Psychological predictors of COVID-19 vaccination in New Zealand

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Is it possible to predict COVID-19 vaccination status prior to the existence and availability of COVID-19 vaccines? Here, we present a logistic model by regressing decisions to vaccinate in late 2021 on lagged sociodemographic, health, social, and political indicators from 2019 in a sample of New Zealand adults aged between 18 and 94 (M_{age} = 52.92, *SD* = 14.10; 62.21% women; *N* = 5324). We explain 31% of the variance in decision making across New Zealand. Significant predictors of being unvaccinated were being younger, more deprived, reporting less satisfaction with general practitioners, lower levels of neuroticism, greater levels of subjective health and meaning in life, higher distrust in science and in the police, lower satisfaction in the government, as well as political conservatism. Additional cross-sectional models specified using the same, and additional COVID-19-specific factors are also presented. These findings reveal that vaccination decisions are neither artefacts of context nor chance, but rather can be predicted in advance of the availability of vaccines.

Keywords: *COVID-19, vaccination, Aotearoa New Zealand*

Introduction

At the time of writing in December 2021, Aotearoa New Zealand had just transitioned to a 'traffic light' system for managing COVID-19 in which freedoms were introduced for vaccinated New Zealanders. This system was part of the COVID-19 protection framework, and involved three settings (red, orange, green) that communicated the settings and restrictions for individuals and businesses in the community with the aim of protecting the healthcare system and populations most at risk (New Zealand Government, 2021). The traffic light system was preceded by a significant and ongoing vaccination campaign for the last three or four months that increased the proportion of the eligible population who were fully vaccinated (two doses) to around 90% (Frost, 2021). This period also saw growing public debate regarding the vaccine, with a visible and vocal minority who expressed strong opposition for reasons including feeling coerced to take an unsafe and untested vaccine due to government mandates (Menon & Awasthi, 2021).

Our research group led the New Zealand Attitudes and Values Study (NZAVS). The NZAVS is a large-scale longitudinal panel study of attitudes and values, the most recent wave of which includes the question, 'Have you been vaccinated for COVID-19?' This question was designed and finalised for use in the questionnaire before the Delta variant was detected in New Zealand, and data collection for the current wave began following our standard annual schedule on October 1st 2021 while the country was in lockdown after Delta had been detected and during the vaccine rollout. There has been considerable research on the psychological factors that predict COVID-19 vaccine hesitancy (e.g., Gerretsen et al., 2021; Murphy et al., 2021), but little research has been done in the New Zealand context. Specifically, how much of what seems like a serious cleavage in the population reflects differences in ethnicity, trust in science and/or institutions, differences in political orientation, differences in education, income, poverty and wellbeing, differences in personality, and so forth?

In this paper, we provide a rapid turn around of self-report questionnaire data collected during the first (online-only) phase of the NZAVS data collection for the 2021/2022 wave to provide New Zealand-specific data on the psychological factors that correlate with, and might also predict, vaccine acceptance versus vaccine hesitancy (that is, delayed acceptance or refusal to vaccinate despite the availability of services; Dubé et al., 2014). Frameworks to understand antecedents of vaccination acceptance and uptake exist, such as the 5C model (Betsch et al., 2018) and the Behavioural and Social Drivers (BeSD) of Vaccination framework (Shapiro et al., 2021) adapted from the Increasing Vaccination Model (Brewer et al., 2017).

The 5C model (Betsch et al., 2018) proposes five psychological antecedents of vaccine acceptance: confidence (i.e., trust in the safety of vaccines and the system that delivers them), constraints (i.e., structural and

psychological barriers), complacency (i.e., not perceiving diseases as high risk), calculation (i.e., engagement with information searching) and collective responsibility (i.e., willingness to protect others). A recent cross-sectional study of eight nations during late 2020 to early 2021 that organised predictors consistent with the 5C model found COVID-19 vaccine acceptance was significantly associated with lack of confidence (e.g., distrust in authorities and scientists, and conspiratorial thinking), constraints (e.g., compliance with recommendations from health authorities), complacency (e.g., younger age, and lack of concern about COVID-19), as well as collective responsibility (e.g., support for restrictions ; Lindholt et al., 2021).

The BeSD framework (Shapiro et al., 2021) proposes four domains that lead to the uptake of recommended vaccines: thinking and feeling (i.e., cognitive and emotional responses to vaccines and vaccine-preventable diseases), social processes (i.e., social norms about vaccination), motivation (i.e., intention, willingness, and hesitancy to get vaccinated), and practical issues (i.e., personal experiences related to getting vaccinated including barriers). A main point of distinction from the 5C model is that it proposes that vaccination intention and hesitancy are motivational states that lead to vaccination acceptance or uptake, but can be impeded or facilitated by practical issues. As our expertise lies in understanding human behaviour, our goal here is not to argue whether people should or should not receive the vaccination, but to simply present, as objectively as we can, our findings on the psychological and demographic factors that predict vaccination status circa October-November 2021 in New Zealand.

The New Zealand Immunisation Schedule provides a series of publicly funded vaccines for babies, children, adolescents, and adults (Ministry of Health, 2021b). At present, the COVID-19 vaccine is not part of this schedule but is freely available to anyone in New Zealand aged 12 and over. Prior to the availability of COVID-19 vaccines in New Zealand in mid-2020, 74% of the adults aged 18 and over indicated a willingness to get vaccinated (Thaker & Menon, 2020). Shortly after the staggered start of New Zealand's Immunisation Programme in early 2021 (which prioritised people based on age and health), a nationwide survey indicated willingness to vaccinate against COVID-19 was hovering at similar levels (71%; Prickett et al., 2021). At the time of writing, levels of first-dose vaccination were approaching 94% of the eligible population (Ministry of Health, 2021a). Thus, a significant proportion of those who were hesitant towards a then-hypothetical vaccine have now accepted vaccination, while up to 6% are actively or passively vaccine hesitant.

Although it is encouraging to see the translation from intention to vaccination, vaccination uptake is not uniform, with diversity in coverage and uptake across district health boards. Further, while there is a small and growing literature examining general vaccination attitudes in Aotearoa (see for example, Lee et al., 2017; Lee & Sibley, 2020a, 2020b) there is limited research examining COVID-specific vaccination intention, let alone vaccination status, beyond general sociodemographic factors such as age, gender, education, and ethnicity (Thaker & Floyd, 2021). Therefore, we examined prospective and concurrent factors of COVID-19 vaccination status in this paper using the NZAVS survey.

Sociodemographic and health-related factors.

Sociodemographic factors that include practical issues or constraints are associated with hesitancy towards childhood vaccination in Aotearoa New Zealand. One NZAVS-based study indicated that attitudes towards vaccination were associated with perceptions of general practitioners (GP), and that this varied depending on ethnic background (Lee & Sibley, 2020a). Among both Pākehā and Māori, weaker vaccination intentions were associated with poorer access to healthcare and decreased satisfaction with GPs. Less formal education among Pākehā and religiosity among Māori were also associated with lower perceptions of vaccine safety. For Pacific peoples, not having a partner and being religious were associated with lower endorsement of vaccine safety. For Asian peoples, being older, female, less educated, and perceiving lesser GP cultural respect were associated with lower vaccine safety agreement.

Prior analysis of past NZAVS data implicates several other background factors or social processes, as well as other non-sociodemographic factors including complacency, in reduced vaccine confidence and intention. As well as lower educational attainment, living rurally, being in a relationship, being unemployed, and being a parent was positively associated with lower confidence in childhood vaccinations among adults (Lee et al., 2017). This analysis also reported that higher subjective health satisfaction was associated with lower vaccine confidence, given that greater engagement with preventative health behaviours tends to be associated with increased optimism about future health problems (Ingledew & Brunning, 1999). Indeed, an individual's perception of the important factors that govern their health or illness, known as health locus of control, not only predicts general health-supporting behaviours (e.g., Norman et al., 1998; Zindler-Wernet et al., 1987) but also plays a role in adult attitudes to childhood vaccination (e.g., Amit Aharon et al., 2018). A recent study found that health locus of control mediated the negative association between religiosity and COVID-19 vaccination intention (Olagoke et al., 2021). Finally, we examined hours spent on the internet, social media, and news to reflect engagement with information searching (vaccine calculation).

Psychological factors

To date, various psychological factors consistent with the BeSD of thinking/feeling and social processes (Shapiro et al., 2021) have been found to correlate with vaccine acceptance/hesitancy. For example, weaker identification with one's local community was associated with decreased willingness to get vaccinated against COVID-19 (Marinthe et al., 2020; Wakefield & Khauser, 2021). While some suggest that subjective wellbeing (e.g., meaning in life and satisfaction with life) should be positively associated with vaccination intention given its association with health preventative behaviours (e.g., Mulkana & Hailey, 2001), findings are mixed; some studies have shown such a relationship (e.g., Bilge et al.,

2021; Kilic et al., 2021), while others have indicated inconsistent or non-significant findings (e.g., Bock et al., 2017; Debus & Tosun, 2021). In New Zealand, individuals lower on Conscientiousness and Agreeableness, but higher on Openness to Experience, expressed greater hesitancy about childhood vaccinations (Lee et al., 2017). An examination of the psychological roots of anti-vaccination attitudes across 24 nations found that there was a small to moderate association with self-reported feelings of disgust in New Zealand (Hornsey et al., 2018). Taken together, the literature indicates there are likely to be several psychological factors that span identification, subjective wellbeing, and individual difference factors including personality that distinguish those who are hesitant to a COVID-19 vaccine from those who are not.

Trust and political factors

The rapid development of a COVID-19 vaccine in under a year is a remarkable scientific achievement, as vaccine development is typically measured in decades (Graham, 2020). In addition to this scientific effort is the testing, regulation, and supply of vaccines involving pharmaceutical companies, health agencies, and governments. Concerns around perceptions of rushed development and emergency use authorisation mechanisms to fast-track the vaccine may have led some individuals to distrust politicians and governments (Limaye et al., 2021), and fuelled conspiracy theories around the science and involvement of pharmaceutical and government authorities. Research has shown that unwillingness to receive a COVID-19 vaccine was associated with decreased trust in science (Agley et al., 2021), decreased trust in medical and scientific experts and greater self-reported conservative ideology (Kerr et al., 2021). In addition, greater belief in both general (Hughes & Machan, 2021) and specific (Hornsey et al., 2021) COVID-19 conspiracy theories, were associated with unwillingness to receive a COVID-19 vaccine. These and additional trust factors seem relevant to New Zealand during the COVID-19 pandemic, as trust in police, politicians, and satisfaction with the government increased post-lockdown in early 2020 (Sibley et al., 2020). This highlights the importance of institutional trust and political factors in how people respond to the ongoing COVID-19 pandemic, including attitudes toward vaccination, that are consistent with vaccine confidence (5C model; Betsch et al., 2018) and what people think and feel about vaccines and vaccine preventable diseases (BeSD model; Shapiro et al., 2021).

This research.

The present research explored the effects of sociodemographic, health, social, and political predictors prospectively from 2019 on current 2021 (October-November) self-reported vaccination status. Furthermore, we will examine the associations between these predictors concurrently using 2021 responses, with a final model including additional COVID-19-specific predictors. To these ends, we present a series of three logistic regression models each predicting vaccination status. Because the NZAVS is a longitudinal panel study that surveys the same people each year, we have data on people's attitudes and personality in the past, not just at the current point in time. Our first model uses people's scores from two years ago (their support for the government, their personality scores, their attitudes, the socioeconomic status deprivation of their neighbourhood) to predict their vaccination status now, two years after those measures were collected. This model is useful because it provides insight into the factors that predicted people's vaccination behaviour years into the future, well before the vaccination was even available, and before any furore about COVID-19 vaccination started. In this sense, specific factors in the model that predict future vaccination behaviour may be thought of as prospective predictors that help to forecast future vaccination behaviour. A notable advantage of this approach is that pre-COVID-19 indicators in the lagged model cannot be due to COVID-19. As such, this approach avoids what is known as post-treatment confounding, or conditioning on the effect of an exposure, which is known to bias inference (King, 2010)

The second model directly replicates the first, using identical measures from the same survey and also assesses vaccination status. This model provides information on the unique association (or correlation) between different psychological and demographic factors and vaccination status at the same point in time. However, it would be a mistake to assume that a correlation between government satisfaction and vaccination status at the same point in time implies that low satisfaction predicted hesitancy because people who are vaccine hesitant may have become less satisfied with the government—a government that has begun implementing vaccine mandates—over time. The third model extends upon this second model to also include additional attitude measures included at the same point in time that were relevant specifically to COVID-19 (and, hence, were not included two years previously).

METHODS

Participants and Procedure

The NZAVS is a longitudinal panel study of health outcomes, personality, and social attitudes that uses a national probability sample of New Zealand adults. The University of Auckland Human Participants Ethics Committee approved all procedures, and participants gave informed consent. The present study uses data for participants who participated at both Time 11 (2019, prior to the emergence of COVID-19) and Time 13 (October-November, 2021). We focus on data from the 5,324 participants aged between 18 and 94 (M_{age} = 52.92, *SD* = 14.10; 62.21% women) who provided responses to our variables of interest as part of the larger omnibus survey. Additional details about the sample, procedure, and retention of participants are available on the NZAVS website (Sibley, 2021).

Materials

All variables and descriptive statistics are presented in Table 1.

Sociodemographic factors: We assessed participants' age, gender education level, decile-ranked level of deprivation (Atkinson et al., 2013), ethnicity, employment status, parental status, partner status, and identification with religion (Hoverd & Sibley, 2010). Participants were

also asked to report weekly hours spent using the internet, watching or reading the news, and on social media (Sibley et al., 2011).

Health-related factors: Participants were asked whether they had a GP, to report their level of access to health care when needed (Lee & Sibley, 2017), their level of satisfaction with their family doctor/GP, cultural respect of GP, and cultural similarity of GP (Lee & Sibley, 2020a). They also responded to items from the short-form subjective health scale (Ware & Sherbourne, 1992). At Time 13, participants also reported their health locus of control (Wallston et al., 1978).

Psychological factors: Measures included sense of community (Sengupta et al., 2013), felt belongingness (Hagerty & Patusky, 1995), meaning in life (Steger et al., 2006), and life satisfaction (Diener et al., 1985). Measures assessing the International Personality Item Pool factors of extraversion, agreeableness, conscientiousness, neuroticism, openness to experience, and honesty-humility were assessed using the Mini-IPIP6 (Sibley et al., 2011). At Time 13, participants also reported their disgust sensitivity (Olatunji et al., 2007)

Trust and political attitudes: Participants reported their level of trust in science (Hartman et al., 2017; Nisbet et al., 2015), trust in the police (Tyler, 2005), and in politicians (Sibley et al., 2020). They also reported their political orientation (Jost, 2006), political identity centrality (Satherley et al., 2020), level of political efficacy (Paulhus & Van Selst, 1990), and satisfaction with the New Zealand government (Tiliouine et al., 2006). At Time 13, participants also reported belief in conspiracy theories (Lantian et al., 2016), and trust in the New Zealand government to make sensible decisions about how to best manage COVID-19.

COVID-19 scepticism: Two additional items relating to COVID-19 scepticism were used only at Time 13: the belief that the health risks associated with COVID-19 were exaggerated, and that COVID-19 was created in a laboratory.

Statistical Analyses

Data were analysed using Mplus version 8.7 (Muthén & Muthén, 2017). We conducted several logistic regressions with maximum likelihood estimation predicting self-reported non-vaccination status at Time 13 both prospectively and concurrently from Time 11 and Time 13, respectively. In Study 1a, we regressed non-vaccination status on demographic, health, social, and political variables from Time 11. In Study 1b, we regressed non-vaccination status on demographic, health, social, and political variables from Time 13, with the final model including additional COVID-19-specific variables only available at Time 13.

We applied a stringent alpha level ($p < .01$), and models report unstandardised effects with frequentist 99% Confidence Intervals. This stringent alpha level has the advantage of reducing the risk of Type I error (false positive), while the large sample size means that the risk of Type II error (false negative) is low for any nontrivial effect size even with a lowered alpha level. A sensitivity analysis delivered 99% power to detect a small effect size $f^2 > .012$ in the sample specifying a multiple regression with 43 predictors. Our results are interpreted using effect size conventions (Cohen, 1992). Missing data for exogenous variables were estimated using Rubin's (1978) procedure for multiple imputation with parameter estimates averaged over 100 datasets (thinned using every 200th iteration). Syntax for all analyses is available on the Open Science Framework https://osf.io/75snb/.

RESULTS

Descriptive statistics for all variables of interest for Study 1a and 1b are presented in Table 1 (see Supplementary Tables S1 and S2 for zero-order correlations between all predictors for Study 1a and 1b, respectively). Of the participants who completed the survey in 2019 and before November 2021 (n = 5324), 93.9% reported being vaccinated for COVID-19 (n = 4997) with the remaining 6.1% indicating they had not (n = 327). At this stage in New Zealand's vaccine rollout, roughly 75% of the eligible population had received both doses of the COVID-19 vaccine (Radio New Zealand, 2021a).

Study 1a – predicting 2021 unvaccinated status from 2019 social, health, and political predictors

Results from Model 1 revealed that being younger (odds ratio 0.98 [99% CI 0.97–1.00]) and more deprived (1.08 [1.02–1.15]) were significantly associated with being unvaccinated for COVID-19 approximately 2 years later. Of the personality traits assessed, only lower levels of neuroticism (0.84 [0.71–0.98]) were significantly associated with the odds of being unvaccinated. Indicators of health and wellbeing also predicted vaccination status, as being less satisfied with one's GP (0.87 [0.76–0.99]), and both higher levels of subjective health (1.18 [1.01–1.38]) and meaning in life (1.21 [1.00–1.46]) were associated with the odds of being unvaccinated. Finally, being more politically conservative (1.19 [1.04–1.36]), less satisfied with government (0.90 [0.84–0.96]), having lower trust in the police (0.80 [0.70–0.92]) and in science (0.65 [0.57–0.74]) were significantly associated with being unvaccinated. Overall, this model explained 30.9% of the variance in vaccination status.

Study 1b – associations between 2021 unvaccinated status and social, health, and political predictors

Results from Model 2 showed that once more, being younger (odds ratio 0.98 [99% CI 0.96–1.00]) and more deprived (1.08 [1.01–1.15]) were significantly associated with being unvaccinated for COVID-19. Of the personality traits assessed, only lower levels of neuroticism (0.74 [0.61–0.89]) were significantly associated with the odds of being unvaccinated. The only health and wellbeing indicator associated with the odds of being unvaccinated was higher levels of subjective health (1.21 [1.02–1.44]). Less satisfaction with the government (0.77 [0.71–0.85]) and having lower trust in science (0.60 [0.52–0.69]) were significantly associated with being un--vaccinated for COVID-19 in 2021. In addition, not having a GP (0.52 [0.29–0.93]), reporting a lower sense of belonging (0.75 [0.62–0.91]), and lower trust in politicians (0.70 [0.59–0.82]) were significantly associated with being unvaccinated. This model explained 51.2% of the variance in vaccination status.

Table 1. Descriptive Statistics and Items

	2019 Descriptive Statistics				2021 Descriptive Statistics			
	Range	*M*	*SD*	*n*	*M*	*SD*	*n*	*Items*
COVID-19 Unvaccinated	0-1	-	-	-	.939	-	5324	"Have you been vaccinated for COVID-19?"
Age	18-94	52.92	(14.096)	5324	54.87	(14.054)	5324	"What is your age?"
Gender	0-1	.378	-	5285	0.379	-	5324	"What is your gender?" (open-ended)
Education	1-10	6.060	(2.559)	5239	5.934	(2.652)	5297	"What is your highest level of qualification?"
NZ Dep	1-10	4.649	(2.705)	5304	4.635	(2.713)	5319	NZ Deprivation Index
Ethnicity Asian	0-1	.033	-	5324	0.036	-	5324	"Which ethnic group(s) do you belong to?" (open-ended)
Ethnicity Māori	0-1	.084	-	5324	0.089	-	5324	"Which ethnic group(s) do you belong to?" (open-ended)
Ethnicity Pacific	0-1	.024	-	5324	0.028	-	5324	"Which ethnic group(s) do you belong to?" (open-ended)
Employed	0-1	.749	-	5292	0.733	-	5277	"Are you currently employed? (this includes self-employment or casual work)"
Parent	0-1	.705	-	5320	0.726	-	5324	Based on reporting having one of more children.
Partner	0-1	.736	-	5261	0.729	-	5231	"What is your relationship status? (e.g., single, married, de-facto, civil union, widowed, living together, etc.)"
Religious	0-1	.296	-	5264	0.274	-	5278	"Do you identify with a religion and/or spiritual group?"
Hours Internet	0-168	16.382	(16.699)	5279	20.120	(19.714)	5132	Hours spent … using the internet (in total)
Hours News	0-168	4.816	(5.237)	5279	5.436	(4.908)	5094	Hours spent … watching/reading the news
Hours Social Media	0-168	4.339	(6.749)	5279	5.154	(8.199)	5090	Hours spent … using social media (e.g., Facebook)
Health Care Access	0-10	7.953	(2.192)	5315	7.709	(2.393)	5311	Your access to health care when you need it (e.g., doctor, GP).
GP Have	0-1	.925	-	5287	0.932	-	5304	"Do you have a regular family doctor/GP?"
GP Cultural Respect	1-7	6.066	(1.195)	4963	5.978	(1.287)	5025	"Does your doctor/GP respect your cultural background when you are discussing health issues with them?"
GP Cultural Similarity	1-7	4.981	(1.873)	4994	4.872	(1.935)	5058	"Do you think your doctor/GP shares a similar cultural background to you?"
GP Satisfaction	1-7	5.642	(1.413)	5010	5.603	(1.481)	5068	"Are you satisfied with the service and care you receive from your family doctor/GP?"
SF Subjective Health Scale	1-7	4.998	(1.164)	5324	4.920	(1.183)	5323	(3 items: Ware & Sherbourne, 1992) E.g., "In general, would you say your health is..." (T11 α=.63; T13 α=.64)
Sense of Community	1-7	4.178	(1.659)	5307	4.286	(1.626)	5220	(Sengupta et al., 2013) "I feel a sense of community with others in my local neighbourhood."
Belonging	1-7	5.064	(1.121)	5306	5.061	(1.130)	5314	(3 items: Hagerty & Patusky, 1995) E.g., "Know that people in my life accept and value me." "Feel like an outsider." (T11 α=.62; T13 α=.61)
Life Meaning	1-7	5.456	(1.255)	5322	5.425	(1.266)	5300	(2 items: Steger et al., 2006) E.g., "My life has a clear sense of purpose." (T11 ρ=.64; T13 ρ =.65)
Life Satisfaction	1-7	5.315	(1.236)	5312	5.182	(1.281)	5322	(2 items: Diener et al., 1985) "I am satisfied with my life." "In most ways my life is close to ideal." (T11 ρ=.65; T13 ρ =.65)
Political Identity Centrality	1-7	4.326	(1.812)	5222	4.350	(1.774)	5210	(Satherley et al., 2020) "How important are your political beliefs to how you see yourself?"
Political Efficacy	1-7	4.484	(1.257)	5324	4.307	(1.314)	5311	(3 items: Paulhus & Van Selst, 1990) E.g., "The average citizen can have an influence on government decisions." (T11 α=.64; T13 α=.67)
Political Orientation	1-7	3.374	(1.424)	5250	4.307	(1.314)	5311	"Please rate how politically liberal versus conservative you see yourself as being."
Satisfaction Government	0-10	5.398	(2.832)	5315	4.981	(3.208)	5319	(Tiliouine et al., 2006) "The performance of the current New Zealand government."
Politician Trust	1-7	3.695	(1.463)	5282	3.819	(1.602)	5202	(Sibley et al., 2020) "Politicians in New Zealand can generally be trusted."
Police Trust	1-7	4.554	(1.288)	5323	4.415	(1.330)	5314	(3 items: Tyler, 2005) E.g., "People's basic rights are well protected by the New Zealand Police." "There are many things about the New Zealand Police and its policies that need to be changed." (T11 α=.78; T13 α=.78)
Science Trust	1-7	5.606	(1.235)	5310	5.873	(1.202)	5294	(2 items: Hartman et al.., 2017) E.g., "I have a high degree of confidence in the scientific community." (T11 ρ=.57; T13 ρ =.58)
Extraversion	1-7	3.755	(1.233)	5306	3.698	(1.231)	5321	(4 items: Sibley et al.., 2011) E.g., "Am the life of the party." "Don't talk a lot." "Keep in the background." (T11 α=.78; T13 α=.77)
Agreeableness	1-7	5.389	(0.991)	5306	5.361	(1.019)	5323	(4 items: Sibley et al.., 2011) E.g., "Sympathize with others' feelings." "Am not interested in other people's problems." (T11 α=.73; T13 α=.74)
Conscientiousness	1-7	5.148	(1.076)	5306	5.137	(1.074)	5322	(4 items: Sibley et al.., 2011) E.g., "Get chores done right away." "Like order." "Make a mess of things." (T11 α=.71; T13 α=.70)
Neuroticism	1-7	3.484	(1.203)	5306	3.454	(1.225)	5323	(4 items: Sibley et al.., 2011) E.g., "Have frequent mood swings." "Am relaxed most of the time." (T11 α=.77; T13 α=.77)
Openness	1-7	5.110	(1.114)	5306	5.101	(1.113)	5318	(4 items: Sibley et al.., 2011) E.g., "Have a vivid imagination." "Have difficulty understanding abstract ideas." (T11 α=.71; T13 α=.70)
Humility	1-7	5.633	(1.114)	5306	5.696	(1.110)	5323	(4 items: Sibley et al.., 2011) E.g., "Feel entitled to more of everything." "Deserve more things in life." (T11 α=.75; T13 α=.75)
Conspiracy Beliefs	1-7	-	-	-	3.922	(1.744)	5207	"I think that the official version of major world events given by authorities often hides the truth."
COVID Exaggerated	1-7	-	-	-	2.417	(1.949)	5195	"I think that health risks associated with COVID-19 have been wildly exaggerated."
COVID Lab	1-7	-	-	-	3.445	(1.993)	5252	"I think it is quite likely that COVID-19 was created in a laboratory."
COVID Trust Govt.	1-7	-	-	-	4.648	(1.981)	5214	"I trust the Government to make sensible decisions about how to best manage COVID-19 in New Zealand."
Disgust Sensitivity	1-7	-	-	-	4.089	(1.823)	5205	(Olatunji et al., 2007) "Bad smells, messes, dead animals and rotten food absolutely disgust me."
Health Locus of Control	1-7	-	-	-	4.901	(1.170)	5323	(3 items: Wallston et al., 1978) E.g.., "If I take care of myself, I can avoid illness." "I am in control of my health." (T13 α=.68)

Table 2. Logistic Regression Predicting Unvaccinated Status

	Model using 2019 predictors of unvaccinated status in 2021					Model using equivalent 2021 (October-November) predictors of concurrent unvaccinated status in 2021					Model using extended set of 2021 (October -November) predictors of concurrent unvaccinated status in 2021				
	B	*p*	*B* 99% CI	*Odds Ratio*	*OR 99% CI*	*B*	*p*	*B* 99% CI	*Odds Ratio*	*OR 99% CI*	*B*	*p*	*B* 99% CI	*Odds Ratio*	*OR 99% CI*
(Intercept)	**1.495**	**.110**	**-0.917, 3.907**	-	-	**4.146**	**<.001**	**1.399, 6.892**	-	-	**0.905**	**.445**	**-2.150, 3.961**	-	-
Age	**-0.016**	**.007**	**-0.031, -0.001**	**0.984**	**0.969, 0.999**	**-0.020**	**.004**	**-0.039, -0.002**	**0.980**	**0.962, 0.998**	**-0.020**	**.005**	**-0.038, -0.001**	**0.981**	**0.963, 0.999**
Gender	0.043	.769	-0.331, 0.416	1.043	0.719, 1.515	-0.091	.567	-0.501, 0.319	0.913	0.606, 1.375	-0.224	.185	-0.661, 0.212	0.799	0.517, 1.236
Education	-0.029	.273	-0.096, 0.039	0.972	0.908, 1.040	-0.015	.586	-0.084, 0.054	0.986	0.920, 1.056	0.007	.802	-0.069, 0.084	1.007	0.933, 1.088
NZ Dep	**0.080**	**.001**	**0.019, 0.141**	**1.084**	**1.019, 1.152**	**0.075**	**.005**	**0.006, 0.144**	**1.078**	**1.006, 1.155**	**0.085**	**.002**	**0.013, 0.157**	**1.088**	**1.013, 1.170**
Ethnicity Asian	-0.346	.337	-1.275, 0.583	0.707	0.279, 1.791	-0.081	.836	-1.092, 0.930	0.922	0.335, 2.534	0.008	.984	-1.009, 1.024	1.008	0.365, 2.785
Ethnicity Maori	-0.197	.358	-0.750, 0.356	0.821	0.472, 1.427	-0.033	.888	-0.626, 0.561	0.968	0.535, 1.752	0.089	.709	-0.526, 0.705	1.093	0.591, 2.024
Ethnicity Pacific	-0.823	.078	-2.025, 0.380	0.439	0.132, 1.462	-0.051	.908	-1.183, 1.081	0.950	0.306, 2.948	-0.193	.633	-1.231, 0.846	0.825	0.292, 2.331
Employed	-0.309	.037	-0.690, 0.072	0.734	0.502, 1.075	-0.311	.059	-0.737, 0.114	0.732	0.479, 1.121	-0.314	.074	-0.766, 0.138	0.731	0.465, 1.148
Parent	0.422	.015	-0.025, 0.869	1.525	0.975, 2.385	0.330	.122	-0.220, 0.880	1.391	0.802, 2.410	0.229	.258	-0.294, 0.752	1.258	0.746, 2.122
Partner	-0.319	.031	-0.698, 0.061	0.727	0.498, 1.063	-0.324	.057	-0.762, 0.115	0.723	0.467, 1.122	-0.302	.091	-0.761, 0.157	0.740	0.467, 1.170
Religious	0.237	.087	-0.120, 0.593	1.267	0.887, 1.810	0.188	.223	-0.210, 0.587	1.207	0.810, 1.798	0.271	.095	-0.147, 0.690	1.311	0.863, 1.993
Hours Internet	0.006	.124	-0.004, 0.016	1.006	0.996, 1.016	-0.004	.258	-0.014, 0.005	0.996	0.986, 1.005	-0.004	.357	-0.016, 0.007	0.996	0.985, 1.007
Hours News	-0.022	.155	-0.063, 0.018	0.978	0.939, 1.018	-0.005	.766	-0.052, 0.041	0.995	0.950, 1.042	0.001	.972	-0.038, 0.039	1.001	0.963, 1.040
Hours Social Media	0.004	.643	-0.019, 0.027	1.004	0.981, 1.028	0.010	.127	-0.007, 0.027	1.010	0.993, 1.027	0.003	.712	-0.021, 0.028	1.003	0.979, 1.028
Health Care Access	-0.014	.652	-0.091, 0.064	0.987	0.913, 1.066	-0.012	.706	-0.094, 0.070	0.988	0.910, 1.072	-0.009	.771	-0.093, 0.074	0.991	0.911, 1.077
GP Have	-0.421	.035	-0.934, 0.093	0.657	0.393, 1.097	**-0.646**	**.004**	**-1.222, -0.071**	**0.524**	**0.295, 0.932**	-0.526	.023	-1.120, 0.069	0.591	0.326, 1.071
GP Cultural Respect	-0.058	.313	-0.206, 0.090	0.944	0.814, 1.094	-0.114	.052	-0.264, 0.037	0.893	0.768, 1.038	-0.138	.024	-0.297, 0.020	0.871	0.743, 1.020
GP Cultural Similarity	0.008	.824	-0.088, 0.105	1.008	0.915, 1.111	0.025	.548	-0.082, 0.132	1.025	0.921, 1.141	0.042	.343	-0.072, 0.156	1.043	0.931, 1.168
GP Satisfaction	**-0.137**	**.007**	**-0.268, -0.007**	**0.872**	**0.765, 0.993**	-0.076	.166	-0.216, 0.065	0.927	0.805, 1.067	-0.076	.199	-0.229, 0.076	0.927	0.796, 1.079
SF Subjective Health Scale	**0.165**	**.006**	**0.009, 0.322**	**1.180**	**1.009, 1.379**	**0.191**	**.004**	**0.019, 0.363**	**1.210**	**1.019, 1.437**	0.127	.097	-0.070, 0.325	1.136	0.932, 1.384
Sense of Community	0.022	.612	-0.088, 0.131	1.022	0.916, 1.140	0.123	.015	-0.007, 0.253	1.131	0.993, 1.287	0.121	.021	-0.014, 0.257	1.129	0.986, 1.293
Belonging	-0.183	.013	-0.372, 0.006	0.833	0.689, 1.006	**-0.291**	**<.001**	**-0.482, -0.099**	**0.748**	**0.617, 0.906**	**-0.237**	**.003**	**-0.445, -0.029**	**0.789**	**0.641, 0.972**
Life Meaning	**0.189**	**.010**	**0.000, 0.377**	**1.208**	**1.000, 1.458**	0.135	.092	-0.071, 0.340	1.144	0.931, 1.405	0.066	.431	-0.150, 0.282	1.068	0.861, 1.325
Life Satisfaction	0.041	.576	-0.149, 0.231	1.042	0.862, 1.260	-0.114	.134	-0.311, 0.082	0.892	0.732, 1.086	-0.108	.192	-0.322, 0.105	0.897	0.725, 1.111
Political Identity Centrality	0.006	.878	-0.087, 0.099	1.006	0.916, 1.104	-0.018	.662	-0.123, 0.087	0.982	0.884, 1.091	-0.019	.659	-0.127, 0.090	0.982	0.881, 1.094
Political Efficacy	-0.053	.323	-0.189, 0.084	0.949	0.827, 1.088	0.088	.129	-0.061, 0.237	1.092	0.941, 1.267	0.100	.088	-0.051, 0.251	1.105	0.950, 1.285
Political Conservatism	**0.170**	**.001**	**0.034, 0.306**	**1.186**	**1.035, 1.358**	0.063	.272	-0.085, 0.211	1.065	0.919, 1.235	0.019	.759	-0.143, 0.182	1.020	0.867, 1.199
Satisfaction Government	**-0.109**	**<.001**	**-0.175, -0.043**	**0.896**	**0.839, 0.958**	**-0.256**	**<.001**	**-0.345, -0.167**	**0.774**	**0.708, 0.846**	0.043	.396	-0.087, 0.172	1.044	0.917, 1.187
Politician Trust	-0.127	.016	-0.263, 0.008	0.881	0.769, 1.008	**-0.360**	**<.001**	**-0.524, -0.196**	**0.698**	**0.592, 0.822**	**-0.206**	**.004**	**-0.393, -0.020**	**0.813**	**0.675, 0.980**
Police Trust	**-0.218**	**<.001**	**-0.351, -0.085**	**0.804**	**0.704, 0.919**	-0.111	.037	-0.247, 0.026	0.895	0.781, 1.026	-0.057	.322	-0.206, 0.092	0.944	0.814, 1.096
Science Trust	**-0.434**	**<.001**	**-0.560, -0.308**	**0.648**	**0.571, 0.735**	**-0.514**	**<.001**	**-0.650, -0.378**	**0.598**	**0.522, 0.685**	**-0.372**	**<.001**	**-0.517, -0.227**	**0.690**	**0.596, 0.797**
Extraversion	-0.024	.674	-0.172, 0.124	0.976	0.842, 1.132	-0.062	.300	-0.217, 0.092	0.940	0.805, 1.097	-0.106	.116	-0.281, 0.068	0.899	0.755, 1.070
Agreeableness	0.080	.258	-0.102, 0.261	1.083	0.903, 1.298	0.120	.102	-0.069, 0.308	1.127	0.934, 1.360	0.148	.060	-0.054, 0.350	1.159	0.947, 1.418
Conscientiousness	-0.124	.045	-0.283, 0.035	0.884	0.754, 1.036	-0.124	.082	-0.307, 0.059	0.884	0.736, 1.061	-0.138	.065	-0.330, 0.054	0.871	0.719, 1.056
Neuroticism	**-0.174**	**.007**	**-0.339, -0.009**	**0.840**	**0.712, 0.991**	**-0.302**	**<.001**	**-0.488, -0.117**	**0.739**	**0.614, 0.890**	**-0.299**	**<.001**	**-0.501, -0.097**	**0.742**	**0.606, 0.908**
Openness	0.157	.012	-0.005, 0.319	1.170	0.995, 1.376	0.122	.064	-0.048, 0.291	1.129	0.953, 1.338	0.136	.058	-0.049, 0.320	1.146	0.952, 1.378
Honesty-Humility	0.082	.182	-0.076, 0.239	1.085	0.927, 1.270	0.119	.084	-0.058, 0.295	1.126	0.943, 1.344	**0.168**	**.002**	**-0.018, 0.354**	**1.183**	**0.983, 1.424**
Conspiracy Beliefs	-	-	-	-	-	-	-	-	-	-	0.110	.057	-0.039, 0.259	1.116	0.962, 1.296
COVID Exaggerated	-	-	-	-	-	-	-	-	-	-	**0.183**	**<.001**	**0.072, 0.294**	**1.201**	**1.074, 1.341**
COVID Lab	-	-	-	-	-	-	-	-	-	-	**0.249**	**<.001**	**0.151, 0.347**	**1.283**	**1.163, 1.415**
COVID Trust. Govt	-	-	-	-	-	-	-	-	-	-	**-0.463**	**<.001**	**-0.665, -0.261**	**0.629**	**0.514, 0.770**
Disgust Sensitivity	-	-	-	-	-	-	-	-	-	-	0.019	.647	-0.088, 0.126	1.019	0.916, 1.134
Health Locus of Control	-	-	-	-	-	-	-	-	-	-	0.039	.623	-0.165, 0.242	1.039	0.848, 1.274
			R^2 = .309; Log Likelihood = -990.885					R^2 = .512; Log Likelihood = -771.752					R^2 = .559; Log Likelihood = -691.019		

Note. Vaccination status is coded as 1 = Unvaccinated, 0 = Vaccinated. Gender is coded as 0 = Women, 1 = Men. Education is coded as (11-unit ordinal rank). NZ Dep (SES) is coded as decile ranked level of deprivation (1 = least deprived, 10 = most deprived). Ethnicity, Employed, Parent, Parent, Partner, Religion, and GP Have is coded as 1 = indicated.

In the final model (i.e., Model 3), we added new variables measured in 2021. Results revealed that being younger (odds ratio 0.98 [99% CI 0.96–1.00]) and more deprived (1.08 [1.01–1.17]) were significantly associated with being unvaccinated. Of the personality traits, lower levels of neuroticism (0.74 [0.61–0.91]) and higher levels of honesty-humility (1.18 [0.98–1.42]) were significantly associated with being unvaccinated. Also, reporting a lower sense of belonging (0.79 [0.64–0.97]), lower trust in politicians (0.81 [0.67–0.98]) and in science (0.69 [0.60–0.80]) were associated with being unvaccinated. Furthermore, those with greater belief that COVID-19 was exaggerated (1.20 [1.07–1.34]) or was due to a lab leak (1.28 [1.16–1.42]), and reporting lower levels of trust in the New Zealand government response to COVID-19 (0.63 [0.51–0.77]) were significantly less likely to be vaccinated. Overall, this model explained 55.9% of the variance in vaccination status.

DISCUSSION

The results of our lagged analyses show that a subset of our theoretically relevant variables prospectively predict vaccination status in Aotearoa New Zealand, in the period following the availability of the COVID-19 vaccine. Specifically, unvaccinated participants were more likely to live in more deprived areas, report more conservative political attitudes and less positive attitudes towards their GPs, Government, police and science. They were also more likely to endorse a greater sense of meaning and satisfaction with their health than were vaccinated participants. Of the Big Six personality variables, lower neuroticism predicted lower likelihood of vaccination (Lin & Wang, 2020). These results hint at two, somewhat paradoxical, patterns. First, the unvaccinated in this sample are more likely to report a societal position that is more socially, economically, or politically marginalised. Second, these same people tell us that they are more *satisfied* with their lives and health.

Feeling connected to one's local community was also not predictive of vaccination status, nor was subjective belonging. This indicates either that these variables are unrelated to vaccination attitudes, or are better explained by other variables in the dataset. Either way, this finding suggests that exhortations centred around collective responsibility to get vaccinated for your neighbours, or similar others, may not be a strong motivator for the remaining minority of New Zealanders yet to be vaccinated. Importantly, complacency and social process factors such as gender, ethnicity, and education were not significant predictors of vaccination status and therefore work against several of the negative characterisations of non-vaccination that have been articulated since the onset of COVID-19. For example, media discourse has, among other tropes, asserted that relatively low rates of vaccination among Māori have held the rest of the nation back from reopening post-Delta (Rātana, 2021). A counter to this argument is that the New Zealand vaccine roll-out initially prioritised vaccination for older New Zealanders, disadvantaging Māori peoples who are a disproportionately young population (only 5% of Māori are aged over 65, compared to 16% of non-Māori)—strongly reaffirmed by a recent Waitangi Tribunal decision in late December 2021 that the Government response and vaccination rollout put Māori peoples at risk (Radio New Zealand, 2021b). Indeed, our results reinforce an age-effect whereby younger people are more likely to be unvaccinated.

Being a parent, or having a partner, were statistically unrelated to vaccination status. Previous NZAVS research has indicated that attitudes to standard vaccinations among parents are important predictors of whether parents vaccinate their children (Lee & Sibley, 2017, 2020a). COVID-19 vaccination status among parents, however, were statistically similar to those of non-parents. Additionally, participants who self-identified as religious were no more, nor any less, likely to report being vaccinated. On the one hand, Destiny Church members have been vocally involved in the spate of anti-vaccination and anti-mandate protests in the closing months of 2021 (Macdonald, 2021). On the other hand, Aotearoa is a famously secular nation in which religion is relatively un-politicised, and Destiny Church represents a small fraction of those who broadly identify as Christian (the 2018 New Zealand Census reported 1772 adherents; Palmer, 2019).

Beyond the lagged predictors of vaccination status, we also examined the concurrent predictors of unvaccinated status in late 2021. Our model using the same predictors once more suggested that unvaccinated participants were younger, living in more deprived areas, reporting less satisfaction with the government, less trust in science, and greater levels of subjective health and lower levels of neuroticism. This underscored the importance of multiple antecedents to vaccine acceptance: confidence, constraints, and complacency. Factors related to what people think and feel were also associated with unvaccinated status, such as not having a GP, reporting feelings of lesser belonging, and lower trust in politicians. A final model with additional COVID-19 specific predictors also suggested that being unvaccinated was associated with vaccine confidence factors of increased levels of honesty-humility and lower trust in the New Zealand Government having made sensible decisions in managing the COVID-19 pandemic.

While vaccination status was not associated with general conspiracy theory belief, those who reported greater beliefs in COVID-19 related scepticism that the virus was created in a laboratory and that the health risks associated with COVID-19 were exaggerated were significantly less likely to be vaccinated, consistent with recent research on the impact of conspiracy belief on future COVID-19 health related decisions including vaccination (van Prooijen et al., 2021). It may be the case that specific COVID-19 scepticism mediated the relationship between general conspiracy beliefs and vaccination status, in line with recent research finding an indirect association between general conspiracy beliefs and intentions to leave the EU through specific "Brexit" conspiracy theories (Jolley et al., 2021). These findings highlight the importance of social processes in vaccination acceptance. Finally, there were no significant differences between vaccinated and unvaccinated status on disgust sensitivity, nor health locus of control.

As well as the specific findings relating to vaccination behaviour interpreted above, these results reveal that information contained in the NZAVS from before

vaccines became available in New Zealand (and even before the pandemic emerged) can predict vaccination status after availability between October 1 and November 22 2021. The lagged model we report (i.e., Model 1) explained 31% of the variance in 2021 vaccination decisions from information collected in 2019. Moreover, by including indicators from 2021, Models 2 and 3 predicted vaccination status while explaining between 51-56% of the sample variance. Importantly, because our models controlled for various plausible confounders, we strengthen our ability to make tentative causal inferences of vaccination status in the absence of an experiment (Grosz et al., 2020).

Our research has important implications for understanding and addressing motivations to vaccinate for future pandemics. The largely successful response early on during the COVID-19 pandemic of elimination and control in Aotearoa New Zealand was in part due to both the science-led response (Geoghegan et al., 2021) and communication efforts by the Government which fostered trust and mobilised support for public health measures prior to the availability of vaccines (Beattie & Priestley, 2021). Our results suggest that positive attitudes and trust towards actors and institutions central to the pandemic response (i.e., GPs, Government, Police, Science) was predictive of future vaccination status. Public health messaging that is transparent, acknowledges complexity, risk or uncertainty, while being empathic and inclusive is likely to engender trust and encourages behaviour change (Beattie & Priestley, 2021).

The current uptake of vaccination by 94% of eligible New Zealanders indicates that on average vaccine hesitancy is low relative to world figures (Ritchie et al., 2021), yet there remains a small number of individuals who are either reluctant to or willing not to vaccinate. Intentions and decisions to vaccinate are not uniquely motivated by personal attitudes, but also depend on systemic factors such as the availability and access of vaccinations (Dubé et al., 2014). Not only does this research highlight the diverse factors associated with vaccination status in New Zealand adults, but it also underscores that these are not necessarily the same factors predictive of parental attitudes and intentions towards childhood vaccinations. For example, research in New Zealand Aotearoa indicates that unemployment, ethnicity and lower educational attainment were associated with lower confidence in childhood vaccinations among adults (Lee et al., 2017), whereas these factors were non-significant predictors of prospective COVID-19 vaccination status for adults. This suggests the need for more research understanding adult vaccination hesitancy, not merely drawing inferences from research on parental vaccination attitudes and intentions. Future studies are needed to better inform interventions targeted to those who are hesitant to adult vaccines.

Another key finding and implication of our final model was that increased belief in COVID-19 scepticism was associated with being unvaccinated. These findings suggest the importance of actively combatting vaccine related scepticism that may lend itself to conspiracy theories during a pandemic (see Lazić & Žeželj, 2021, for a review of narrative vaccination interventions), given that belief in conspiracy theories are associated with socially (e.g., van Prooijen et al., 2018), economically (e.g., Salvador Casara et al., 2022), and politically marginalised groups (e.g., Uscinski & Parent, 2014). It is a wicked problem since the fundamental needs associated with belief in conspiracy theories are also those likely to be brought about during a global pandemic—the need for certainty, safety, and belonging (Douglas et al., 2017).

There are some limitations to our research. We caution our audience against a direct causal interpretation of the coefficients presented in Study 1b (Models 2 and 3). Any coefficient that we report in this study is predictive of vaccination outcomes *relative* to the 36 (or 42) other indicators included in each of our regression models on the logit scale. A common fallacy in regression analysis is to interpret the coefficients of multiple regression models as mutually independent total causal effects. This "Mutual Adjustment Fallacy" (Green & Popham, 2019), or "Table 2 Fallacy" (Westreich & Greenland, 2013) is unfortunately somewhat commonplace in the psychological, medical, and social sciences. In short, the coefficients presented here should not be interpreted as "like-for-like" total effect causal estimates, or even comparable estimates of association.

The NZAVS contains rich participant-level measures repeated prior to and during the COVID-19 pandemic, at a national-scale. This study is important because it reveals the extraordinary predictive power of NZAVS indicators prior to vaccination availability in New Zealand to forecast national-level vaccination rates following New Zealand's vaccine roll-out in late 2021. Overall, our results highlight meaningful diverse psychological and social mechanisms that underpin vaccinations decisions and underscore the importance for future research using the NZAVS.

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SUPPLEMENTARY MATERIALS

Table S1. Summary of Intercorrelations, Means, and Standard Deviations for all T11 predictors

	M	*(SD)*	*n*	1	2	3	4	5	6
1. Age	52.920	(14.096)	5324	1					
2. Gender	.378	(.485)	5285	.119					
3. Ethnicity Asian	.033	-	5324	-.127	-.010	1			
4. Ethnicity Māori	.084	-	5324	-.045	-.040	-.007	1		
5. Ethnicity Pacific	.024	-	5324	-.030	-.003	.047	.072	1	
6. Employed	.749	-	5292	-.319	.035	.041	.008	.008	1
7. GP Have	.925	-	5287	.161	-.032	-.024	-.013	-.011	-.050
8. NZ Dep	4.649	(2.705)	5304	-.042	-.018	.030	.118	.035	-.053
9. Parent	.705	-	5320	.455	.020	-.076	.014	-.002	-.082
10. Partner	.736	-	5261	.064	.102	-.036	-.042	-.021	.063
11. Religious	.296	-	5264	.098	-.033	.063	.007	.031	-.033
12. GP Cultural Respect	6.066	(1.195)	4963	.073	-.069	-.056	-.079	-.042	-.038
13. GP Similarity	4.981	(1.873)	4994	.147	-.004	-.114	-.157	-.078	-.034
14. GP Satisfaction	5.642	(1.413)	5010	.157	.001	-.046	-.039	-.003	-.059
15. Health Care Access	7.953	(2.192)	5315	.115	.025	-.018	-.061	-.016	.004
16. Hours Internet	16.382	(16.699)	5279	-.209	.018	.057	.057	.024	.004
17. Hours News	4.816	(5.237)	5279	.270	.052	-.027	-.045	.016	-.171
18. Hours Social Media	4.339	(6.749)	5279	-.191	-.126	.025	.072	.030	-.021
19. Education	6.060	(2.559)	5239	-.100	-.033	.060	-.075	-.010	.128
20. Political Identity Centrality	4.326	(1.812)	5222	.090	.037	-.018	.004	-.018	-.046
21. Political Orientation	3.374	(1.424)	5250	.149	.063	.020	.019	.004	-.045
22. Trust in Politicians	3.695	(1.463)	5282	.077	-.013	-.011	-.067	-.044	.012
23. Satisfaction with Govt	5.398	(2.832)	5315	-.013	-.157	-.008	-.003	-.012	-.005
24. Sense of Community	4.178	(1.659)	5307	.269	-.064	-.044	.006	-.017	-.070
25. Belonging	5.064	(1.121)	5306	.153	-.058	-.036	-.029	-.025	.019
26. Agreeableness	5.389	(.991)	5306	.035	-.289	-.020	-.021	-.019	-.020
27. Conscientiousness	5.148	(1.076)	5306	.083	-.070	.010	.016	-.005	-.016
28. Extraversion	3.755	(1.233)	5306	.034	-.043	-.017	.031	.013	.052
29. Honesty-Humility	5.633	(1.114)	5306	.215	-.118	-.032	-.044	-.030	-.104
30. Neuroticism	3.484	(1.203)	5306	-.244	-.116	.019	.033	.013	.013
31. Openness	5.110	(1.114)	5306	-.061	.061	.002	.015	-.007	.036
32. Meaning in Life	5.456	(1.255)	5322	.246	-.077	-.024	-.010	.010	<.001
33. Life Satisfaction	5.315	(1.236)	5312	.153	-.069	-.013	-.057	-.012	.012
34. Political Efficacy	4.484	(1.257)	5324	-.008	-.073	.027	-.007	-.001	.017
35. Trust in Police	4.554	(1.288)	5323	.089	.013	-.018	-.090	-.041	.020
36. Trust in Science	5.606	(1.235)	5310	-.063	.055	-.019	-.080	-.035	.044
37. SF Subjective Health Scale	4.998	(1.164)	5324	.075	-.007	.015	-.067	-.018	.095

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S1** continued...

	7	8	9	10	11	12	13	14	15	16
7. GP Have	1									
8. NZ Dep	-.054	1								
9. Parent	.128	-.057	1							
10. Partner	.037	-.181	.239	1						
11. Religious	.030	.037	.090	.004	1					
12. GP Cultural Respect	.155	-.053	.041	.013	.024	1				
13. GP Similarity	.105	-.111	.042	.037	-.003	.261	1			
14. GP Satisfaction	.207	-.064	.079	.009	.034	.436	.245	1		
15. Health Care Access	.131	-.120	.069	.124	-.004	.245	.142	.458	1	
16. Hours Internet	-.064	.065	-.157	-.098	-.041	-.029	-.054	-.049	-.039	1
17. Hours News	.053	.004	.082	.011	.001	.012	.030	.062	.042	.193
18. Hours Social Media	-.037	.100	-.117	-.088	<.001	-.017	-.07	-.051	-.056	.432
19. Education	.009	-.078	-.068	.054	-.017	.015	.045	-.008	.071	.051
20. Political Identity Centrality	.037	.001	-.015	.010	-.008	.040	.080	.045	-.002	.041
21. Political Orientation	.027	-.028	.131	.040	.274	.010	.008	.010	.008	-.125
22. Trust in Politicians	.044	-.062	.057	.039	-.007	.103	.110	.166	.223	-.029
23. Satisfaction with Government	.011	.060	-.033	-.071	-.065	.064	.029	.068	.112	.072
24. Sense of Community	.065	-.108	.221	.102	.059	.117	.091	.175	.188	-.140
25. Belonging	.059	-.099	.154	.176	.007	.196	.139	.221	.314	-.157
26. Agreeableness	.059	-.038	.064	.021	.054	.132	.087	.089	.067	-.049
27. Conscientiousness	.056	-.096	.094	.088	.039	.090	.061	.080	.118	-.146
28. Extraversion	.011	-.071	.070	.078	.018	.053	.049	.047	.092	-.042
29. Honesty-Humility	.023	-.001	.100	.022	-.007	.078	.049	.097	.104	-.111
30. Neuroticism	-.005	.078	-.172	-.051	-.015	-.077	-.053	-.152	-.222	.111
31. Openness	.008	.023	-.068	-.035	-.051	.040	.022	.009	.032	.100
32. Meaning in Life	.079	-.071	.244	.154	.122	.185	.107	.191	.275	-.17
33. Life Satisfaction	.037	-.137	.154	.228	.013	.172	.123	.210	.357	-.158
34. Political Efficacy	.016	-.014	-.019	-.010	-.037	.089	.061	.112	.134	.030
35. Trust in Police	.045	-.115	.098	.083	.067	.140	.104	.173	.248	-.099
36. Trust in Science	.018	-.096	-.069	.045	-.203	.105	.102	.112	.155	.072
37. SF Subjective Health Scale	-.017	-.100	.073	.077	-.005	.084	.073	.127	.236	-.133

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S1** continued...

	17	18	19	20	21	22	23	24	25	26
17. Hours News	1									
18. Hours Social Media	.111	1								
19. Education	.011	-.012	1							
20. Political Identity Centrality	.118	.036	.130	1						
21. Political Orientation	-.020	-.093	-.246	-.2	1					
22. Trust in Politicians	.082	-.035	.122	.077	-.130	1				
23. Satisfaction with Govt	.047	.089	.163	.102	-.401	.364	1			
24. Sense of Community	.072	-.090	.003	.079	.057	.160	.051	1		
25. Belonging	.029	-.098	.021	.015	.053	.196	.040	.369	1	
26. Agreeableness	.017	.055	.091	.067	-.143	.118	.181	.184	.244	1
27. Conscientiousness	-.007	-.113	-.037	-.082	.146	.058	-.045	.103	.267	.097
28. Extraversion	.029	.034	.044	.089	-.057	.091	.025	.240	.320	.201
29. Honesty-Humility	.030	-.093	.070	.018	-.087	.045	.104	.135	.147	.190
30. Neuroticism	-.073	.139	-.012	.009	-.047	-.145	.013	-.265	-.461	-.046
31. Openness	.012	.031	.233	.160	-.285	.035	.106	.034	.004	.200
32. Meaning in Life	.039	-.100	.101	.082	.081	.161	.030	.381	.531	.226
33. Life Satisfaction	.026	-.113	.079	.006	.042	.213	.069	.357	.567	.147
34. Political Efficacy	.058	.076	.175	.233	-.276	.363	.325	.153	.150	.172
35. Trust in Police	.042	-.095	-.001	-.094	.180	.373	.118	.155	.244	.029
36. Trust in Science	.069	-.011	.271	.147	-.293	.227	.197	.052	.106	.064
37. SF Subjective Health Scale	-.023	-.113	.044	-.023	.051	.100	-.017	.172	.331	.058

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S1** continued...

	27	28	29	30	31	32	33	34	35	36
26. Agreeableness	1									
27. Conscientiousness	.040	1								
28. Extraversion	.090	-.07	1							
29. Honesty-Humility	-.202	-.162	-.176	1						
30. Neuroticism	-.097	.161	.029	-.013	1					
31. Openness	.262	.240	.191	-.445	.083	1				
32. Meaning in Life	.236	.248	.189	-.45	.006	.652	1			
33. Life Satisfaction	-.010	.124	.046	-.066	.143	.155	.146	1		
34. Political Efficacy	.150	.043	.008	-.168	-.085	.172	.244	.139	1	
35. Trust in Police	-.029	.027	.074	-.056	.207	.033	.115	.245	.131	1
36. Trust in Science	.226	.131	.125	-.343	.020	.331	.396	.080	.152	.058

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

Table S2. Summary of Intercorrelations, Means, and Standard Deviations for all predictors from T13.

	M	*(SD)*		1	2	3	4	5	6
1. Gender	.379	-	5324	1					
2. Age	54.870	(14.054)	5324	.116					
3. GP Have	.932	-	5304	-.029	.147	1			
4. Employed	.733	-	5277	.012	-.388	-.058	1		
5. Ethnicity Asian	.036	-	5324	-.014	-.112	-.004	.031	1	
6. Ethnicity Māori	.089	-	5324	-.039	-.046	-.013	.005	-.010	1
7. Ethnicity Pacific	.028	-	5324	-.003	-.024	-.008	-.003	.059	.078
8. Religious	.274	-	5278	-.035	.073	.026	-.014	.061	.009
9. Parent	.726	-	5324	.016	.420	.068	-.086	-.077	.019
10. Partner	.729	-	5231	.106	.030	.055	.073	-.037	-.051
11. NZ Dep	4.635	(2.713)	5319	-.015	-.044	-.058	-.041	.016	.104
12. Trust in Politicians	3.819	(1.602)	5202	-.030	.040	.043	.018	-.003	-.054
13. GP Cultural Respect	5.978	(1.287)	5025	-.052	.092	.231	-.039	-.037	-.066
14. GP Similarity	4.872	(1.935)	5058	-.002	.125	.142	-.065	-.102	-.171
15. GP Satisfaction	5.603	(1.481)	5068	.006	.158	.256	-.058	-.019	-.017
16. Health Care Access	7.709	(2.393)	5311	.012	.134	.168	-.023	.007	-.059
17. Hours Internet	2.120	(19.714)	5132	-.019	-.251	-.031	.080	.053	.049
18. Hours News	5.436	(4.908)	5094	.043	.293	.052	-.207	-.006	-.030
19. Hours Social Media	5.154	(8.199)	5090	-.133	-.192	-.040	.018	.045	.060
20. Education	5.934	(2.652)	5297	-.045	-.163	.005	.132	.060	-.084
21. Political Identity Centrality	4.350	(1.774)	5210	.052	.071	.033	-.062	-.005	.020
22. Political Orientation	3.291	(1.345)	5227	.063	.157	.014	-.055	.018	.007
23. Satisfaction with Govt	4.981	(3.208)	5319	-.115	.013	.047	-.027	.007	.013
24. Sense of Community	4.286	(1.626)	5220	-.068	.257	.093	-.076	-.036	-.002
25. Agreeableness	5.361	(1.019)	5323	-.272	.025	.053	.001	-.028	-.032
26. Conscientiousness	5.137	(1.074)	5322	-.056	.094	.059	-.007	.003	.015
27. Extraversion	3.698	(1.231)	5321	-.029	.041	.045	.041	-.020	.028
28. Honesty-Humility	5.696	(1.11)	5323	-.096	.243	.038	-.135	-.037	-.055
29. Openness	5.101	(1.113)	5318	.077	-.036	-.010	.019	-.017	.012
30. Neuroticism	3.454	(1.225)	5323	-.119	-.276	-.014	.046	.029	.019
31. Belonging	5.061	(1.13)	5314	-.047	.164	.100	-.002	-.028	-.035
32. Meaning in Life	5.425	(1.266)	5300	-.048	.232	.086	-.026	-.024	-.013
33. Life Satisfaction	5.182	(1.281)	5322	-.033	.160	.077	-.015	-.013	-.057
34. Political Efficacy	4.307	(1.314)	5311	-.031	.004	.045	.021	.037	-.009
35. Trust in Police	4.415	(1.33)	5314	.018	.144	.063	-.017	-.020	-.100
36. Trust in Science	5.873	(1.202)	5294	.002	-.061	.066	.048	-.032	-.087
37. SF Subjective Health Scale	4.92	(1.183)	5323	.001	.064	-.027	.080	.005	-.061
38. Conspiracy Belief	3.922	(1.744)	5207	.019	.153	-.041	-.101	-.005	.070
39. COVID Exaggeration	2.417	(1.949)	5195	.098	.036	-.084	-.019	.006	.011
40. COVID Lab Leak	3.445	(1.993)	5252	.054	.100	-.039	-.022	.006	.026
41. COVID Trust Govt.	4.648	(1.981)	5214	-.108	.005	.070	-.014	.009	<.001
42. Disgust Sensitivity	4.089	(1.823)	5205	-.104	-.141	.001	.002	.085	.023
43. Health Locus of Control	4.901	(1.170)	5323	.043	.084	-.017	.045	.015	.021

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S2** continued...

	7	8	9	10	11	12	13	14	15	16
7. Ethnicity Pacific	1									
8. Religious	.033	1								
9. Parent	-.005	.074	1							
10. Partner	-.033	-.002	.237	1						
11. NZ Dep	.024	.035	-.067	-.191	1					
12. Trust in Politicians	-.033	-.062	.001	.011	-.052	1				
13. GP Cultural Respect	-.027	.012	.039	.042	-.06	.139	1			
14. GP Similarity	-.090	-.005	.035	.043	-.123	.119	.302	1		
15. GP Satisfaction	.012	.018	.065	.028	-.049	.175	.489	.264	1	
16. Health Care Access	.005	-.003	.034	.077	-.086	.260	.312	.175	.532	1
17. Hours Internet	.059	-.045	-.158	-.077	.073	-.007	-.044	-.059	-.068	-.015
18. Hours News	.038	.020	.092	.030	-.013	.098	.039	.041	.061	-.030
19. Hours Social Media	.084	-.001	-.093	-.059	.106	-.040	-.028	-.049	-.046	-.052
20. Education	-.016	-.027	-.102	.043	-.082	.155	.026	.040	-.006	-.002
21. Political Identity Centrality	-.002	-.022	-.032	-.011	.022	.093	.030	.059	.029	.006
22. Political Orientation	.016	.269	.145	.047	-.016	-.230	-.013	-.008	.015	.012
23. Satisfaction with Govt	-.010	-.087	-.064	-.081	.045	.567	.109	.080	.140	-.019
24. Sense of Community	-.025	.037	.224	.114	-.102	.133	.138	.100	.183	.043
25. Agreeableness	-.017	.067	.050	.015	-.027	.085	.107	.070	.075	-.133
26. Conscientiousness	.003	.031	.098	.084	-.105	.026	.104	.053	.112	-.045
27. Extraversion	.032	.007	.089	.085	-.070	.064	.06	.052	.063	.052
28. Honesty-Humility	-.037	.010	.098	.012	.006	.078	.058	.044	.068	.063
29. Openness	-.002	-.047	-.053	-.013	.007	.050	.044	.026	.007	-.115
30. Neuroticism	.010	-.029	-.179	-.051	.060	-.107	-.071	-.05	-.152	-.068
31. Belonging	-.031	-.002	.141	.168	-.095	.197	.212	.156	.232	-.272
32. Meaning in Life	.010	.121	.233	.165	-.081	.091	.168	.104	.187	-.056
33. Life Satisfaction	-.004	.020	.160	.239	-.125	.190	.189	.139	.238	-.029
34. Political Efficacy	.006	-.013	-.030	-.004	-.016	.433	.107	.081	.123	-.096
35. Trust in Police	-.016	.037	.092	.075	-.102	.371	.171	.124	.212	.077
36. Trust in Science	-.038	-.202	-.060	.068	-.096	.339	.152	.101	.157	-.119
37. SF Subjective Health Scale	-.017	-.009	.071	.098	-.110	.074	.08	.075	.118	-.047
38. Conspiracy Belief	.022	.079	.067	-.063	.055	-.413	-.084	-.063	-.095	-.048
39. COVID Exaggeration	.020	.059	.074	-.015	.038	-.280	-.101	-.083	-.110	-.033
40. COVID Lab Leak	.019	.115	.099	.002	.022	-.276	-.056	-.070	-.074	-.031
41. COVID Trust Govt.	-.027	-.072	-.063	-.072	.035	.589	.137	.101	.166	.018
42. Disgust Sensitivity	.027	.040	-.112	-.047	.044	-.036	.004	-.023	-.025	.002
43. Health Locus of Control	.018	.009	.073	.042	-.039	.032	.087	.039	.128	.001

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S2** continued...

	17	18	19	20	21	22	23	24	25
17. Hours Internet	1								
18. Hours News	.11	1							
19. Hours Social Media	.388	.086	1						
20. Education	.063	-.025	-.022	1					
21. Political Identity Centrality	.050	.102	.018	.139	1				
22. Political Orientation	-.126	.008	-.056	-.265	-.212	1			
23. Satisfaction with Govt	.050	.058	.020	.172	.092	-.397	1		
24. Sense of Community	-.120	.097	-.054	-.009	.079	.047	.049	1	
25. Agreeableness	-.012	.010	.034	.061	.051	-.125	.128	.163	1
26. Conscientiousness	-.123	.001	-.105	-.037	-.080	.140	-.017	.136	.108
27. Extraversion	-.019	.027	.045	.035	.106	-.049	-.007	.246	.198
28. Honesty-Humility	-.132	.058	-.114	.054	-.005	-.066	.119	.121	.181
29. Openness	.068	.002	-.004	.222	.141	-.265	.100	.032	.185
30. Neuroticism	.126	-.071	.133	.016	.025	-.058	-.009	-.284	-.025
31. Belonging	-.111	.054	-.085	.013	.035	.030	.078	.383	.202
32. Meaning in Life	-.148	.054	-.086	.070	.079	.076	.017	.389	.209
33. Life Satisfaction	-.149	.054	-.114	.050	.018	.040	.067	.365	.114
34. Political Efficacy	.044	.085	.033	.153	.239	-.265	.367	.162	.132
35. Trust in Police	-.134	.068	-.112	-.017	-.116	.131	.190	.177	.033
36. Trust in Science	.046	.062	-.029	.245	.110	-.302	.316	.064	.062
37. SF Subjective Health Scale	-.127	-.026	-.095	.026	-.037	.066	-.035	.174	.065
38. Conspiracy Belief	-.024	-.044	.023	-.195	-.038	.224	-.337	-.034	-.067
39. COVID Exaggeration	-.045	-.075	.014	-.16	-.076	.238	-.359	-.032	-.110
40. COVID Lab Leak	-.043	-.005	.002	-.213	-.056	.294	-.333	.001	-.069
41. COVID Trust Govt.	.046	.053	.017	.154	.089	-.354	.832	.069	.134
42. Disgust Sensitivity	.066	-.026	.075	-.017	.010	.035	-.018	-.076	.007
43. Health Locus of Control	-.108	-.029	-.043	-.125	-.060	.181	-.078	.174	-.005

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S2** continued...

	26	27	28	29	30	31	32	33	34	35
26. Conscientiousness	1									
27. Extraversion	.069	1								
28. Honesty-Humility	.077	-.086	1							
29. Openness	-.066	.144	.044	1						
30. Neuroticism	-.242	-.148	-.162	-.040	1					
31. Belonging	.283	.295	.147	.008	-.435	1				
32. Meaning in Life	.283	.252	.184	.101	-.446	.283	1			
33. Life Satisfaction	.252	.222	.170	.022	-.460	.252	.645	1		
34. Political Efficacy	.004	.108	.044	.153	-.069	.004	.162	.157	1	
35. Trust in Police	.165	.050	.041	-.073	-.181	.165	.181	.233	.130	1
36. Trust in Science	.006	.035	.052	.167	-.038	.006	.029	.102	.277	.204
37. SF Subjective Health Scale	.245	.155	.117	.024	-.336	.245	.315	.389	.078	.124
38. Conspiracy Belief	-.004	-.044	-.046	-.083	.034	-.004	-.025	-.109	-.270	-.234
39. COVID Exaggeration	.023	.001	-.069	-.082	-.024	.023	-.003	-.031	-.202	-.102
40. COVID Lab Leak	.029	-.010	-.101	-.079	-.011	.029	.019	-.044	-.191	-.056
41. COVID Trust Govt.	-.014	-.007	.112	.077	.001	-.014	.030	.090	.390	.232
42. Disgust Sensitivity	.011	-.062	-.145	-.078	.156	.011	-.101	-.096	-.015	-.036
43. Health Locus of Control	.212	.103	.023	-.039	-.240	.212	.274	.329	.106	.154

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$

... **Table S2** continued...

	36	37	38	39	40	41	42	43
36. Trust in Science	1							
37. SF Subjective Health Scale	.031	1						
38. Conspiracy Belief	-.362	-.039	1					
39. COVID Exaggeration	-.353	.029	.325	1				
40. COVID Lab Leak	-.314	-.004	.349	.290	1			
41. COVID Trust Govt.	.374	-.033	-.384	-.413	-.362	1		
42. Disgust Sensitivity	-.043	-.109	.066	.001	.043	<.001	1	
43. Health Locus of Control	-.042	.493	.104	.142	.138	-.079	-.033	1

Notes. n = 5324. All correlation coefficients are significant at $p < .01$ where $r \geq .036$