 64% (or 34% of the overall population) stated that they had seen a reduction of half or more, and 13% (7% of the total population) reporting a total loss of earnings. Overall, 35% of citizens said that they had had difficulties paying bills since February.

Figure 12: Changes in income compared to February



There are striking differences in income loss between those who were employed as formal workers in February (who comprise only 46% of those with a payed professional activity), and those who were employed informally in February (38% of paid workers), and formal entrepreneurs – mostly MEIs (16%). We included in the survey questions about changes in income as opposed to asking about job losses, in order to pick up variation among the self-employed, and in the number of work hours among employed people. Only 2% of formal workers reported losing all of their earnings between February and the time of the survey, compared with 9% of microentrepreneurs, and 13% of informal workers. Overall, reductions in income were far less common among formal workers (39% of this group) than among microentrepreneurs (77%), or informal workers (67%). Difficulties in paying bills were more common among informal microentrepreneurs (47% of this group) and informal

workers (45%), compared to formal workers (23%). Corresponding results can be seen when changes in income are compared across different income brackets, with the poor experiencing the greatest losses (see Appendix for more details).

On 31 March, the Brazilian national congress passed an income support law (Law No. 13982/2020, sanctioned on 2 April 2020), which stipulates that low-income individuals should receive an emergency cash-transfer of R$ 600 (equivalent to US$110) once per month initially for three months, but with the possibility of extension by the federal government.[40] Approximately 22% of the population of the eight cities had received the first installment of this income support before their survey interview, 10% applied were deemed eligible but had not received it, and 9% had applied and were not deemed eligible. (The disbursement was part-way through at the time of our survey.) A greater proportion (54%) of beneficiaries of Bolsa Familia (a pre-existing cash transfer programme) stated that they had received at least part of this emergency support, in line with development economists' expectations that increasing payment amounts within existing cash-transfer programmes is easier to execute than setting up payments to new payees[41].

A level of income support that was sufficient to make up at least half of income reduction experienced since February was attained by 64% of people who both experienced a loss in income and had received the R$ 600. The support measure reached 46% of those with a monthly income below 1 minimum wage, 25% in the 1 to 2 minimum-wage range, 22% of people in the 2-5 minimum-wage bracket, and 10% in the 5-10 minimum-wage range.

In the two weeks prior to survey interviews, schools were closed across Brazil. We therefore included a survey question to indicate the quality of the education that children and teenagers were receiving outside of the classroom. Survey respondents who stated that there was more than one under-18-year-old in their household enrolled in school were randomly assigned to comment on either the youngest or the eldest student. Figure 13 displays the results. Broadly speaking, most individuals stated that children were studying most days using materials supplied by their usual teacher, or by another teacher or the government. We consider that these two categories indicate that students have continued access to study materials at levels appropriate to their level of education.

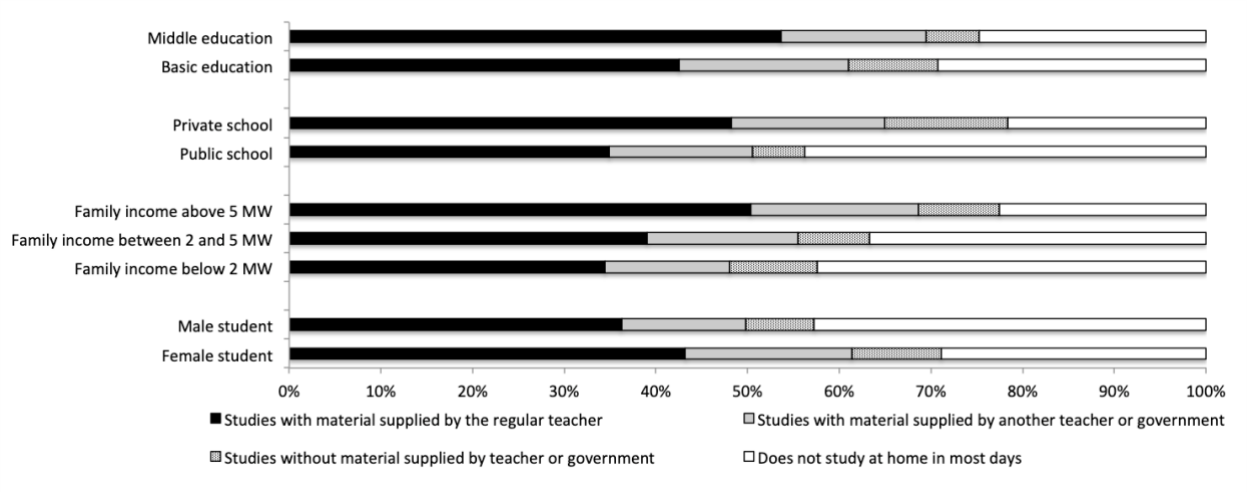
[40] There are several extra requirements to be eligible to Auxílio Emergencial, including: i) being 18 years old or older (except teenage mothers), ii) having no formal employment, iii) not be receiving any other benefit or cash transfer from the government (with the exception of Bolsa Família), iv) having per capita household income of less than 50% of the minimum wage or total household income of up to 3 minimum wages, v) having had taxable income of less than R$ 28559.70 (equivalent to US$ 5240) in 2018, vi) being either a microentrepreneur, retired, or informal worker.

[41] Gerard, F., Imbert, C., & Orkin, K. Policy Brief: Social Protection Response to the COVID-19 Crisis: Options for Developing Countries. April 2020(due to be published in the Oxford Review of Economic Policy). Available at: https://econfip.org/policy-brief/social-protection-response-to-the-covid-19-crisis-options-for-developing-countries/#

Studying with materials not supplied by a teacher or by the government may be fruitful, but the quality is unknown. We did not ask for how long students were studying each day.

Most school-age students continued to study at home on most days (66%). A majority of students either studied using materials provided by their usual teacher (40%), or by another teacher in their school or the government (16%). As Figure 13 shows, these figures varied across public and private schools, and by gender. Fewer public school students (56%) than private school students (78%) studied at all most days, and fewer boys (57%) did so than girls (71%). A higher percentage of students in private schools studied using materials provided by either their teacher (48%) or by another teacher or from the government (17%), compared to students in public schools, of whom 35% studied using material provided by their teacher and 16% used material from another teacher or the government.

Figure 13: Study at home during school closures



Models of Testing Frequency and Going Out

To look more closely at the results discussed so far, we estimated linear regression models or linear probability models (for binary dependent variables) with several dependent variables representing testing for the new coronavirus, and frequency of leaving home. The results of these models are reported in Table 2. Model 7 predicts whether the respondent had been tested for coronavirus. Model 8 predicts whether the respondent never left the house during the two weeks prior to interview. Model 9 predicts the number of days that the respondent left home during the previous fortnight, and Model 10, whether the respondent left home on just one or two days in the same period.

We estimate two versions of the model predicting whether a respondent has received a coronavirus test. In the first, (Model 7a), we observe that individuals in the income bracket

of 10 or more minimum wages were 4.7% more likely to get tested than those who received up–to –one –minimum wage. However, being probably contagious and having had at least one symptom of Covid-19 did not significantly predict whether people had received a test (although this coefficient is positive). In the second model (Model 7b), we substitute being probably contagious and having had at least one symptom of Covid-19, for ever having had symptoms during the outbreak (regardless of when the symptoms occurred). The effect of income remains unchanged in this model while the symptoms variable is positive and significant, indicating that symptomatic individuals were 9% more likely to be tested than people who had not had any such symptoms during the outbreak. To be sure, tests of viral load need to be carried out within the correct window to diagnose infectiousness.

Table 2 – Regression results of models with testing and leaving home frequencies as dependent variables

	Model 7a Tested for corona virus	**Model 7b** Tested for corona virus	**Model 8** Never left the house in two weeks	**Model 9** Number of days left the house in two weeks	**Model 10** Left the house once or twice in two weeks
Age (reference 18 to 24)					
24 to 40	-0.0236	-0.0229	-0.0788***	0.5760*	-0.0123
	(0.0167)	(0.0165)	(0.0245)	(0.3270)	(0.0340)
40 to 60	-0.0219	-0.0222	-0.0488*	0.5990*	-0.0462
	(0.0173)	(0.0171)	(0.0254)	(0.3390)	(0.0352)
60 or more	-0.0315	-0.0269	0.0684**	-0.3810	-0.0087
	(0.0202	(0.0201)	(0.0297)	(0.3960)	(0.0412)
Education (ref. primary education)					
Middle education	0.0086	0.00847	-0.0047	0.3220	0.0044
	(0.0135)	(0.0134)	(0.0199)	(0.2650)	(0.0276)
Higher education	0.0022	0.00304	0.0241	-1.0870***	0.0949***
	(0.0157)	(0.0155)	(0.0230)	(0.3070)	(0.0319)
Gender (reference female)	-0.0038	-0.00238	-0.0660***	2.6190***	-0.1450***
	(0.0113)	(0.0112)	(0.0166)	(0.2220)	(0.0231)
Income (reference up to 1 MW)					
1 to 2 MW	-0.0119	-0.0131	0.0360	-0.1710	0.0286
	(0.0189)	(0.0188)	(0.0278)	(0.3710)	(0.0386)
from 2 to 5 MW	-0.0099	-0.00768	-0.0102	0.3350	0.0328
	(0.0172)	(0.0171)	(0.0253)	(0.3370)	(0.0351)
from 5 to 10 MW	0.0173	0.0224	0.105***	-0.3370	-0.0241
	(0.0234)	(0.0232)	(0.0344)	(0.4580)	(0.0477)
more than 10 MW	0.0466*	0.0497*	-0.0092	0.2510	-0.0136
	(0.0259)	(0.0257)	(0.0380)	(0.5060)	(0.0527)
Type of work (ref. formal worker)					
Informal worker	-0.0021	-0.00344	0.0488**	-1.2370***	0.0686**
	(0.0149)	(0.0147)	(0.0218)	(0.2910)	(0.0303)
Formal entrepreneur	0.0068	0.00572	0.0879***	-1.3260***	0.0427
	(0.0190)	(0.0188)	(0.0279)	(0.3720)	(0.0387)
No payed work	-0.0238	-0.0263	0.0992***	-1.943***	0.0867***
	(0.0163)	(0.0161)	(0.0239)	(0.3180)	(0.0331)
Ever had Covid symptoms		0.0926***			
		(0.0178)			
Contagious (with symptoms)	0.0070		-0.0050	-0.9340*	0.1520***
	(0.0287)		(0.0421)	(0.5610)	(0.0584)
Contagious (contact w. susp.)	0.0033		-0.0261	1.9400**	-0.1030
	(0.0393)		(0.0577)	(0.7700)	(0.0801)
Did not reg. leave house (Feb.)	0.0007	0.00234	0.1270***	-1.4520***	-0.0291
	(0.0184)	(0.0183)	(0.0270)	(0.3600)	(0.0375)
N. of people in household	-0.0041	-0.00426	0.0024	0.0791	-0.0054
	(0.0036)	(0.00360)	(0.0053)	(0.0712)	(0.0074)
City-fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1654	1654	1654	1654	1654
R-squared	0.035	0.019	0.106	0.190	0.057

Standard errors in parentheses
* p<0.10 ** p<0.05 *** p<0.01

Model 8 shows that staying at home during the prior two weeks was strongly related to age, with people aged 60 and above more likely than 18-24-year-olds to have never left the house during the previous fortnight. Women were 6.7% more likely to have not left home than men. Informal workers were 4.9% more likely to have stayed at home than formal workers, and formal (micro) entrepreneurs were 8.8% more likely than formal workers. Those who lacked payed employment in February were the most likely to have stayed at home during the fortnight prior to interview (they were 9.9% more likely than formal workers).

Men also tended to leave the house more often than women. Model 9 reports that this was on 2.6 days more, on average, during the previous two weeks. Over the same period, people with higher education left the house on fewer days than those with primary education (1.1 days less, on average). And formal workers left the house on more days (1.2 more, on average) than informal workers, on more days (1.3 more, on average) than formal entrepreneurs, and on 1.9 more days, on average, than those without a remunerated activity in February. This is likely to be because formal workers are more often deemed essential workers (42% were compared to 30% of informal workers), and because they were less likely to have lost their jobs (as indicated by total income loss). Individuals who were probably contagious for having at least one Covid-19 symptom left home on significantly fewer days (0.9 days fewer over two weeks) than those unlikely to be contagious. However, those who were probably contagious for contact left the house on 1.9 more days, on average, than people who are unlikely to be contagious. Note that this finding is based on a small number of people's behaviour.

Model 10 further characterises the frequency with which different groups of people are leaving the house over the fortnight prior to interview. Compared to Model 9, some differences are seen across education levels. Whereas informal workers left home on fewer days during the fortnight than formal workers did (Model 9), these individuals were more likely than formal workers to go out on one or two days over the two weeks (Model 10). Whereas the unemployed went out on fewer days than formal workers, they were more likely to have also gone out on one or two days in the period than formal workers. Analogous patterns are evident when the results for different education levels are compared across the two models (with highly educated people going out on more days, and less likely to leave on one or two days). Women went out on fewer days, and were more likely to go out on one or two days.

A difference is also evident for people who may be contagious. Those in the category 'probably contagious with symptoms' left home on fewer days than probably non-contagious individuals, and were more likely to leave on only one or two days in the fortnight. Our interpretation here, given the confusion around appropriate self-isolation behaviours, is that these people may have reduced how often they left home to a minimum number of days to accommodate basic needs, instead of remaining in their residence throughout the fortnight and asking others to deliver food and other necessary items.

Taking the results of Models 1 to 10 in Tables 1 and 2 together, it is clear that government response policies have had an effect on how much citizens in general are staying at home, how often they venture out to make non-essential trips, and how far they travel. By 6 to 27 May, when survey interviews were conducted, many people had seen their incomes fall dramatically. For those going to work then, it was certainly not the case that all workplaces had established distancing practices. For those whose incomes had fallen, and who were receiving income support, this support was generally making an important difference.

In summary, staying at home over a full fortnight to avoid any risk of transmission was rare among people who were likely to be infectious, for whom getting tested also was rare. Citizens understand how to recognise the symptoms of Covid-19, frequently wear masks when outside, and are, on the whole, supporting people who self-isolate fully. Yet there is a clear opportunity to improve knowledge about appropriate self-isolation behaviours. Public information campaigns on TV may be the most appropriate vehicle for this.

Further information relevant to policymakers in each of the state-capital governments surveyed can be found after the conclusion. The data presented in these summaries are drawn from our coding of subnational government response policies, from mobile phone mobility data, and from the 200+ survey responses for each city. Cognisant that local governments each face unique challenges, our intention in including summaries of results for each capital is not to compare the eight cities with one another, but to provide information in support of evidence-based policymaking. In the city summaries, we present survey results for each city's population as a whole; we do not assess variation in survey responses for different social groups within individual cities as sample sizes for each state capital have insufficient statistical power.

Discussion

Our intention in writing this paper has been to bring together information to support evidence-based policymaking in Brazil, as decision makers in different levels of government consider how to handle a serious and worsening outbreak of Covid-19, given the economic and social costs of distancing policies. Currently, the discussion is focused on how and when to relax existing measures, and this process has started in many parts of the country.

We began by summarising the WHO's guidance for governments on relaxing distancing measures, and then described the policy responses of Brazil's federal government to date. Using the OxCGRT stringency index as an objective measure of policy strength, we showed that state and city governments have stepped in to strengthen Covid-19 response policies across the country.

Our analysis of mobile-phone mobility data—averages of how much people with smart phones have been staying at home all day, making non-essential trips and how far they have been travelling—demonstrated that policies enacted to control the spread of SARS-CoV-2 have significantly affected all three mobility measures, and in the directions intended. A raft of state-government response policies were enacted in the middle of March. Between the first Covid-19 cases appearing in Brazil and up to that point, mobility patterns responded only slightly. Then, with these policies' introduction en masse, mobility suddenly changed. And even though the extent of the mobility shift softened gradually from mid-March to the end of May, it never came close to diminishing to the level seen prior to mid-March.

Our survey offers a snapshot of the frequency of testing and of public understanding of Covid-19 from 6 to 27 May, and of behaviours during the two weeks prior to each respondent's interview (a fortnight period between 22 April and 13 May). Unlike the analyses of mobility, which consider average behaviours across smart phone users, the survey allows us to pick up variation between different groups of people. We report some but limited differences in the behaviours of people who were reasonably likely to be contagious and those who were less likely to be contagious.

Moreover, we identified variation in the quality of home study among children and teenagers during school closures. In line with the recent findings[42] of IBGE (The Statistics Brazilian Institute of Geography and Statistics), we found much larger income reductions among economically vulnerable groups. This has also been reported in research that has used convenience sampling via social networks[43], though the stratified random sampling

[42] A recent survey by the Brazilian Institute of Geography and Statistics reported loss in income during the pandemic and that people faced difficulty in finding jobs in May. IBGE. Pesquisa Nacional por Amostra de Domicílios - PNAD COVID19. May 2020. Available at: https://covid19.ibge.gov.br/pnad-covid/IBGE study.
[43] Bezerra, A. C. V., Silva, C. E. M. da, Soares, F. R. G. & Silva, J. A. M. da. Fatores associados ao comportamento da população durante o isolamento social na pandemia de COVID-19. *Ciênc. saúde coletiva* 25, 2411–2421 (2020).

and telephone interviews used in this study provides a more reliable source of information about the population at large.

In the paragraphs below, we summarise information from the different sources of data presented in this paper under each of the WHO's six recommendations. We then reflect on what the survey results say about the impacts of Covid-19 response policies on other aspects of the lives of citizens of the eight state capitals.

Compliance with International Public Health Advice

1) Transmission is controlled to the level of sporadic cases and clusters of cases.

As a first indicator of whether a country is managing to achieve a controlled and deliberate transition from widespread community transmission to low levels of transmission, the WHO advices relaxing response policies only when new cases are few and far between. To be certain of the true number of cases, governments need to ensure that everyone who could have caught the virus receives a test in a timely manner, and, if they are positive for the SARS-CoV-2 virus, be physically isolated so as to not infect others until they are no longer contagious. Contact-tracing programmes must be fit for purpose, and people who are notified that they might be contagious must understand how they should adapt their behaviour.

Our survey results show that the proportion of those tested among symptomatic people who were likely to be contagious was low in the eight state capitals. It also shows how rare testing was by 6 to 27 May[44]. While those who had at any point during the outbreak experienced Covid-19 symptoms were more likely to receive a test than those who had not experienced symptoms in the same period, this result does not tell us whether the testing was timely (whether it was conducted when their viral loads would have yielded a positive result). When we evaluated testing among people whose symptoms started during a period that suggested that they could be infectious, they were no more likely to have been tested than people who were unlikely to have been infectious. High-income individuals were most able to access tests.

Even though symptomatic people were more likely to leave home on only one or two days in two weeks when they might have been be contagious than people who were unlikely to be infectious, just 15% of this probably contagious group never left their home during the whole period. Combined with our findings about what citizens understand to be the appropriate behaviours of someone who is self-isolating, this degree of behaviour change makes sense. Indeed, 95% of people incorrectly thought that self-isolation means 'you may leave the house to buy essential items'. Clearer public health campaign messaging around what to do and what not to do could change this. After all, the population of the eight urban centres have been noticing public information campaigns and are good at recognising Covid-19 symptoms.

[44] This state of affairs may have since improved with the introduction of new testing policies on 25 May. Since then, anyone with symptoms should be able to access a PCR test via the public health system.

The survey results also indicate that public contact-tracing systems were not well established during the period studied. Less than half of those with at least one symptom reported this to a doctor or to a public employee, and we know that identification of Covid-19 symptoms was not the problem. Only 9% of people who had been in contact with a symptomatic person found out about this person's symptoms through a doctor or public employee.

2) The health system has sufficient capacity to detect and isolate all cases.

We do not directly assess this criterion because the OxCGRT indicators that we have so far coded for Brazil do not include the H4 indicator (emergency investment in healthcare), which is not part of the stringency index. We surveyed the population at large rather than the healthcare workforce specifically, and, as such, we recommend that policymakers consider our findings alongside other information about health-system supply chains and the healthcare workforce. Our survey did ask, however, about citizens' impressions of the regional health system's ability to cope with Covid-19. These results were not encouraging: 86% of the population of the eight capitals were either worried or very worried about medical equipment, hospital beds, or the number of doctors in their region failing to meet demand.

As part of assessing a health system's capacity to detect and isolate cases, the WHO recommends that the healthcare workforce should be provided with personal protective equipment. We did not ask about this in detail, but we can say that the 12% of people who had visited hospitals in the late April to early May period reported that mask use was almost universal among hospital staff. Similarly, the WHO guidance states that those contacted through contact-tracing and who are advised to stay at home receive daily virtual monitoring, for example, by community volunteers. Our survey is encouraging on this matter: 60% of those not leaving home in the prior fortnight received daily calls or messages.

3) The risk of new outbreaks should be minimised in highly vulnerable settings, such as hospitals and residential care homes.

WHO guidance focuses on hospitals and residential care facilities because of the risk of spreading infection in the former and the additional risk that the virus presents to patients or residents in both settings. In addition to the high rate of mask use in hospitals, we find that more than 80% of those visiting hospitals reported that two-metre physical distancing measures had been established, for example by moving apart seats for those waiting. More than 80% of hospital visitors said that soap or hand sanitiser was easy to come by. Only 1% survey respondents had been to a residential care home in the prior fortnight, so we have little information about the measures that were introduced in those settings. The information provided by this small minority of respondents suggests that mask use, physical distancing and the provision of hand washing facilities was established in the care homes visited.

4) Workplaces should establish physical distancing of two metres, handwashing, and respiratory etiquette.

Our analyses of the effects of policies on smart-phone mobility suggest that workplace closures have had the most consistent impact across the three measures of mobility, holding other policies constant (i.e. while additional policies have been in place). The WHO guidance recommends standard prevention measures for workplaces. People who were going to work shortly prior to the survey reported that although handwashing facilities in workplaces were common, distancing policies to keep people at least two metres apart were notably less well established.

5) Measures are put in place to reduce the risk of import and export of cases.

We do not have information about the export of cases from Brazil to other countries. However, coding the OxCGRT indicators for federal, state and state-capital government policies showed that many measures have been put in place across the country to reduce the risk of importing cases from abroad and of spreading the virus between states and capital cities. Brazil currently allows Brazilian nationals to return to the country. Otherwise, its borders are closed. Many subnational governments have also closed borders between Brazilian states, and halted public transport services between big cities, which could otherwise lead to transmission across city and state boundaries. The city summaries that follow elaborate these policies.

6) Communities are engaged in and understand a stepwise transition away from strict restrictions.

Community engagement is difficult to measure. But we have assessed how widespread the belief is that the easing of government response policies will be gradual, and how long people think it will take until Covid-19 response policies are completely lifted. As previously noted, PAHO's advice places additional emphasis on stage-wise easing. It recommends a two-week gap between each stage of policy relaxation.

Our survey results show that the message that policy easing will be conducted in a stepwise manner is getting through. In every one of the eight cities surveyed, at least 70% of citizens expected the loosening of restrictions to be gradual. Across all eight cities, the average expected time until all policies are removed was 4.7 months (starting from 6 to 27 May). Because different parts of Brazil have different outbreak trajectories and different policies in place, it is reasonable to anticipate different expectations from respondents in different cities. We found that people in Recife thought that all Covid-19 policies would be gone in the shortest amount of time (4.1 months, on average). Meanwhile residents of Manaus, capital of the state with currently the highest number of per-capita Covid-19 deaths, believed that some measures would be in place for longer (5.4 months, on average) than people in the other seven state capitals.

Measured Impacts of Government Response Policies

The above summary makes clear that the WHO's recommendations had not been met in eight large urban centres in Brazil by the time of our survey. Yet many subnational governments have since started the process of relaxing distancing policies. To help inform these choices, our survey also collected basic information about the effects of government-response policies on other aspects of people's lives. To be sure, over time, the cost of maintaining closure and containment policies will have repercussions for the economy, which, among other outcomes, may limit available resources for public health.

Offering advice to policymakers would be more straightforward had our analyses of mobility data suggested that closure and containment policies were having negligible effects on behaviour. However, the regulations and recommendations of state governments are clearly associated with shifts in mobility over and above the changes that occurred prior to widespread policy enactment. And there was limited policy fatigue over time—people did not revert to pre-mid-March mobility levels after growing tired of a stringency policy regime.

A number of other impacts are evident. During school closures, public school students are not studying as much as private school students, and they are not doing so with material that is likely to be appropriate for their level. The poorest, and those who work informally or as formal microentrepreneurs, have experienced the brunt of the income losses between February and mid to late May. All else equal, informal workers and formal entrepreneurs left home on fewer days in the prior fortnight than formally employed workers, which may have been because they were working fewer hours or because more of them had lost their jobs.

In the context of the most economically vulnerable groups in society experiencing the largest contractions in income, the federal government's emergency income support measure had already shown signs of helping its recipients by the time of the survey. We find that 64% of people who experienced a loss in income since February and had received the first installment by the time of our survey, reported that this support made up for at least half of their income loss. Indeed, the income bracket with the highest proportion of people receiving these funds was the lowest income bracket. Given that this money is reaching those who need it most, and is making a substantial difference to their circumstances, continuing this support may prove to be crucial for sustaining compliance among people who are struggling financially, especially while workplace closures remain in place.

The next section looks more closely at the eight cities surveyed.

Fortaleza, Ceará

Figure CE.1 – Accumulated number of deaths and deaths per capita for Ceará and the seven other states surveyed.

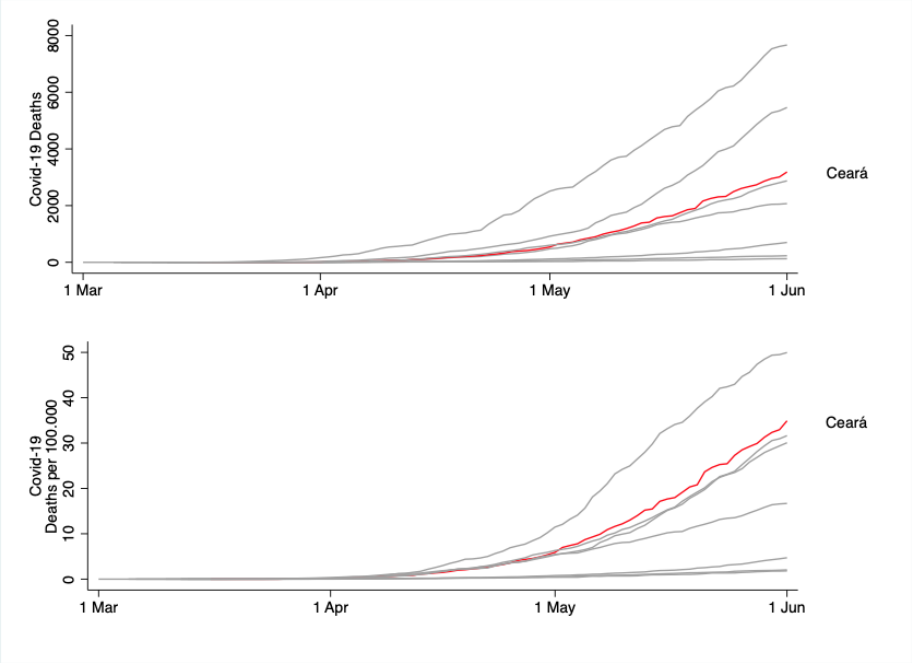
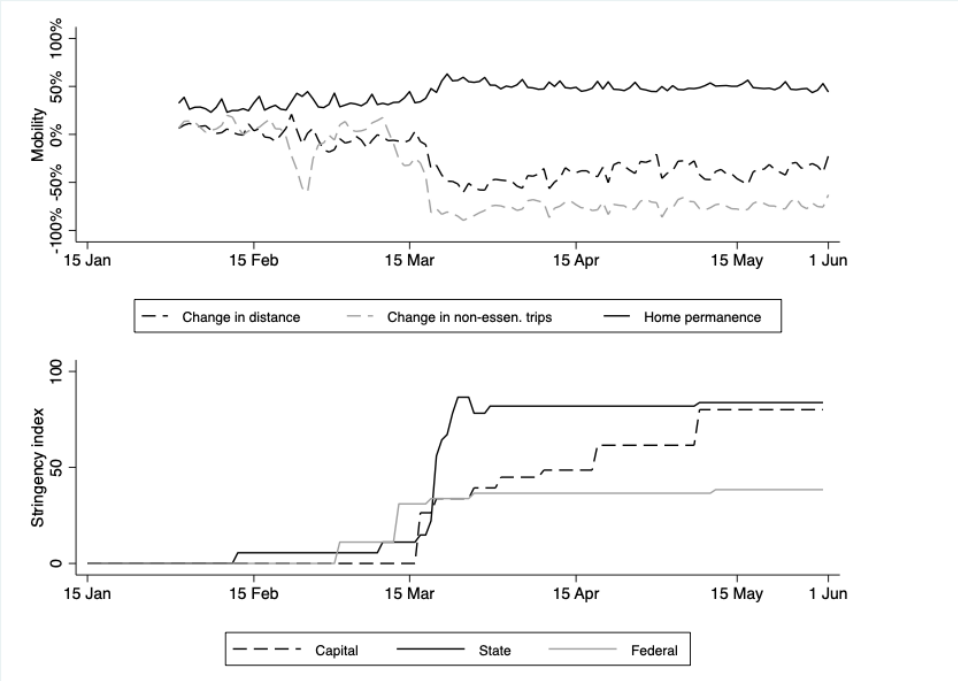


Figure CE.2 – Mobility indicators for Ceará and the OxCGRT stringency index for different levels of government.



State and City Government Responses

The first five cases of Covid-19 in the state of Ceará were confirmed on 17 March, and the first three deaths on 26 March. Since then, Ceará has become one of the states with the highest per capita number of cases and deaths in the country, with 841.3 cases and 53.5 deaths per 100,000 inhabitants as of 15 June.

The state government of Ceará acted swiftly. It published a decree declaring a health emergency and established a series of measures to contain the virus, the day before the first case in the state was officially confirmed. This decree required the suspension of public events at which more than 100 people tend to congrugate, the closgin of all establishments where large numbers of people gather together (including shows, cinemas, theatres, libraries and cultural centres), and the closure of all state schools and universities. Over the following days, the state government implemented additional measures, requiring all non-essential services to close, such as bars, restaurants, gyms, shops and museums, and suspending the activities of churches and other religious institutions. Ceará has been one of the few states in Brazil to impose restrictions on industry, however, it has made exceptions for businesses that produce essential goods, such as pharmaceutical and cleaning products, food, water, as well as energy companies. The state-wide closure and containment measures were in place until 31 May, and thereafter some of the restrictions started to be removed in parts of the state, while in other parts stricter measures were introduced.

Since mid-March, the governor of Ceará has repeatedly addressed the population emphasising the importance of staying at home as much as possible. No state-wide stay-at-home requirements have been established, however. The state transport regulator suspended all intercity trains from 21 March and all intercity buses from 23 March. These public transport closures were initially in place for ten days, but have been extended several times. These services are currently expected to resume only in final phase the reopening plan.

International travel controls have been the subject of legal battles. On 22 March, a legal ruling allowed the state government to implement entry screening of passengers from both domestic flights and international ones (which land in Fortaleza International Airport). The federal health and sanitary regulator appealed against this measure, but on 2 April the Court of Appeals decided in favour of the state governor's proposed screening policy. On 24 March, another court decision provisionally banned departures and arrivals of all international flights in the state of Ceará, but this ban was later overturned.

On 5 May, a state decree established stricter social distancing measures for the city of Fortaleza, which were initially in place from 8 to 20 May, and then extended until 31 May. The mayor of Fortaleza issued a decree with similarly strict measures in response to low levels of social distancing identified through mobility data and the especially fast-growing number of cases and deaths in the capital. In May, Ceará's health system was reaching capacity. These new measures permitted residents of Fortaleza to only leave their homes when necessary, such as when they needed to buy groceries, for health reasons, and for work if they do a job that is considered to be essential. The use of private vehicles in Fortaleza was also restricted (cars could only circulate within the city to enable people to

access essential services). However taxis and ride-hailing vehicles were free to operate as per usual. During the lockdown period, officers from both the state and the city governments controlled the flow of people and vehicles coming in and going out of Fortaleza. Those violating the rules could be subjected to civil and criminal penalties.

In light of the perceived success of these stricter containment policies, in terms of both lowering the number of Covid-19 cases and the volume of public hospital appointments, on 28 May, the state government published a plan to gradually remove some of the restrictions. From 1 June, the transition phase allowed dental practices and medical clinics to reopen, and some industries to partially operate again. From 8 June, Fortaleza was the first city in the state to move into the first phase of the reopenning plan, in which construction work, industry, and commerce (including shopping centres) were allowed to operate again with 40% of their employees on site, and as long as physical distancing and hygiene protocols are followed. The majority of the municipalities in Ceará remained in the transition phase, while in some municipalities in the north of the state, stricter distancing measures were brought in.

Fortaleza Survey Results

Fortaleza has 2.7 million inhabitants, with 10% of the population above 60 years of age. Its Human Development Index (HDI) is 0.754 according to the Brazilian Institute of Geography and Statistics (IBGE), making it the 18th most developed state capital out of 27.

The results show that 17% of the respondents in Fortaleza did not leave their homes in a two-week prior between 22 April and 13 May. Those who did venture out did so on average on 4.7 days. Three quarters of respondents left home to access essential services, such as going to the supermarket, pharmacy or to the bank. Eighteen percent of went out to work during this period (compared to 66% who did in February). Those who went out estimated that 81% of people were wearing masks on the street. Only 4% of respondents had ever been tested for the virus, and 2.5% declared having tried to access a test without success. To put these percentages in context, 10% of respondents in Fortaleza reported having had symptoms.

According to those who had visited hospitals and supermarkets in Fortaleza, mask use was common among employees, soap or alcohol gel were easily accessible for visitors, and distancing measures had generally been established. Among those going to work, 62% said that distancing measures were in place in their where they worked, to keep employees two metres apart. Only a quarter of people in Fortaleza said that they used public transport in February, and 13% stated that they had used it in the two weeks prior to interview. Reduced public transport services prevented 16% of respondents from going about their intended activities.

Levels of knowledge about the symptoms of Covid-19 and about the meaning and practices of self-isolation were similar in Fortaleza to average survey responses across the

eight urban populations. Residents of Fortaleza scored on average 82 out of 100 for ‘knowledge of symptoms’ and 46 out of 100 for 'knowledge about self-isolation'. (See the results section of the main paper for an explanation of these scores.)

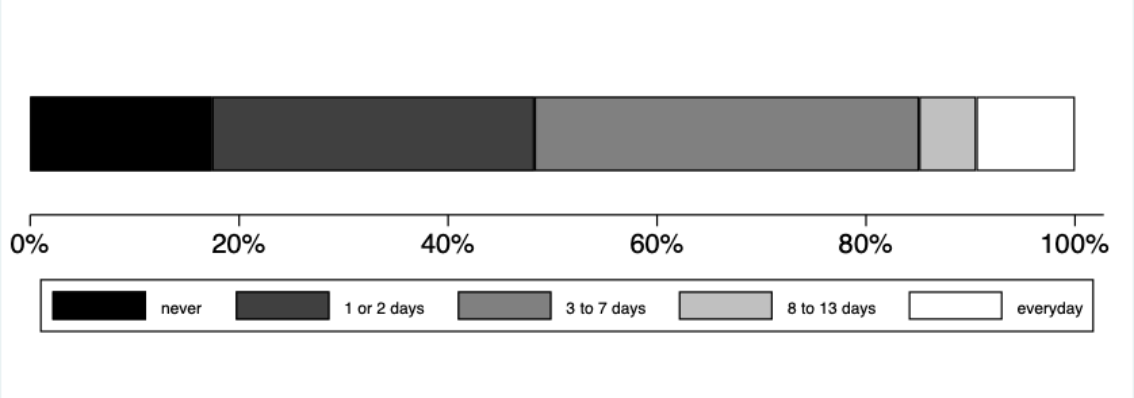
When respondents were asked where they get most of their information about Covid-19, a slight majority said TV news shows (52%). Newspapers and newspapers websites were the second most common source (24%). Out of the 69% of respondents who had seen campaigns from the government, 80% saw them on the TV, 35% in newspapers. Most of these people (75%) said they had seen campaigns from the state government, while 33% saw campaigns from the federal government, and 30% saw them from the city government).

In Fortaleza, only 23% of people believe that the public health system in their region is well prepared (13%) or very well prepared (10%) to handle Covid-19, and 87% of people were either worried (11%) or very worried (76%) that hospital equipment, beds, or doctors, would not meeting demand.

A large majority (82%) of people in Fortaleza perceive Covid-19 to be much more serious than a common flu. Approval of the current public measures to fight the spread of the disease is high, with 56% considering the response to be adequate, while 27% of people of the opinion that the measures are insufficiently stringent, and 17% believing them to be too stringent. Most people think government response policies will be lifted gradually: only 23% said they expected them to be lifted in one go. On average, people in Fortaleza expect it will take 4.9 months for government response policies to be completely removed.

Figure CE.3 – Social distancing, knowledge and testing in Fortaleza.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

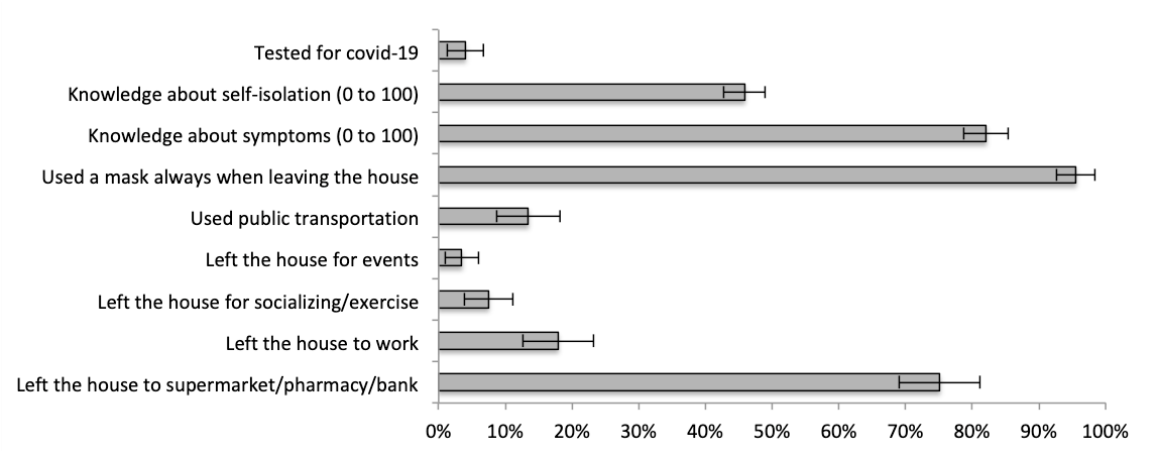
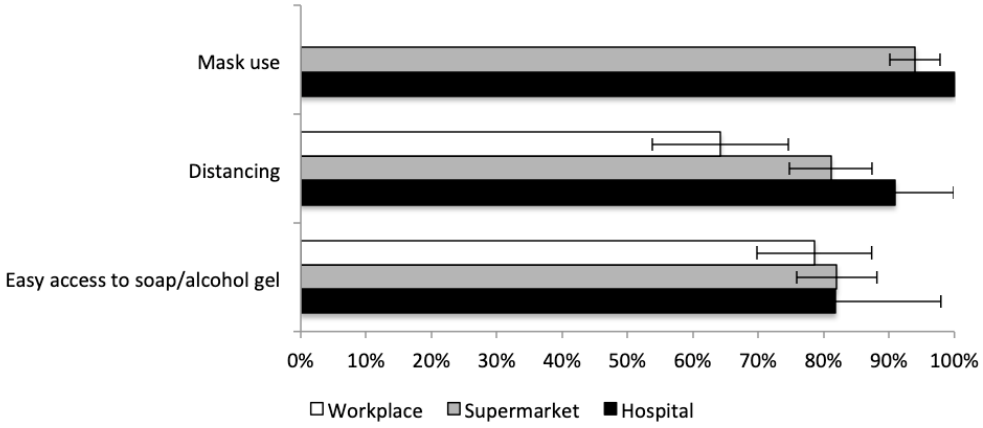


Figure CE.4: Hand hygiene, distancing and mask use.



Goiânia, Goiás

Figure GO.1 – Accumulated number of deaths and deaths per capita for Goiás and the seven other states surveyed.

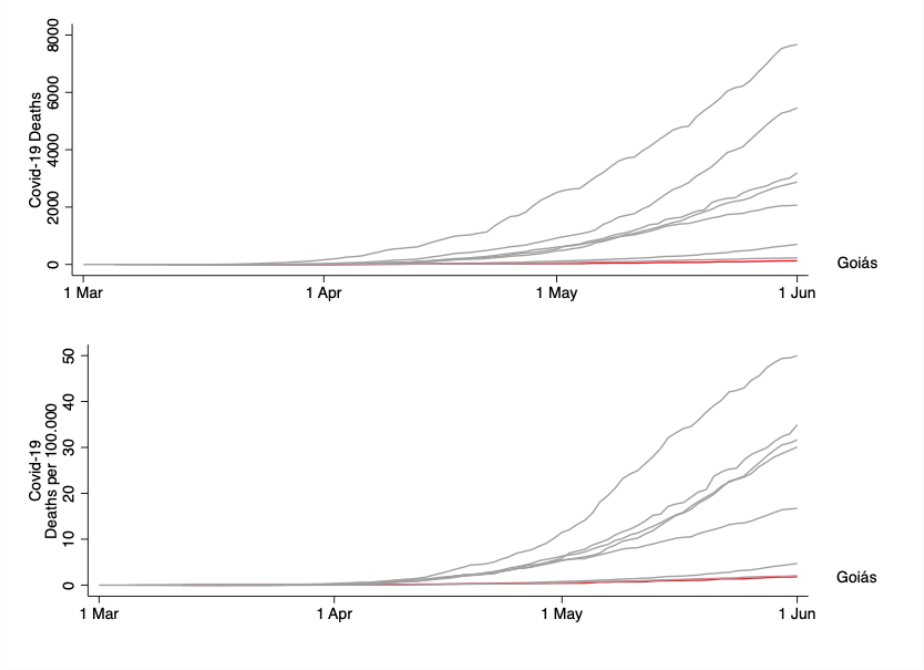
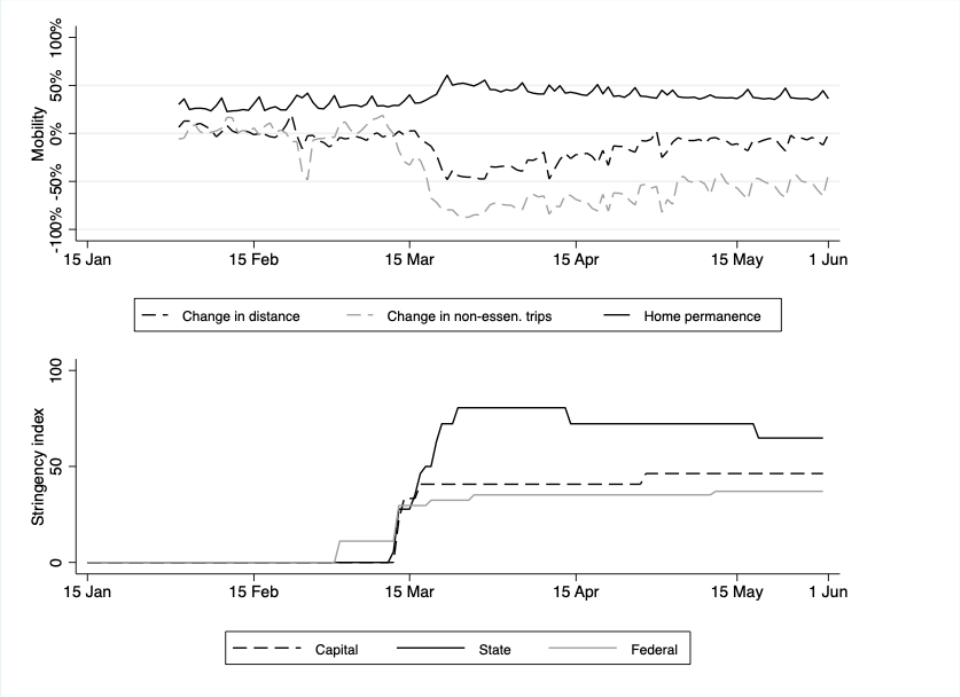


Figure GO.2 – Mobility indicators for Goiás and the OxCGRT stringency index for different levels of government.



State and City Government Responses

There were 113.4 confirmed cases of Covid-19 and 3 deaths per 100,000 inhabitants in the state of Goiás as of 15 June. On 13 March, the first three cases of Covid-19 were confirmed in the state of Goiás, and the first death on 26 March. Immediately on 13 March, the state governor issued a decree declaring a health emergency. Over the following days, the state government published a series of decrees establishing closure and containment measures, including the suspension of all non-essential commercial and industrial activities, the closing of entertainment establishments (cinemas, clubs, gyms, bars, restaurants, and theatres), the cancelling all private and public events of any kind (including religious and philosophical gatherings), and the closing of state schools. The state government also brought in restrictions that affected how much people could travel to other states: public transport was suspended to states where Covid-19 cases had been confirmed, and where an emergency had been declared. Private vehicles were also banned from making such trips. Moreover, the governor advised people to avoid leaving their home whenever possible to avoid all kind of gatherings, and to wear a mask when outside of their house. There was no curfew or formal requirement to stay at home, however.

On 19 April, the state government published a decree that extended the declaration of a health emergency and continued social distancing measures such as the cancellation of events, school and university closures, and bans on public gatherings. However, this decree also introduced the gradual reopening from 20 April of some workplaces. This restarted some industrial activities, and reopened construction sites, car washing facilities, and (at half capacity) barbers and hairdressers. As part of this easing of policies, religious services were permitted to take place twice a week, though attendees were required to wear masks and abide by distancing rules.

The government of the capital city, Goiânia, introduced additional measures to complement, or, depending on the policy, to strengthen state-government regulations. It required schools in the city to close, public events to be cancelled, and restricted all kind of events where people gather together and it is not possible to keep the minimum safe distance of 2 metresThe city government did not bring in any workplace closure rules, as the state measures applied to all municipalities. Nonetheless, with the aim of limiting the number of public transport users, on 20 May the city government adopted a staggered working hours schedule, which designated different times of day when different kinds of businesses were allowed to open. Bakeries, for example, could open between 5am and 6am. Waste collectors could operate between 7am and 8am. These rules were intended to reduce mixing among Goiânia's inhabitants.

Goiânia Survey Results

Goiânia has 1.5 million inhabitants, with 10% of the population over 60 years of age. Its HDI is 0.799, making it the 10th most developed capital out of 27 Brazilian capitals.

Only 7% of respondents in Goiânia said that they had not left home during a two-week period from 22 April to 13 May. The remainder went out, on average, on 6.5 days. Of the whole sample, 80% went out for essential activities, such as to the supermarket, the pharmacy or to the bank, and 34% went to work (compared to 70% who reported going out to work in February). Those who left the house estimated that 80% of people, on average, were wearing masks on the streets. Four percent of respondents in Goiânia said they had at least one symptom of Covid-19 during the seven days prior to interview. Just 3% of the people had ever been tested, and 1% said that they had tried to get tested but without success.

The workplaces of those venturing out to work had introduced social distancing measures in 65% of cases. People who had visited a hospital in Goiânia, and those who had been to the supermarket, said that mask wearing was common among employees, and that it was easy to wash one's hands with soap or alcohol gel. In February, 28% of people in Goiânia reportedly used public transport, whereas only 8% used it during the two weeks prior to survey interviews. Reductions in public transport services prevented only 12% of people doing what they had intended.

Levels of knowledge about the symptoms of Covid-19 and about the meaning and practices of self-isolation were similar among the inhabitants of Goiânia to averages across the eight surveyed populations. In Goiânia, the average score for 'knowledge about symptoms' was 84 out of 100, and that of 'knowledge about self-isolation' was 43 out of 100. (See the results section of the main paper for an explanation of these scores.)

TV news shows (50%), and newspapers and newspapers websites (25%) are the main sources of Covid-19 information for people in Goiânia. Public information campaigns are reaching the majority of the population (57%). Of those who said they had seen or heard these directly, 71% had seem them on TV, 31% through Facebook or Twitter, 29% had read them in newspapers, 21% on blogs, and 19% had come across them on WhatsApp. The state government was perceived to be the main source of such campaigns; 77% of people who had seen a public information campaign had seen one from the state government, 31% had seen one from the federal government, and 16% had seen one from the city government. More than half (55%) of those surveyed in the city said that their incomes had reduced since February, and 42% reported a drop of half or more of their household income. Six percent of people reported a total loss of income.

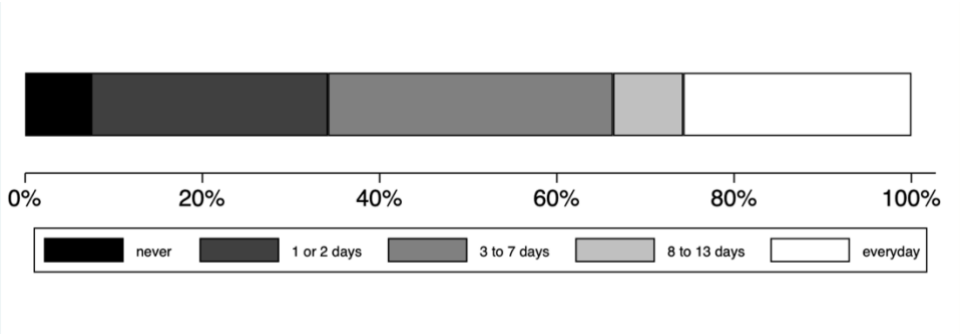
Concern about regional shortages of medical equipment, hospital beds, or doctors is evident. Twenty-four percent of people in Goiânia said that they were worried by this, and 56% said they were very worried. Confidence in the preparedness of the regional public health system is low: only 27% of people believe it is either well prepared (16%) or very well prepared (11%) to deal with the outbreak.

In Goiânia, 81% of residents perceive Covid-19 to be much more serious than a common flu. The majority of population also assessed the public policies put in place to fight the spread of the disease as adequate (57%). Smaller proportions considered them to be less stringent than necessary (32%), and only 10% considered measures to be too stringent.

Most people in the city expect that these measures will be lifted gradually, with just 22% saying they believed all government response policies will be removed at the same time. On average, people in Goiânia estimated it would take 4.4 months for all restrictions to be lifted.

Figure GO.3 – Social distancing, knowledge and testing in Goiânia.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

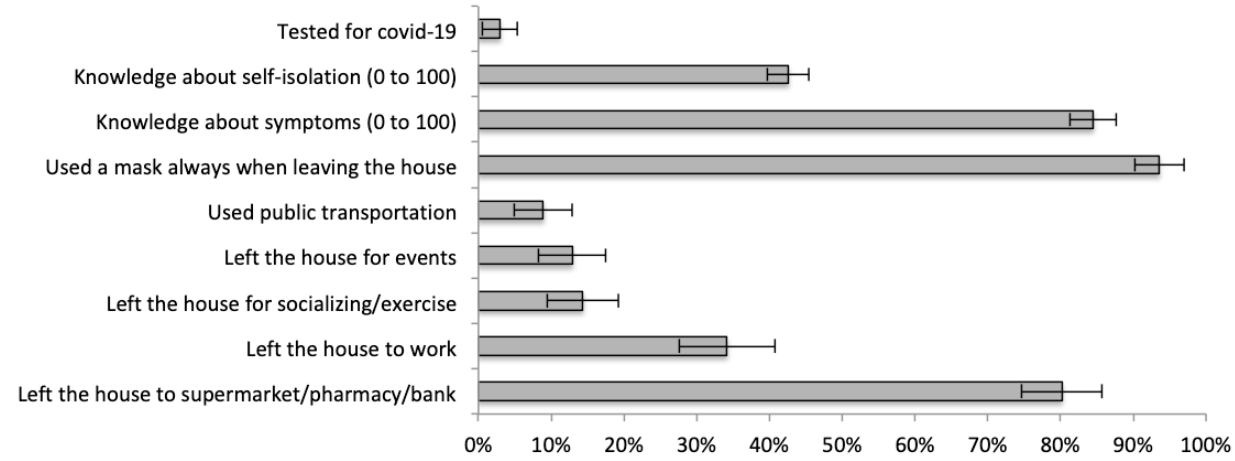
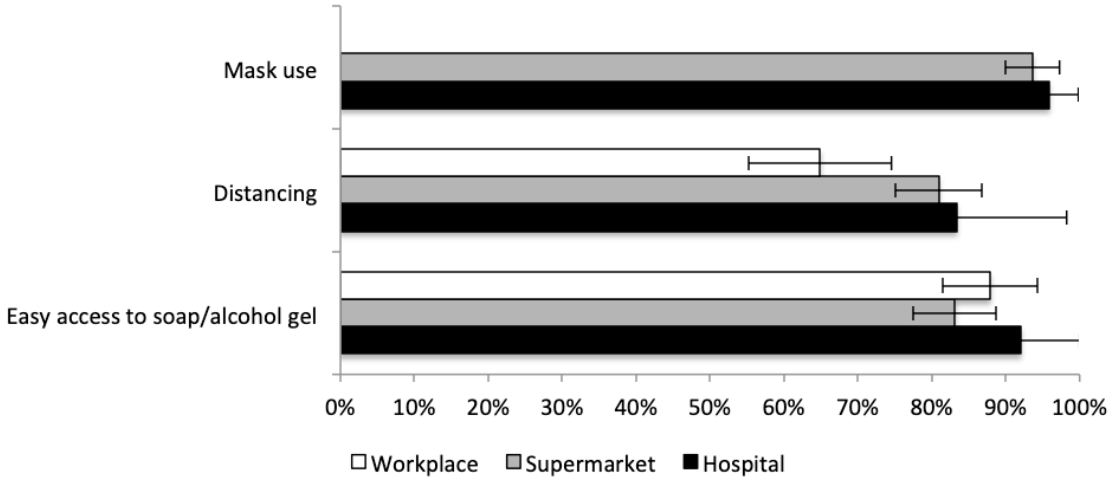


Figure GO.4 - Hand hygiene, distancing and mask use.



Manaus, Amazonas

Figure AM.1 – Accumulated number of deaths and deaths per capita for Amazonas and the seven other states surveyed.

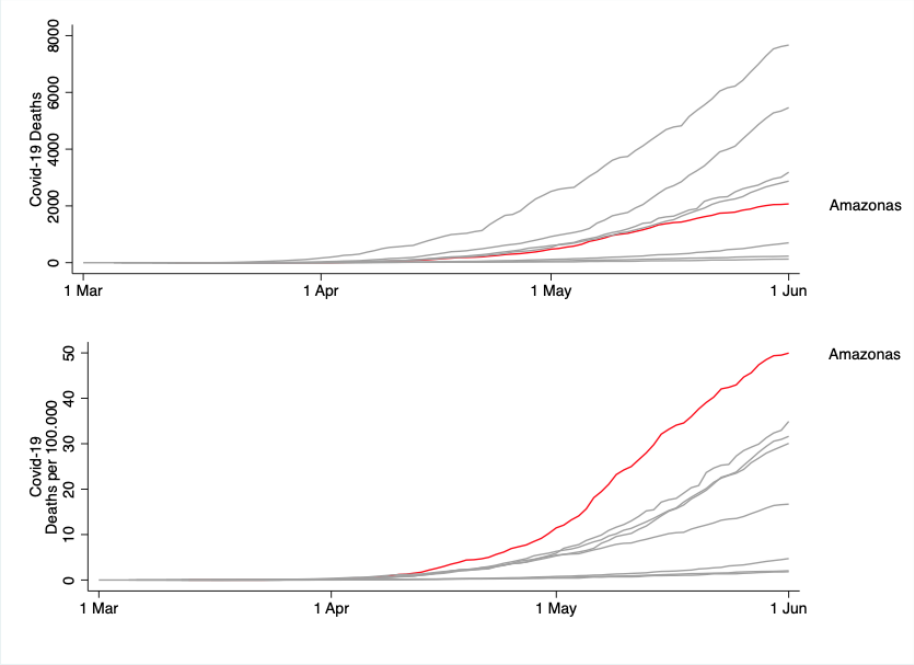
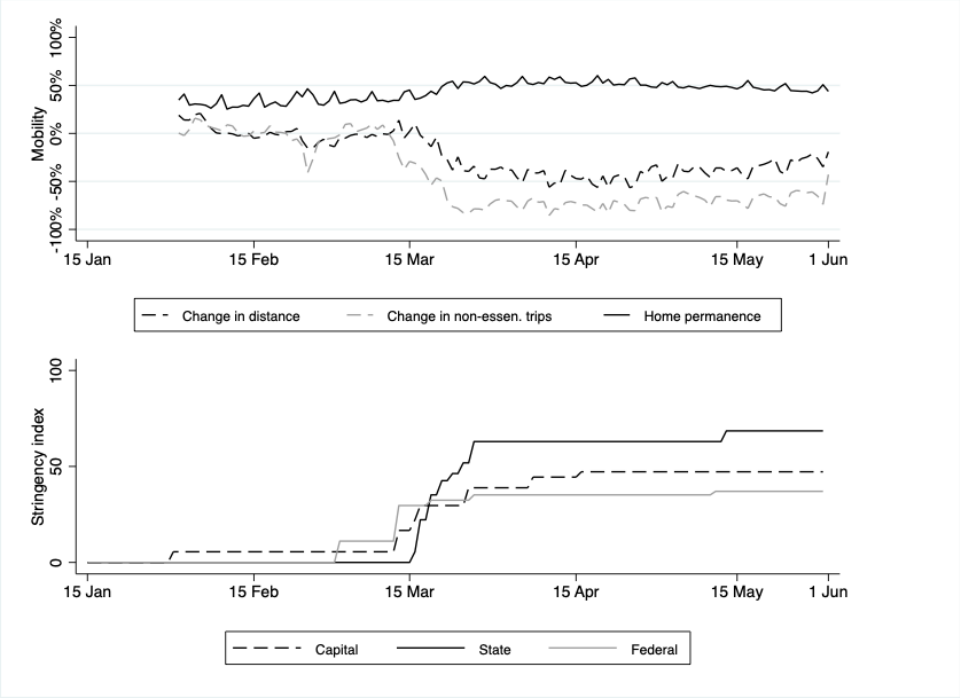


Figure AM.2 – Mobility indicators for Amazonas and the OxCGRT stringency index for different levels of government.



State and City Government Responses

The state of Amazonas had registered 1,363.4 cases and 60.1 deaths per 100,000 inhabitants as of 15 June, making it one of the hardest hit states in Brazil. Its first case was confirmed on 15 March. Over the following days, the state government declared a public health emergency and published a series of decrees introducing closure and containment measures. Public events were cancelled, gyms and sports centres closed, fluvial transport services restricted (these are the primary form of public transport over much of the state), and all classes in public schools were suspended. All restaurants, bars, and other entertainment establishments were not allowed to serve the public.

At this stage, neither the state or city governments in Amazonas formally introduced stay-at-home orders. But on 23 March, the governor raised the 'public health emergency' (when a danger is imminent) to 'a state of public calamity' (declaring damage to be done). Thereafter, the state government required all non-essential commercial and service-sector workplaces to close and recommended that citizens stay at home and not leave unless strictly necessity. Industry, however, was allowed to continue operating provided firms adopted sanitary measures to contain the spread of the virus. In this way, one of the largest industrial centres in the north of Brazil, the Polo Industrial de Manaus, remained operational.

From early on in Amazonas's outbreak, the state government and municipal governments in the state launched public information campaigns, set up websites dedicated to gathering daily information and providing updates about Covid-19 The state government also launched an official mobile phone application to connect people who had tested positive with health care workers, who offered self-care advice to those with symptoms.

Late March also saw new rules for all passengers arriving at Eduardo Gomes International Airport, in Manaus. Whether symptomatic or not, they had to enter quarantine. On April 6, the governor announced further restrictions on internal movement within Amazonas and suspended interstate and intercity transport of passengers, even banning taxi and van rides between towns in the state.

Yet the outbreak has continued to grow. Manaus, the capital city of Amazonas, is home to more than half of the state's inhabitants, and is also one of the most densely populated cities in the north of Brazil. As the number of cases has grown fast in Amazonas, the vast majority have been recorded in Manaus, which has also registered more than 60% of the state's Covid-19 deaths. The crude death rate (the proportion of deaths among confirmed cases) in Manaus was 4,4% as of 15 June.

Manaus's city government has adopted measures to further restrict the movement of people in the capital. The sale and use of student bus passes and free bus passes for the elderly were suspended from 7 April to 30 April. From 25 April, public transport was only allowed to operate within Manaus if passenger numbers did not exceed the number of seats.

In late April, Amazonas was the first state in Brazil to hit the capacity of its health system. There were reports of containers being used to store bodies and of mass burials taking place in the city's cemeteries. Nonetheless, closure and containment policies established by the governor remained in place only until 31 May, and, as of 15 June, some of restrictions have started to be lifted**.** The easing of Covid-19 response policies in Amazonas will follow a phased plan established by the state government, based on the growth of cases. In the first phase, from June 1 to June 15, some kinds of shops were allowed to reopen (including sports shops, car show rooms and pet shops), as well as churches and other kinds of religious venues as long as they operated at 30% capacity and they offered only one service per hour, with at least a five-hour interval between services.

Manaus Survey Results

Manaus has 2.2 million inhabitants, and 6% of the population is over 60 years of age. Its HDI is 0.737, making it the 16th most developed state capital (among 27 cities).

In Manaus, 17% of people stated that they had not left home during a fortnight between 22 April and 13 May. Those who did on average left on 6 days. The majority of all respondents (62%) left to go to the supermarket, pharmacy, bank, or for some other essential errand. Just under a third (30%) went out to work (compared to 66% who left home to go to work in February). People who ventured onto the street during this period estimated that 75% of others were wearing masks. Among all respondents, 20% reported at least one Covid-19 symptom during the week prior to interview, 7% said they had been tested at some point, and 3% reported trying to get tested without success.

Social distancing in the workplace appears to be relatively common in Manaus. Seventy percent of respondents who said they were going out to work stated that their workplace had introduced measures to keep colleagues two metres from one another. Those who had visited hospitals and supermarkets in Manaus in the two weeks prior to interview found it easy to access soap or alcohol gel to wash their hands, and reported widespread mask use among hospital and supermarket employees. Reduced public transport services prevented 16% of people from going about what they intended. Twenty-two percent of people said they had used public transport during the previous fortnight; 38% said they had used it in February.

Respondents in Manaus scored 78 out of 100, on average, for levels of knowledge about the symptoms of Covid-19, while the average score for knowledge about the meaning and practices of self-isolation was 40 out of 100. (See the results section of the main paper for an explanation of these scores.)

For the majority of population in Manaus, the main source of information about Covid-19 is TV news shows (65% of respondents said named these as their primary information source), followed by newspapers and newspapers websites (15%). Public information campaigns are reaching 57% of people in the city. Among those who report having seen

these, 81% had seen them on TV, 28% had seem them on Facebook or Twitter, 22% had seen them in newspapers, 20% on WhatsApp, and 16% had seen them on blogs. Fifty-four percent of people who reported seeing a public information campaign said they had seen one from the state government.

In Manaus, only a fifth of people believe that the public health system is either well prepared (9%) or very well prepared (11%) for the outbreak, meanwhile 91% said they were either worried (19%) or very worried (72%) about there being insufficient medical equipment, hospital beds, or doctors in their region.

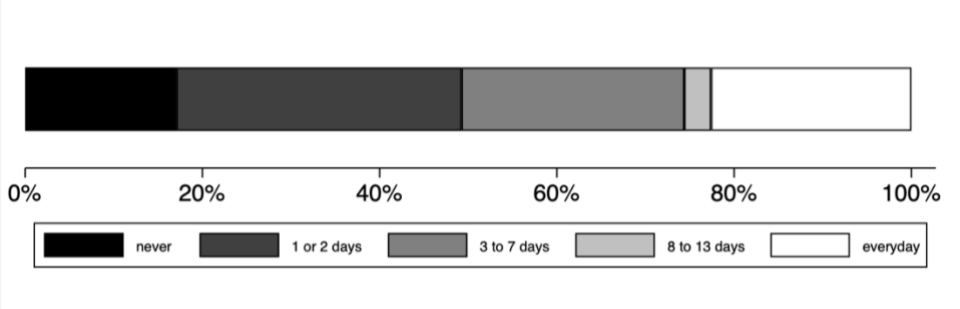
Approximately 40% of people in Manaus reported reductions in income, and a little over a quarter of the population (27%) experienced a cut of half or more in their income. Five percent of the population said that their income had reduced to zero.

The inhabitants of Manaus take Covid-19 seriously: 81% said that they believe it is more serious than a common flu. A little under half of respondents (46%) assessed government response policies to be adequate. The same proportion (46%) said they think the response has been less stringent than necessary. Only 8% considered these policies to be too strict.

On average, people in Manaus estimated that lifting all government response measures will take 5.4 months, considerably more than the average expectation of 4.6 months across the eight cities surveyed. Just over a quarter (28%) of the population expected the restrictions will be removed all at once.

Figure AM.3 – Social distancing, knowledge and testing in Manaus.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

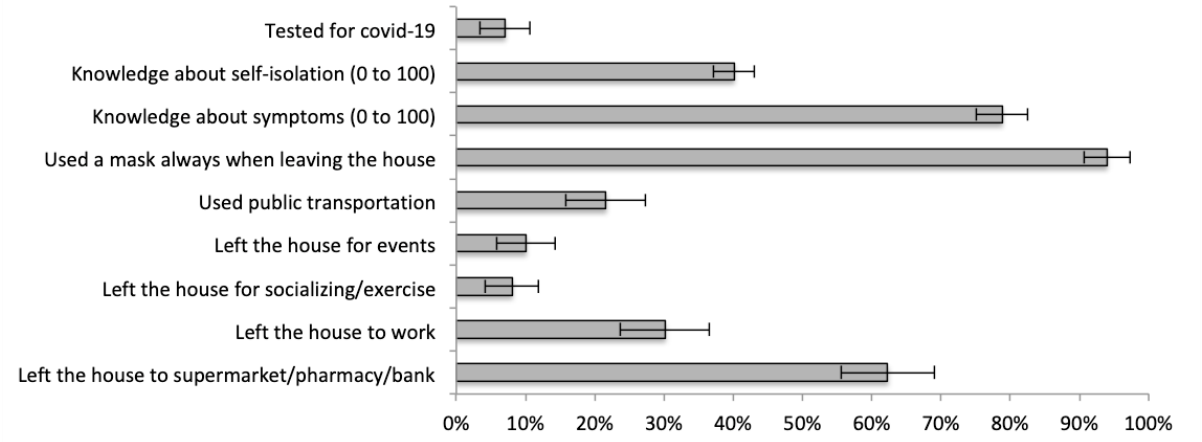


Figure AM.4: Hand hygiene, distancing and mask use.

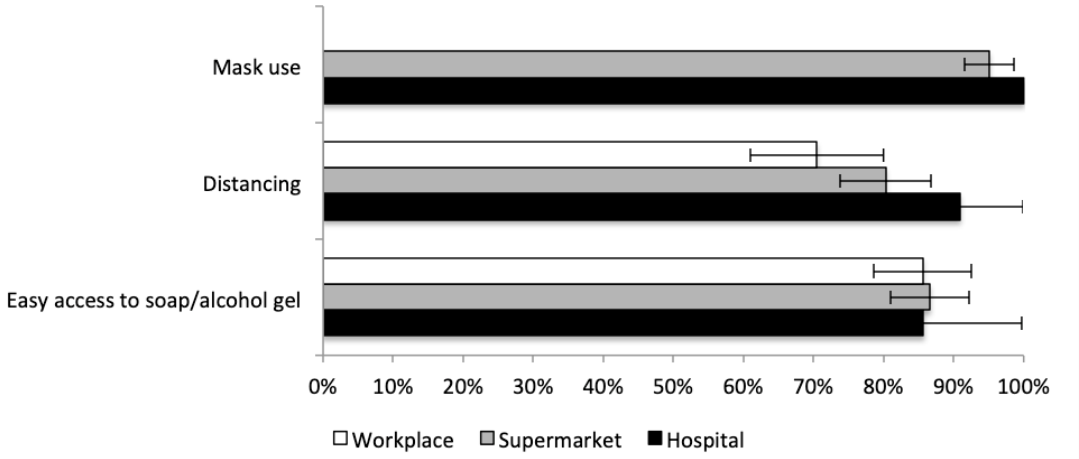


Figure RS.1 – Accumulated number of deaths and deaths per capita for Rio Grande do Sul and the seven other states surveyed.

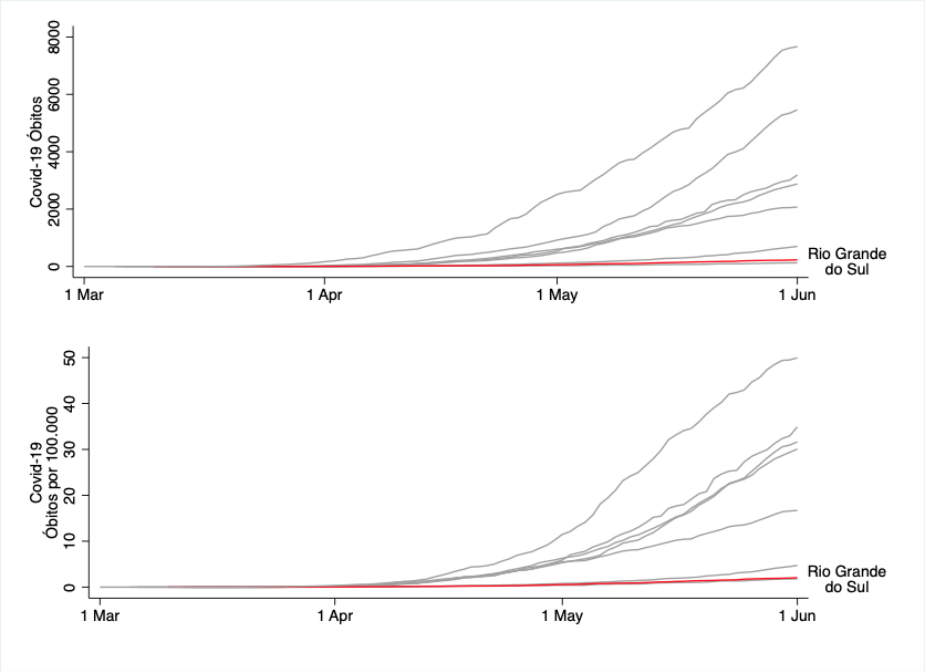
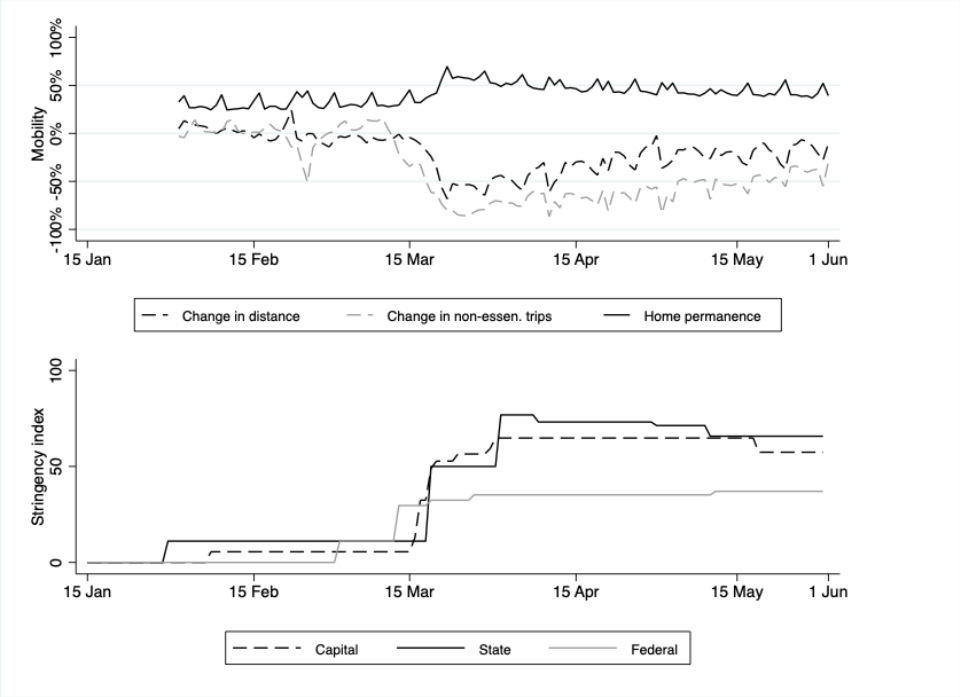


Figure RS.2 – Mobility indicators for Rio Grande do Sul and the OxCGRT stringency index for different levels of government.



State and City Government Responses

Rio Grande do Sul's first case of Covid-19was confirmed on 10 March, and its first death on 25 March. Between these dates, on 19 March—by which time 30 cases had been found in the city of Porto Alegre—the state government issued a decree declaring a public calamity (thus leapfrogging the less extreme declaration of a 'public emergency'). This decree introduced a series of closure and containment measures: it cancelled school classes, and required shopping centres to close as well as all shops selling non-essential items. Only pharmacies, supermarkets, and banks were allowed to remain open—as well as restaurants, provided that they ensured a distance of two metres between each diner. Public transport continued but only with seated passengers. Inter-state transport was restricted. The governor urged citizens to stay at home whenever possible. As of 15 June Rio Grande do Sul had 128.9 confirmed cases of Covid-19 and 3 deaths per 100,000 inhabitants.

The state government issued another decree on 1 April, tightening social distancing requirements even more. All non-essential services had to close, such as cinemas, and theatres. All public events were called off. Private gatherings with more than 30 people were prohibited. Beache s were closed,nd all vehicles coming from other states or from abroad (the state borders Uruguay) were not allowed to enter Rio Grande do Sul. This decree also required that people only travel within the state out of necessity.

From 11 May, these restrictions were gradually relaxed. The state government decided to transition to a 'controlled' social distancing policy, which meant allowing some establishments to begin reopening in places where levels of transmission had been controlled, and in accordance with evaluation and guidance provided by each municipal government. Schools remained closed and gatherings remained restricted to no more than 10 people.

The city of Porto Alegre implemented similar closure and containment policies to the state government. For example, from mid-March the municipal government suspended school classes, closed shopping centres, and introduced social distancing measures in bars and restaurants, requiring tables to be arranged two metres apart. In addition, itlimited restaurant services to half capacity. At the end of March, the city government also closed all non-essential activities in commerce, industry and services, cancelled public events, and prohibited all private and public gatherings. Mirroring the state government's decision just over a week before, the city of Porto Alegre started to lift some of its rules on 20 May. Gyms, bars, churches, and shopping centres, and other establishments, were allowed to reopen, provided that social distancing and hygiene measures had been adopted.

Porto Alegre Survey Results

Porto Alegre has 1.5 million inhabitants, and 15% of the population is more than 60 years of age. It has a fairly high standard of living: its HDI is 0.805, making it the 3rd most developed Brazilian capital (out of 27).

Remaining at home for two weeks between 22 April and 13 May was rare among Porto Alegre's residents. Only 10% of respondents reported not going out during this period. Those that did left home on average on 6.1 days. The majority of the sample (79%) left home for essential activities, such as going to the supermarkets, pharmacy or banks. Almost a third, 30%, went out to work (compared to 61% who reported going to work in February). Those who went out during the two-week period estimated that, on average, 76% of people were wearing masks on the streets. Four percent of respondents had been tested, and 1% said that they had sought a test without success. Six percent of respondents reported having had at least one symptom in the week prior to interview

Of the 30% of people going to work in Porto Alegre, 60% stated that their workplace had introduced measures to keep workers 2 metres apart. Respondents who had visited hospitals and supermarkets reported that employees in these places commonly used masks, that it was easy for them to access alcohol gel or hand washing facilities that had soap, and that social distancing measures for queuing and waiting had been brought in. Public transportation closures did little to stop people going about their intended activities: this was the case for only 9% of respondents. Twenty-six percent of people in Porto Alegre used public transport during the prior fortnight; 45% stated that they had used it in February.

Levels of knowledge about the symptoms of Covid-19 and about the meaning and practices of self-isolation were similar in Porto Alegre to average survey responses across the eight urban populations studied. The average scores were 82 out of 100 for 'knowledge of symptoms' and 43 out of 100 for 'knowledge about self-isolation'. (See the results section of the main paper for an explanation of these scores.)

The main sources of information about Covid-19 were TV news shows (58%) and newspapers and newspapers websites (14%). Of those who had seen public information campaigns (65% of all respondents in Porto Alegre), 74% reported seeing them on TV, 31% came across them through newspapers, 29% via Facebook or Twitter, 17% via blogs, and 11% via WhatsApp. Of those who had seen public information campaigns, 59% said they thought they had seen a campaign from the state government, 42% said they thought they had seen one from the federal government, and 31% from the municipal government.

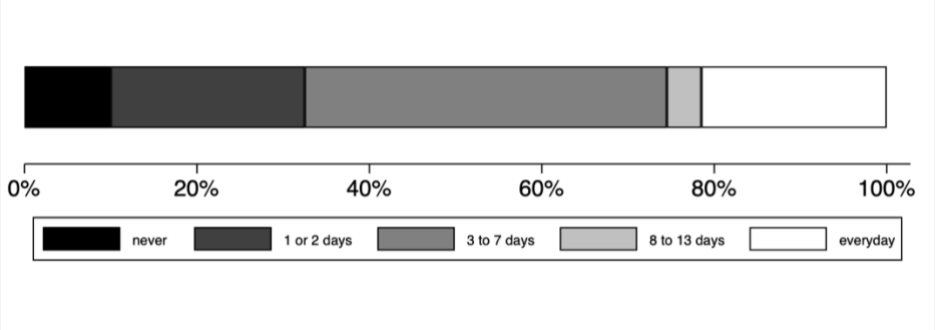
The preparedness of the public health system is a cause of concern for people in Porto Alegre. Only 37% considered the public health system in the region to be either well prepared (16%) or very well prepared (21%) for the outbreak. Most of the population (79%) said they were either worried (15%) or very worried (64%) about the possibility that medical equipment, hospital beds, or doctors might be insufficient to tackle it.

Half of the sample reported reductions in income, and almost a third (31%) suffered an income cut of half or more, relative to their income in February. Five percent of people reported a total loss of income since February.

Sixty-nine percent of Porto Alegre residents perceived Covid-19 to be much more serious than a common flu. The public measures adopted to fight the spread of the disease were assessed as adequate by 62% of respondents in the city, as insufficiently stringent by 30%, and as too stringent by only 8%. People in the city generally understand that lifting these restrictions will be a gradual process: they think it will take on average 5.1 months for measures to be removed, and only 18% of respondents in Porto Alegre expected that restrictions would be removed all at once.

Figure RS.3 – Social distancing, knowledge and testing in Porto Alegre.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

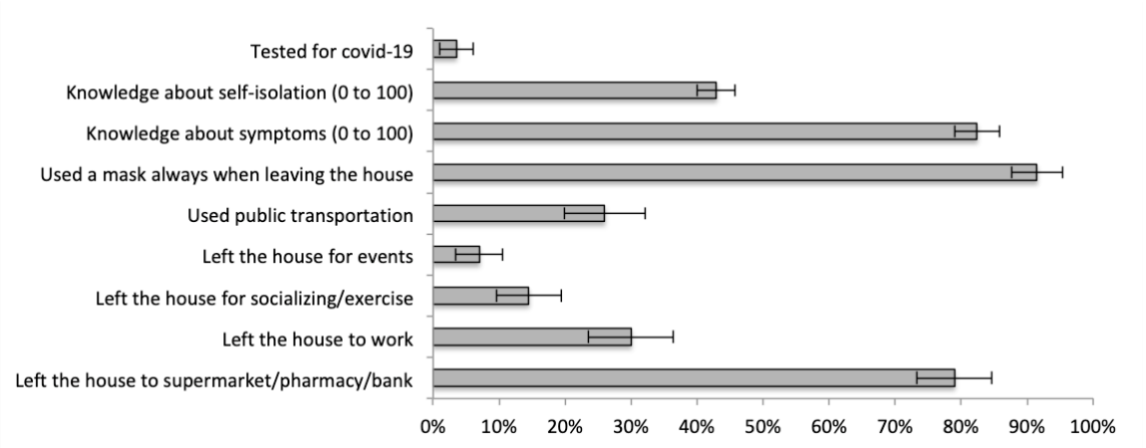
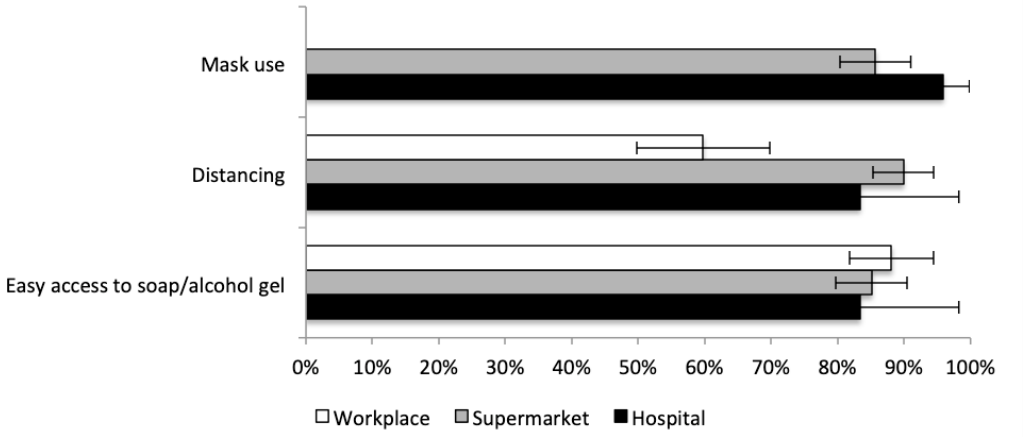


Figure RS.4 - Hand hygiene, distancing and mask use.



Recife, Pernambuco

Figure PE.1 – Accumulated number of deaths and deaths per capita for Pernambuco and the seven other states surveyed.

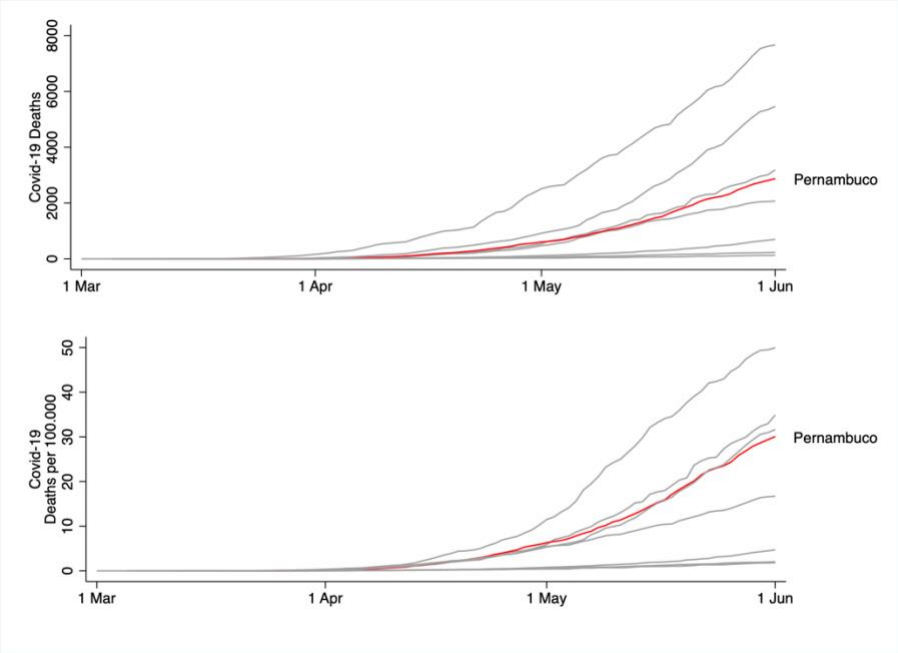
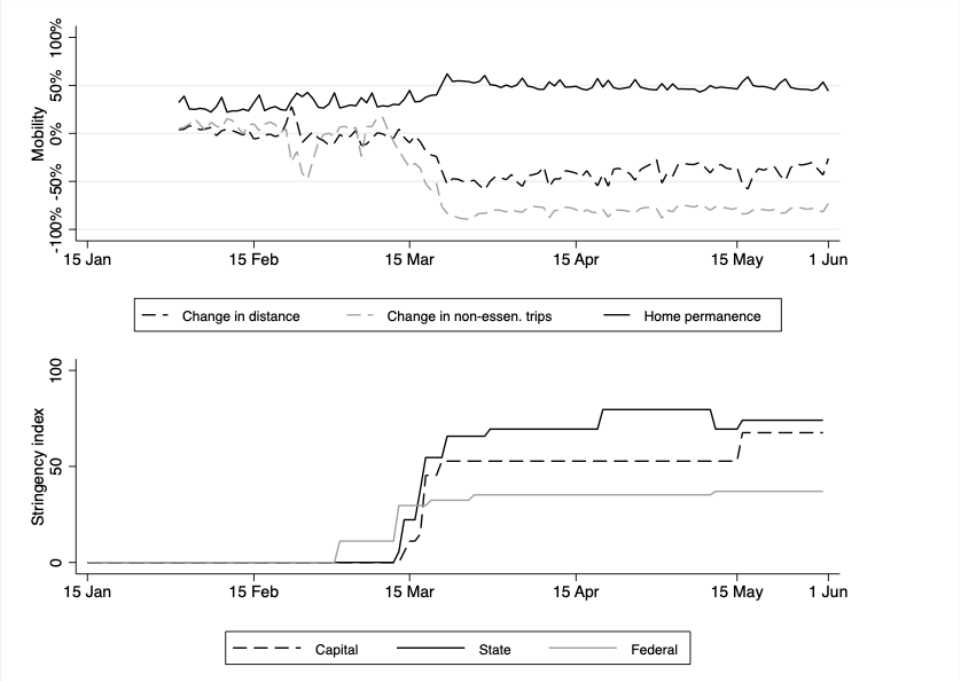


Figure PE.2 – Mobility indicators for Pernambuco and the OxCGRT stringency index for different levels of government.



State and City Government Responses

Pernambuco had 473.6 cases and 40.3 deaths per 100,000 inhabitants as of 15 June. The state saw its first two confirmed Covid-19 cases on 12 March. Its first death was confirmed 25 March. The state government was swift to act. Public information campaigns were up and running by mid-March. On 18 March, it released a WhatsApp number to provide citizens with information about Covid-19 via instant messages. It was also one of the first to launch a website that allowed citizens to see how confirmed cases are spatially distributed, providing detailed information about the number of confirmed cases in cities within the state, and even within neighborhoods.

On 18 March, the state government closed all public and private schools, universities and other educational establishments. A state decree required the closure of all bars and restaurants, barber shops and beauty salons, clubs, as well as shopping centres and shops selling non-essential items. People were only allowed to go to the beach to exercise, provided they kept a safe distance from others. All non-essential services and commercial activities were later suspended, as well as as intercity transportation.

Initially the state goverment cancelled public events with more than 500 people. Then it changed this policy to include all events with more than 50 people, before eventually cancelling all public events. From 4 April, gatherings of more than 10 people were banned in the state of Pernambuco, and beaches and parks were completely closed.

More restrictive social distancing policies were introduced thereafter, and while the state government recommended that citizens to stay home as much as possible, no state-wide curfew or stay-at-home requirements were introduced as law. The state goverment did eventually announce the suspension of all public transport services on islands off the coast, including buses and taxis. The archipelago of Fernando de Noronha was the first part of Pernambuco to introduce public transport closures on 20 April, and eventually a state government decree required people on this island to stay at home. They could only leave their homes with an authorisation to perform specific activities, including buying groceries, going to the bank, for health reasons, and to go fishing. The landing and taking-off of aircraft at the Fernando de Noronha State District Airport has been suspended since 21 March.

From 16 to 31 May, a state-government decree required stricter containment measures in the municipalities of Recife (the capital), Olinda, Camaragibe, São Lourenço da Mata, and Jaboatão dos Guararapes. Residents of these cities were only allowed to leave their homes when completely necessary (to buy groceries, for health reasons, and to work if they job was considered to be essential). The stay-at-home order was lifted on 1 June, but access to beaches and parks was still restricted, and most shops remained closed to the public. On that same day, shops selling construction materials were allowed to reopen provided they follow strict hygiene and social distancing practices, as were some delivery services.

The policies adopted by Recife's municipal government mimicked those of the state government. From mid-March, schools, shopping centres, restaurants, bars, beauty parlours and private clubs were closed, public events were cancelled, and gatherings of more than 50 people banned. From 16 to 31 May, in line with the state government policy, the city of Recife established measures to enforce compliance with some social distancing policies. For example, it assigned officials to patrol the streets and close establishments that were open against city orders.

Recife Survey Results

Recife has1.6 million inhabitants, and 12% of the population is above 60 years of age. Its HDI is 0.772, meaning that it is the 17th most developed state capital (among 27 cities).

Approximately 17% of people in Recife did not leave home during a two-week period between 22 April and 13 May. Those who left did so on average on 5.2 days. The majority interviewees (71%) left home for essential activities, such as going to the supermarket, the pharmacy or to the bank. Twenty-seven percent left their residence to work (compared to 62% who went out to work in February). Those who ventured outside during the fortnight prior to interview on average estimated that 72% of people on the street were wearing masks. Eighteen percent of people reported experiencing at least one Covid-19 symptom during the week prior to interview. Seven percent of respondents from Recife had been tested, and 1% said that they had sought a test without success.

As in other cities surveyed, those who had visited hospitals and supermarkets during the previous fortnight said that employees were overwhelmingly using masks, that social distancing measures had been introduced in these places, and that it was easy for visitors to wash their hands with soap or alcohol gel. Among the residents of Recife leaving their homes for work, 68% said that their workplace had made changes to keep people 2 metres apart. Reductions in public transport services stopped 18% of people from performing intended activities. Twenty-three percent of those surveyed had used public transport in the prior two weeks; 38% used these services in February.

On average, respondents' level of knowledge about the symptoms of Covid-19 scored 78 out of 100, similar to the average level across the eight cities in the study. Average levels of knowledge of the meaning and practices of self-isolation scored 44 out of 100. (See the results section of the main paper for an explanation of these scores.)

The main sources of information about Covid-19 for the population of Recife are TV news shows (67%), and newspapers and newspaper websites (12%). Public information campaigns are reaching 77% of people in the city, and the majority of these people (89%) report having seen them on TV, 31% of them have seen a campaign in a newspaper, and smaller percentages said they had come across them on blogs (18%), via Facebook or Twitter (23%), and via WhatsApp (19%). Among people in Recife who had seen a public information campaign, 64% said they had seen one from the state

government, 44% had seen one from the federal government, and 36% from the municipal government.

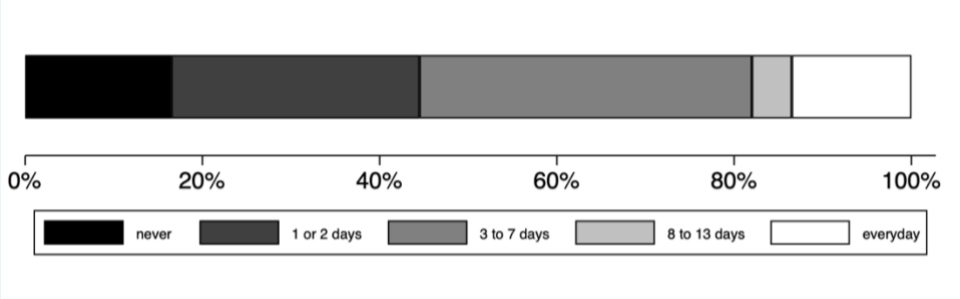
In Recife, 89% of the population were either worried (9%) or very worried (81%) about the possibility that the regional health system has insufficient medical equipment, hospital beds, or doctors to cope with the outbreak. Only 21% of people reported believing that the public health system in their region is either well prepared (10%) or very well prepared (11%) to deal with the outbreak.

More than half (52%) of people in Recife have seen their income reduce since February. Just over a third (34%) said that their income had been cut in half, or worse. Seven percent of the population reported that they no longer had any income.

The vast majority of people in Recife (84%) perceive Covid-19 to be much more serious than a common flu. Less than half (46%) believe that the public measures adopted to fight the spread of the disease have been adequate, 39% say they are less stringent than necessary, and 15% believe they are too stringent. On average, people in Recife estimate that it will take 4.1 months for all government response measures to be removed, and 28% of people in the city expect all such policies will be removed in one go.

Figure PE.3 – Social distancing, knowledge and testing in Recife.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

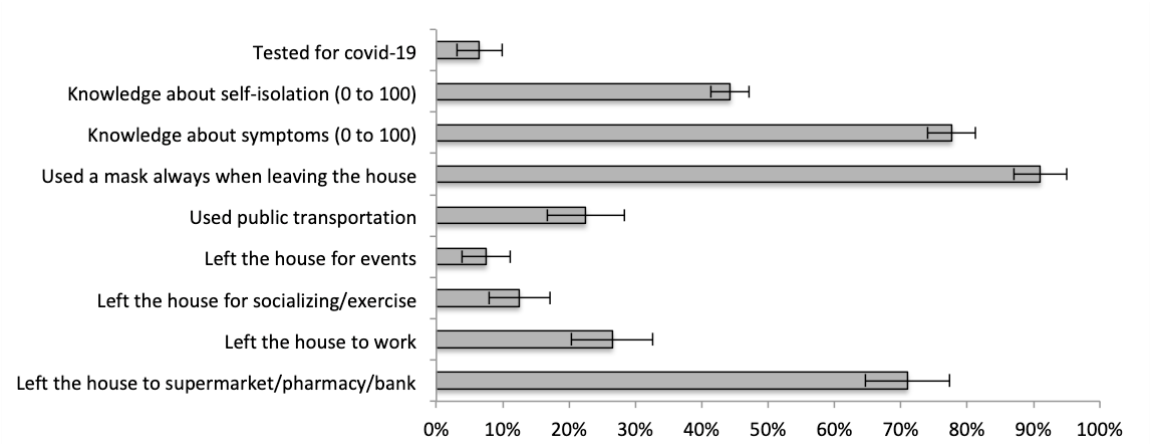
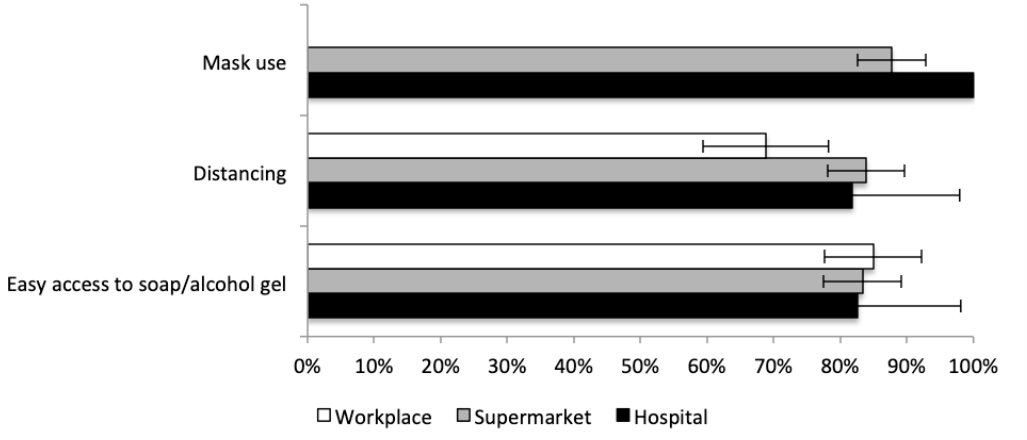


Figure PE.4: Hand hygiene, distancing and mask use.



Rio de Janeiro, Rio de Janeiro

Figure RJ.1 – Accumulated number of deaths and deaths per capita for Rio de Janeiro and the seven other states surveyed.

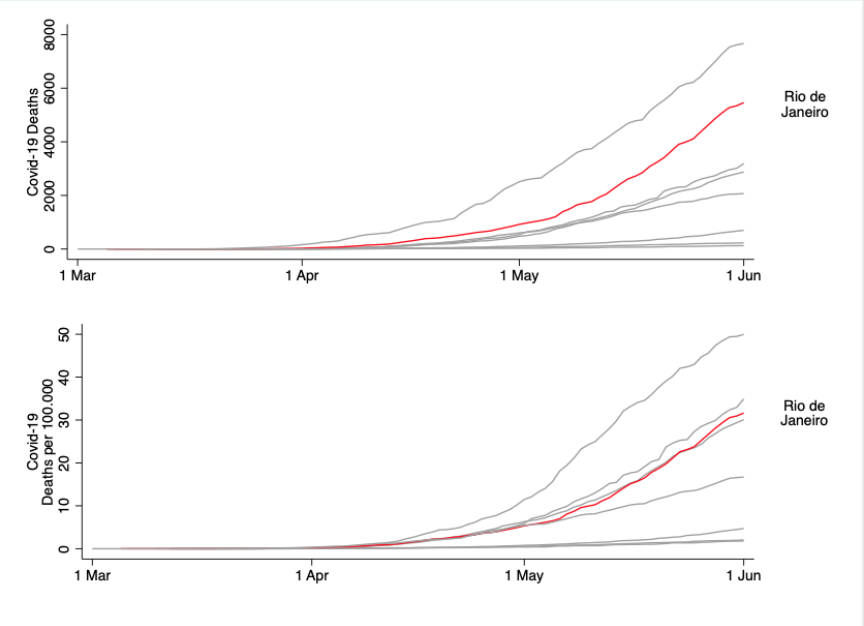
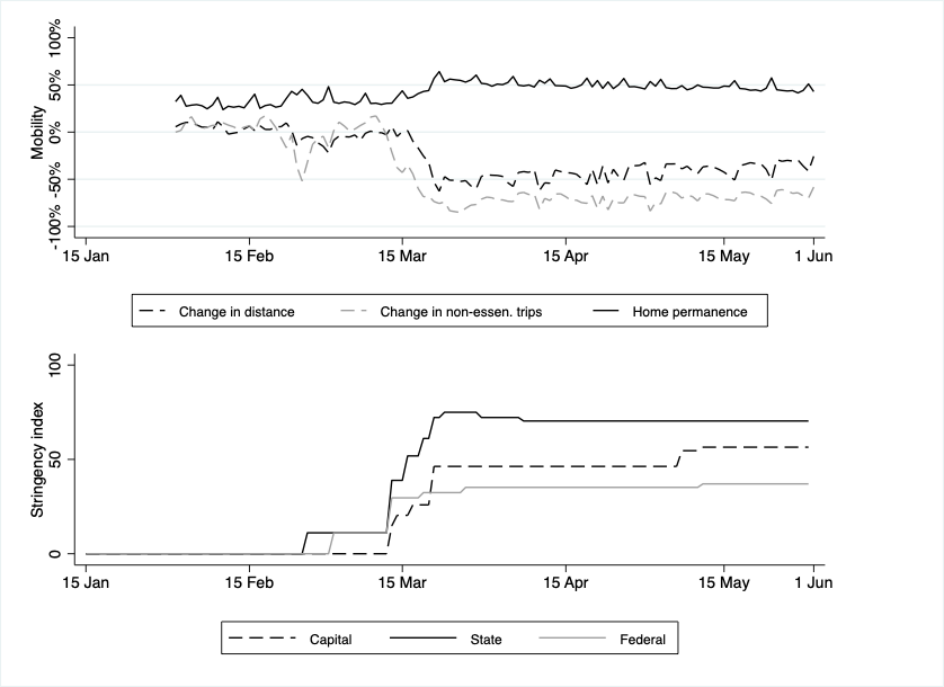


Figure RJ.2 – Mobility indicators for Rio de Janeiro state and the OxCGRT stringency index for different levels of government.



State and City Government Responses

On 26 February, on the same day that the first Covid-19 case was confirmed in Brazil, the official social media pages of Rio de Janeiro's state government and the state health secretary announced that there were no cases in Rio and that the state government already had a contingency plan. The first confirmed case in the state was on 5 March. The first two deaths occurred on 19 March. Since then, these numbers have increased fast. There were 460.9 cases and 44.4 deaths per 100,000 inhabitants registered in the state, as of 15 June.

In mid-March, the state government launched an official 'hot site' with public information about the virus. Later in March, the government of Rio de Janeiro city, the capital of the state of the same name, launched its "Rio contra o Corona" campaign, also with a dedicated website

Acknowledging the risks that the state was facing, on March 13 the governor of Rio de Janeiro published a decree with the first set of government responses. All classes at schools and universities were suspended, and public events and activities with gatherings of people (such as concerts, fairs, and sporting events) were cancelled. On March 16, the state government declared a public emergency and recommended the closing of gyms, bars, restaurants, cinemas and tourist attractions across the state. As of March 19, commercial establishments and non-essential services, including shopping centres, were required to close their doors to the public, but bars and restaurants were allowed to continue operating at up to 30% of capacity. Small shops selling food and drinks, including butchers and convenience stores, have been allowed to provide take-away services. Three days later, the governor closed the state borders and suspendedintercity buses. These policies were initially put in place for 15 days, but were extended several times and remained in force until 5 June.

The state government also introduced temperature checks of all passengers arriving on international flights into Galeão International Airport.

The state of Rio de Janeiro has had no curfews nor strict, state-wide stay-at-home requirements. But the state government has recommended staying at home and that people avoid going to beaches or visiting lakes and rivers. On 13 March, the mayor of Rio de Janeiro city recommended that those in high-risk groups should remain indoors, and this advice was later extended to all of the city's inhabitants. The city government dovetailed off state policy by cancelling events, and by requiring schools and commercial establishments to close their doors. It ruled that buses should only operate with seated passengers. On 23 April, the mayor of Rio issued a decree that required people to wear masks when outdoors in the city.

Even though the capital has not adopted a city-wide requirement to stay-at-home, roadblocks have been introduced in neighbourhoods with high rates of infection, including the regions of Bangu and Campo Grande.

From 6 June, the state government started a gradual process of easing closure and containment restrictions, allowing shopping centres, bars, restaurants, and tourist attractions (including Christ the Redeemer and the Sugar Loaf cable car) to reopen at reduced hours and at half capacity. Religious organisations were once again allowed to run services, and beaches, parks, and lakes were reopened for exercise. In order to be allowed to reopen, establishments of all kinds had to ensure a minimum of 1 metre distance between people on their premises, as well as supply hand sanitiser and require all employees and customers to wear face masks at all times. Schools and some workplaces (including cinemas, gyms, and theatres), however, are expected to remain closed at least until 21 June, as of 15 June.

Rio de Janeiro Survey Results

The city of Rio de Janeiro has 6.7 million inhabitants, with 15% of the population over 60 years of age. Its HDI is 0.799, making it the 8th most developed Brazilian capital (out of 27).

Only 12% of respondents in Rio de Janeiro stayed at home without leaving in a two-week period between 22 April and 13 May. Those who left home did so less often than every three days, on average (or on 4.6 days, on average, during the fortnight). More than three quarters of people in Rio (78%) went out for essential activities, such to the supermarket, the pharmacy, or bank. Just under a quarter (24%) left home to go to work (compared to 67% who did so in February). Those who left home during this period estimated that 75% of people they saw on the street were wearing masks. In Rio, 6% of people said they had been tested, and 1% stated that they had tried to get tested but had not managed met with success. Eleven percent of the sample reported having had at least one Covid-19 symptom in the week prior to interview.

Respondents who had visited hospitals and supermarkets during the fortnight prior to interview reported finding it easy to wash their hands with soap or alcohol gel if they wished, that employees in these places were wearing masks, and that measures had been put in place to help people stay two metres apart (for example while they queued or waited in a seating area). People going out to work in Rio said that distancing measures were less widespread in the workplace: 62% of them said that such measures had been introduced where they work. A quarter of respondents used public transportation in the prior two weeks, whereas 34% claimed to have used public transport in February. Just 16% of people said that reduced public transport services prevented them from going about their intended activities.

Knowledge about the symptoms of Covid-19 was similar among Rio's residents to the average across the eight cities surveyed. The average score for respondents from Rio was 83 out of 100. Knowledge about the meaning and practices associated with self-isolation on average received a score of 48 out of 100, which is slightly higher than the mean across the eight cities. (See the results section of the main paper for an explanation of these scores.)

The main sources of information about Covid-19 for the residents of Rio de Janeiro were TV news shows (60% of Cariocas said that they received most of their information about the disease from this source), and newspapers and newspapers websites (18%). Sixty-one percent of people stated that they had seen a public information campaign, with 82% of these people reporting seeing one on TV, 33% in newspapers, 33% on Facebook or Twitter, 27% on blogs, and 24% on WhatsApp. More than half or those who had seen a public information campaign (52%) recalled seeing a state-government campaign, 46% reported seeing a federal-government campaign, and 34%, a city-government one.

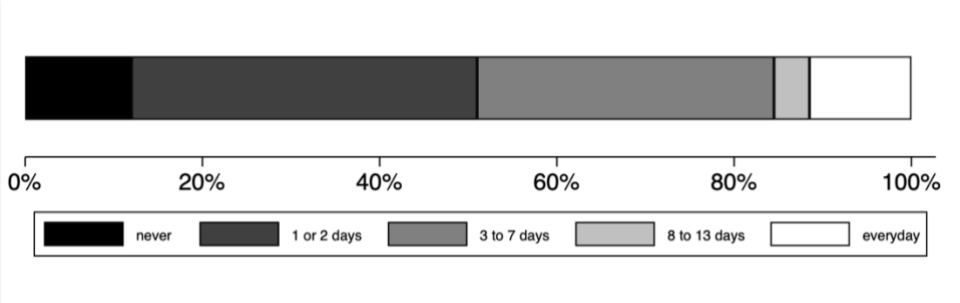
Around 49% of those surveyed in Rio said that their income had reduced since February, and nearly a third (30%) said they had lost at least half of their income. Six percent of the sample said they had lost all income since February.

Respondents in Rio were not confident that the public health system can handle the outbreak. Only 16% of people believed that the regional public health system is either well prepared (9%) or very well prepared (7%) for the pandemic. Eighty-six percent of people said that they were either worried (11%) or very worried (75%) about shortages of medical equipment, hospital beds, or doctors.

A large majority of the population in Rio (81%) considers Covid-19 to be more serious than the common flu. At the time of the survey, there was appetite for stricter response policies: public policy responses to Covid-19 were considered adequate by only 41% of respondents, whereas 51% considered them to be less stringent than necessary. Only 9% believed they were too stringent. The average time that people in Rio estimated it will take for all measures to be lifted was 4.4 months, which is slightly lower than the average across the eight cities surveyed (4.6 months). Just 14% of respondents in Rio believed the policies would be removed in one go.

Figure RJ.3 – Social distancing, knowledge and testing in Rio de Janeiro.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

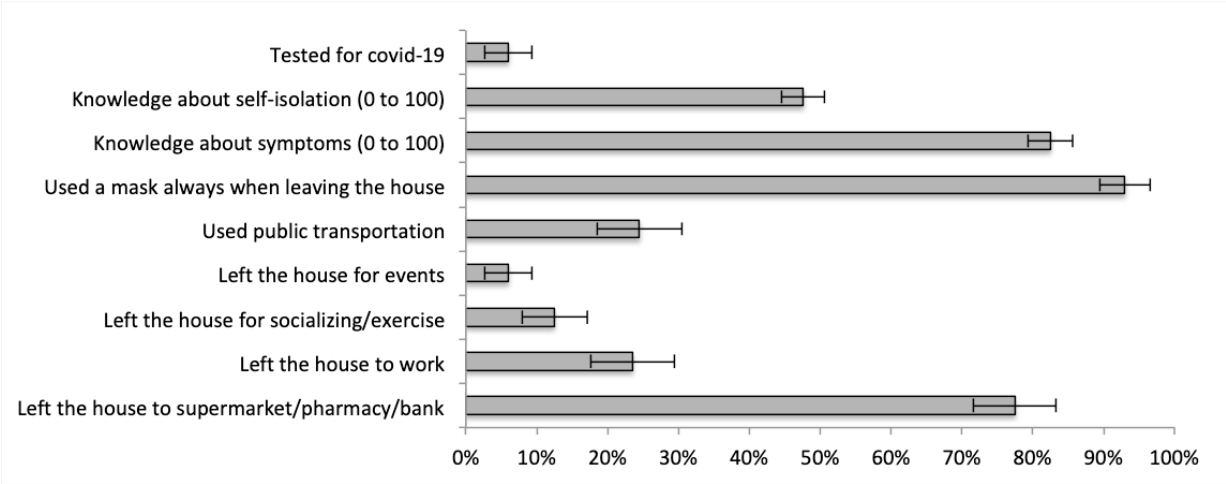
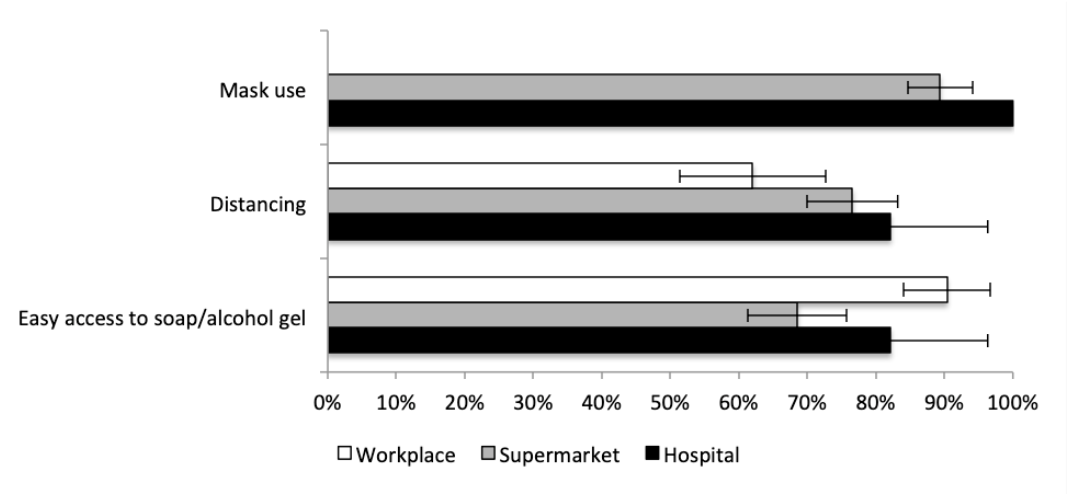


Figure RJ.4 - Hand hygiene, distancing and mask use.



Salvador, Bahia

Figure BA.1 – Accumulated number of deaths and deaths per capita for Bahia and the seven other states surveyed.

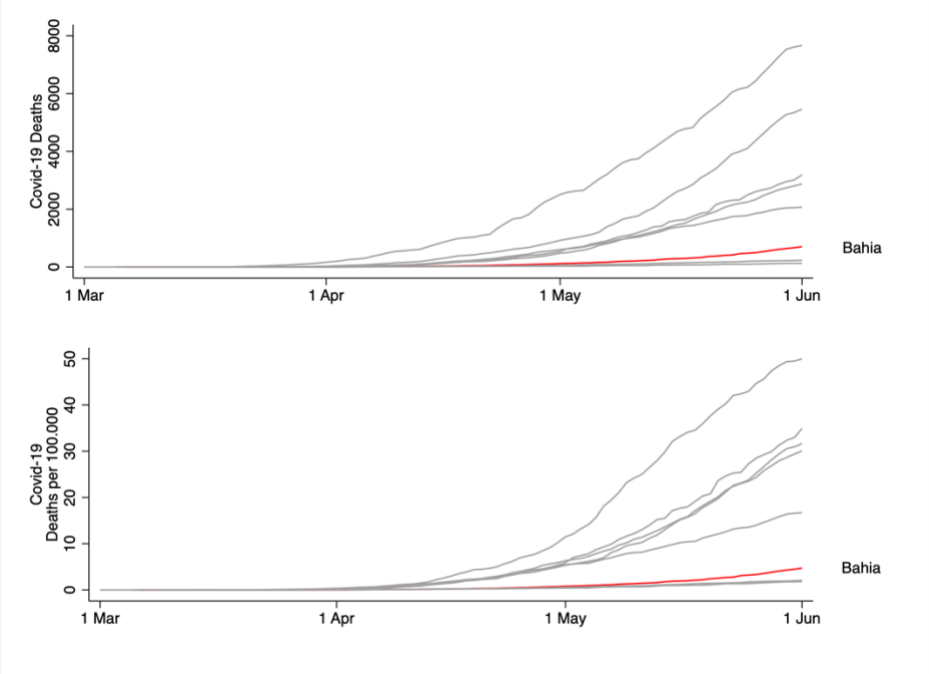
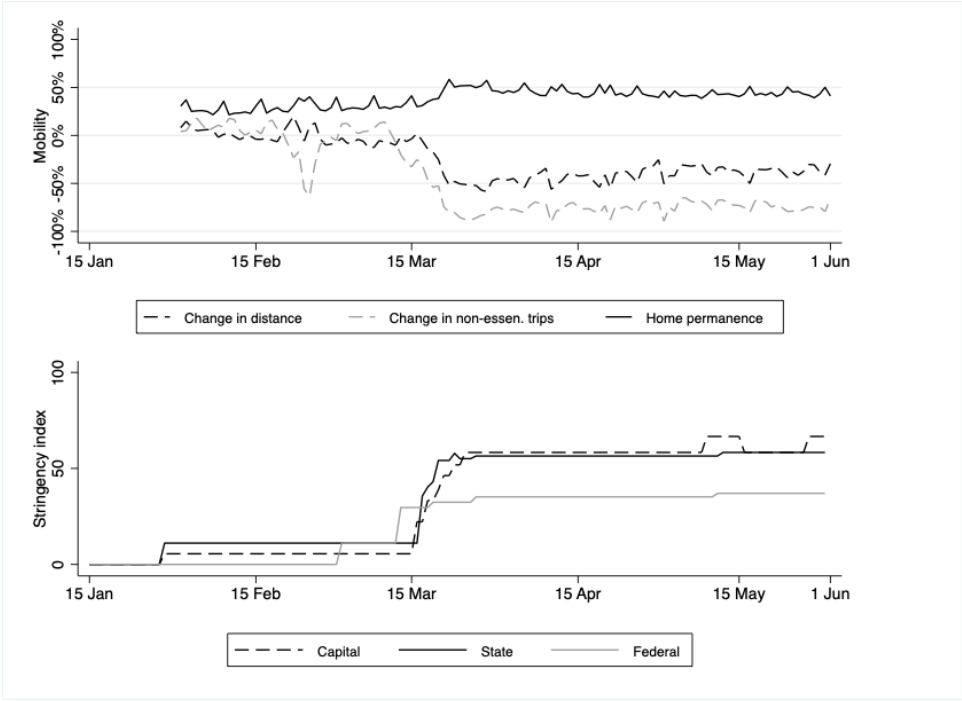


Figure BA.2 – Mobility indicators for Bahia and the OxCGRT stringency index for different levels of government.



State and City Government Responses

On 6 March, Bahia was the fifth state in Brazil to confirm a case of Covid-19. Its first confirmed death was on 29 March. Since then, numbers have grown fast and the state had registered 244.7 cases and 7.4 deaths per 100,000 inhabitants as of 15 June. However, as far back as 29 January, before a Covid-19 case was reported anywhere in Brazil, the state's official communication channels (its website and social media channels) started publishing information about how to prevent the virus's spread. A more concerted effort, in the form of an official campaign called ' A Prevenção Está em Nossas Mãos' (meaning 'prevention is within reach') was launched on 17 March, which asked people to avoid social gatherings and to wash their hands frequently. Since then, the state health secretary's website and social media pages have been continuously updated with Covid-related information.

A day before the launch of ' A Prevenção Está em Nossas Mãos', on 16 March, the state government introduced the first set of public health measures, requiring the cancellation of all events with more than 50 people, and the closure of schools, gyms, zoos, museums, and theatres in cities with confirmed cases. By that point in time, Salvador, Feira de Santana, Porto Seguro, and Prado were the only cities in the state with confirmed cases. The state government also introduced travel restrictions, and the new rules meant that all passengers arriving from places with community transmission had their temperatures screened, whether they were arriving in Bahia via bus, boat, or aeroplane.

On 18 March, the state government declared an emergency and amplified the scope of its mandated closure and containment policies. Interstate buses were suspended. Entertainment establishments and schools were told to close, gatherings of more than 50 people were prohibited, and public events were cancelled in all municipalities of the state. These measures were initially put in place for 10 days, but over time they have been extended and are currently in place until 21 June.

The state government has not mandated that industrial, commercial, and most service-sector workplaces close. However, it has required employers to supply masks, protective equipment, and to make available hand sanitising facilities to all workers, or face a fine of R$ 1,000 (US $ 200) per worker. The state government has also not officially required people to stay at home, although the governor has urged this in his announcements, and government vehicles have been reportedly circulating throughout the capital, Salvador, to advise people to remain at home. Intercity buses have been suspended between certain municipalities; the state government has continuously updated a list of affected cities as the state's outbreak has evolved.

On 12 May, the governor and the mayors of Itabuna and Ipiaú established a curfew in these two cities due to the severity of their outbreaks. This prohibited people living in these cities from leaving their homes between 8pm and 5am, and required the suspension of all commercial activities during those hours, with the exception of pharmacies. Other municipalities have since been required to implement similar measures. In early June the

state government announced a curfew in 19 cities in southern Bahia, where the number of cases has been growing fast, including the historical city Porto Seguro.

The Salvador city government has adopted additional policies to restrict movement, aligned with the state government. For example, the mayor has suspended all activities in public markets, concert halls, nightclubs; closed bars, restaurants, shopping centers and social clubs; and prohibited meetings, gatherings or events with more than 50 people. The municipal government has also restricted access to Salvador's beaches and reduced the public bus fleet by 30%. From early May, the Salvador city government brought in even more restrictive measures targeted at neighbourhoods with the highest number of Covid-19 cases, requiring all but the most essential services to close in these districts and not allowing anyone but residents to enter these areas of the city. Starting on 20 May, the city government permitted some commercial establishments with a total area of less than 200m_2 to open to the public, provided protective measures were in place.

Salvador Survey Results

Salvador is the third most populous municipality in Brazil, home to 2.9 million inhabitants, 9% of whom are above 60 years of age. Its HDI is 0.759, making it the 11$_{th}$ most developed state capital in Brazil (among 27 cities).

In Salvador, 15% of people did not leave their homes during a two-week period from 22 April and 13 May. Those who ventured out, did so on average on 4.7 days during that period. As elsewhere, most people (68%) left home for essential tasks, such as going to the supermarket, pharmacy or bank; 29% of all respondents reported leaving home to go work during the fortnight (compared to 62% who reported going out to work in February). Those who went out estimated, on average, that 80% of people on the street were wearing masks. Ten percent of respondents reported having had at least one Covid-19 symptom in the week prior to interview. Nine percent of people reported having been tested, and 1% stated that they had tried to get tested without success.

In hospitals and supermarkets, the use of masks by employees, and measures to ensure that visitors remained 2 metres apart, and had access to soap or alcohol gel to wash their hands, were widespread. Respondents leaving home to go to work indicated that social distancing measures were less common in workplaces; 63% of these people said that such steps had been taken in their place of work. Reductions in public transport prevented 19% of people from going about their intended activities. Just less than a quarter of people (22%) stated that they had used public transport during the previous two weeks, while exactly a third said they used it in February.

The vast majority of people in Salvador (81%) see Covid-19 as much more serious than a common flu. The average score for knowledge about Covid-19 symptoms was 83 out of

100, while that for knowledge about the meaning and practices of self-isolation was 45 out of 100. (See the results section of the main paper for an explanation of these scores.)

The main source of information about Covid-19 were TV news shows (62%) and newspapers and newspapers websites (18%). As many as 71% of respondents reported having seen government information campaigns, which is above the average across the eight cities surveyed (65%). Of those who had seen public information campaigns, 68% said they thought they had seen a campaign from the state government, 25% said they thought they had seen one from the federal government, and 59% from the municipal government.

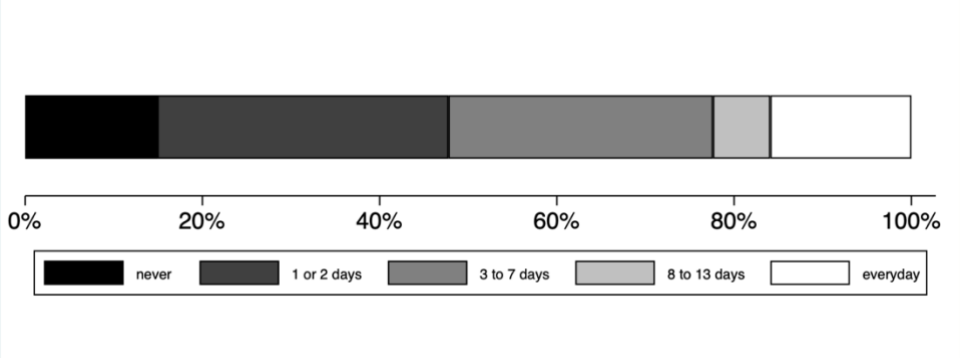
Around 56% of people in Salvador reported reductions in household income, 42% said they had lost at least half of their income since February, and 8% had experienced a complete loss of income since February.

Only 37% of respondents in Salvador reported believing that the public health system in their region is either well prepared (20%) or very well prepared (17%) for the outbreak. As many as 85% of people stated that they were either worried (11%) or very worried (74%) that there might be insufficient medical equipment, hospital beds, or doctors to with the outbreak in their region.

Nonetheless, most respondents in Salvador (65%) assessed the policy responses adopted to fight the spread of Covid-19 as adequate. Just over a quarter (26%) considered the policies to be insufficiently strict, while only 9% considered them too stringent. Most respondents thought that these policies will be removed gradually, with only 17% saying they thought they would all be removed at once. On average people in Salvador believe it will take 4.6 months for Covid-19 response policies to be completely removed.

Figure BA.3 – Social distancing, knowledge and testing in Salvador.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

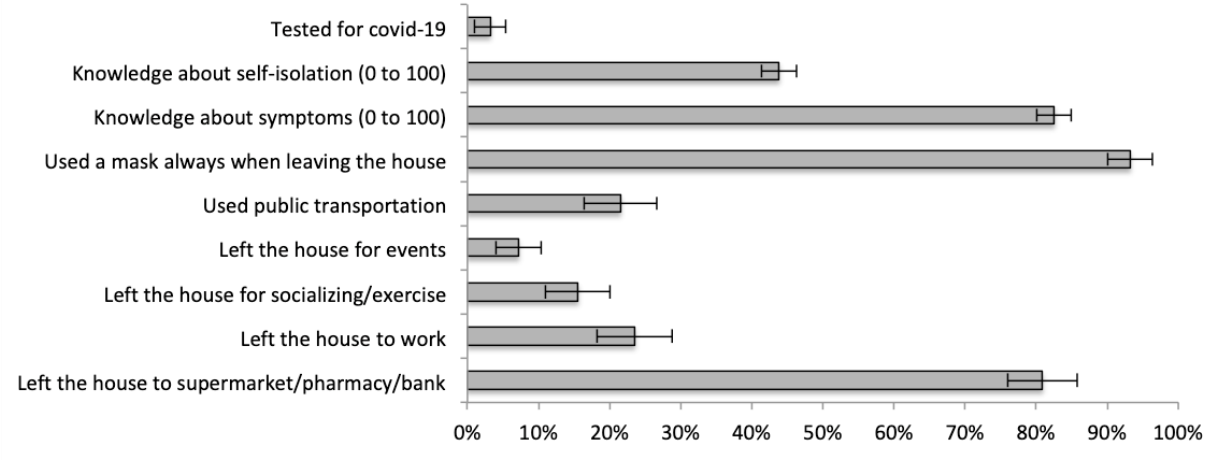
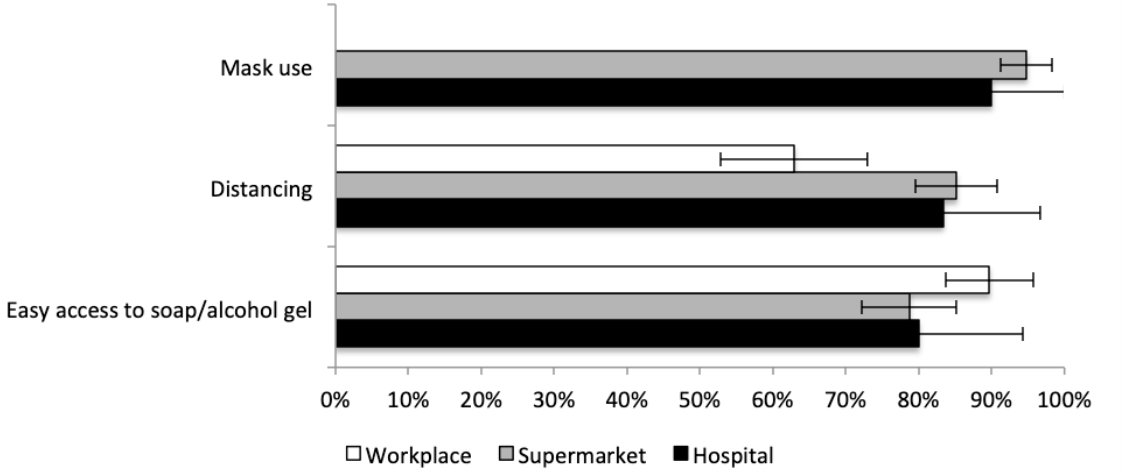


Figure BA.4: Hand hygiene, distancing and mask use.



São Paulo, São Paulo

Figure SP.1 – Accumulated number of deaths and deaths per capita for São Paulo and the seven other states surveyed.

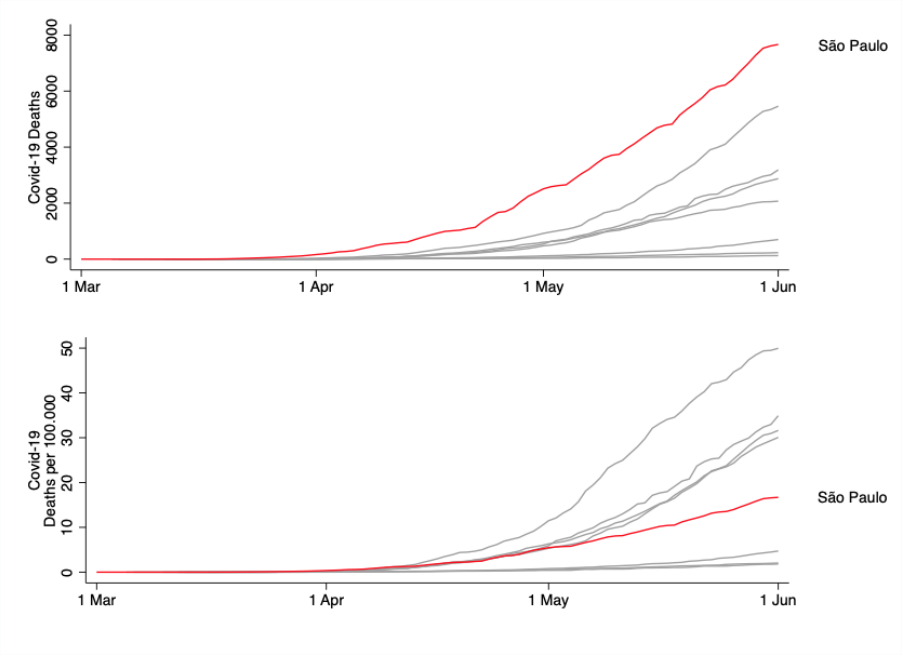
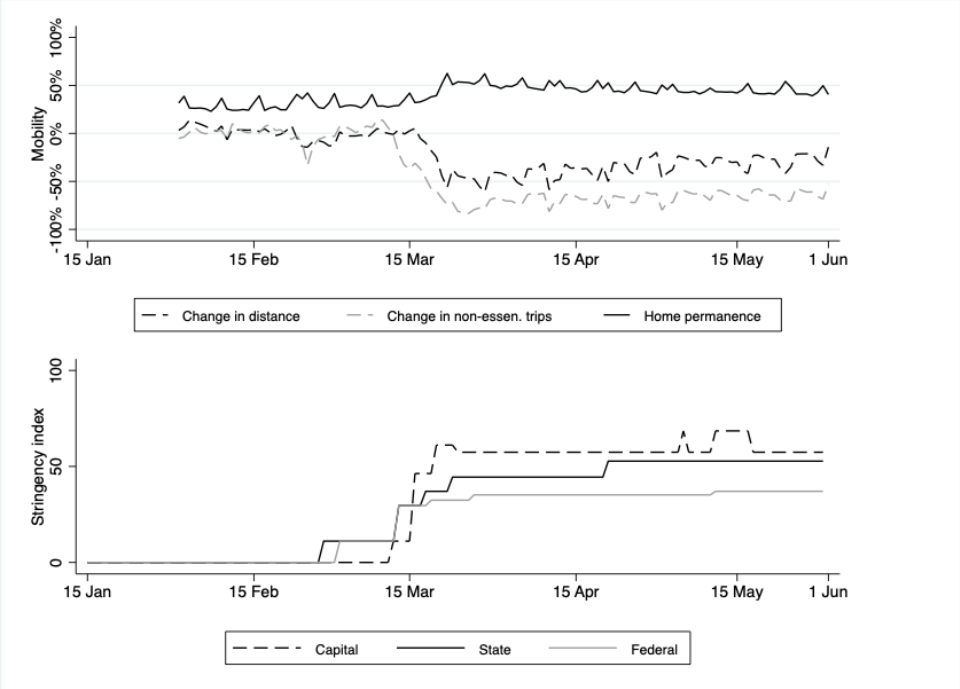


Figure SP.2 – Mobility indicators for São Paulo state and the OxCGRT stringency index for different levels of government.



State and City Government Responses

The city of São Paulo registered Brazil's first case of the new coronavirus on 26 February. The individual in question was a 61-year-old man arriving from Italy. The country's second, third, and fourth cases were also confirmed in the city, which quickly became the epicentre of Brazil's outbreak. The first Covid-19 death in both São Paulo and Brazil occurred on 17 March. As of 15 June, the state of São Paulo had recorded 388 cases and 23.3 deaths per 100,000 inhabitants.

On 16 March, São Paulo's state government started to introduce social distancing requirements. It required schools and universities to gradually close between March 16 and March 23, when all in-person classes were suspended across the state. On 22 March, the governor published a decree putting in place a series of stricter measures, allowing only essential services, certain industries, and construction to continue operating. The governor also recommended that people only travel within the state under exceptional circumstances, and that they leave home only to buy groceries, for health reasons, and go out to work if their job is considered to be an essential role. The measures were initially brought in to last until 7 April, and after being extended several times, they were in force until 31 May. Thereafter the state government implemented a five-phase plan to gradually ease closure and containment polices.

On 30 March, the state government announced a new communication campaign that emphasised staying at home. The governor also urged people not to travel during the Easter and Workers' Day holidays, and, in particular, to not to go to beaches due to the risk of taking the virus to coastal cities that have little in the way of public health infrastructure.

On 27 May, the governor published a phased plan to loosen response policies in some parts of the state. According to the plan, each municipality could consider gradually opening workplaces and public spaces from 1 June, based on the number of cases, the availability of hospital beds, and on people's behaviour in public spaces. In all 645 municipalities of São Paulo, industry and civil construction activities are allowed to operate normally. However, the plan keeps in place a total ban on public events, theatre shows, cinema screenings and big gatherings (such as parties, concerts, and sports events), which will gradually be lifted. Schools remain closed, but the state governor has announced that classes will be resumed, initially with only some of the students attending in person.

The mayor of São Paulo has issued additional regulations, tightening the statewide policies within the city. On 17 March, he signed a decree declaring a state of emergency, closing museums, libraries, theatres, sports clubs and cultural centres, cancelling all public events, and limiting attendance at burials and funerals to a maximum of 10 people. On 20 March, he closed all bars and restaurants to the public and recommended that the city's residents stay home.

From 11 May, the mayor brought in further measures to cut in half the number of cars circulating in São Paulo city. On calendar days ending in 0, 2, 4, 6 or 8, only cars with number plates ending in even numbers were allowed on the streets. On calendar days

ending in 1, 3, 5, 7 or 9, only cars with number plates ending in odd numbers were allowed to circulate. But because these measures were not considered successful in reducing mobility in the city (according to mobile phone data), they were lifted after only a week. Extra buses have been added to the public transport fleet to reduce the number of passengers in each public transport vehicle.

From 1 June, according to the criteria established in the phased plan designed by the state government, the city of São Paulo would be in 'orange' phase, whereby some non-essential businesses (including shopping centres, and other commercial and service-sector firms) can open their doors to the public. This reopening depends on the approval of a proposal presented by representatives from each sector to the municipal government, listing all protective measures that would be place for that sector, including staggered shifts, hygiene and social distancing protocols, and childcare support. After reviewing several proposals, the São Paulo city government approved the reopening of high-street shops from 11 June and of shopping centres from the following day.

São Paulo Survey Results

São Paulo, the capital of the state of the same name, is a huge city of 12.2 million inhabitants, with 12% of its population above 60 years of age. The city's HDI is 0.805, which makes it the 7th most developed state capital (among 27 cities).

Approximately 13% of respondents in São Paulo did not leave home for at least two weeks during the period between 22 April and 13 May. Those who did leave went out on average on 5.44 days. About 81% of São Paulo residents left home to go to the supermarket, pharmacy or to the banks; 24% left home to go to work (compared to 65% who reported to leave regularly to work in February). Survey respondents who did leave home estimated 74% of people on the street, on average, to be wearing masks. Eight percent of people reported having had at least one Covid-19 symptom in the previous week, 3% said they had been tested, and 1% stated that they had tried to get tested without success.

Respondents who had visited hospitals and supermarkets reported widespread use of masks among hospital and supermarket workers, and that measures had been established to ensure a physical distance of at least 2 metres between people. In these places, visitors could easily wash their hands with soap or alcohol gel. Respondents going out to work found that distancing in the workplace was less common; 58% of this group said that their workplace had put in place measures to maintain a 2-metre distance between them and their colleagues.

Changes in public transportation did little to prevent people going about their intended activities. Only 8% of respondents claimed that this was the case. In February, 36% of people reportedly used public transport. Twenty-two percent said they had used it in the previous two weeks.

The average score among respondents in São Paulo for knowledge about the symptoms of Covid-19 was 83 out of 100. The average score for knowledge about the meaning and practices of self-isolation was 44 out of 100. (See the results section of the main paper for an explanation of these scores.)

Only a small proportion of people in São Paulo said that they believe the public health system in their region is either well prepared (11%) or very well prepared (8%) to deal with the outbreak, while 86% said they were either worried (11%) or very worried (75%) about the possibility of shortages of medical equipment, hospital beds, or doctors.

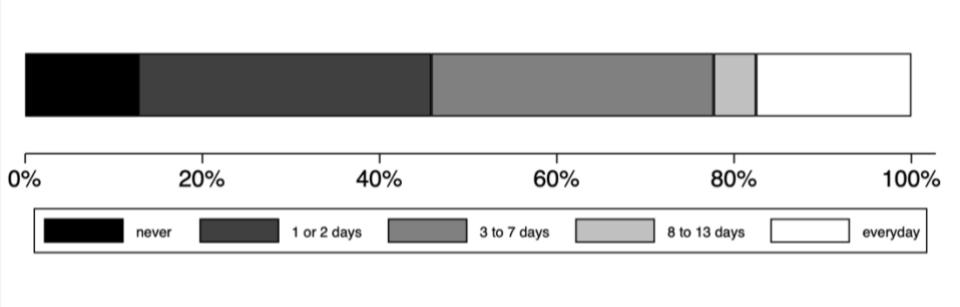
For Paulistas, TV news shows (62%), and newspapers and newspapers websites (19%) were the main source of information about Covid-19. Among the 69% of the population who had seen a public information campaign, the vast majority (89%) had seen one on TV, 41% had seen one in a newspaper, 29% on blogs, 29% had come across one via Facebook or Twitter, and 23% had seen one on WhatsApp. The state government was perceived as the main source of such information campaigns; 67%) of people who had seen one said they had seen a state government campaign.

Around 56% of Paulistas said that their income had reduced since February, and 35% said they had experienced a drop of 50% or more. Seven percent of the population reported a total loss of income.

The vast majority of Paulistas (81%) see Covid-19 as more than just a flu. Approximately the same proportion of people (45%) assess the government response measures that have been introduced to fight the spread of the disease to be insufficiently strict, as judged them to be adequate (43%). Only 12% of respondents said the measures were too strict. People in São Paulo on average believe it will take, 4.3 months for all restrictions to be lifted. Twenty percent expect measures to be lifted all at once.

Figure SP.3 – Social distancing, knowledge and testing in São Paulo city.

A. Number of days that respondents left home in the previous two weeks.



B. Testing, knowledge, mask use, and reasons for leaving home.

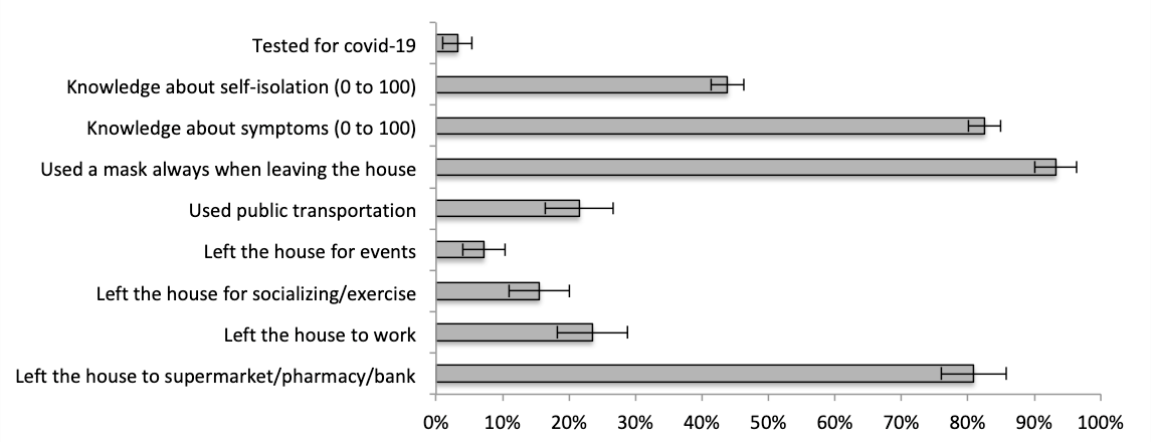
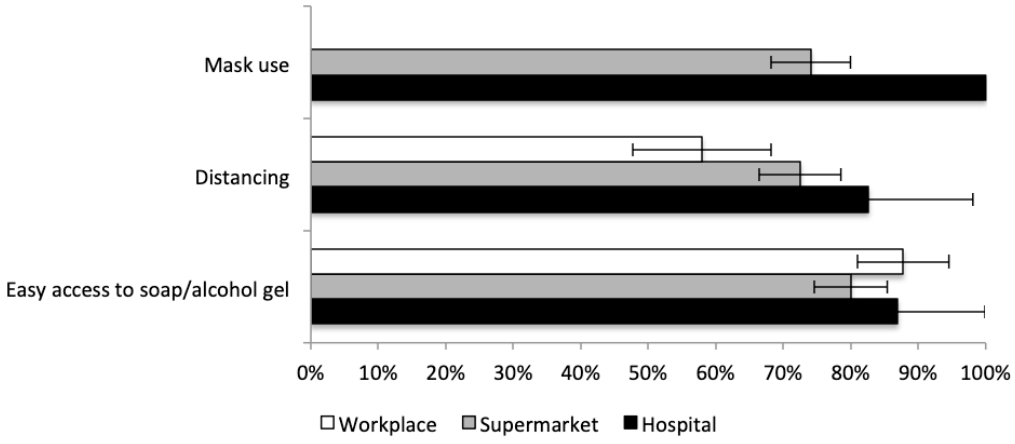


Figure SP.4: Hand hygiene, distancing and mask use.



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Appendix

Fig A1: Changes in household income by income bracket

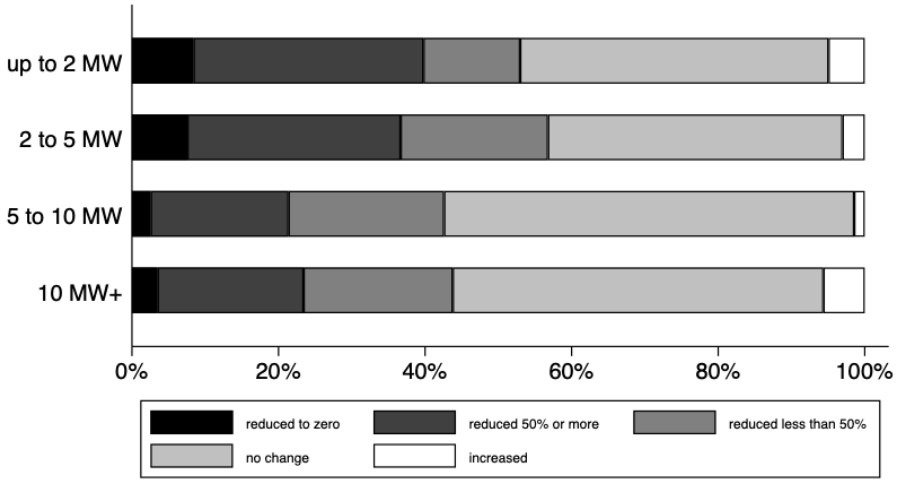

Table A1: Demographic characteristics of the sample by city

Quotas	São Paulo	Rio de Janeiro	Porto Alegre	Goiânia	Fortaleza	Salvador	Manaus	Recife
Sex								
F	53.0	54.5	55.0	53.0	54.2	55.2	51.8	55.5
M	47.0	45.5	45.0	47.0	45.8	44.8	48.2	44.5
Age								
18 to 24	15.9	15.5	14.5	18.8	20.4	18.9	22.1	18.0
25 to 40	35.5	31.5	33.0	37.1	35.3	37.8	40.7	33.5
40 to 60	32.7	35.0	34.0	31.2	31.3	31.8	28.1	32.5
60 +	15.9	18.0	18.5	12.9	12.9	11.4	9.1	16.0
Education								
Primary education	35.1	31.0	32.5	38.6	39.8	32.8	38.7	39.5
Middle education	30.3	36.5	30.5	35.2	37.3	39.3	39.2	34.5
Higher education	34.7	32.5	37.0	26.2	22.9	27.9	22.1	26.0
Income								
Up to 2 MW	19.2	33.0	24	41.6	45.3	36.3	50.3	41.5
from 2 to 5 MW	51.8	40.5	54.0	38.6	43.8	46.3	33.2	44.0
from 5 to 10 MW	17.5	15.5	14.0	10.4	8.0	11.0	9.6	5.5
10 MW +	11.6	11.0	8.0	9.4	3.0	6.5	7.0	9.0

Table A2: Regression models for mobility with binary policy variables (0=below 50, 1=50 or higher)

	Home perm.	Change in non-ess. trips	Change in distance	Home perm.	Change in non-ess. trips	Change in distance
School closing (binary)	8.599***	-33.523***	-12.098***	1.882*	-6.504**	-0.706
	(1.469)	(5.857)	(3.617)	(0.932)	(2.597)	(3.427)
Workplace closing (binary)	3.838***	-8.606**	-8.931**	2.434***	-4.467	-5.837*
	(1.112)	(3.776)	(3.400)	(0.804)	(2.682)	(3.101)
Cancel public events (binary)	4.023***	-23.382***	-10.309***	1.051	-9.883***	-5.842*
	(1.100)	(4.683)	(3.254)	(0.759)	(2.826)	(2.916)
Restriction on gatherings (binary)	-0.818	2.546	1.187	-0.570	1.685	0.570
	(0.787)	(2.323)	(2.623)	(0.500)	(1.734)	(1.881)
Stay at home requirements (binary)	0.778	6.016	2.265	1.234	4.072	1.307
	(1.648)	(4.814)	(5.806)	(1.619)	(4.723)	(5.959)
Restrictions on int. mov. (binary)	1.987*	-5.767*	-9.037**	0.926	-3.177	-6.325*
	(1.085)	(3.312)	(3.541)	(0.823)	(2.604)	(3.321)
Public information campaigns (binary)	0.014*	-0.079**	-0.018	-0.001	-0.001	0.001
	(0.008)	(0.032)	(0.029)	(0.006)	(0.026)	(0.029)
Day of week fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar-week fixed-effects	No	No	No	Yes	Yes	Yes
Calendar-month fixed-effects	Yes	Yes	Yes	No	No	No
Observations	3078	3078	3078	3078	3078	3078
R-squared	0.805	0.841	0.720	0.860	0.904	0.784

Clustered standard errors in parentheses
* p<.10 ** p<.05 *** p<.01"

Table A3: Regression models for mobility with month fixed-effects

	Home perm.	Change in non-ess. trips	Change in distance	Home perm.	Change in non-ess. trips	Change in distance
Stringency Index	0.285***	-1.129***	-0.628***			
	(0.014)	(0.059)	(0.034)			
School closing (index)				0.071***	-0.328***	-0.096**
				(0.014)	(0.054)	(0.040)
Workplace closing (index)				0.061***	-0.165**	-0.160***
				(0.017)	(0.065)	(0.047)
Cancel public events (index)				0.040***	-0.229***	-0.094**
				(0.012)	(0.048)	(0.037)
Restriction on gatherings (index)				-0.015	0.059*	0.023
				(0.009)	(0.033)	(0.027)
Stay at home requirements (index)				0.117***	-0.232**	-0.176**
				(0.030)	(0.091)	(0.085)
Restrictions on int. movem. (index)				0.016	-0.048	-0.087**
				(0.011)	(0.030)	(0.033)
Public information campaigns (index)				0.014	-0.087**	-0.014
				(0.009)	(0.032)	(0.029)
Day of week fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3078	3078	3078	3078	3078	3078
R-squared	0.788	0.817	0.712	0.819	0.851	0.738

Clustered standard errors in parentheses
* p<.10 ** p<.05 *** p<.01

Table A4: Regression models for mobility with month fixed-effects and first order auto-regressive term

	Home perm.	Change in non-ess. trips	Change in distance	Home perm.	Change in non-ess. trips	Change in distance
Stringency Index	0.285***	-1.129***	-0.628***			
	(0.014)	(0.059)	(0.034)			
School closing				0.032***	-0.085***	-0.043***
				(0.006)	(0.016)	(0.014)
Workplace closing				0.022***	-0.033**	-0.051***
				(0.007)	(0.016)	(0.016)
Cancel public events				0.018***	-0.068***	-0.043***
				(0.005)	(0.014)	(0.014)
Restriction on gatherings				-0.007**	0.021**	0.011
				(0.003)	(0.008)	(0.009)
Stay at home requirements				0.031***	-0.002	-0.022
				(0.010)	(0.017)	(0.023)
Restrictions on internal movement				0.004	-0.002	-0.024**
				(0.004)	(0.007)	(0.010)
Public information campaigns				0.005	-0.022**	-0.009
				(0.003)	(0.010)	(0.009)
Home permanence$_{t-1}$				0.626***		
				(0.016)		
Change in non-ess. trips $_{t-1}$					0.772***	
					(0.016)	
Change in distance $_{t-1}$						0.689***
						(0.021)
Day of week fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3078	3078	3078	3078	3078	3078
R-squared	0.788	0.817	0.712	0.893	0.938	0.867

Clustered standard errors in parentheses
* p<.10 ** p<.05 *** p<.01

Table A5: Regression models for mobility with week fixed-effects and first order auto-regressive term

	Home perm.	Change in non-ess. trips	Change in distance	Home perm.	Change in non-ess. trips	Change in distance
StringencyIndex	0.088***	-0.321***	-0.326***			
	(0.017)	(0.092)	(0.093)			
School closing				0.007	-0.025**	-0.015
				(0.005)	(0.009)	(0.014)
Workplace closing				0.016***	-0.030*	-0.043**
				(0.005)	(0.015)	(0.016)
Cancel public events				0.005	-0.030***	-0.026*
				(0.004)	(0.009)	(0.014)
Restriction on gatherings				-0.005*	0.015*	0.006
				(0.003)	(0.008)	(0.009)
Stay at home requirements				0.033***	-0.027	-0.026
				(0.010)	(0.023)	(0.026)
Restrictions on internal movement				0.003	-0.008	-0.025*
				(0.004)	(0.008)	(0.012)
Public information campaigns				-0.000	-0.004	-0.002
				(0.003)	(0.009)	(0.011)
Home permanence$_{t-1}$				0.553***		
				(0.017)		
Change in non-ess. trips $_{t-1}$					0.685***	
					(0.019)	
Change in distance $_{t-1}$						0.629***
						(0.025)
Day of week fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3078	3078	3078	3078	3078	3078
R-squared	0.858	0.902	0.780	0.910	0.954	0.876

Clustered standard errors in parentheses

* p<.10 ** p<.05 *** p<.01

Table A6 – Regression models results (with alternative measure of exposure to Covid-19)

	Number of days in which left the house in two weeks	Left the house once or twice in two weeks	Never left the house in two weeks	Tested for coronavirus
Age (reference 18 to 24)				
24 to 40	0.558*	-0.0112	-0.0784***	-0.0233
	(0.327)	(0.0341)	(0.0245)	(0.0167)
40 to 60	0.576*	-0.0440	-0.0485*	-0.0209
	(0.339)	(0.0353)	(0.0254)	(0.0173)
60 or more	-0.365	-0.00843	0.0678**	-0.0315
	(0.396)	(0.0413)	(0.0297)	(0.0202)
Education (reference primary education)				
Middle education	0.317	0.00428	-0.00453	0.00854
	(0.265)	(0.0276)	(0.0199)	(0.0135)
Higher education	-1.101***	0.0962***	0.0242	0.00206
	(0.307)	(0.0320)	(0.0230)	(0.0157)
Gender (reference female)	2.617***	-0.144***	-0.0662***	-0.00412
	(0.222)	(0.0231)	(0.0166)	(0.0113)
Income (up to 1 MW)				
from 1 to 2 MW	-0.154	0.0293	0.0355	-0.0116
	(0.371)	(0.0386)	(0.0278)	(0.0189)
from 2 to 5 MW	0.350	0.0327	-0.0106	-0.00991
	(0.338)	(0.0352)	(0.0253)	(0.0172)
from 5 to 10 MW	-0.288	-0.0253	0.104***	0.0169
	(0.459)	(0.0478)	(0.0344)	(0.0234)
more than 10 MW	0.245	-0.0112	-0.00965	0.0468*
Type of work				
Informal worker	-1.232***	0.0697**	0.0485**	-0.00306
	(0.292)	(0.0304)	(0.0219)	(0.0149)
Formal Entrepreneur	-1.328***	0.0409	0.0884***	0.00774
	(0.372)	(0.0388)	(0.0279)	(0.0190)
No payed work	-1.962***	0.0900***	0.0991***	-0.0240
	(0.318)	(0.0332)	(0.0238)	(0.0162)
Contagious with symptoms (alternative def.)	-0.100	0.0662	-0.0194	0.00703
	(0.506)	(0.0527)	(0.0379)	(0.0258)
Contagious for contact with suspect (alternative def.)	1.716**	-0.0139	-0.0439	-0.0359
	(0.679)	(0.0708)	(0.0509)	(0.0347)
Did not use to leave the house in February	-1.457***	-0.0277	0.127***	0.000215
	(0.361)	(0.0376)	(0.0270)	(0.0184)
Number of people living in household	0.0748	-0.00461	0.00234	-0.00409
	(0.0712)	(0.00742)	(0.00533)	(0.00363)
Observations	1654	1654	1654	1654
R-squared	0.188	0.053	0.107	0.019

Standard errors in parentheses
* p<0.05 ** p<0.01 *** p<0.001