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Different conspiracy theories have different psychological and social determinants: Comparison of three theories about the origins of the COVID-19 virus in a representative sample of the UK population

Running Head

DIFFERENT CONSPIRACY THEORIES HAVE DIFFERENT PSYCHOLOGICAL AND SOCIAL DETERMINANTS

Todd K. Hartman1*, Michael Marshall1, Thomas VA Stocks1, Ryan McKay2, Kate Bennett3, Sarah Butter1, Jilly Gibson Miller1, Philip Hyland4, Liat Levita1, Anton P. Martinez1, Liam Mason5, Orla McBride6, Jamie Murphy6, Mark Shevlin6, Frédérique Vallières7, & Richard P. Bentall1

1 University of Sheffield
2 Royal Holloway, University of London
3 Liverpool University
4 Maynooth University
5 University College London
6 Ulster University
7 Trinity College Dublin

* Corresponding Author: t.k.hartman@sheffield.ac.uk

Abstract

Conspiracy theories about COVID-19 have proliferated during the global pandemic, and their rapid spread among certain groups in the population has important implications for policy attitudes (e.g., motivation to engage in social distancing and willingness to vaccinate). Using survey data from two waves of a nationally representative, longitudinal study of life in lockdown in the UK (N = 1,406), we analyze the factors associated with belief in three theories related to COVID-19, namely that it 1) originated in a meat market in Wuhan, China, 2) was developed in a lab in Wuhan, China, and 3) is caused by 5G mobile networks. Using a dual-factor model, we test how cognitive ability and motivations affect susceptibility to misinformation. Our findings suggest that motivational and political dispositions, as well as the sources from which people derive COVID-19 related information, are strongly associated with belief in conspiracy theories about the virus, though these predictors vary among conspiracies. Belief in the Chinese lab conspiracy is associated with right-wing authoritarianism (RWA), social dominance orientation (SDO) and a preference for tabloid newspapers, while belief in the 5G network origin story is associated with social dominance orientation and a tendency to derive information on COVID-19 from social media. Moreover, we find that motivational factors like RWA and SDO have larger effect sizes than COVID-19 related anxiety, a desire for certainty, cognitive reasoning ability, or even general conspiracy ideation (in the case of 5G belief). These findings suggest that efforts to mitigate the potential damage caused by conspiracy theories, for example, by increasing education and awareness, may be inadequate because they miss a larger story, namely the role that politically motivated reasoning plays in making individuals susceptible to misinformation, and the propagation of conspiracies through networks and channels that reinforce these inaccurate worldviews.

It is virtually not assimilable to our reason that a small lonely man felled a giant in the midst of his limousines, his legions, his throng, and his security. If such a nonentity destroyed the leader of the most powerful nation on earth, then a world of disproportion engulfs us, and we live in a universe that is absurd.

> - From *Oswald's Tale: An American Mystery* by Norman Mailer, on the public's obsession with conspiracy theories about the assasssination of John F. Kennedy

1. Introduction

Major world events are known to spawn conspiracy theories. This may be due, at least in part, to proportionality intuitions that render mundane explanations for important events inadequate and unsatisfying (Douglas, Sutton & Cichocka, 2019; Leman & Cinnirella, 2007). Thus, the notions that Princess Diana died because her driver was drunk, or that John F. Kennedy was felled by a lone gunman, threaten to engulf us in Mailer's "world of disproportion."

Like Kennedy's assassination, the COVID-19 pandemic is an event of immense global importance. The pandemic has occasioned massive social and economic upheaval, including nationwide lockdowns, school closures, the postponement or cancellation of major public events, and the largest global recession since the Great Depression of the 1930s. At the time of writing, the pandemic is already responsible for upwards of 1.5 million deaths worldwide.

As with Kennedy's assassination, the pandemic has proven to be fertile ground for conspiracy theories. Some theories, for example, deny the reality of the virus or downplay its severity. Such theories may attribute COVID-19 "propaganda" to nefarious actors such as the US government (and its plans to link passports with vaccination records as a means of totalitarian control; Ritschel, 2020, March 24), to opponents of the Trump administration (Uscinski et al., 2020), and to Bill Gates and the World Health Organization (McGreal, 2020, May 14). Other theories posit that the virus was engineered deliberately by the Chinese or the Americans, or that its effects are caused or enhanced by 5G mobile technology (Henley & McIntyre, 2020, October 26).

Here we analyze the factors associated with belief in three theories regarding the origin of the COVID-19 pandemic, which at the time of data collection were prominent, namely that it (1) originated in a meat market in China (a theory widely held in the early days of the pandemic but now contested); (2) originated in a laboratory in Wuhan, China; and (3) was caused by the rollout of the 5G mobile network. Using data from two waves of a nationally representative, longitudinal dataset collected during the UK lockdown in 2020 ($N = 1,406$), we analyze several potential factors that may explain belief in COVID-19 origin theories. More specifically, we investigate four distinct sets of predictors: cognitive reasoning ability, motivational factors derived from political-psychological predispositions, informational sources, and socio-demographic indicators. Our results suggest that motivational factors stemming from political-psychological predispositions like right-wing authoritarianism (RWA) and social dominance orientation (SDO) have larger effect sizes on belief in various COVID-19 origin stories than do educational background, cognitive reasoning ability, information sources or general conspiracy ideation. We take these results to indicate that motivational factors are strongly associated with susceptibility to COVID-19 conspiracy theories, and that cognitive ability, while important, is inadequate at explaining belief in these origin stories.

In the sections that follow, we address two research questions: What factors predict belief in unsubstantiated COVID-19 origin theories? And what implications do these conspiracy beliefs have for policy attitudes and behaviour? We contribute to the literature by presenting a dual-factor model of belief in COVID-19 origin theories, in which we posit the importance of both cognitive ability and motivational factors in explaining susceptibility to belief in conspiracy theories. In particular, we demonstrate that motivated reasoning plays an important role in belief in some of the COVID-19 conspiracy theories propagated via social media and other "news" outlets. Finally, we find that there are real consequences for belief in COVID-19 conspiracy theories because they affect attitudes toward social distancing and vaccination.

2. Theory

2.1 Belief in COVID-19 Origin Theories

Conspiracy theories are *unsubstantiated* explanations of major events with a twist -- that powerful and malevolent actors are involved in secret plots for their own benefit to the detriment of the common good (Goertzel, 1994; Uscinski & Parent, 2014). They generally consist of complex storylines that are hidden from public scrutiny, thus making them especially resistant to falsification (Lewandowsky et al., 2015). Most importantly, conspiracy theories function to protect entrenched beliefs by discounting contrary evidence as the product of a conspiracy (Lewandowsky, Oberauer, & Gignac, 2013). Indeed, some conspiracy theories *predict* such contrary evidence, evincing what Boudry (2020) calls a "warped epistemology." Hence, conspiracy theories serve a valuable purpose for individuals by allowing them to maintain certain beliefs in the presence of contradictory evidence (Douglas et al. 2017).

A striking finding in the literature on conspiracy theories, however, is that belief in one conspiracy theory tends to predict belief in others (Goertzel, 1994). This is not epistemically problematic when conspiracy theories are mutually consistent or reinforcing. Yet, studies have found that even flagrantly contradictory conspiracy theories are positively correlated in endorsement. For example, Wood, Douglas and Sutton (2012) reported that participants who believed Princess Diana faked her own death were also more likely to believe she was murdered. Such findings imply that conspiracist ideation is driven by a conspiratorial worldview, perhaps characterised by higher-level rejection of official explanations (Franks et al., 2017). Indeed, the tendency to believe in conspiracy theories is associated with narcissism (Chichocka et al. 2016), and those highly disposed to believe in conspiracy theories are especially likely to endorse theories which they think are only believed by a minority (Imhoff & Lamperty, 2016).

Yet conspiracy thinking may also confer a sense of control during periods of perceived uncertainty or threat (Sullivan, Landau & Rothschild, 2010; Uscinski et al., 2017). Miller (2020) has recently amassed evidence for the "monological belief system" (Goertzel, 1994) conception of conspiracy theories in the context of COVID-19, finding that contradictory COVID-19 conspiracy beliefs are positively related in endorsement, although this finding was partially explained by personal uncertainty (the more uncertain people were about themselves, the world and the future, the more intercorrelated their evaluations of conspiracy theories were). This adds to previous work demonstrating that people are more likely to endorse conspiracy theories when conditions of uncertainty and stress are salient (van Prooijen and Jostmann, 2013; Swami et al., 2016), and that intolerance of this uncertainty is

related to a tendency to seek simplifying explanations often involving external and threatening agents (Darwin, Neave & Holmes, 2011). In the wake of arsonist attacks on 5G network towers, Jolley and Paterson (2020) found conspiracy ideation predicted justification of, and intent to enact, violent acts against 5G networks, and that this occurred especially amongst people high in paranoia.

In line with the theory of monological belief systems, that there is a general conspiracist mentality underpinning belief in specific conspiracy theories, we hypothesize that conspiracist ideation will be associated with belief in specific COVID-19 origin theories (Hypothesis 1a); and that endorsement of one specific theory will correlate with endorsement of another (Hypothesis 1b). In addition, insofar as they provide a psychological 'comfort blanket' to individuals in periods of uncertainty, we expect that these associations will be most prevalent among anxious or paranoid individuals (Hypothesis 2). However, these associations may be limited in helping us understand the *diversity* in conspiracy belief during the pandemic. Thus, in the sections that follow, we propose a dual-factor approach to belief in COVID-19 conspiracy theories.

2.2 A Dual-Factor Model of Belief in Conspiracy Theories

Borrowing from social psychological theories of attitude change (Chaiken & Trope, 1999), we posit that belief in COVID-19 conspiracy theories depends on two important and interrelated influences, namely cognitive ability and motivation.

2.2.1 Cognitive Ability

There is a glut of (mis)information related to COVID-19, the merits of which require a fair degree of *cognitive ability* to successfully evaluate. Analytical reasoning, for instance, has been found to correlate negatively with conspiracy belief (Swami et al., 2014). Increasing cognitive reflection and providing credible information is the rationale of particular interventions aiming to mitigate the spread of "fake news", including fact-checking websites and strategies to promote 'inoculation' against misinformation (Roozenbeek & van der Linden, 2018; 2019). Given previous evidence that more educated individuals are less likely to believe in conspiracy theories (e.g., van Prooijen, 2017), we predict that conspiracy theory endorsement will be negatively associated with both cognitive reasoning ability (Hypothesis 3a) and education (Hypothesis 3b).

Such an association would be consistent with the vaunted "deficit model" of science communication, which assumes that aligning popular belief with scientific consensus is just a matter of information provision (see Brown, 2009). However, a wide range of studies have discredited this model, at least in its strong form. For instance, Drummond and Fischoff (2017) found that individuals with greater education, science education, and scientific literacy display *more* polarized beliefs on these issues than their less educated counterparts. One possibility is that people with greater knowledge and education are better equipped to deploy motivated reasoning in the service of reaching their desired conclusions (Ditto & Lopez, 1992; Kunda, 1990).

The evaluations people make of sources cast further doubt on the potential for information provision to act as a panacea for misinformation. For instance, trust in knowledgeable experts may be undermined where they are perceived as withholding information or possessing ulterior motives, whilst proximate sources, such as family and friends, may be judged more

favourably due to their perceived transparency and common interests (Eiser et al., 2009). Hence, research by Nyhan et al. (2014) on an information campaign about vaccination myths found that parents with stringent anti-vaccination attitudes had lower intent to vaccinate their children after the campaign, despite the campaign falsifying incorrect justifications for anti-vaccination belief. Together, these findings suggest that conspiracy theory beliefs depend not only on cognitive reasoning, but also on motivation.

2.2.2 Motivational Factors

Research on motivated reasoning suggests that individuals are biased information processors, who seek out and accept information that conforms to their existing predispositions, while expending considerable effort to discount that which challenges strongly held priors (Kahan, 2013; Taber & Lodge, 2005). For example, Tappin, van der Leer and McKay (2017) reported evidence of desirability bias in the context of the 2016 US election campaign: individuals presented with polling evidence about the anticipated election outcome updated their beliefs more if the evidence was consistent (vs. inconsistent) with their preferred result.   Similarly, Hartman & Newmark (2012) found that Republicans and ideological conservatives were especially predisposed to believe negative rumors about former President Barack Obama because of their strong dislike of the former president. Interestingly, Donald Trump, who was instrumental in proliferating anti-Obama conspiracy theories, has promoted a number of them about COVID-19 himself, including endorsing the notion it originated in a Wuhan laboratory (BBC, 2020). Trump has also repeated false claims regarding COVID-19, including equating its severity to that of the flu, and that it can be treated by hydroxychloroquine (Hatcher, 2020).

One set of political-psychological dispositions that may influence motivational factors related to belief in COVID-19 origin theories are right-wing authoritarianism (RWA) and social dominance orientation (SDO). Both RWA and SDO emerged from research investigating different individual factors or dispositions behind prejudice and are thought to represent two types of right-wing personalities (Altemeyer, 1981; Diaz-Veizades et al., 1995; Duckitt, 2001; Sibley et al., 2006; Wilson and Sibley, 2013). In the Dual Process Motivational Model, Duckitt (2001) theorised that two sets of motivational schemas, threat-control and competition-dominance, are the foundations of RWA and SDO, respectively, and that these dimensions were responsible for two distinct forms of prejudice. While RWA and SDO both predict prejudice towards lower status groups, RWA-based prejudice typically categorises outgroups as *dangerous* – as threatening to security and safety – or *dissident* – as representing a symbolic threat to social norms and cohesion (Shaffer and Duckitt, 2013; Kauff et al. 2015; Crowson and Brandes, 2017; Faragó et al. 2019). Conversely, SDO-based prejudice typically categorises outgroups as inferior, weak, or undeserving (Duckitt, 2001; Ho et al. 2015).

However, the relationship that RWA and SDO have with conspiracy belief remains unclear. In the development of the Conspiracy Mentality Scale, Imhoff and Bruder (2014) note the importance of recognising the distinction between prejudice toward lower status groups, such as minority ethnic or religious groups, which is associated with RWA and SDO, and prejudice toward higher status groups, such as wealthy people, which is not associated with RWA and SDO. Conversely, conspiracy mentality is related to prejudice against high-power groups, which are perceived as less likeable and more threatening compared to low-power groups (Imhoff and Bruder, 2014). In contrast, Richey (2017) presented an alternative theory in which those with authoritarian personalities are more likely to support conspiracy beliefs due to higher levels of anxiety and difficulty with higher order thinking. Yet, this work focused exclusively on birtherism (that former US President Obama is not an American

citizen) and trutherism (that former US President Bush and the Republican Party knew of 9/11 prior to the attack) but did not control for SDO. Moreover, other research has shown that political conservatism, which is predicted by both RWA and SDO, was positively associated with the endorsement of conspiracy theories and a general conspiracist world view (van der Linden et al., 2020). However, Green and Douglas (2018) found that SDO, along with anxious attachment, interpersonal trust, and a Manichean world view, predicted scores on the General Conspiracist Belief scale, while RWA did not.

Both RWA and SDO were found to mediate the relationship between party preference and partisan support for politicians spreading misinformation (De keersmaecker and Roets, 2019). De keersmaeker and Roets (2019) theorise that, for RWA, these findings are explained by authoritarian submission, a sub-component of RWA that is associated with approval of and respect for authority. For SDO, De keersmaeker and Roets (2019) theorise that, as SDO is associated with Machiavellianism and psychopathy, people high in SDO would be more likely to perceive dishonesty as an accepted norm in a highly competitive world, in which people do whatever is necessary to succeed. In the context of the coronavirus pandemic, Lobato et al. (2020) found that individuals high in traditionalism, a sub-component of RWA, but low in SDO, were more willing to share misinformation about the severity and spread of coronavirus; those low in traditionalism, but high in SDO, were more willing to spread conspiracy theories but less willing to spread misinformation about the spread or severity of the pandemic. SDO is also associated with seeing participatory deliberative processes as rigged when they do not result in the desired outcome (Werner and Marien, 2016).

Noting the divergent findings on the ability of RWA to predict conspiracy belief, Wood and Gray (2019) highlight that psychologists tend to treat conspiracies as a unitary construct rather than engaging with the content of different conspiracy theories. Moreover, they note that some conspiracy theories reinforce the RWA-associated view that the world is a threatening place, but that others present a view of the world that is incompatible with RWA, in which authority figures are corrupt and authorities and traditions are social control mechanisms that must be resisted. In their findings, pro-establishment conspiracy beliefs correlated positively with RWA, while anti-establishment conspiracy beliefs did not. Wood and Gray (2019) speculate that a dislike of the deviant groups behind anti-establishment conspiracies, which present a material threat to social order, could explain this finding. Contrary to Richey's (2017) model, in which RWA is one component of a wider propensity for belief in all conspiracy theories, this model proposes that RWA predicts a susceptibility to a belief in specific conspiracies that are compatible with the individual's existing world view.

Of the three explanations for the origin of the coronavirus examined by the present paper, the theory that the coronavirus was a bioweapon developed by China's military is inherently compatible with the world views of those high in RWA. In this theory, China's proliferation of bioweapons presents an external danger in the form of a security threat from a potentially hostile political rival, and a social threat in the form of a deviant or dissident political ideology, communism, which people high in RWA are sensitive to (Kauff et al. 2015; Crowson and Brandes, 2017; Faragó et al. 2019). It is also compatible with the world view of those high in SDO. In the bioweapon origin theory, an international competitor is trying to gain a military advantage that might threaten international hierarchies and challenge Britain's ability to leverage military power in the international arena. Moreover, the bioweapon theory presents a situation that could be used to justify more aggressive foreign policy positions or increased militarisation in the UK. RWA and SDO are both associated with nationalism, support for aggressive foreign policy, and military action (Pratto et al. 1994; Doty et al. 1997;

Terrizzi and Drews, 2005; McFarland and Mathews, 2005; Crowson et al. 2006; Jackson and Gaaertner, 2010; McFarland, 2015; Lindén et al. 2018). Conversely, while the 5G origin theory taps into a potential security threat, the development of 5G technology in the UK had the support of the government. Furthermore, it might be seen as an umbrella term for a range of often contradictory conspiracy theories (Sturm and Albrecht, 2020), many of which are not explicitly related to the concerns about Huaewi's involvement in the development of 5G infrastructure.

In sum, we expect RWA and SDO to differentially predict belief in specific COVID-19 origin theories, such that RWA and SDO will be positively associated with belief in the Chinese lab origin story (Hypothesis 4a); only SDO will be positively associated with the 5G origin theory (Hypothesis 4b), while we have no specific expectations about RWA and belief in 5G origin theories. Finally, we have no strong expectations regarding the association between RWA / SDO and belief in the Chinese meat market theory.

2.3 Information Sources

Conspiracy theories often spread through networks that bolster inaccurate worldviews via social reinforcement and selective exposure to information. Reporting of COVID-19 conspiracy theories has highlighted the role of social media in facilitating the proliferation of misinformation. Tracing of the 5G conspiracy theory on social media has demonstrated its assimilation into pre-existing networks of conspiracy theorists, such as the far-right website *Infowars* and the anti-vaccination movement (Bruns et al., 2020:25-26; Ahmed et al., 2020). Moreover, frequent usage of Facebook has been found to predict endorsement of COVID-19 misinformation (Dhanani and Franz, 2020). Beyond social media consumption, reliance upon Fox News for information has been found to predict acceptance of COVID-19 misinformation, but there is relatively little systematic evidence on the relationship between news consumption and conspiracy belief in the UK context. However, survey evidence from the US suggests that endorsement of misinformation is associated with higher levels of trust in Trump, and lower trust in the Centers for Disease Control and Prevention (CDC) (Dhanani and Franz, 2020).

Taken together, we hypothesize that information from sources that could be characterized as unreliable (e.g. social media, friends and family, tabloid newspapers, etc.) will be positively associated with belief in COVID-19 conspiracy theories (Hypothesis 5).

2.4 Public Health Implications
Finally, endorsement of COVID-19 conspiracy theories may affect critical public health issues such as social distancing and vaccination. Experimental evidence suggests exposure to conspiracy theories reduces the intent to engage in health-promoting behaviours, such as visiting a doctor, and that the relationship is mediated by decreased trust in health professionals (Natoli and Marques,2020). Important factors reinforcing public health, such as individual motivation to socially distance (Miller et al., 2020), may be undermined if the severity of the virus is understated or if the scientific consensus on human-to-human transmission is questioned, as insinuated by claims it is caused by 5G radiation or that the pandemic lockdowns were only a pretense for the rollout of 5G (Bruns et al., 2020). Similarly, a number of conspiracy theories make unfounded claims regarding the supposed dangers of a potential vaccine (Bruns et al., 2020; Sturm and Albrecht, 2020). Thus, we expect conspiracy belief to be negatively associated with social distancing motivation (Hypothesis 6a) and positively associated with vaccine rejection (Hypothesis 6b).

3. Materials and Methods

3.1 Data

The data for this study come from a nationally representative longitudinal survey of adults living in the United Kingdom during the early phases of the COVID-19 global pandemic. Participants were recruited by Qualtrics from March 23rd to 28th, 2020 (Wave 1: $N = 2,025$), and were recontacted from April 22nd to May 1st, 2020 (Wave 2: $n = 1,406$, recontact rate = 69%). Data for Wave 1 of the survey occurred during the first week of the strict national lockdown in the UK, while follow-up data for Wave 2 was collected approximately 1 month later during the lockdown and 3 months after the first confirmed COVID-19 case there, which saw rapidly increasing infections. These data comprise part of a longitudinal, multi-country study that aims to assess the psychological, social, economic, and political impact of the COVID-19 virus in the general population (McBride et al., 2020).

Although the sample was drawn from non-probability methods, research suggests that Qualtrics approximates probability-based samples reasonably well when quotas are used (Zack, Kennedy & Long, 2019). Thus, we employed stratified quota sampling matched against known demographics in terms of age, gender, and household income within the UK. McBride et al. (2020) provide a more detailed description of the panel recruitment, sampling methodology (including post-stratification weights and analysis of panel attrition), and explanation of all measures administered in the study. The full panel dataset will be deposited to the UK Data Archive and Open Science Framework approximately six months after data collection for the project has been completed.

3.2 Dependent Variables

To assist interpretation and comparison of effect sizes, we normalised all of the continuous variables described below to range from zero to one. Descriptive statistics for all measures included in our analyses are available in Table 1.

Table 1: Descriptive statistics of key measures

Variable	Mean	SD	Wave	Description
Conspiracy belief				
Meat market belief	0.64	0.29	2	Slider scale from 0-100, scaled 0-1
Wuhan lab belief	0.38	0.33	2	Slider scale from 0-100, scaled 0-1
5G belief	0.11	0.22	2	Slider scale from 0-100, scaled 0-1
Conspiracy ideation	0.57	0.20	1	5-item conspiracy mentality scale, alpha = 0.85, scaled 0-1
Public health policy attitudes				
Social	0.82	0.19	2	4-item subscale of reflective motivation from

distancing				the COM-B model, alpha = 0.87, scaled 0-1
Vaccination acceptance	N/A	N/A	2	Willingness to accept a COVID-19 vaccine for themselves: Yes ($n = 939$), Maybe ($n = 325$), No ($n = 126$)

Cognitive ability (Cognitive reflection test, CRT)

CRT score	0.39	0.33	1	5-item adapted scale, alpha = 0.73, scaled 0-1
CRT pre-exposure	0.63	0.48	1	Dummy for whether respondents were new to the CRT (no prior exposure = 1)

Motivational factors

Fiscal conservatism	0.50	0.22	1	Self-reported degree of fiscal conservatism, ranging from 1-10, scaled 0-1
RWA	0.51	0.17	1	6-item Very Short Authoritarianism Scale, alpha = 0.68, scaled 0-1
SDO	0.36	0.18	1	8-item SDO_7 Scale, alpha = 0.84, scaled 0-1
Nationalism	0.57	0.25	2	2-item scale, alpha = 0.82, scaled 0-1
Distrust of scientists	0.34	0.25	2	Ordinal degree of distrust of scientists, scaled 0-1
COVID-19 anxiety	0.61	0.26	2	Slider scale from 0 (not at all) to 100 (extremely anxious), scaled 0-1
Death anxiety	0.36	0.22	2	17-item Death Anxiety Inventory, alpha = 0.94, scaled 0-1
Intolerance of uncertainty	0.49	0.20	2	12-item scale, alpha = 0.91, scaled 0-1
Paranoia	0.33	0.24	2	5-item scale, alpha = 0.86, scaled 0-1

Information sources

News: elite	0.38	0.48	2	Dummy for those who read "elite-level" newspapers (yes = 1; none = 0)
News: mid-level	0.32	0.47	2	Dummy for those who read "mid-level" newspapers (yes = 1; none = 0)
News: tabloid	0.27	0.44	2	Dummy for those who read tabloid newspapers (yes = 1; none = 0)
Family and friends	0.38	0.28	2	Ordinal measure of extent of COVID-19 information received from family and

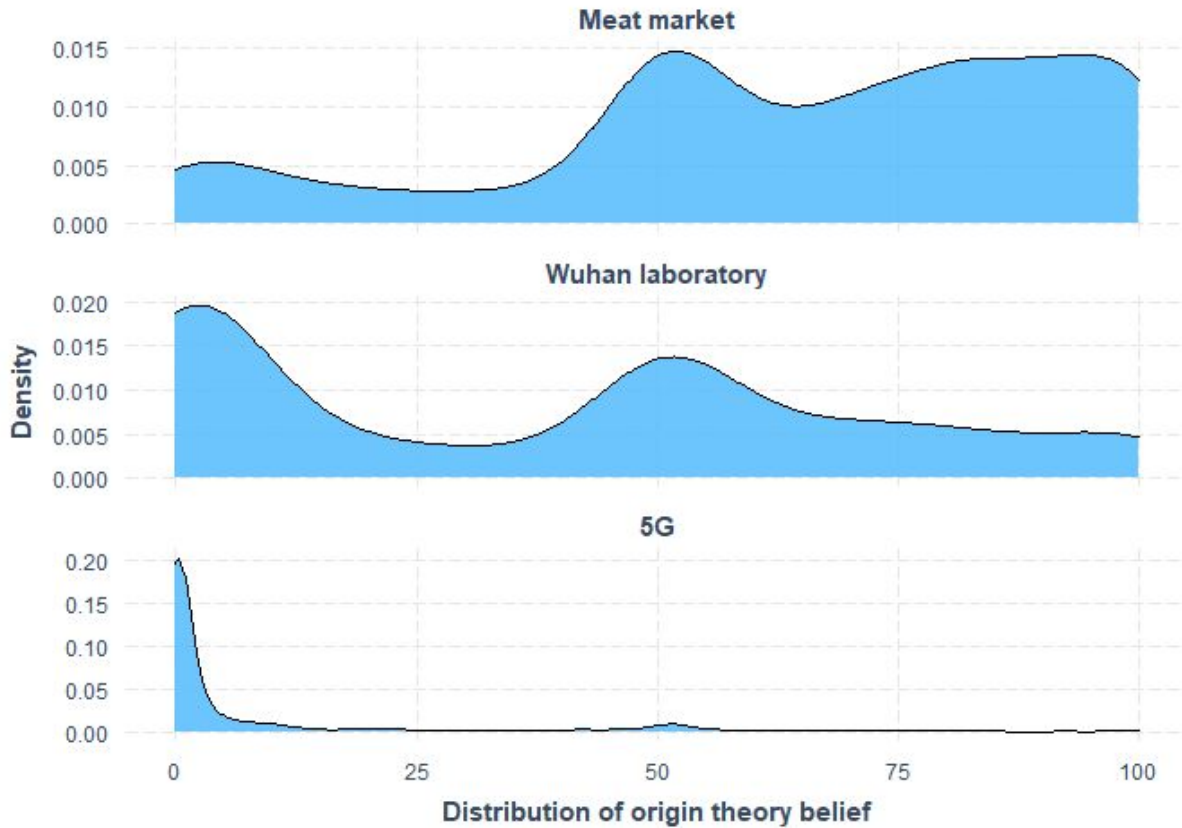|				
				friends, scaled 0-1
Social media	0.30	0.32	2	Ordinal measure of extent of COVID-19 information received from social media, scaled 0-1
Socio-demographic indicators				
Age	0.45	0.21	2	Continuous variable, scaled 0-1
Gender	0.48	0.50	2	Dummy variable (female = 1)
Income	0.52	0.36	1	Ordinal gross income bands (2019), scaled 0-1
Education	0.61	0.49	1	Dummy for post-secondary education (university degree or higher = 1)

3.2.1. Theories about the Origin of COVID-19

Respondents indicated the degree to which they believed various COVID-19 origin stories using a slider scale ranging from 0-100. This yielded three outcomes concerning belief in the following:

1. "COVID-19 originated in a meat market in Wuhan, China" ($M = 0.64$, $SD = 0.29$);
2. "COVID-19 was developed in a lab in Wuhan, China" ($M = 0.38$, $SD = 0.33$);
3. "5G mobile networks are responsible for the current global pandemic" ($M = 0.11$, SD = 0.22)

The distributions for these three origin stories are displayed in Figure 1. Prior to data collection, we reviewed a number of potential conspiracy theories regarding COVID-19 (e.g., see Lynas, 2020, April 20). We selected these three origin stories because they appeared to variy on a latent conspiracy scale from lowest (Wuhan meat market) to highest (5G networks).

Figure 1. Distributions of Belief in COVID-19 Origin Stories

Meat market

0.015
0.010
0.005
0.000

Wuhan laboratory

Density

0.020
0.015
0.010
0.005
0.000

5G

0.20
0.15
0.10
0.05
0.00

0   25   50   75   100

Distribution of origin theory belief

3.2.2. Motivation to Engage in Social Distancing

Four items from the Capability, Opportunity, Motivation-Behaviour (COM-B) model of behaviour change (Michie, Van Stralen, & West, 2011) were used to assess respondents' motivation to engage in social distancing behaviours ($M = 0.82$, $SD = 0.19$, alpha = 0.87).

3.2.3. Willingness to Take a COVID-19 Vaccine

Respondents were asked "If a new vaccine were to be developed that could prevent COVID-19, would you accept it?" Three response options were available: Yes ($n = 939$, 67.6%), No ($n = 126$, 9.1%), and Maybe ($n = 325$, 23.4%).

3.3 Independent Variables

As with the outcomes above, we rescaled all continuous predictors to range from 0 to 1 to aid interpretation and comparison of effect sizes.

3.3.1. Conspiracy Ideation

Conspiracy mentality (Imhoff & Bruder, 2014) was measured using five items (scored on an 11-point scale from 1 'Certainly not 0%' to 11 'Certainly 100%'), including: 'I think that many very important things happen in the world, which the public is never informed about'; and 'I think that events which superficially seem to lack a connection are often the result of secret activities' ($M = 0.57$, $SD = 0.20$, alpha = 0.85).

3.3.2. Cognitive Reflection Test

Respondents completed an adapted version of the Cognitive Reflection Test (CRT), which was used to measure an individual's analytical reasoning-- that is, the ability to override incorrect 'gut' responses and engage in deeper processing (Frederick, 2005). For example, one item read: "If you're running a race and you pass the person in second place, what place are you in?" Analytic reasoning, or 'slow thinking' (Kahneman, 2012), is identified by discounting the incorrect answer designed to appeal to impulsive 'quick' thinking in favour of the reflective, correct answer ($M = 0.39$, $SD = 0.33$, alpha = 0.73). Given that some participants may have already seen items from the CRT, we also created a dummy variable to account for prior exposure ($M = 0.63$, $SD = 0.48$).

3.3.3. Political Ideology

Three questions adapted from the British Election Study 2017, asked respondents how they would describe their (1) political affiliation (on a 10-point scale ranging from 1 'left-wing' to 10 'right-wing'); (2) views on social issues such as abortion and same-sex marriage (on a 10-point scale from 1 'very liberal' to 10 'very conservative'); and (3) views on economic issues such as taxes and government spending (on a 10-point scale from 1 'very liberal' to 10 'very conservative') ($M = 0.50$, $SD = 0.22$).

3.3.4. Right-wing Authoritarianism

The 6-item Very Short Authoritarianism scale (Bizumic & Duckitt, 2018) was used to assess respondents' levels of authoritarianism. Participants indicated the extent to which they agreed with statements (on a 5-point Likert scale ranging from 1 'strongly disagree' to 5 'strongly agree') such as follows: 'It's great that many young people today are prepared to defy authority'; 'What our country needs most is discipline, with everyone following our leaders in unity'; and 'Our society does NOT need tougher government and stricter laws' ($M = 0.51$, $SD = 0.17$, alpha = 0.68).

3.3.5. Social Dominance Orientation

Respondents' levels of social dominance orientation were assessed using the 8-item social dominance orientation scale (SDO-7; Ho et al. (2015). Respondents were asked the extent to which they favoured statements (on a 5-point Likert scale ranging from 1 'Strongly oppose' to 5 'Strongly favour') such as the following: 'An ideal society requires some groups to be on top and others to be on the bottom'; 'Some groups of people are simply inferior to other groups'; and 'We should do what we can to equalize conditions for different groups' ($M = 0.36$, $SD = 0.18$, alpha = 0.84).

3.3.6. Nationalism

Two items to measure nationalism were adapted from Davidov (2011): 'The world would be a better place if people from other countries were more like the British' and 'Generally speaking, Britain is a better country than most other countries'. Responses were scored on 5-point Likert scales from 1 'strongly disagree' to 5 'strongly agree' ($M = 0.57$, $SD = 0.25$, alpha = 0.82).

3.3.7. Distrust in Scientists

Respondents were asked the extent to which they trusted scientists. Responses were reverse scored on a 5-point Likert scale ranging from 1 'completely trust' to 5 'do not trust at all' (*M* = 0.34, *SD* = 0.25).

3.3.8. COVID-19 Related Anxiety

Respondents' degree of specific anxiety about the COVID-19 pandemic was assessed using a single visual slider scale, ranging from 0 'not at all anxious' on the left-hand side to 100 'extremely anxious' on the right-hand side (*M* = 0.61, *SD* = 0.26).

3.3.9. Death Anxiety

Respondents' attitudes toward death were assessed using the 17-item Death Anxiety Inventory (DAI; Tomás-Sábado, Gómez-Benito, & Limonero, 2005), which measures four death-related anxiety constructs with items such as 'I get upset when I am in a cemetery' and 'I find it difficult to accept the idea that it all finishes with death'. Responses were scored on a 5-point Likert scale ranging from 1 'totally disagree' to 5 'totally agree' (*M* = 0.36, *SD* = 0.22, alpha = 0.94).

3.3.10. Intolerance of Uncertainty

Respondents' intolerance of uncertainty, which is thought to play a key role in the aetiology and maintenance of worry, was assessed using the 12-item Intolerance of Uncertainty Scale (IUS) (Buhr & Dugas, 2002). The IUS has a good construct validity (Birrell, Meares, Wilkinson, & Freeston, 2011), and recent psychometric research has shown that it is best scored as a single dimension (Shajata et al. 2018). All 12 items are scored on a 5-point Likert scale ranging from 1 'not at all characteristics of me' to 5 'entirely characteristic of me'. The IUS has excellent internal consistency, good test–retest reliability over a five-week period, and convergent and divergent validity when assessed with symptom measures of worry, depression, and anxiety (Buhr & Dugas, 2002). (*M* = 0.49, *SD* = 0.20, alpha = 0.91)

3.3.11. Paranoia

Paranoia was measured using a 5-item scale based on the Persecution and Deservedness Scale (Melo, Corcoran, Shryane, & Bentall, 2009) designed for use in epidemiological studies (McIntyre et al. 2018). Participants rated their agreement on a 5-point scale with statements such as 'I'm often suspicious of other people's intentions towards me' and 'You should only trust yourself' (*M* = 0.33, *SD* = 0.24, alpha = 0.86).

3.3.12. Sources of Information about COVID-19

Respondents were asked to indicate, from a list of the mainstream newspapers, their preferred news source (either in print or online), as a proxy measure for quality of news sourced and political affiliation.

3.3.13. Socio-Demographic Indicators

Respondents provided their gender, age, and gross annual household income, each of which were used for quota sampling, as well as their highest level of education (no qualifications;

O-level/GCSE or similar; A-level or similar; diploma; undergraduate degree; postgraduate degree; technical qualification; or Other).

4. Results

4.1. COVID-19 Origin Theories

To test our hypotheses, we regressed each COVID-19 origin conspiracy theory on the predictors outlined in the previous section using ordinary least squares (OLS)[12]. We present the estimated coefficients (with 95% confidence intervals) from these regression models in Figures 2-4, and the full tables regression results are available in Table A1 in the Supplemental Appendix[3]. The dashed vertical line represents the null hypothesis (i.e., $b = 0$); plot points to the right of this vertical line indicate a positive association with belief in the listed conspiracy theory; plot points to the left, suggest a negative association. Statistically significant results correspond to estimates for which the 95% confidence intervals do not include zero (i.e., those that do not cross the dashed vertical reference line). Finally, recall that all variables have been scaled to range from 0 to 1, which means that while they are not measured in the same units, they do display the associated change in each outcome for a minimum to maximum change in the predictors. For example, a 1-unit change in RWA is equivalent to increasing from those who scored lowest to highest on the 6-item Very Short Authoritarianism scale.

Beginning with the regression estimates for the Wuhan meat market theory (Figure 2), we see that ability factors -- that is, post-secondary education (having a university degree or higher) and cognitive reasoning ability (high scores on the CRT) -- have virtually no impact on belief in the Wuhan meat market theory. Likewise, conspiracy ideation does not appear to predict

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[1] Due to the non-normality of the 5G origin belief dependent variable, and issues of heteroscedasticity in the residuals, we ran two supplementary tests on this belief scale. The first involved transforming the dependent variable using the inverse hyperbolic sine (IHS) transformation, and subsequently fitting an OLS regression. The IHS transformation approximates the natural logarithm for large values of the dependent variable, but unlike the log transformation, it can accommodate zero values, hence being traditionally applied to long-tailed distributions such as wealth data (Burbridge et al.,1988:123,126; Zhang et al.,2000:169; Williams,2017). The second supplementary test was a poisson regression model, with a parameter added to adjust for overdispersion, which may otherwise bias the standard errors. We estimated the poisson regression model using Maximum Likelihood. For both supplementary models, the results broadly confirm those of the initial OLS model in terms of statistical significance and effect size. Therefore, to allow easier comparisons across origin stories, we present the OLS model (Model 3) results in the sections that follow, with any differences between these results and the supplementary models highlighted where necessary. We present the full results of the supplementary models in the appendix, referred to as Model 3a (IHS) and Model 3b (poisson).

[2] We removed measures of political affiliation (left-right) and social conservatism, outlined in section 3.3.11., due to multicollinearity issues. The correlation between political affiliation and fiscal conservatism was 0.67. Whereas the correlation between social conservatism and RWA was 0.45. The measure of fiscal conservatism remained. Following this, the variance inflation factors (VIF) for these variables were below 2.

[3] All Variance Inflation Factors (VIFs) were below 2, suggesting that multicollinearity was not an issue among the various predictors in the models.

belief in this specific theory, nor does belief in the specific 5G conspiracy theory. In fact, the estimate for belief in the Wuhan lab origin story is statistically significant and negatively signed, which means that the belief in the lab conspiracy is associated with a modest decrease in the meat market theory. In short, these results differ from prior research finding that these origin theories are positively correlated (Miller, 2020).

Instead, Figure 2 reveals that estimates for motivational factors are statistically significant predictors with modest effect sizes of belief in the meat market theory. For instance, COVID-19 related anxiety and intolerance of uncertainty predictors each account for an increase in belief in the meat market origin story by 13 percentage points. Moreover, a strong motivational factor like nationalism is positively signed and statistically significant, again accounting for a modest increase in the meat market theory. Yet, as predicted, RWA, SDO, and ideological conservatism exert no significant influence on belief in this origin theory.

Figure 2: Regression Estimates for Belief in Wuhan Meat Market Origin Theory
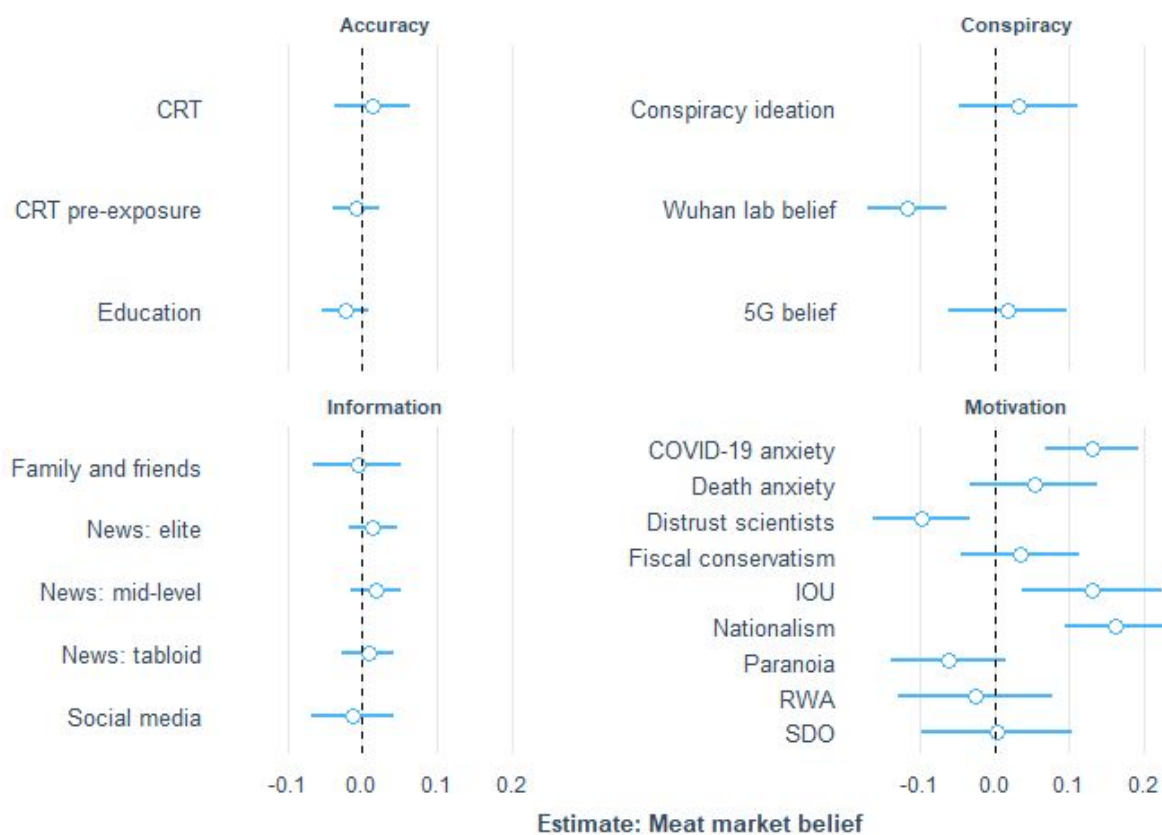
Turning to belief in the Wuhan laboratory origin (Figure 3), we see once again that motivational factors--albeit a different set--are statistically and practically significant predictors in the model. For instance, both SDO and RWA are in the hypothesized positive direction, and statistically significant at the .05 level, accounting for a 13 and 15 point increase in belief, respectively. However, our dual-factor model of belief in conspiracy theories also suggests that ability should reduce one's susceptibility to conspiracy theories, and this is what we find. The effects of cognitive reflection and education are statistically significant at the .05 level, and they decrease belief in the Chinese lab origin theory by 7 and 4 points, respectively. The smaller effect sizes relative to partisan motivational factors like SDO and RWA, though, are supportive of the hypothesis that partisan motivated reasoning

contributes to conspiracy theory belief. Indeed, the only predictors in this model with larger effect sizes than SDO and RWA are those directly related to conspiracy belief; general conspiracy ideation is associated with a 25 point increase in belief in the lab origin theory, as is specific belief in the 5G origin story, which accounts for a similarly large 22 point increase.

Figure 3: Regression Estimates for Belief in Chinese Lab Origin Theory
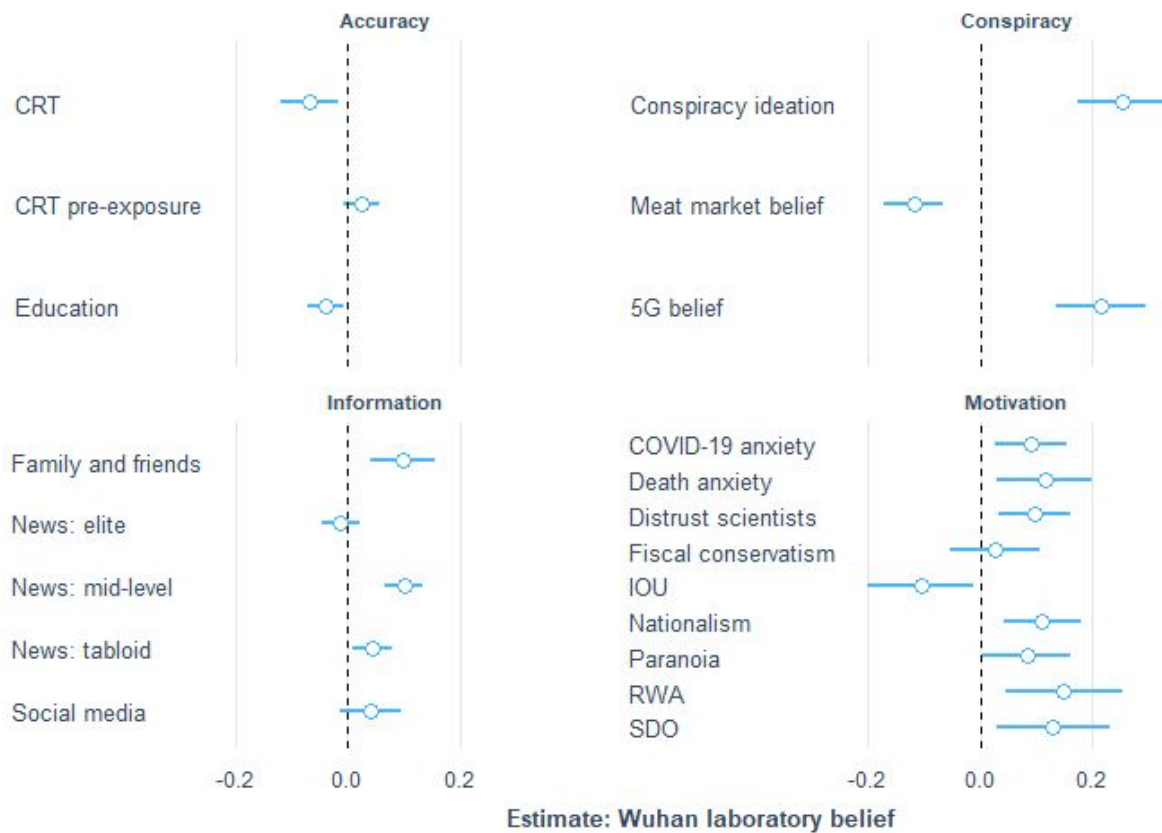
Finally, a similar story appears in relation to belief in the 5G mobile network origin story. Recall that belief in this particular COVID-19 origin story best fits the traditional definition of a conspiracy theory because it implicates powerful forces in the global telecommunications industry in a secret plot to intentionally cover-up the dangers of 5G technology (for motives of either profit or complicity with government). Once again, motivational factors like SDO and RWA are statistically significant predictors of belief in this origin story, albeit in different directions. The effect of SDO in this model is positive and statistically significant, associated with an 18 point increase in belief. In fact, SDO has the largest effect size of all predictors in the model, including belief in the Wuhan laboratory origin, which is statistically significant but only accounts for half of that increase (i.e., a 9-point increase), while general conspiracy ideation is positively signed but non-significant. RWA, by contrast, is associated with a statistically significant decrease of 13 points in belief for the 5G origin theory[4]. Similarly, the effect size of cognitive ability as measured by the CRT is negative and

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[4] It is worth noting that in supplementary models 3a and 3b, this finding was statistically non-significant, and the effect size reduced. Therefore, this finding should be treated with more caution than others which were replicated in the supplementary models.

statistically significant, decreasing belief by 8 points, though the effect of education is near zero and non-significant.

Figure 4: Regression Estimates for Belief in 5G Network Origin Theory
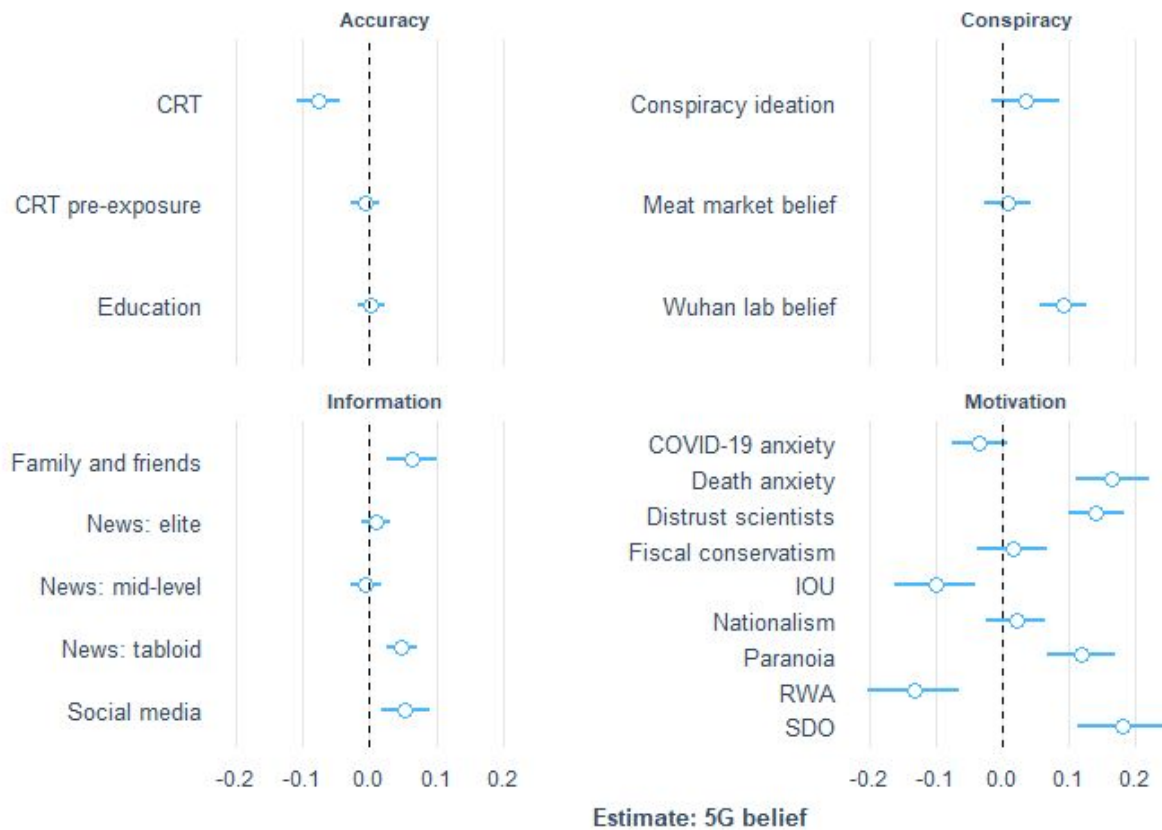
The results of Models 2 and 3 provide some support for the argument that conspiracy theories proliferate through anxious members of the population during periods of uncertainty or threat. In both models the effect of death anxiety is positive and statistically significant, while the effect of COVID-19 anxiety is positive and statistically significant in Model 2. Paranoia and distrust of scientists are statistically significant motivational factors that predict increased belief in the Wuhan laboratory and 5G origin theories.

It is also worth noting that information sources play a larger role in increasing belief in the 5G origin theory than they do with other COVID-19 origin theories. For example, the estimates for social media, tabloid news, and family and friends are all statistically significant and positively signed, with effect sizes ranging from an increase in belief of 4 to 7 percentage points. By contrast, the effects of family and friends and a preference for tabloid newspapers are each positive and statistically significant for Wuhan laboratory belief, with effect sizes between 4 to 10 percentage points. Consumption of elite-level newspapers had virtually no effect across all three of the COVID-19 origin theory models.

4.2. Public Health Behaviours

We conducted additional analyses seeking to understand the potential effect of conspiracy beliefs on attitudes towards public health policies, namely motivation to engage in social distancing and willingness to accept a COVID-19 vaccine. To this end, we regressed social

distancing motivation on the predictor variables from Models 1, 2 and 3 using OLS, presented in full in Table A2 in the Supplemental Appendix. Using the same predictor variables, we conducted a multinomial logit regression on attitudes toward vaccination, with the baseline set to 'yes', also presented in full in Table A2. As before, we present the coefficients (with standard errors) of the regression results for visual inspection in Figures 5 and 6, respectively, this time presenting only statistically significant (p < .05) or theoretically important estimates, including RWA, SDO and measures of conspiracy belief.

Figure 5 displays the results of the OLS regression on social distancing motivation. Belief in the 5G origin theory is statistically significant and negatively associated with social distancing motivation, accounting for an 11-point reduction in social distancing. So too are a number of the predictors from the 5G conspiracy belief in Model 3, including SDO ($b = -0.197$), distrust of scientists ($b = -0.140$), and death anxiety ($b = -0.095$), suggesting that these variables may have both a direct effect on social distancing, as well as an indirect effect through belief in specific conspiracies. Belief in the meat market origin theory is positively associated with social distancing motivations, though the estimate is relatively small ($b = 0.068$), while the effects of both general conspiracy ideation and belief in the Wuhan laboratory origin are near zero and non-significant. Finally, receiving a lot of COVID-19 information from family and friends is positively associated with social distancing motivation ($b = 0.57$), despite also being positively associated with Wuhan laboratory and 5G belief in Models 2 and 3. Moreover, the results of Model 4 provide support for the findings of Millet et al. (2020) that suggest both age ($b = 0.152$) and gender ($b = 0.038$) are positively associated with social distancing. Notice, too, that cognitive reasoning ability and education are absent from the figure, as these estimates are not statistically significant and have relatively small effect sizes.

Figure 5: Regression Estimates for Motivation to Engage in Social Distancing
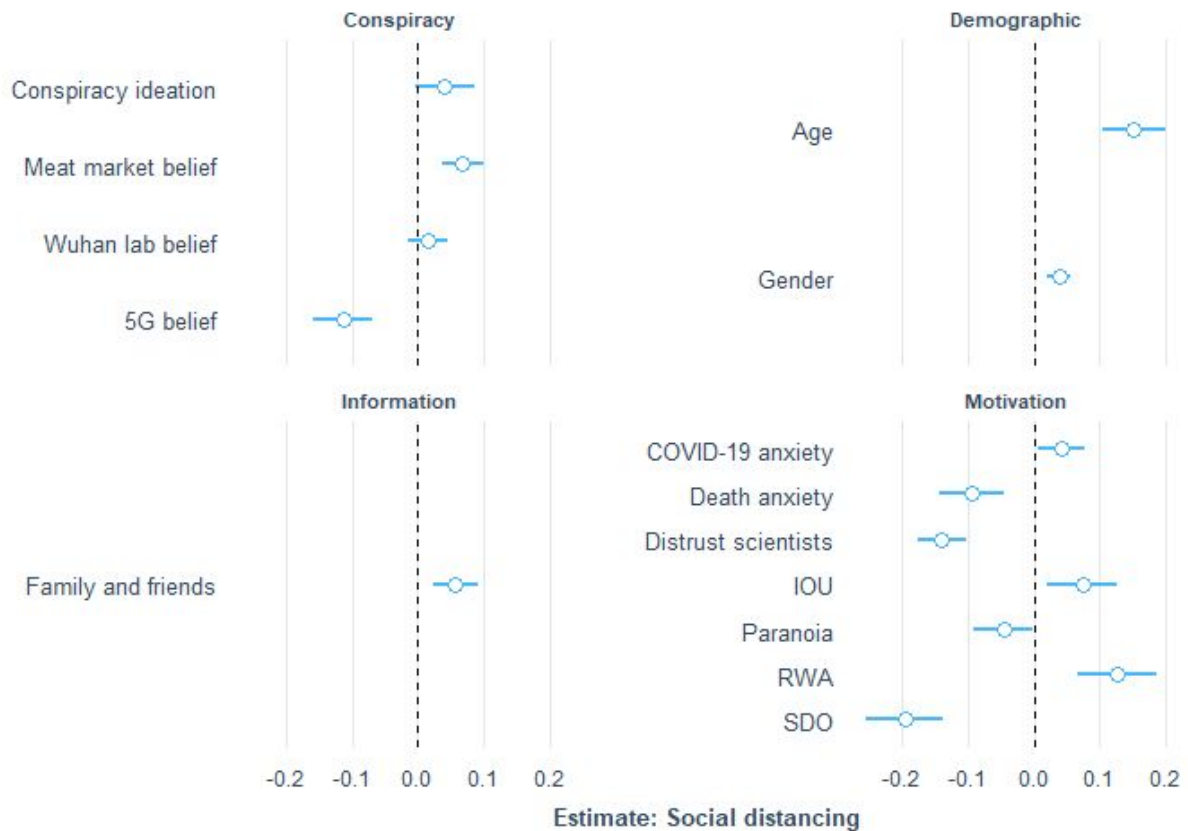
We display the results of Model 5 in Figure 6. Both belief in the 5G origin theory ($b = 1.94$, *odds ratio* $= 6.96$) and the Wuhan laboratory theory ($b = 0.92$, *odds ratio* $= 2.51$) are statistically significant and positively related to saying 'no' to a potential COVID-19 vaccine. In other words, belief in the 5G conspiracy theory increases opposition to vaccination nearly seven-fold, while belief in the Chinese lab does so by two and a half times. By contrast, belief in the meat market origin theory is negatively associated with both vaccine rejection ($b = -1.01$, *odds ratio* $= 0.37$) and vaccine hesitancy ($b = -0.47$, *odds ratio* $= 0.63$), both of which are statistically and practically significant.

Figure 6: Regression Estimates for Willingness to Vaccinate
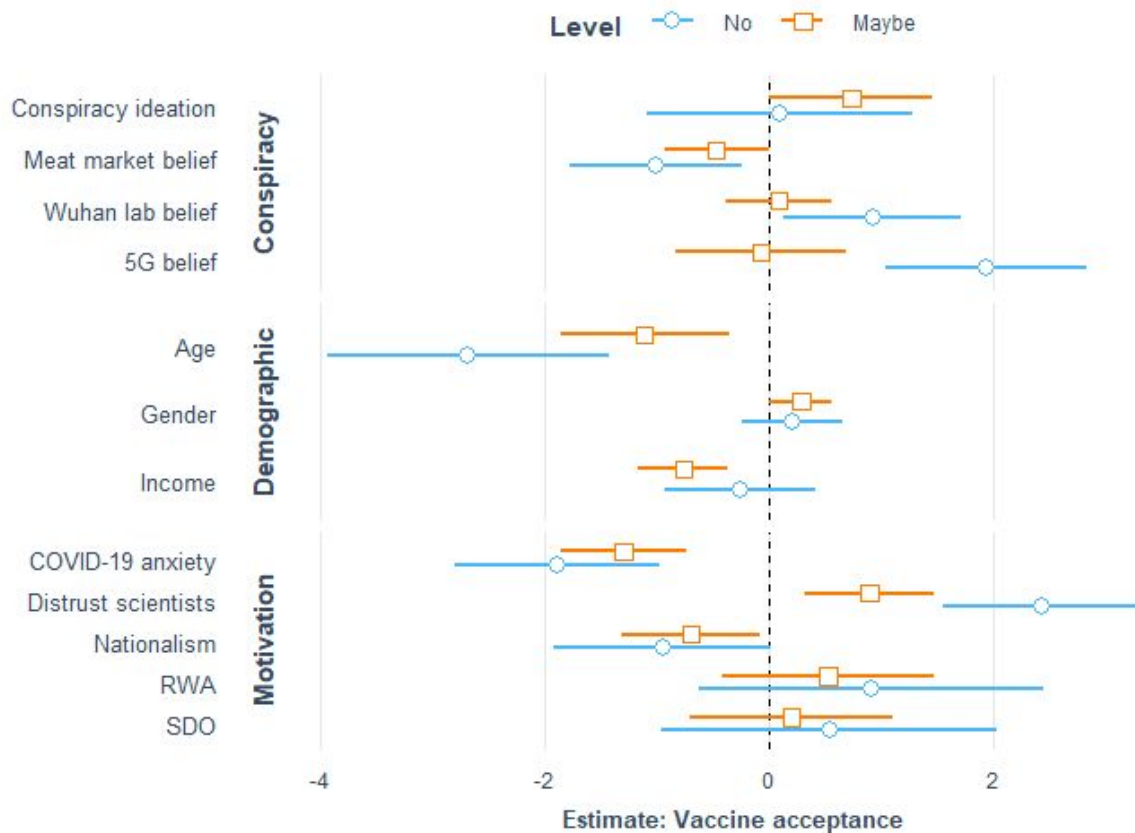
As depicted by Figure 6, our results provide support for the findings of Murphy et al. (2020) in that we find a statistically significant negative effect of age on vaccine rejection (b = -2.69, *odds ratio* = 0.07), in which older individuals are considerably less likely to reject a potential vaccine, as well as a positive and statistically significant effect of distrust of scientists (b = 2.43, *odds ratio* = 11.36). However, our results differ from our previous models in that we find no effect of motivational factors like SDO or RWA on vaccine rejection or hesitancy when controlling for other factors, including conspiracy theory beliefs.

5. Discussion

In this study we have tested hypotheses about COVID-19 origin theories, including two that can be considered conspiracy theories (that the virus originated in a Wuhan laboratory and that the current pandemic has been caused by 5G wireless technology) and one that may be considered plausible (that the virus originated in the Wuhan meat market). We also studied the implications of these theories for two public health measures: social distancing and accepting a vaccine. Our findings provide broad support for our dual factor approach to explaining conspiracy theories, which assumes that these beliefs are influenced both by cognitive ability and motivation. Our results also highlight the importance of these theories for effective public health interventions.

In general, the results, which were obtained from a representative sample of the UK population, suggest that motivational factors are of greater importance than cognitive ability, and also raise some questions about the monological model of COVID-19 conspiracy theories (Miller, 2020). Previous research has found that there is a general disposition to believe in conspiracy theories, which has sometimes been referred to as a conspiracy mentality

(Goertzel, 1994; Bruder et al. 2013). Only partially consistent with this literature, our general measure of conspiracy ideation was associated with the Wuhan lab theory but not the 5G theory. Also, the differences observed in the psychological processes associated with the two conspiracy theories suggest that, while common cognitive vulnerabilities are associated with these theories, some of the motivational contributions are shared across the conspiracy theories but others are particular.

With regard to cognitive abilities, consistent with a literature that shows that poor cognitive reflection or analytic reasoning contributes towards belief in conspiracies (Swami et al., 2014; van Pooijen et al. 2017), we found that both the Wuhan lab and the 5G theories (but not the scientifically credible meat market theory) were associated with reduced capacity for analytical reasoning (prior exposure to the widely available CRT items had no effect, which is consistent with previous research that this instrument is robust to multiple exposure; Bialek and Pennycook, 2017). Van Prooijen et al (2017) have proposed that poor analytic thinking may be a partial mediator between educational attainment and belief in conspiracies but, in this study, only the Wuhan lab theory was associated with educational status.

The more plausible meat market theory differed from both of the conspiracy theories in being positively associated with intolerance of uncertainty, which we would expect, whereas the conspiracy theories were negatively associated with this construct. This is perhaps a counterintuitive finding given evidence of the role uncertainty plays in conspiracy belief (e.g. van Prooijen and Jostmann, 2013). However, it is notable that one mechanism through which uncertainty affects conspiracy belief is through over-attentiveness to prior judgements of the morality of conspiracy protagonists (ibid.), which may not be a salient factor for people's judgements of the 5G network, for instance. Moreover, the effect of uncertainty in these studies was demonstrated on conspiracies involving political and military espionage that posed no direct threat to the participants (ibid.). By contrast, belief in the Wuhan laboratory and 5G origin theories were associated with death anxiety which is likely heightened during a pandemic and perceived as a personal threat. An association between death anxiety and conspiracy beliefs has been reported in previous research (Newheiser et al. 2017) and this observation is clearly consistent with the hypothesis that the willingness to believe these theories is heightened during times of existential threat (van Prooijen, 2019).

The political variables revealed some differences between the two conspiracy theories. As hypothesised, the Wuhan lab theory was associated with both RWA and SDO. The specific association between RWA and the Wuhan lab theory is not consistent with previous research suggesting an association between authoritarianism and conspiracy theories in general (Bruder et al. 2013; Richey, 2017), but it is in line with more recent work that indicates a susceptibility of those high in RWA to conspiracy theories that conform to their world view (Wood and Gray, 2019). RWA is associated with pro-military positions, and those high in RWA are particularly sensitive to threats to both security and social order (Pratto et al. 1994; Doty et al. 1997; Terrizzi and Drews, 2005; McFarland and Mathews, 2005; Crowson et al. 2006; Jackson and Gaaertner, 2010; McFarland, 2015; Lindén et al. 2018). In this respect, a susceptibility of those high in RWA to a specific belief in the Weapons lab theory seems logical. A similar case was put forward for why those high in SDO would be specifically susceptible to the weapons lab theory; however, SDO also predicted belief in the 5G origin theory. While it might seem unexpected that this preference should be associated with conspiratorial ideation, previous research has reported a similar magnitude of association to that reported here (Bruder et al. 2013). The association can be understood if it is assumed that conspiracy accounts are more plausible for those that see the world as a naturally

hierarchical, ruthless, dog-eat-dog competition, in which people do whatever is necessary to succeed (De keersmaeker and Roets, 2019). Perhaps, then, a theory in which the UK government has risked or deliberately compromised the health of the population to either get ahead technologically or for some more nefarious purpose, seems more plausible to those high in SDO. Moreover, although this is speculative, the present study cannot rule out the possibility that the responses given by those high in SDO are expressive responses, rather than truthful responses (Richey, 2017). In other words, perhaps those high in SDO are reporting a belief in the 5G theory due to a desire to express a related opinion that they hold, rather than because they truly believe 5G causes COVID-19. Those high in SDO are particularly sensitive to the economic threat of outgroups and are motivated towards socio-economic dominance (Craig and Richeson, 2014; Ho et al. 2015); it is therefore conceivable that those high in SDO are expressing an attitude about the reliance on Chinese technology during the development of the 5G network. It is also possible that the link between 5G and China is more salient to those high in SDO, and their response here is motivated by prejudice (Duckitt, 2001; Ho et al. 2015). Alternatively, perhaps indicating belief in conspiracies in this context is related to a deeper desire to spread conspiracy beliefs, which fits with Lobato et al.'s (2020) findings. Finally, nationalism, uniquely amongst the political variables, was positively associated with both the meat market theory and also the Wuhan lab theory, perhaps reflecting the fact that both of these theories implicate the actions of Chinese citizens. The influence of political factors on the perceived plausibility of COVID-19 origin theories draws attention to the fact that conspiracy theories are to some extent social phenomena. Both conspiracy theories were associated with obtaining information about the pandemic from family and friends and tabloid newspapers.

In addition to revealing general and specific influences on theories about the origins of the COVID-19 virus, our findings also reveal the effects of these theories on willingness to take part in public health interventions. Willingness to comply with social distancing was associated with the meat market theory but negatively with the 5G theory, a finding which may reflect logical reasoning given that the 5G theory carries the implication that social distancing will not be an effective measure. Both conspiracy theories were also associated with skepticism about vaccines, perhaps reflecting the fact that these theories are both strongly associated with distrust in scientists. These observations highlight the fact that conspiracy theories are a potentially severe threat to public health.

This study has a number of strengths and limitations that must be acknowledged. The main strengths were a large, representative sample of the UK population who had provided a rich dataset encompassing social, demographic, psychological and political variables. The major limitations were that we had measurements of only three origin theories and also that the data were observational and cross-sectional, preventing proof of causal relationships between the variables. In particular, we are unable to adjudicate with our data the mediators underlying the relationship between SDO and 5G belief, although we have outlined a number of plausible theories. Nonetheless, the origin theories we discuss usefully highlight the relative dominance of motivational over cognitive factors in belief in conspiracies about the pandemic and also point to the potential toxic effects of these theories. An important implication is the need for public health agencies to consider conspiracy theories in their planning and also potential interventions that might mitigate these effects. Research suggests that individuals can be 'inoculated' against conspiracy theories, either by being pre-warned about them or by taking part in exercises, for example presented as computer games, in which they are asked to generate 'fake news' themselves (see van der Linden et al. 2020). Strategies such as these may be amenable to mass dissemination but this would require public health agencies to

include the tracking of conspiracy theories in their pandemic planning and be ready to intervene as widely as possible at the earliest opportunity.

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Figure A1: Comparison of Regression Estimates for Belief in COVID-19 Origin Theories

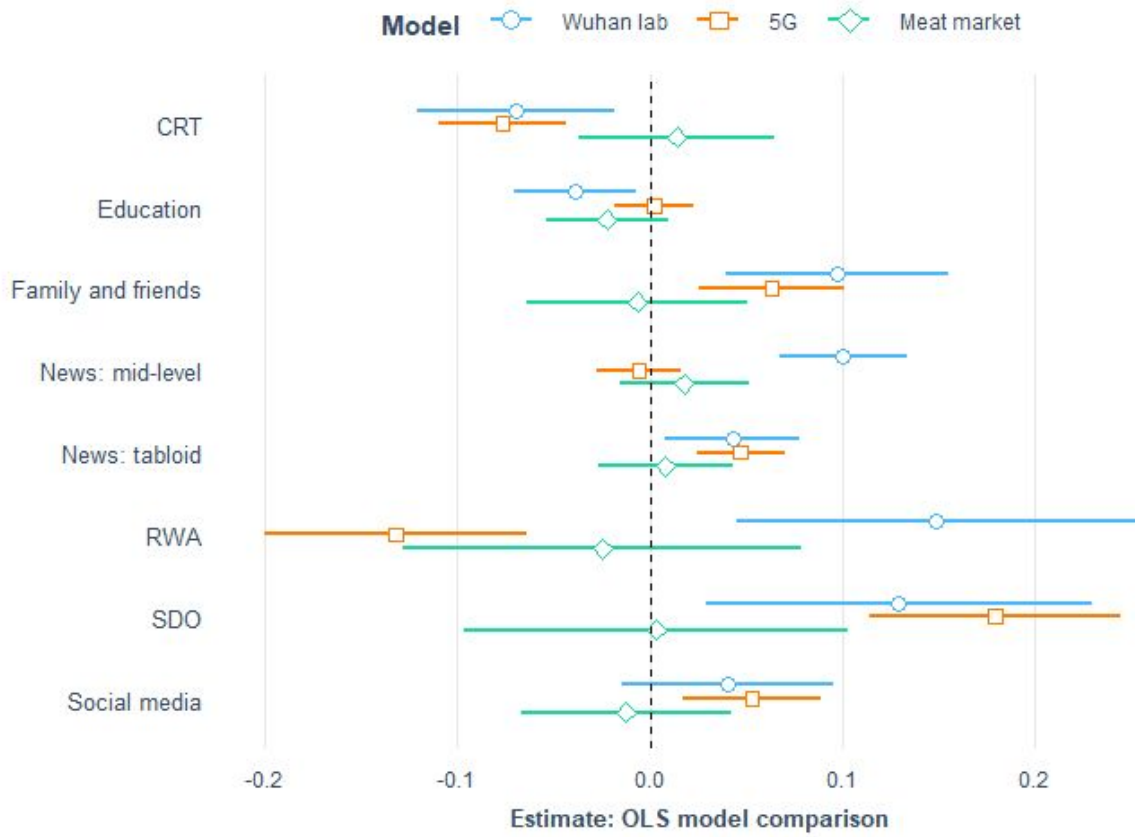| Table A1: Regression Results Origin Theory Belief					
	Dependent variable:				
	Meat market	Wuhan lab	5G	5G	5G
	1. OLS	2. OLS	3. OLS	3a. OLS (IHS)	3b. Poisson
5G belief	0.017 (0.041)	0.215 (0.041)***	--	--	--
Age	0.055 (0.042)	0.024 (0.043)	-0.030 (0.028)	0.044 (0.055)	-0.551 (0.243)*
Conspiracy ideation	0.032 (0.040)	0.253 (0.040)***	0.035 (0.026)	0.061 (0.052)	0.440 (0.230)
COVID-19 anxiety	0.130 (0.032)***	0.091 (0.032)**	-0.034 (0.021)	-0.072 (0.042)	-0.199 (0.193)
CRT	0.014 (0.026)	-0.069 (0.026)**	-0.076 (0.017)***	-0.213 (0.034)***	-0.857 (0.178)***
CRT pre-exposure	-0.008 (0.016)	0.024 (0.016)	-0.007 (0.011)	0.024 (0.021)	-0.004 (0.093)
Death anxiety	0.053 (0.043)	0.115 (0.043)**	0.166 (0.028)***	0.330 (0.055)***	1.424 (0.259)***
Distrust scientists	-0.097 (0.033)**	0.098 (0.033)**	0.141 (0.021)***	0.322 (0.042)***	0.875 (0.166)***
Education	-0.022 (0.016)	-0.039 (0.016)*	0.002 (0.011)	0.025 (0.021)	0.036 (0.093)
Elite news	0.015 (0.016)	-0.012 (0.016)	0.010 (0.011)	-0.012 (0.021)	0.039 (0.096)
Family and friends	-0.007 (0.029)	0.098 (0.030)**	0.064 (0.019)**	0.094 (0.038)*	0.400 (0.174)*
Fiscal conservatism	0.034 (0.041)	0.027 (0.041)	0.016 (0.027)	-0.014 (0.053)	-0.068 (0.219)

Gender	-0.003 (0.016)	0.012 (0.016)	-0.007 (0.010)	0.036 (0.020)	0.001 (0.090)
Income	0.048 (0.023)*	-0.028 (0.023)	-0.015 (0.015)	-0.036 (0.030)	-0.089 (0.142)
Intolerance of uncertainty	0.131 (0.047)**	-0.106 (0.048)*	-0.100 (0.031)**	-0.145 (0.062)*	-1.029 (0.270)***
Meat market belief	--	-0.119 (0.027)***	0.008 (0.018)	-0.021 (0.035)	-0.150 (0.165)
Mid-level news	0.018 (0.017)	0.101 (0.017)***	-0.006 (0.011)	-0.007 (0.022)	-0.023 (0.093)
Nationalism	0.161 (0.034)***	0.111 (0.035)**	0.021 (0.023)	0.050 (0.045)	0.021 (0.210)
Paranoia	-0.061 (0.040)	0.083 (0.040)*	0.118 (0.026)***	0.163 (0.051)**	0.871 (0.236)***
RWA	-0.025 (0.053)	0.149 (0.053)**	-0.132 (0.035)***	-0.043 (0.068)	-0.496 (0.333)
SDO	0.004 (0.051)	0.130 (0.051)*	0.180 (0.033)***	0.365 (0.066)***	1.747 (0.307)***
Social media	-0.012 (0.028)	0.041 (0.028)	0.053 (0.018)**	0.128 (0.036)***	0.241 (0.164)
Tabloid news	0.008 (0.018)	0.043 (0.018)*	0.047 (0.012)***	0.078 (0.023)***	0.350 (0.092)***
Wuhan lab belief	-0.116 (0.027)***	--	0.092 (0.017)***	0.216 (0.035)***	0.913 (0.163)***
Constant	0.414 (0.054)***	-0.073 (0.056)	-0.043 (0.036)	-0.013 (0.072)	0.789 (0.333)*
Observations	1,399	1,399	1,399	1,399	1,399
R2	0.083	0.302	0.309	0.343	
Adjusted R2	0.068	0.29	0.297	0.332	

Note:	p<0.05; p<0.01; p<0.001

	Social distancing	Vaccine acceptance	
Table A2: Public Health Measures Model Results			
	Dependent variable:		
	Social distancing	Vaccine acceptance	
	4. (OLS)	5. (multinomial logit)	
		No	Maybe
5G belief	-0.114 (0.023)***	1.940 (0.460)***	-0.069 (0.388)
Age	0.152 (0.024)***	-2.687 (0.640)***	-1.106 (0.384)**
Conspiracy ideation	0.040 (0.023)	0.096 (0.602)	0.736 (0.372)*
COVID-19 anxiety	0.041 (0.018)*	-1.893 (0.466)***	-1.295 (0.284)***
CRT	0.013 (0.015)	-0.412 (0.403)	0.181 (0.235)
CRT pre-exposure	0.005 (0.009)	0.0001 (0.228)	-0.002 (0.145)
Death anxiety	-0.095 (0.025)***	-0.281 (0.650)	0.095 (0.388)
Distrust scientists	-0.140 (0.019)***	2.430 (0.448)***	0.897 (0.297)**
Education	0.012 (0.009)	0.168 (0.235)	0.125 (0.146)
Elite news	0.009 (0.009)	0.063 (0.235)	-0.209 (0.152)
Family and friends	0.057 (0.017)***	-0.337 (0.445)	-0.013 (0.270)
Fiscal conservatism	0.009 (0.023)	-0.032 (0.584)	0.120 (0.370)
Gender	0.038 (0.009)***	0.213 (0.229)	0.288 (0.143)*
Income	0.017 (0.013)	-0.249 (0.342)	-0.763 (0.206)***
Intolerance of uncertainty	0.074 (0.027)**	-0.712 (0.686)	0.191 (0.426)
Meat market belief	0.068 (0.015)***	-1.006 (0.391)*	-0.468 (0.238)*
Mid-level news	0.001 (0.010)	0.188 (0.237)	0.065 (0.156)
Nationalism	0.034 (0.020)	-0.946 (0.493)	-0.696 (0.313)*
Paranoia	-0.046 (0.023)*	1.077 (0.577)	0.380 (0.355)

RWA	0.126 (0.030)***	0.913 (0.784)	0.529 (0.481)
SDO	-0.197 (0.029)***	0.538 (0.767)	0.204 (0.462)
Social media	-0.011 (0.016)	0.358 (0.409)	0.207 (0.250)
Tabloid news	-0.006 (0.010)	-0.237 (0.246)	-0.116 (0.162)
Wuhan lab belief	0.017 (0.015)	0.922 (0.403)*	0.085 (0.241)
Constant	0.650 (0.032)***	-1.097 (0.820)	-0.394 (0.499)
Observations	1,399		
R2	0.279		
Adjusted R2	0.267		
Akaike Inf. Crit.		2,066.48	2,066.48
Note:	p<0.05; p<0.01; p<0.001		