



# Political Preferences, Knowledge, and Misinformation About COVID-19: The Case of Brazil

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The COVID-19 pandemic has led to a vast research agenda focusing on how citizens acquire knowledge about the virus and the health expert guidelines to protect themselves and their close ones against it. While many countries and regions have been accounted for, there still remains a substantial gap with respect to public opinion about the virus in Latin America, most notably in Brazil, which currently has the second highest in number of fatalities in the world. In this article, we employ a national survey of Brazilians ( $n = 2,771$ ) to measure and explain knowledge and misinformation about the coronavirus and its illness, COVID-19. Our focus concerns the role of political preferences in a context of high elite polarization with a sitting government that has systematically downplayed the risks associated with the coronavirus and its illness. Our findings are clear: political preferences play a substantial role in explaining differences in knowledge about the coronavirus and COVID-19, more than conventional determinants of learning like motivation, ability, and opportunities. Specifically, we find that supporters of President Jair Bolsonaro—an avid science and COVID-19 denier—know significantly less about the coronavirus and its illness and are more likely to believe in a conspiracy theory that claims that the coronavirus was purposefully created in a Chinese laboratory to promote China's economic power, when compared to Brazilians who are less supportive of him and his government. Our findings carry important implications for how Brazilians take informational cues from political elites in that—even in a major event like a global pandemic—supporters of the president are as likely as ever to “follow their leader” and deny expert-backed scientific evidence.

**Keywords:** coronavirus, COVID-19, public health, knowledge, partisanship, political preferences, misinformation, Brazil

## INTRODUCTION

Fighting a pandemic like the coronavirus SARS-Cov-2 and its illness COVID-19 requires an adequate public response to guidelines issued by public health professionals. For these guidelines to be effective, however, they need to be relayed by the media and elected officials to the public so that its members can learn about the virus and its illness and protect themselves and people around them (World Health Organization, 2018). What happens, however, when guidelines are downplayed by political elites that believe the virus is inoffensive and that its illness is no worse

than a “small flu”? The US and Brazil are two emblematic cases that illustrate this situation, despite other notable differences in their capacity to handle such crisis. In both countries, political elites, including their respective presidents Donald Trump and Jair Bolsonaro, minimized the seriousness of the coronavirus and its illness since its outbreak and failed to be informative agents to curb the spread of the virus (Barberia and Gómez, 2020; Ortega and Orsini, 2020; Rutledge, 2020; Yamey and Gonsalves, 2020; Calvo and Ventura, 2021)<sup>1</sup>. This has resulted in lower compliance with health recommendations along partisan lines (Clinton et al., 2020) and many lives lost<sup>2</sup>.

In this article, our focus is on Brazil, one of the countries most severely hit by the coronavirus and COVID-19<sup>3</sup>. According to the *Coronavirus Resource Center* from Johns Hopkins University, Brazil, as of late February 2021, had more than 10.2 million confirmed cases—third in the world, after the U.S. and India—and more than 250 thousand deaths—in this case only overcome by the U.S. Brazilians also have seen the collapse of their public health services in many important cities. In Manaus, for example, dozens of COVID-19 patients died because hospitals did not have oxygen to treat them. In Rio de Janeiro, I.C.U.s reached an occupancy rate of 99.8% in public hospitals. Furthermore, a new COVID variant was detected in Manaus and spread rapidly to other cities and parts of the world, leading governments in the U.K., Italy, and Portugal to suspend flights from Brazil.

More specifically, we seek to measure how much Brazilians know about COVID-19 and what explains variations in their knowledge about this subject. We argue that Brazil’s political elites have been unable to provide its citizens with clear health guidelines to protect themselves against the virus, explaining, in part, why the country has fared so poorly at fighting the coronavirus pandemic. Specifically, President Jair Bolsonaro has systematically rejected the recommendations of health authorities, including those from his own health ministers, resulting in two consecutive substitutions in the Ministry of Health in less than a month at the beginning of the pandemic (between April 16 and May 15, 2020) when the number of infections and deaths grew rapidly<sup>4</sup>. Since then, the Health Ministry has been under the command of an army general with no previous experience in public health.

Despite the criticism it has received for its (lack of) actions against COVID-19, the popularity of the Bolsonaro government has remained relatively high since the beginning of the pandemic (Jota, 2020). This is cause for concern given the role of elites in influencing public opinion along partisan lines (Zaller, 1992; Druckman et al., 2013) and, in particular, on complex and novel

(“hard”) issues like a pandemic (Carmines and Stimson, 1980). In this paper, we rely on survey data collected in September and October of 2020, several months after the outbreak of the coronavirus pandemic, to examine the influence of political preferences on knowledge about COVID-19. We look at two measures. The first is a measure of knowledge about the virus and its illness, including how the virus is transmitted, ways to protect oneself from the virus and the symptoms related to COVID-19. The second concerns support for a conspiracy theory about the origin of the coronavirus. Our findings show a substantial role for political preferences, with Brazilians supportive of President Bolsonaro significantly showing less knowledge about COVID-19 and more likely to believe that the virus was created purposely in a Chinese laboratory to increase China’s economic power.

In what follows, we discuss the importance of information acquisition by citizens for a successful collective response to combat pandemics. We next address the individual-level determinants of knowledge acquisition followed by the presentation of our data and measures of interest. The subsequent sections present our results and a brief discussion of what we found, as well as some limitations of this study. We conclude by summarizing our main findings and proposing avenues for future research.

## THE ROLE OF (MIS)INFORMATION IN A PANDEMIC

An individual is said to be health literate when they are capable of acquiring, understanding and applying health knowledge in ways which promote and maintain good health (Nutbeam, 2009). Not surprisingly, health literacy is desirable to combat the COVID-19 pandemic (Paakkari and Okan, 2020). The knowledge acquisition process, however, must not only be quick but also homogeneous to prevent uninformed (or worse, misinformed) minorities from adopting behaviors that put a large number of people at risk in a pandemic (Vaughan and Tinker, 2009; Lin et al., 2014).

Recent work on the COVID-19 pandemic reveals that those more knowledgeable about the disease are more likely to adhere to preventive practices like the use of masks (Bates et al., 2020; Li et al., 2020; Zhong et al., 2020), social distancing (Clements, 2020; Li et al., 2020; Zhong et al., 2020), and frequent hand hygiene (Bates et al., 2020; Li et al., 2020). In addition, people who consider themselves knowledgeable about the virus and its illness report lower levels of stress and claim that the pandemic has low psychological impact on them (Wang et al., 2020). In sum, knowledge acquisition is central in the preparedness to fight a pandemic.

Paradoxically, acquiring knowledge about COVID-19 is challenging because of the scarcity of the information or the abundance of competing false information, depending on the context. In poor countries (Lau et al., 2020) or in more vulnerable population segments (Vaughan and Tinker, 2009), for example, many do not have access to means of communications like radio, TV or the Internet to access information about the coronavirus and its disease. Many of these members of vulnerable populations are not even properly exposed to government communication

<sup>1</sup>In the Philippines, President Rodrigo Duterte played a similar, dysfunctional role, downplaying the pandemic and telling the public that he wanted to “slap the virus” (Lasco, 2020).

<sup>2</sup>As of March 3, 2021, the US and Brazil count 529,515 and 257,562- deaths, respectively (worldmeters.info).

<sup>3</sup>We recognize that COVID-19 is the disease caused by the coronavirus (SARS-CoV-2). For the sake of simplicity, however, we will hereafter only use COVID-19 to refer to both the virus and its illness.

<sup>4</sup>Luiz Henrique Mandetta was fired by President Bolsonaro on April 16, 2020, after several public disagreements about the sanitary measures that should be taken by the federal government; and Nelson Teich resigned on May 15, 2020 expressing his frustration with the lack of support he received from the President.

campaigns. Moreover, they also generally possess very low levels of health literacy, which reduces their ability to understand and apply the health recommendations and judge their importance for their own health and that of others (Paakkari and Okan, 2020; Van den Broucke, 2020).

Acquiring knowledge in a context characterized by the profusion and diffusion of incorrect information about the coronavirus and its illness can also be challenging (Vaezi and Javanmard, 2020; Zarocostas, 2020). In an infodemic, countless misinformation is disseminated (purposefully or not), including fake news and conspiracy theories (Van Bavel et al., 2021). Such environment, like one characterized by a scarcity of information, creates important hurdles to combat the pandemic because it prevents or slows down the adherence of preventive behaviors. Worst, it can even encourage behaviors that contribute to the greater spread of the virus and its disease.

## LEARNING ABOUT COVID-19

Numerous studies have already explored the determinants of knowledge about different aspects of COVID-19, including the most common symptoms of the disease, how the virus is transmitted and what are the recommended treatments to fight the illness. Multiple knowledge questions were applied to population samples in surveys from several countries, including China (Lin et al., 2020; Zhong et al., 2020), where the pandemic originated, the United States (Clements, 2020), where the highest number of cases and deaths have been reported so far, and in developing countries from the Middle East (Saudi Arabia, Al-Hanawi et al., 2020; Jordan, Khasawneh et al., 2020), Africa (Nigeria, Olapegba et al., 2020), and Asia (Malaysia, Azlan et al., 2020; Philippines, Lau et al., 2020). Interestingly, little is known about how much Latin Americans know about the virus and its illness (with the exception of Bates et al., 2020) and, most notably, the current situation in Brazil. Moreover, most of the existing work on the determinants of knowledge about COVID-19 focuses on demographic variables like income, education, gender, and age. The bulk of these studies overlook the importance of the political context on people's ability to learn, like the degree of elite polarization around the pandemic and the measures to fight it (for an exception, see Clements, 2020). In particular, we wish to contribute to the extant literature by showing that people's political preferences can explain variations in knowledge about COVID-19 in a context where political elites have diverged about the importance of the pandemic and on how to address it.

We use Luskin's (1990) model for explaining political sophistication as our starting point to identify the factors related to knowledge about the coronavirus and COVID-19. According to Luskin, knowledge is associated with three factors: the opportunity to access information, the ability to understand and store it and the motivation to be aware of it.

First, the opportunity to learn speaks to an individual's ability to overcome financial and logistical barriers of access to sources of information. Not surprisingly, higher levels of knowledge about COVID-19 are observed among individuals with higher

income (Al-Hanawi et al., 2020; Azlan et al., 2020; Clements, 2020; Krägeloh et al., 2020) and among those with greater access to means of communication (Olapegba et al., 2020). In poor countries, financial, and communications infrastructure barriers reduce access to the Internet and other technological equipment like cell phones and computers, especially among the most vulnerable (Coetzee and Kagee, 2020).

Second, the ability to understand and store information is related to the cognitive capacity of individuals and, more generally, their level of education. This is consistent with recent work that shows that higher levels of education are usually associated with greater knowledge about COVID-19 (Al-Hanawi et al., 2020; Lau et al., 2020; Zhong et al., 2020).

Third, the motivation to seek information is the result of the complex and heterogeneous sets of interests individuals have to direct their attention to some objects and not others. As for the coronavirus and COVID-19, greater proximity to the illness has been associated with higher levels of knowledge. Zhong et al. (2020), for example, find that people who live in Hubei province, whose capital is Wuhan (Ground Zero for the coronavirus pandemic), know more about COVID-19 than people in other Chinese provinces. Little is known, however, about the association between knowledge of the virus and its illness and proximity with the disease, in either having caught the disease or through interpersonal networks like infection or death among members of the same household, family members or close friends. Surprisingly, not much is known about the relationship between knowledge and an individual's level of preoccupation or worriedness about the virus and its disease.

Beyond the opportunities, ability and motivation to learn about COVID-19, we argue that political preferences can affect knowledge in contexts where political elites have *not* responded uniformly to the pandemic, that is, in places where the issue has been "politicized" along partisan lines. Although in some countries political elites have united and uniformly supported health authorities (e.g., see Merkley et al., 2020 for Canada; and Harris, 2020 for U.K.), followed technical guidelines (Hindustan Times, 2020 for India), and tried to compromise to better respond to the crisis (The Conversation, 2020 for South Africa), in others, however, the pandemic has led to important political divisions about how to tackle the issue. The US and Brazil stand as two emblematic examples that come to mind where political elites have diverged in substantial ways, with one camp taking the issue of the pandemic seriously and encouraging the adoption of guidelines issued by public health professionals with the other, frequently in position of power, downplaying the virus and its illness and ignoring such guidelines. In both cases, the political divide over COVID-19 has led to disastrous consequences in terms of infections and fatalities.

In the US, independent voters and Democrats know more than Republicans about the disease (Clements, 2020). Specifically, independents and Democrats know 7.5 and 10.2% more about COVID-19 than Republicans, respectively. This is consistent with the divide observed at the elite level where Democrats have championed the adoption health guidelines to combat the pandemic while Republicans have downplayed them (Clinton et al., 2020; Green et al., 2020; Gadarian et al., 2021). In Brazil,

**TABLE 1** | Knowledge items presented to respondents and distribution of responses (in %).

	True	False	Don't know
1. Coronavirus spreads via respiratory droplets from infected individuals.	96.0	0.9	3.1
2. The use of a mask helps to protect against the coronavirus.	95.3	2.7	2.1
3. Being isolated at home is an effective way to reduce the spread of the virus.	91.7	5.7	2.6
4. You can contract COVID-19 if you touch your eyes with contaminated hands.	91.0	3.2	5.8
5. The most common symptoms of COVID-19 are fever, tiredness and a dry cough.	87.9	4.3	7.8
6. Diarrhea and loss of taste can also be symptoms of COVID-19.	86.8	4.0	9.2
7. People with COVID-19 but without a fever do not transmit the coronavirus to other people.	6.8	82.6	10.6
8. COVID-19 symptoms can take up to 14 days to appear.	81.8	7.4	10.8
9. The coronavirus can stay in your hands if you don't scrub them with soap for at least 20s.	73.3	11.9	14.8
10. There are specific drugs for the prevention of COVID-19.	11.1	70.0	18.9
11. If a person with COVID-19 coughs or breathes near you, there is a risk of getting the disease, even if you and the other person are wearing masks.	66.9	22.4	10.6
12. Taking chloroquine prevents COVID-19.	12.6	60.8	26.7
13. Taking chloroquine cures COVID-19.	15.8	56.8	27.3
14. Unlike the common cold, stuffy nose, runny nose and sneezing are less common in people infected with COVID-19.	29.8	39.6	30.6
15. You can get COVID-19 if you eat contaminated food.	55.2	20.8	24.0

Correct answers are gray-shaded. Items were randomly presented to respondents each time.

where President Jair Bolsonaro has systematically minimized the seriousness of the virus and its illness (Barberia and Gómez, 2020; Ortega and Orsini, 2020), Calvo and Ventura (2021) show that Bolsonaro voters are more optimistic about the health risks and job insecurity associated with the COVID-19 pandemic when compared to those who voted for Fernando Haddad (PT) in the second round of the 2018 presidential election. Furthermore, a study looking at vaccination acceptance finds that Bolsonaro supporters are less likely to vaccinate than those who do not support him (Gramacho and Turgeon, 2021), in line with Bolsonaro's expressed skepticism about vaccination as a means to combat the pandemic. Consequently, we expect Brazilians supportive of the president to also be less knowledgeable about COVID-19 when compared to those who disapprove of him.

The above discussion suggests that individuals with greater opportunity and motivation to learn and equipped with greater skills to integrate the information acquired are likely to have more knowledge about COVID-19 when compared to those with less opportunity, motivation, and ability. But, more importantly for present purposes, we also argue that the political context matters. Specifically, we expect that supporters of political elites that have downplayed the importance of the pandemic are likely to know less about the virus and its illness, as compared to those who do not support these elites.

## DATA AND MEASURES

We collected survey data from a national online sample of 2,771 Brazilians<sup>5</sup>. The survey was conducted from September 23 to

<sup>5</sup> Respondents were recruited from Netquest among their nearly half a million Brazilian panelists. Netquest is the only survey firm in Brazil that has the ISO 26362 certification for online panels.

October 2, 2020 and asked many questions about the COVID-19 pandemic and politics, in general. The sample follows quotas for age, gender, region and social class (including joint distributions of these population characteristics) based on the recent data from the Brazilian National Household Sample Survey (PNAD)—a large survey conducted periodically by the Brazilian census agency (*Instituto Brasileiro de Geografia e Estatística*, IBGE).

## Measures

Our study affords one measure of knowledge and another of misinformation about COVID-19 as dependent variables of interest. First, respondents in our survey were asked 17 true or false questions about how the coronavirus is transmitted, ways they can protect themselves from the virus and the symptoms related to the illness. Correct answers are scored "1" while incorrect and don't know answers are coded as "0," following the recommendation from Luskin and Bullock (2011) about don't know responses. We create a score of knowledge about COVID-19 using 15 of the 17 items. Two items were left out. One of them, about the use of masks in children, because the science here is more ambiguous. The other, about the transmission of COVID-19 from sexual activities, because the wording we used could lead to ambiguous interpretation. **Table 1** provides the details about the 15 true or false questions asked by our survey respondents about COVID-19. For the regression analysis presented below, we transformed this score on a scale that runs from 0 to 100 for ease of interpretation of the ordinary least squares coefficient estimates. Consequently, one correct answer is worth 6.67 percentage points on that new scale.

All 15 items come from *frequently asked questions* mentioned and answered by World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) in their respective official websites. Besides that, eight out of the 15 items

in our questionnaire were also used in previous studies on the same subject. More specifically, similar versions of items 1, 5, 7, 8, and 14 were used by Azlan et al. (2020), Clements (2020), and Zhong et al. (2020); items 2 and 3 were used by Azlan et al. (2020); and item 15 appeared in Lin et al. (2020). Details are provided in the **Supplementary Material**.

Our measure of misinformation concerns support for a conspiracy theory about the origin of the coronavirus (SARS-CoV-2). The question asks respondents if they believe that the novel coronavirus originated in a live-animal market in Wuhan, China, that ended up accidentally getting spread throughout the world or if it is a virus that was created purposely in a Chinese laboratory to increase China's economic power, a conspiracy theory circulated heavily on social media. The best scientific evidence to date excludes the idea that the novel coronavirus originated in a lab or was purposeful manipulated (Andersen et al., 2020). The most plausible theory about the origin of the virus links it to a live-animal market in Wuhan, China, where several of the initial cases were identified (Wu et al., 2020; Zhou et al., 2020). Our interest lies with those who believe in the conspiracy theory that the virus was created purposefully in a laboratory in China and, for that reason, our measure codes support for such claim as “1” and “0” otherwise (including those that don't know which of the two explanations is true).

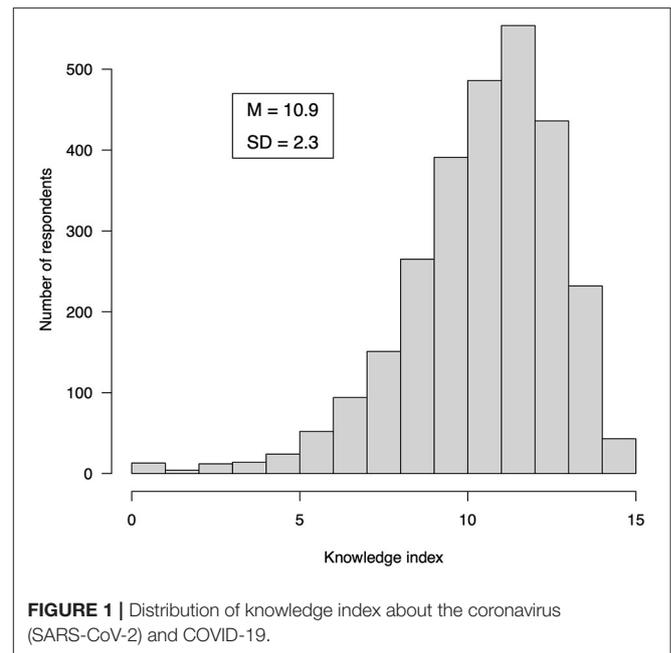
## RESULTS

In what follows, we present how much Brazilians know about COVID-19 and what determinants help explain why some people know more and other less. We next look at misinformation about the origin of the novel coronavirus and identify those Brazilians that are most susceptible to fall prey for such misleading information.

### Knowledge About COVID-19

**Table 1** shows the distribution of respondents that identified the statement to be true or false or that they did not know whether the statement is true or false. The correct answer to each statement is gray-shaded and the statements are ordered from the most to the least successfully answered. The table indicates that nearly all Brazilians (96.0%) know that the coronavirus spreads via respiratory droplets from infected individuals and that the use of a mask helps to protect against the virus (95.3%). Significantly less Brazilians, however, are aware that chloroquine does not prevent or cure COVID-19 (60.8 and 56.8%, respectively).

Overall, knowledge about COVID-19 is moderately high in Brazil with 8 out of 15 items being correctly answered by more than 80% of the respondents. **Figure 1** below shows the distribution of correct answers to the 15 items. The distribution is left-skewed, indicating that most Brazilians possess accurate knowledge about the virus and its illness. Precisely, respondents answered, on average, 10.9 items correctly with a low standard deviation of 2.3, suggesting that most Brazilians scored around that mean.



**FIGURE 1** | Distribution of knowledge index about the coronavirus (SARS-CoV-2) and COVID-19.

### Explaining Knowledge About COVID-19

Despite the relatively high knowledge about COVID-19 in Brazil, some differences exist. What explains these differences? In other words, what are the determinants of knowledge about the disease? Our earlier discussion suggests that people are capable of learning when they are motivated and have the ability and opportunity to do it. But, because the COVID-19 pandemic has been extensively “politicized” in Brazil—not only along partisan lines but also involving other branches of government like the Supreme Court (Barberia and Gómez, 2020), we also argue that political preferences affect how much people know about the virus and its illness. In particular, we believe that supporters of President Jair Bolsonaro—an avid denier of the coronavirus and COVID-19—are likely to know less about the virus and its illness when compared with those who are less supportive of the president and his government.

We propose a multivariate regression model where we account for respondents' motivation, ability and opportunity to learn about COVID-19. More importantly, we examine how the respondents' political preferences affect knowledge about the illness.

Our model has five variables to capture the role of motivation. All five measures, we argue, provide respondents with incentives to learn about COVID-19 and should, therefore, be positively correlated with knowledge. The first measure captures the respondent's level of worriedness about COVID-19 on a 4-point scale from “not worried at all” to “very worried,” rescaled to range from 0 to 1. In our sample, 72.4% of respondents claim to be quite or very worried about the illness. The second measure is a dichotomous variable that indicates whether the respondent had (1) or did not have (0) COVID-19, independently of the strength of the symptoms. 11.2% of our respondents indicated they had contracted COVID-19 at some point. The third measure

of motivation is also a dichotomous variable and that takes the value of “1” for respondents who live with someone or have a close friend or relative that had or died from COVID-19 and “0” otherwise. Some 46.0% of our respondents find themselves in either of these conditions. The fourth measure speaks to the respondents’ own health condition. It indicates respondents who suffer from a health condition that increases their risk of becoming severely ill from COVID-19. Specifically, it identifies all respondents who have or had (1) cancer; (2) chronic kidney or heart diseases; (3) diabetes; (4) asthma or other respiratory disease; (5) heart problems related to obesity; or, (6) organ transplant. Those who answered positively to any of these health conditions are scored “1” or “0” otherwise. 26.1% of our respondents indicated suffering from at least one of these health conditions. The fifth, and last measure of motivation, identifies respondents that live with an elder (60+) in their household (1) and 0 otherwise. In our sample, 25.7% of respondents indicated living with an elder.

Our measure of ability is proxied by the respondent’s level of education. Specifically, we include in our regression equation a dichotomous variable that identifies respondents with a college degree or more (1) and 0 otherwise. In our sample, 21.9% of respondents possess such level of education. We expect respondents with a college education to be more knowledgeable about COVID-19.

Our model affords three measures of opportunity to learn about the virus and its illness. The first measure identifies respondents that are from the upper strata of the Brazilian society. Precisely, we include in our model a dichotomous variable that takes the value of 1 for respondents who pertain to the top three social class categories (out of seven) and 0 otherwise. The social class measure is based mainly on the respondent’s household patrimony and income and is commonly used in survey research in Brazil. We expect upper class Brazilians to know more about COVID-19 because their social status provides for conditions that are more propitious to learning. In our sample, 22.9% of respondents are considered upper class. The second and third measures refer to media consumption about COVID-19. Both measures are dichotomous variables. The first identifies respondents who say they very frequently get their information about the virus and its illness from Brazil’s traditional and well-establish media outlets (1) and “0” otherwise. Some 44.0% of our respondents fall into that category. The second, on the other hand, identifies respondents who claim they very frequently get their information about the virus and its illness from social media (1) (Facebook, Instagram, YouTube, Twitter, or WhatsApp) and “0” otherwise. 26.1% of our respondents claim they get most of their information about the virus and its illness from social media. We expect those who get most of their information about COVID-19 from traditional media outlet to know more about the virus and its illness and those that get that information from social media to know less because the content shared on those platforms are more prone to misinformation (Silverman, 2016; Allcott and Gentzkow, 2017) and low-quality health information (Xuewei et al., 2018).

The next two variables serve to evaluate the hypothesis that political preferences can affect learning about COVID-19 in

contexts where the pandemic has been extensively “politicized” like it has in Brazil (Barberia and Gómez, 2020). In particular, President Jair Bolsonaro and his government has constantly downplayed the importance of the virus and its illness. We believe that such stance by government officials has negatively affected the capacity of Brazilians to learn fact-based knowledge about the virus and its illness, especially among those who are supportive of the president and his government. To capture the role of political preferences, we include a measure of the Bolsonaro government’s approval. Respondents were asked to indicate their approval of the Bolsonaro government on a 5-point scale, from “great” (1), “good” (2), “fair” (3), “bad” (4) to “terrible” (5). The measure was rescaled from 0 to 1, with higher values indicating positive evaluations and lower values negative ones. In our sample, 34.3% of the respondents judged the Bolsonaro government to be “good” or “great” while 43.9% thought his government to be “bad” or “terrible.” We expect respondents with higher evaluations of the president and his government to be less knowledgeable about COVID-19. The second measure indicates the respondent’s preferred political party and is coded “1” for those whose select “Bolsonaro’s party” and “0” otherwise. It is important to note that President Bolsonaro has not been affiliated to a political party since November 19, 2019 and, for that reason, respondents were given that option of merely indicating “Bolsonaro’s party.” We recognize that this operationalization is not ideal, but we see this variable as a measure that allows us to identify those voters that feel particularly strongly for President Bolsonaro, as such voters are willing to adopt any party that President Bolsonaro would eventually become affiliated with. In our sample, 7.8% of the respondents indicated “Bolsonaro’s party” as their preferred party. Again, we expect respondents to identify with Bolsonaro’s party to know less about the virus and its illness.

Finally, we include additional controls in our regression model. The first is age of the respondent. The second is a dichotomous variable that identifies female respondents (1) and 0 otherwise. The third is also a dichotomous variable and identifies white (1) from non-white (0) respondents. Finally, we include dummies for the respondent’s state of residency (including the Federal District) and use the state of Rondônia as the reference category. Women, on average, are more health literate than men (Manierre, 2015) and whites are generally more privileged than non-whites in Brazil beyond mere wealth (Theodoro et al., 2008). We expect both women and whites to know more about COVID-19. We have no clear expectation for age and state of residency.

**Table 2** (left column) presents the regression coefficients and standard errors for our knowledge of the COVID-19 model, as estimated by ordinary least squares (OLS). **Table 2** shows that many of our independent variables exert statistically significant effects on knowledge of the virus and its illness despite the model’s adjusted- $R^2$  being relatively low at 0.181. Recall that the measure of knowledge has been transformed to range from 0 to 100 to ease interpretation of the regression coefficients. Effects can thus be presented in percentage points on the knowledge scale.

Results from **Table 2** suggest that three of the five motivation variables exert statistically significant effects on knowledge and

**TABLE 2 |** Explaining knowledge about COVID-19 and support for conspiracy theory about the origin of the coronavirus.

	OLS estimated coefficients (s.e.)	
	Knowledge	Conspiracy theory
<b>Motivation</b>		
Worried about COVID-19	6.992** (1.035)	-0.152** (0.031)
Had COVID-19	1.856* (0.903)	0.027 (0.027)
Relative or close friend had or died from COVID-19	2.244** (0.571)	-0.002 (0.017)
R's health condition increases risk of severe illness from COVID-19	-0.372 (0.635)	0.025 (0.019)
Elder living in household	-0.028 (0.642)	0.014 (0.019)
<b>Ability</b>		
College education	2.624** (0.726)	-0.013 (0.021)
<b>Opportunity</b>		
Upper social class	3.300** (0.744)	-0.039 (0.022)
Most information on COVID-19 from traditional media sources	2.751** (0.604)	0.012 (0.018)
Most information on COVID-19 from social media	-0.479 (0.666)	0.023 (0.020)
<b>Political preferences</b>		
Bolsonaro's government approval	-10.972** (0.859)	0.325** (0.032)
Preferred party is Bolsonaro's party	-3.169** (1.096)	0.173** (0.032)
<b>Additional control<sup>†</sup></b>		
Age	-0.033 (0.020)	-0.002* (0.001)
Female	0.717 (0.563)	-0.010 (0.017)
White	1.872** (0.615)	-0.017 (0.018)
Constant	69.753** (3.688)	0.362** (0.109)
Number of observations	2,652	2,643
Adjusted-R <sup>2</sup>	0.181	0.131

\* $p < 0.05$  and \*\* $p < 0.01$  (two-tailed).

<sup>†</sup>The regression equations also include dummies for all Brazilian states and the Federal District except for Rorônia that serves as the reference category.

in expected ways. First, respondents that are more worried with the illness show greater knowledge ( $p < 0.01$ , two-tailed). Specifically, the difference in knowledge is seven percentage points from an individual that is not worried at all to one that is very worried holding the other variables fixed. Second, those that had COVID-19 also know slightly more than those who did not have it—a difference of nearly two percentage points ( $p < 0.05$ , two-tailed). Third, respondents who have a relative or close friend that had COVID-19 or died from the disease also know slightly more, an increase of a little over two percentage points ( $p < 0.01$ , two-tailed). Lastly, the respondent's health condition and whether he or she lives with an elder has no effect on how much the respondent knows. Overall, these results suggest that respondents with greater motivation or incentives to learn about the novel coronavirus and its illness generally do so.

The literature on health behavior offers a potential reason why two of our five motivation variables have failed to show any effect on knowledge about COVID-19. Previous studies suggest that self-efficacy can be a decisive factor in obtaining

information about a serious health threat and in adjusting behavior accordingly (Witte, 1994; Sheeran et al., 2016). When individuals have a low sense of self-efficacy in the face of a health threat, it is common for them to control their fear of the disease instead of changing their behavior to avoid it. Unfortunately, we do not have a variable that measures the respondents' sense of self-efficacy, but this finding from the literature may explain why those with serious illnesses or who lived with elderly people at home have not seek out more information about COVID-19.

Next, we look at the role of ability. The estimated coefficient for education suggests, as expected, that respondents with a college education are slightly better informed about the virus and its illness than those less educated by close to three percentage points. The effect is not particularly large although it is statistically significant at 0.01 (two-tailed). Our sample characteristics may account for at least part of this result, as low educated Brazilians are underrepresented among our respondents. We believe that the effect of education is presumably larger in the Brazilian population than the one obtained from our data.

The third group of variables examine the role of opportunity. Here, two of our three variables of opportunity exert a statistically significant effect on knowledge of COVID-19. First, upper class respondents, as expected, know more about the virus and its illness. On average, respondents from the upper class are more knowledgeable by a little more than three percentage points, as compared to those from lower social classes ( $p < 0.01$ , two-tailed). Also as expected, respondents who very frequently look for information about the coronavirus and its illness from traditional media outlets know slightly more about the virus and COVID-19, when compared with those who do not, by a difference of close to three percentage points ( $p < 0.01$ , two-tailed). Finally, those that very frequently use social media platforms to inform themselves about the virus and its illness do not know less than those who do not. This finding is somewhat surprising, but, because we also control for traditional media consumption, the group of comparison are all those respondents who do not use any type of media to inform themselves and this group may also not be very informed about COVID-19.

Together, motivation, ability and opportunity explain differences in knowledge but nearly all effects—with the exception of how worried one is with COVID-19—are relatively small. We now turn to the role of political preferences.

Our first measure of political preferences is the approval of the Bolsonaro government. As expected, those that have more positive evaluations of President Jair Bolsonaro tend to know substantially less about COVID-19. Specifically, those who believe that the Bolsonaro government is “great” score <11 percentage points on the knowledge scale, as compared to those that believe that it is “terrible” ( $p < 0.01$ , two-tailed). This is, by far, the largest difference detected by our regression model. The second measure, for its part, indicates that those that chose the party of Bolsonaro as their preferred party are some three percentage points less knowledgeable about the coronavirus and its illness than those who indicated another party or none ( $p < 0.01$ , two-tailed). Put together, individuals who, at the same time, consider the Bolsonaro government to be “great” and also

**TABLE 3** | Support for conspiracy theory about the origin of the coronavirus (SARS-CoV-2).

Every country in the world is currently confronted with the coronavirus, also known as COVID-19. In your opinion, the coronavirus is:	
a) A virus that originated in a live-animal market in Wuhan, China, that ended up accidentally getting spread throughout the world	35.9
b) A virus that was created on purpose in a Chinese laboratory to increase China's economic power	26.4
c) I don't know which of the options is true	37.7
Number of observations	2,759

Options a and b were randomly presented to respondents each time.

indicated a preference for his political party score 14 percentage points less than those who see his administration as “terrible” and prefer another party or no party.

The effects of both political measures suggest important differences in knowledge about COVID-19 between Brazilians who support President Bolsonaro and his government or indicate a preference for his party and those who do not. The effects are larger than those uncovered for the traditional determinants of learning (motivation, ability, and opportunity) and highlight the importance of the political context and the role of elites on knowledge about public health issues.

This last finding is quite impressive and deserves closer attention. How robust are our findings about the role of politics on knowledge of COVID-19? We performed a robustness check by estimating the same regression equation as presented in **Table 2** but by dropping one item, each time, from our knowledge score to evaluate if our results were not driven by any specific knowledge item. We found that in each of these 15 additional regression estimations, our two political variables of interest (evaluation of President Bolsonaro and the respondent's preferred party) remain statistically significant and their effects are of similar size, indicating that our findings are not unduly influenced by any specific knowledge item. Specifically, the average estimated coefficients are  $-11.0$  and  $-3.2$  for the evaluation of President Bolsonaro and the respondent's preferred party, respectively. The minimum and maximum coefficient estimates are  $(-11.8; -7.5)$  and  $(-3.9; -2.4)$ , again, for the evaluation of President Bolsonaro and the respondent's preferred party, respectively.

Finally, among our control variables, only race shows a statistically significant effect and a rather small. Precisely, white respondents, as compared to non-whites score about two percentage points more on our knowledge scale. None of the dummies used to control for the respondent's state of residency (including the Federal District) showed statistical significance.

## Support for Conspiracy Theory About the Origin of the Coronavirus (SARS-CoV-2) and Its Determinants

The other side of being informed or knowledgeable is being *misinformed*, that is, “firmly holding beliefs that happen to be wrong” (Kuklinski et al., 2000, p. 793). We tapped our

respondents about one such form of misinformation—the belief that the coronavirus was created on purpose in a Chinese laboratory to increase China's economic power. This conspiracy theory, like many others, has been circulated on social media platforms (Aos Fatos, 2020). **Table 3** below presents support for this conspiracy theory. We find that a little over a quarter of Brazilians believe that the coronavirus was purposefully created in a Chinese laboratory to increase China's economic power. About 36% of Brazilians believe in what accounts to be the best evidence-based explanation for the origin of the virus, that is, that the virus originated in a live-animal market in Wuhan, China, and spread accidentally to other parts of the world. Interestingly, there is close to 38% of our respondents that do not know which of these two explanations about the origin of the coronavirus is true. Although we do not have, as of yet, a definitive answer about the origin of the virus, there is a scientific consensus that it did not originate in a laboratory (Andersen et al., 2020).

The question now is: what explains support for such misinformation? **Table 2** (right column) presents the coefficients and standard errors for support of the conspiracy theory about the origin of the coronavirus where support is coded 1 and 0 otherwise, also estimated by OLS for ease of interpretation as recommended by Angrist and Pischke (2008)<sup>6</sup>. The expectation about the effect of our independent variables is, this time, reversed. Admittedly, the determinants of misinformation are not necessarily the same as knowledge, but we believe that our model of knowledge is a good place to start if we consider misinformation to be the flip side of knowledge. The Adjusted  $-R^2$  (at 0.131) suggests that this model performs only slightly worse at explaining support for the conspiracy theory about the origin of the coronavirus than it does for knowledge of the virus and its illness. In the Discussion section below, we address some of the other known determinants of misinformation and, in particular, conspiracy theory beliefs. Unfortunately, our data do not allow to account for them.

If more motivated individuals are likely to know more about the coronavirus and its illness, then those that are less motivated should be more prone to misinformation. Of our five independent variables measuring motivation, only one exerts a statistically significant effect on support of the conspiracy theory about the origin of the virus. Precisely, we find that respondents who are more worried about COVID-19 tend to show less support for the conspiracy theory ( $p < 0.01$ , two-tailed). The probability to support the conspiracy theory that the coronavirus was purposefully created in a Chinese laboratory to increase China's economic power decreases by 15 percentage points when comparing individuals who claim to be “not worried at all” with those who are “very worried” about COVID-19, holding the other variables fixed. This drop in support for the conspiracy theory about the origin of the virus is substantially large and suggests that motivation also plays an important in explaining misinformation, although the other variables proxying motivation do not exert any effect.

<sup>6</sup>In **Supplementary Table 1**, we also present the estimated coefficients obtained from maximum likelihood, adopting a logit model. The substance of the findings is the same as the ones presented in **Table 2**.

Contrary to what we found earlier about the role of ability on knowledge of the coronavirus and its illness, it appears that education does not explain support for the conspiracy theory about the origin of the virus in Brazil. In other words, college educated Brazilians appear to be no less supportive of the conspiracy theory about the origin of the coronavirus.

Social status and media consumption, be it from traditional or social media platforms, do not affect support for the conspiracy theory about the origin of the virus. Thus, there is no apparent role for the opportunity to learn in explaining support for the conspiracy theory about the origin of the coronavirus.

Results in **Table 2** indicate that both variables measuring political preferences have statistically significant effects on support for the conspiracy theory ( $p < 0.01$ , two-tailed). The effects are also as expected with Brazilians with positive evaluations of the Bolsonaro government and those preferring Bolsonaro's party being all more likely to support the conspiracy theory that the coronavirus was created in a Chinese laboratory to increase China's economic power. The effects are also substantively large. In particular, we find that the probability to support the conspiracy theory among Brazilians who see the Bolsonaro government as "great" is 33 percentage points higher than those who think his government is "terrible." This effect is more than twice the size of the effect uncovered for motivation (as proxied by worriedness about COVID-19). The effect for the respondent's preferred party is also substantively large. Specifically, the probability to support the conspiracy theory among those who indicated Bolsonaro's party as their preferred party is 17 percentage points higher than that among those who indicated another party or no party. This effect is substantial and slightly larger than the effect for motivation (again, as proxied by worriedness about COVID-19).

Finally, among our control variables, only age shows a statistically significant effect. Our results suggest that older people are less likely to believe in the conspiracy theory about the origin of the coronavirus. For example, a 60-year-old respondent, as compared to an 18-year-old, is about 8 percentage points less likely to support the conspiracy theory about the origin of the coronavirus.

The analysis above indicates, once again, an important role for political preferences in contexts where the COVID-19 pandemic has been extensively politicized like in Brazil. Specifically, supporters of elites that downplayed the importance of the pandemic tend to be less knowledgeable about the coronavirus and COVID-19 and also to be more likely to believe in falsehoods about the origin of the virus. Our findings show support for the idea that people "follow the leader" (Lenz, 2012), even in dire circumstances like a pandemic.

## DISCUSSION

Our findings add to the growing literature that shows that elite discourse affects the masses along partisan lines, including on a priori non-political issues like public health. For example, Baum (2011) has shown that Democrats and Republicans in the US differed in their concerns about the 2009 swine flu

(H1N1 virus) and vaccination uptake, with Republicans who consume less traditional media sources being less worried about the pandemic and to vaccinate. Similarly, Clinton et al. (2020) show that Republicans are less likely to follow guidelines to limit mobility and social contact as compared to Democrats in curbing the novel coronavirus pandemic. Even when it comes to health policy or benefit uptake, Democrats and Republicans differ, with Republicans being less likely to adhere to the Affordable Care Act (Lerman et al., 2017; Sances and Clinton, 2019).

Our contribution moves beyond the US to another political context that is also increasingly polarized. Over the past three decades, Brazilian politics has been increasingly divided along voters supportive of the Worker's Party (PT) and those opposed to it (Samuels and Zucco, 2018). Today, the Anti-PT figure is populist right-wing President Jair Bolsonaro. Since he took office in early 2019, President Bolsonaro has been a fervent denier of science and climate change. When the coronavirus pandemic reached Brazil in 2020, President Bolsonaro maintained course, downplaying the importance of the virus and its illness (Barberia and Gómez, 2020). He referred to COVID-19 as a "small flu" and did not adopt behaviors recommended by public health experts. He did not practice social distancing and refused, most of the time, to publicly wear a mask. He gathered with hundreds if not thousands of supporters at various rallies, putting many of Brazilian lives at risk. In July 2020, President Bolsonaro tested positive for COVID-19 (UOL, 2020) but that did not change his behavior. Worst, in early December 2020, President Bolsonaro said on public TV that he would not receive the vaccine against COVID-19 (Reuters, 2020).

The Brazilian government has done poorly to promote the health of its citizens since the outbreak of COVID-19, with millions infected and more than 250,000 deaths by early March 2021 and many more to come. These infections and deaths are, in part, the result of lower health literacy about the virus and its illness among Brazilians and, in particular, among supporters of President Bolsonaro. This is presumably because of his failure, as a leader, to promote good behavior and communicate adequate health guidelines to combat the pandemic. Our findings in that respect could not be clearer: the strongest determinant of knowledge about COVID-19 and belief in the conspiracy about the origin of the virus is support for President Bolsonaro. Specifically, those that support him are significantly less knowledgeable about the virus and are more likely to believe in a conspiracy theory that stipulates that the virus was created in a laboratory to promote China's economic power, despite there being scientific consensus that the virus did *not* originate in a lab.

Although our model looks at the direct effect of political preferences on knowledge, we believe that the causal mechanism is more complex than what our observational design can reveal. Specifically, political preferences affect knowledge because it might affect the opportunities and motivations to learn. For example, Brazilians who support Bolsonaro—like him—are less concerned about COVID-19. Specifically, 43% of those who consider the Bolsonaro government to be "bad" or "terrible" claim that they are "very concerned" about the disease. That portion is only 23% among those who believe his government

to be “good” or “great.” Moreover, today’s fragmented media environment allows partisans to feed on media diets that are congruent with their beliefs (Iyengar and Hahn, 2009). Bolsonaro supporters are more likely to reject traditional media. Precisely, only 36% of those who consider the Bolsonaro government to be “good” or “great” say that they very frequently get their information about the virus and its illness from Brazil’s traditional and well-established media outlets. On the other hand, more than 53% of those who believe his government to be “bad” or “terrible” do so.

Our study is not without limitations. First, most work in the area and, more specifically in the US, has looked at partisanship as the dividing force. In Brazil, partisanship is not nearly as meaningful and even less so since the election of President Bolsonaro who has now spent most of his tenure without a party affiliation. Samuels and Zucco (2018) demonstrate rather clearly that the only party with a solid partisan base in Brazil is the Worker’s Party (PT) and that politics in Brazil is largely divided among three groups: Worker’s Party supporters (*petistas*), those that oppose the Worker’s Party (*antipetistas*) and non-partisans. Consequently, partisanship is not the cornerstone of Brazilian politics and, for that reason, we relied instead on support for President Bolsonaro—a prominent *antipetista* figure in Brazil politics (Hunter and Power, 2019; Rennó, 2020). The conclusions, however, remain the same: when political elites show discordance, the masses respond accordingly, even on non-political issues of high importance like a pandemic where elite consensus is most desirable.

A second limitation concerns the representativeness of our online sample. Sampling representative national samples over the Internet, in Brazil or anywhere else in the world, is no easy feat (Smith et al., 2016). Although we are confident that our sample is as close as one can get to a representative sample of Brazilians in times of social distancing, we also know that our respondents are slightly more educated and wealthier than members of the Brazilian population because we use a sample of online respondents. It should be noted that around 25% of Brazilians do not have access to the Internet (NIC.br., 2020) and are, therefore, not represented in our data. This implies that knowledge about COVID-19 is presumably lower in Brazil than what we find in our survey. That does not mean, however, that the knowledge gap attributed to political preferences would be lower had we had a more representative sample. To the contrary, less educated and poorer Brazilians that approve of President Bolsonaro are also likely to know less than similarly poor and low educated Brazilians who disapprove of his administration.

A third limitation is our inability to account for other known determinants of support for conspiracy theories. There is a large literature about conspiracy theory beliefs and the individual-level determinants of such beliefs (for a general discussion on the topic, see Douglas et al., 2019). For example, support for conspiracy theories is also related to beliefs in unseen, intentional forces and attraction to Manichean narratives (Oliver and Wood, 2014), particular cognitive style (Dagnall et al., 2015), political extremism (Van Prooijen et al., 2015), and many others. Unfortunately, our survey does not afford measures for these other known individual-level determinants.

We do not believe, however, that our inability to account for these other determinants has biased in any substantial way the effect we uncovered for the role of political preferences, another well-known determinant of belief in conspiracy theories (Uscinski et al., 2016).

Finally, a fourth limitation of our study concerns the fact that knowledge about COVID-19 is fluid and constantly changing as the pandemic evolves. For example, we still know little about the proportion of asymptomatic cases of COVID-19. Some studies have suggested that this proportion can be as high as 82% of the cases (He et al., 2021a), others have it at about 48% (Syangtan et al., 2021), and still others estimate that proportion to be only 16% of the cases (He et al., 2021b). Therefore, it is possible that what we believe to be true or correct knowledge today—in the light of the best scientific evidence we have at hand—might be invalidated in the future as we learn more about COVID-19.

## CONCLUSION

This study examined the determinants of knowledge about COVID-19 in Brazil, paying particular attention to the role of political preferences. The COVID-19 pandemic has been extensively politicized in Brazil with its president, Jair Bolsonaro, at center stage. From the beginning of the outbreak, President Bolsonaro has systematically minimized the lethality of the coronavirus and the severity of the pandemic. Our survey results from a national sample of Brazilians reveal that political preferences explain most of the differences observed in levels of knowledge about the virus and its illness and support for the incorrect belief that the coronavirus was purposely created in a Chinese laboratory to increase China’s economic power. The effects of motivation, ability and opportunity—known determinants of learning—pale in comparison to the role of political preferences. Specifically, Brazilians who believe that the Bolsonaro government is “great” know around 10% less about the virus and its disease when compared to those who believe his government is “terrible.” Similarly, the probability to support the conspiracy about the origin of the coronavirus is 32 percentage points higher among those who believe the Bolsonaro government to be “great,” as compared with those who believe it is “terrible.”

The results from our study also prompt other important questions for future research. In particular, further work is needed to better understand the relationship between political preferences and knowledge. For example, are the effects of political preferences on knowledge conditioned by other factors like political sophistication or particular cognitive style? Similarly, does proximity with the disease moderate the effect of political preferences on knowledge? In other words, how are supporters of a government that denies the severity of the COVID-19 pandemic affected when they themselves get infected or when a close friend or family member gets infected and/or dies from the disease? Do they seek out more information or do they keep following their leader in denying the science? The answers to these questions are important to better understand the relationship between political elites and citizens. On one hand,

it allows us to understand the limits of the influence of political elites on the opinions and behaviors of citizens in the midst of a major crisis like a pandemic. On the other hand, it allows us to identify the conditions that are more propitious for people to form opinions and adopt behaviors autonomously, even when contrary to those of their preferred political leader.

## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## ETHICS STATEMENT

We have submitted documentation to the Brazilian research ethics committee (Comitê de Ética em Pesquisa) prior to data collection but, unfortunately, we had to start collecting our data before obtaining the approval of said committee. We recognize the importance of obtaining ethical assessment prior to data collection but the funds used for this research project were released a few weeks only before the first round of the 2020 municipal elections in Brazil and part of the project was to collect data about the electoral campaign leading up to the first-round election. Thus, we decided to move forward with the data collection without ethics approval. We were later informed (early January 2021) that the committee will not emit a decision about our protocol because the data have already been collected. That said, we strongly believe that our research protocol would have been approved by any ethics committee because: (1) respondents were informed about the purpose of the study and were asked

to give their consent prior to participating; (2) no identifying information was collected about the respondents; (3) respondents could skip questions and/or terminate the questionnaire at any time; (4) we did not deceive respondents in any way or provided them with misinformation about COVID-19; and, (5) our survey represents less than minimal risks.

## AUTHOR CONTRIBUTIONS

WG and MT wrote the article and conducted all empirical analyses. JK wrote the first version of the abstract. MS has been responsible for data collection and communications with the online sample provider Netquest. All authors commented, copyedited, and approved the submitted version of the article. All authors contributed to the creation of the survey instrument.

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpos.2021.646430/full#supplementary-material>

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**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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