Institutional Trust, Trust in Scientists and Medical Professionals, and Vaccine Acceptance: Analyses of the Wellcome Monitor Studies

Siobhan McAndrew[1]

University of Bristol

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Introduction

Social resilience to the current emergency partly depends on trust. For the public to comply with health advice and requirements, they must be receptive towards their communicators, namely the medical profession, scientists, governments, and media professionals. Trust as a basic value has been eroded in the longer time by cultural shifts, and it is plausible that it has been diminished more recently by the proliferation of conspiracism online. These health messages, most concisely rendered as 'stay at home, protect the NHS and save lives', have been communicated directly, via government ministers (for example, a letter to every household from the UK Prime Minister; and via texts from the UK Government and the 'NHS Coronavirus Service') and government health officials, notably including the Chief Medical Officer, Chief Scientific Officer and Chief Nursing Officer.[2] They have also been communicated via traditional print and broadcast media sources, and online via the NHS 111 Online and targeted advertising.

Compliance will be affected by many variables, including the extent to which they are practical, and the extent to which they are understood. Compliance will also be affected by the extent to which the advice is believed to be meaningful and conveyed by trustworthy sources. In the coming months, compliance will also involve adhering to plans regarding exit from lockdown, which may well be phased; and with future testing regimes and vaccination programmes. In the present research note, we examine two dimensions of relevant public attitudes for which high-quality secondary data are available. First, we examine trust in the reliability of medical research as conveyed by a variety of sources, specifically doctors, government, medical research charities, journalists, academic scientists and government scientists, using Wellcome Monitor surveys of Britain in 2009 and 2012. Secondly, we examine attitudes towards vaccines in cross-national context, using the Wellcome Global Monitor Survey 2018.

[1] Working version: comments and feedback to siobhan.mcandrew@bristol.ac.uk

[2] Compliance at present involves adhering to the following:
(a) to practice social distancing by staying within dwellings except to buy basic necessities, work when it cannot be conducted at home, one form of exercise a day or for medical need or to provide care or help to the vulnerable;
(b) to wash hands for 20 seconds several times a day, and on return from trips from outside the home; and
(c) to maintain a two-metre distance from those living in other households when outside for necessary shopping or exercise;
(d) to withdraw completely into the household if displaying COVID-19 symptoms, until one week after symptoms have begun. For asymptomatic household members, this period lasts from two weeks from the first symptoms of a symptomatic household member; and
(e) shielding of the vulnerable, who are strongly advised stay at home at all times and avoid any face-to-face contact for a period of at least 12 weeks from the time of notification, maintaining social distance from fellow household members who are not deemed extremely vulnerable and who may be leaving the house for essential purposes.

1. Trust in Medical Research as a Form of Institutional Trust

There is a considerable literature on long-run decline in generalised social trust (Putnam 2000), often understood as an individual-level tendency to trust other unknown individuals, or as a moral value (Delhey and Newton 2003, Uslaner 2002). By comparison, institutional trust refers to a general tendency to trust specific bodies or groups of actors, most frequently politicians, governments, government officials, journalists, police forces, the military and so on. Different institutions may have different levels of trustworthiness depending on how well they function and serve their clients. Equally, it is thought that trust varies across societies and is declining generationally and over time; and that this is less because of institutional features and more because of a moralistic rather than strategic or evaluative orientation towards trust (Uslaner 2008).

While those are important questions, our specific interest here is in trust in different sources of authority with regard to medical advice. Accordingly, we focus on measures more akin to institutional trust. Measures of trust in science are relatively rare in general social surveys in Britain, although one notable study modelled attitudes towards science using the British Social Attitudes survey, contrasting 'deficit' and 'contextual' accounts of how such attitudes are formed (Sturgis and Allum 2004).[3] It is plausible that higher levels of education and scientific knowledge diminish trust in that the more scientifically-informed may have a clearer sense of how institutions function and thereby their failings. Accordingly, in the present case, we bear in mind the contrast between trust in medical research information sources as a basic moral value, and trust as evaluation of trustworthiness.

The following items relating to institutional trust are available on the Wellcome Trust Monitor Survey. This is designed to measure the British public's attitudes towards and understanding of science, and was carried out in 2009, 2012 and 2015.[4] Each survey was carried out face-to-face during a short fieldwork period with response rates of about 50 percent and sample sizes of c.1000 for each wave. While basic values and general social trust measures are relatively lacking, a range of socio-structural variables (particularly occupational status and education) and measures of religious affiliation and practice are available, alongside a measure of extent of internet use, and of scientific knowledge as tested by a quiz included on the questionnaire. Moreover, we can examine how different measures of institutional trust relate to each other taking socioeconomic status of respondents into account, to gain insight into how different sources of health information are perceived.

Respondents were asked,

> *Please tell me how much trust you have in each of the following to provide accurate and reliable information about medical research. Please pick your answer from this card.*
>
> *- Doctors, nurses and other medical practitioners?*
>
> *- Government departments and ministers?*
>
> *- Medical research charities?*
>
> *- Journalists?*
>
> *- Scientists working for universities?*

[3] While it is intuitive to interpret low confidence in science as arising due to poor scientific understanding, their findings showed that attitudes also depended on wider knowledge, specifically political knowledge, perhaps serving as a proxy for identification with public institutions ultimately supporting science.

[4] A further wave was carried out in 2018, but variables of interest here were split across two different surveys stored in different repositories.

- *Scientists working for the government?*

Response options comprised complete trust; a great deal of trust; some trust; very little trust; and no trust at all. These were reversed and scored so that 1 denoted no trust and 5 complete trust. Figure 1 below illustrates how scores vary by profession or source, ranging from 3.9 for doctors, nurses and medics, and 2.3 for journalists. Medical charities and academic scientists rate relatively highly, government and journalists rate rather lower.

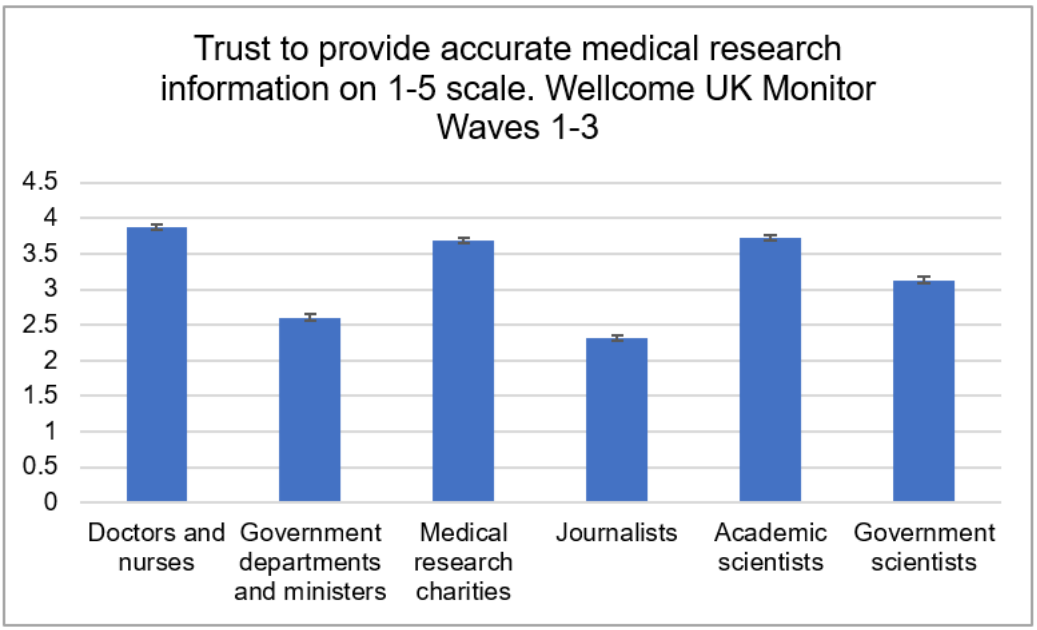

Figure 1: Mean trust scores by information source. Source: Wellcome UK Monitor.

A number of variables could be driving variation in scores across individuals. The dataset includes variables on age, gender, marital or partnership status, employment status, occupational status, level of education, ethnicity (White versus other than White), religious affiliation (recoded as no religion, Anglican, Catholic, Other Christian and Other Religion), frequency of religious practice, self-reported health, level of scientific knowledge (categorised as low, medium or high following a science quiz), and reported hours of internet usage per week, which we divided into four quartile groups. Descriptive statistics are available in Table A1 below the bibliography.

Our main research questions are:

- How do socio-structural variables explain variation in trust in medical research information?
- How do the effects of these drivers vary by profession or information source?
- Does education level explain variation in trust once scientific knowledge is taken into account?
- Does heavier internet use predict greater scepticism, controlling for education and scientific knowledge?

2. Analytic Strategy

We address these questions by treating the indicators of interest as continuous (in bivariate analyses, statistical tests are more powerful, while regression analysis results will be more intuitive to interpret).

We begin by exploring how average scores for each profession vary by education level, by level of scientific knowledge, and by internet usage. We might expect that the more educated are more supportive of those tasked with conveying technical information; alternatively, they might have higher expectations of those who do so. We categorised respondents as having a degree-level education, having secondary-level qualifications, or as having no qualifications. Figure 2 illustrates how trust by profession or information source varies by education level. Rates appear to vary less by education for medics, academic scientists and medical research charities, and to the extent they do the differences is largest for secondary-level qualification versus no qualifications. For government scientists, government, and journalists, there is a clearer association between trust and level of education.

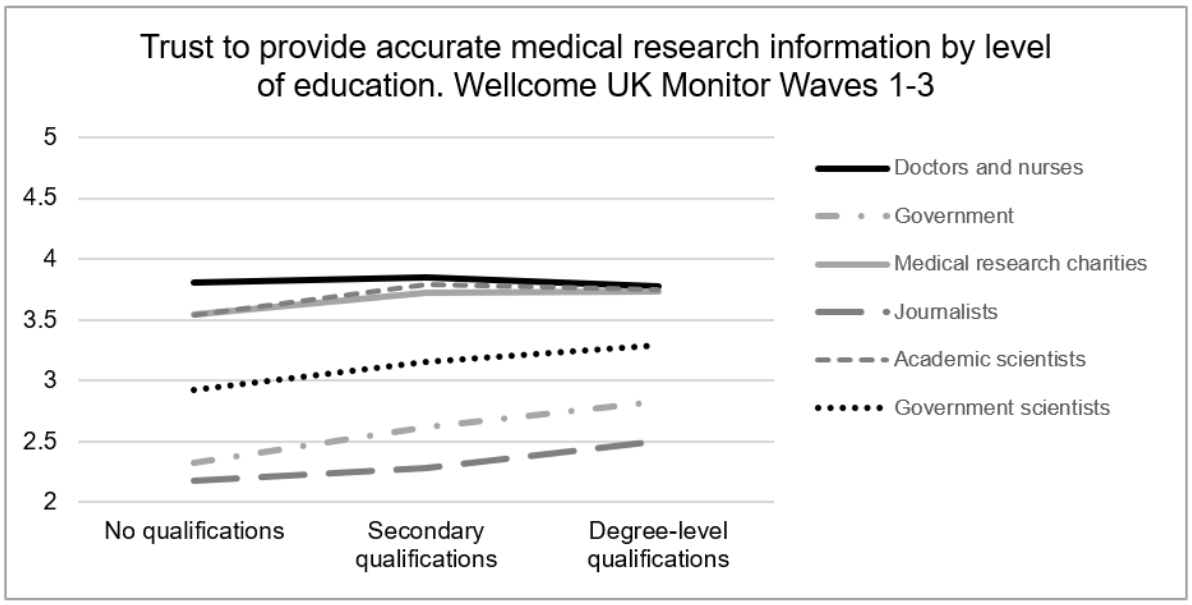

Figure 2: Variation in Trust by Education Level.

We next examined variation in trust by profession or information source, and level of scientific knowledge, as summarised in Figure 3. There are essentially no differences by level of scientific knowledge for medics; for the other professions or sources, there are perhaps slight differences whereby the more knowledgeable are a little more trusting. Finally, we explored variation by level of internet usage (a measure unfortunately not available in 2015). On the one hand, the more educated and knowledgeable are likely to use the internet more extensively and we would expect that to generate an apparent relationship between internet use level and trust (one accordingly requiring multivariate analysis for us to disentangle these drivers). On the other hand, the more sceptical may well turn to internet sources to evaluate scientific claims themselves; they may be more likely to absorb elite-challenging (after Inglehart and Catterberg 2002) norms more generally; or they may occasionally become susceptible to (unintentional) misinformation or (intentional) disinformation. Figure 4 illustrates variation by level of reported usage. Rates of trust look essentially stable across levels of usage for medics, medical research charities and academic scientists. For journalists, government and government scientists, trust is highest on average for the second quartile group,

namely those who use the internet relatively little, compared with those who use it least. Thee relationship with trust looks non-linear for these three source types with trust slightly lower for the third quartile group. It may well be that members of this group tend to be more accurate than those in the highest quartile group in their assessment of usage as well as more exacting in their evaluation of different information sources, so that variation is ascribable to perceptual differences rather than reflective of internet usage itself.

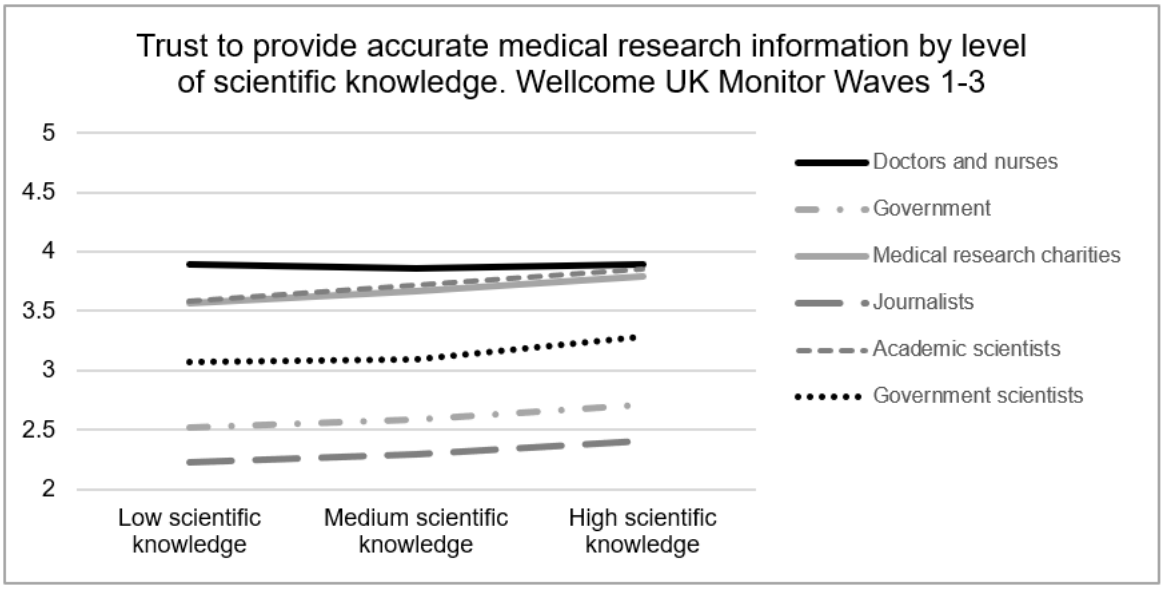

Figure 3: Variation in trust by level of scientific knowledge.

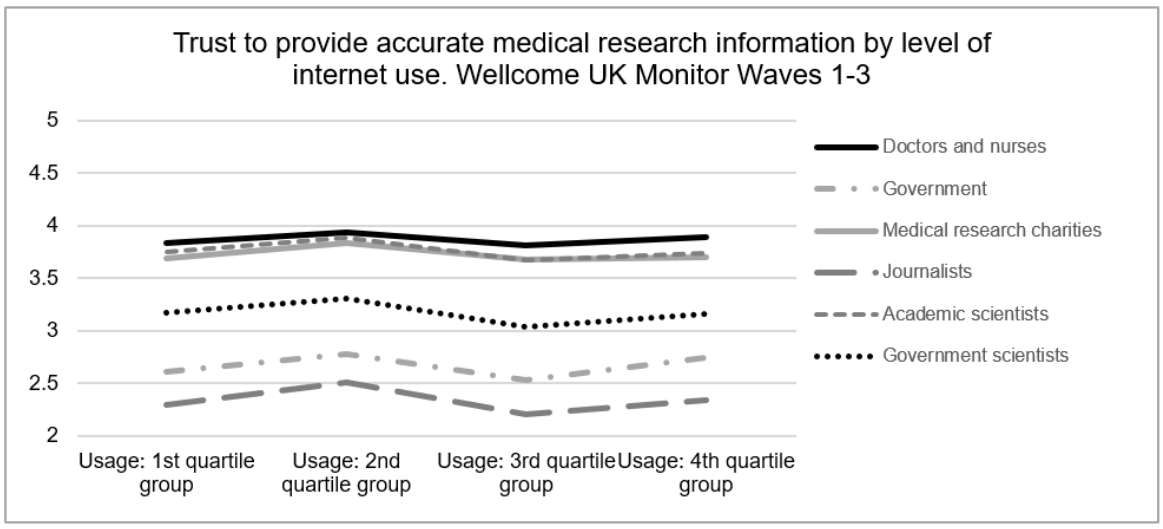

Figure 4: Variation in trust by level of internet usage.

To examine further, we modelled trust in each of the six sources as a function of age, gender, marital status, occupational status, religious affiliation (partly proxying for differences in cultural values) and attendance, self-reported health, education level, scientific knowledge and internet usage. We use the same set of explanatory and control variables across models. Because of the linear regression model specification, coefficients can be interpreted in terms of points on the 1-5 scale: for example, the coefficient of -0.207 for 'female' in the trust in medics model (Table 2a) indicates that on average, female respondents score a fifth of a point lower than male respondents in terms of trust in medics,

	Trust in doctors			Trust in government			Trust in medical research charities		
	Coefficient	SE	P	Coefficient	SE	p	Coefficient	SE	p
Female	-0.207	0.048	<0.001*	-0.007	0.049	0.887	0.059	0.043	0.174
Married/partnered vs single	0.041	0.051	0.422	0.076	0.049	0.122	-0.003	0.045	0.946
Age	-0.002	0.002	0.136	-0.014	0.002	<0.001*	-0.003	0.001	0.025*
Managerial/professional	-0.024	0.058	0.681	0.126	0.061	0.040*	0.093	0.053	0.076
Intermediate occupation	0.017	0.060	0.780	0.227	0.068	0.001*	0.054	0.057	0.346
White	-0.039	0.140	0.782	-0.294	0.126	0.020*	-0.126	0.111	0.257
Degree	-0.141	0.060	0.019	0.116	0.063	0.065	-0.093	0.050	0.064
No qualifications	-0.038	0.092	0.680	-0.073	0.080	0.361	-0.108	0.085	0.206
Anglican	0.197	0.062	0.001*	0.183	0.068	0.007*	0.010	0.061	0.869
Catholic	0.077	0.096	0.425	0.323	0.105	0.002*	0.012	0.087	0.893
Other Christian	0.056	0.060	0.352	0.131	0.065	0.043	-0.002	0.057	0.966
Other Religion	-0.069	0.176	0.694	-0.207	0.179	0.249	-0.139	0.149	0.350
Frequency of church attendance	0.021	0.013	0.098	0.017	0.015	0.244	0.025	0.012	0.039*
Self-reported health	0.015	0.030	0.607	0.038	0.027	0.158	-0.009	0.027	0.745
Internet use: 2nd quartile group vs 1st	0.144	0.079	0.067	0.112	0.077	0.146	0.173	0.063	0.006*
Internet use: 3rd quartile group vs 1st	0.024	0.057	0.679	0.028	0.058	0.624	0.056	0.053	0.298
Internet use: 4th quartile group vs 1st	0.092	0.065	0.160	0.129	0.074	0.082	0.044	0.066	0.505
Moderate scientific knowledge	0.007	0.072	0.925	-0.062	0.072	0.389	0.038	0.066	0.563
Good scientific knowledge	0.017	0.079	0.831	0.006	0.083	0.946	0.159	0.071	0.025*
Constant	3.934	0.216	<0.001*	3.110	0.204	<0.001*	3.820	0.187	<0.001*
R^2	0.037			0.109			0.030		
N	1831			1810			1804		

*Table 1a: Linear regression models of trust variables in Waves 1-2 of Wellcome UK Monitor. Survey weights applied. Reference category is respondent is single, has a routine occupational status, is other than white, has secondary-level qualifications, has no religious affiliation, is in the lowest quartile group in terms of internet use, has low scientific knowledge. * $p < 0.05$.*

	Trust in journalists			Trust in academic scientists			Trust in government scientists		
	Coefficient	SE	P	Coefficient	SE	p	Coefficient	SE	p
Female	-0.098	0.046	0.034*	-0.041	0.042	0.329	-0.077	0.048	0.108
Married/partnered vs single	-0.074	0.046	0.109	-0.010	0.045	0.819	0.029	0.048	0.552
Age	0.000	0.002	0.969	-0.001	0.001	0.465	-0.006	0.002	<0.001*
Managerial/professional	0.108	0.059	0.067	-0.005	0.053	0.920	0.039	0.061	0.520
Intermediate occupation	0.138	0.066	0.038*	-0.024	0.055	0.658	0.010	0.066	0.880
White	-0.200	0.092	0.029*	0.000	0.104	0.999	0.003	0.115	0.980
Degree	0.124	0.057	0.029*	-0.083	0.056	0.138	0.044	0.062	0.480
No qualifications	-0.087	0.071	0.221	-0.199	0.086	0.021*	-0.175	0.082	0.033*
Anglican	-0.026	0.067	0.698	-0.037	0.060	0.544	0.068	0.070	0.327
Catholic	0.149	0.097	0.122	0.054	0.087	0.534	0.194	0.104	0.060
Other Christian	0.107	0.065	0.098	0.025	0.054	0.645	0.161	0.065	0.013*
Other Religion	0.134	0.136	0.324	0.251	0.135	0.064	0.244	0.163	0.134
Frequency of church attendance	0.020	0.013	0.136	-0.004	0.011	0.742	-0.007	0.014	0.642
Self-reported health	0.033	0.028	0.237	0.046	0.027	0.084	0.023	0.028	0.398
Internet use: 2nd quartile group vs 1st	0.196	0.070	0.005*	0.119	0.064	0.062	0.115	0.078	0.143
Internet use: 3rd quartile group vs 1st	-0.053	0.056	0.349	-0.027	0.054	0.611	-0.082	0.059	0.164
Internet use: 4th quartile group vs 1st	0.031	0.067	0.643	-0.064	0.059	0.285	-0.041	0.068	0.550
Moderate scientific knowledge	0.057	0.065	0.386	0.071	0.062	0.252	-0.052	0.069	0.455
Good scientific knowledge	0.163	0.079	0.039*	0.200	0.070	0.004*	0.113	0.080	0.154
Constant	2.180	0.179	<0.001*	3.578	0.162	<0.001*	3.282	0.185	<0.001*
R^2	0.064			0.043			0.057		
N	1809			1795			1799		

*Table 1b. Linear regression models of trust variables in Waves 1-2 of Wellcome UK Monitor. Survey weights applied. Reference category is respondent is single, has a routine occupational status, is other than white, has secondary-level qualifications, has no religious affiliation, is in the lowest quartile group in terms of internet use, has low scientific knowledge. * $p < 0.05$.*

holding other variables constant. To examine how these different dimensions of trust relate to each other once these variables have been taken into account, we examined how model residuals correlated.[5]

Detailed results are available in Tables 1a and 1b above. Having degree-level rather than secondary-level qualifications predicts significantly lower trust in medics, significantly higher trust in journalists. For other professions differences are not significant. Having no qualifications compared with secondary-level qualifications is associated with significantly lower trust in academic and government scientists; otherwise, differences are not significant. Having a high rather than low level of scientific knowledge is associated with significantly more trust in journalists and medical charities; having a moderate rather than low level of scientific knowledge is associated with significantly more trust in academic scientists. Being in the second quartile group for self-reported internet usage rather than the lowest - a usage equating to 3 hours a week rather than 2 or fewer - is associated with greater trust in journalists and medical charities regarding reliability of information relating to medical research.

Trust in medics is generally high, and so it is arguably plausible that the relatively more educated are, on average, more critical of their reliability; and the coefficient is in any case not large. Since trust in journalists tends to be low, the relatively more educated again are distinctive perhaps because some are more likely to deviate from the social norm that they are untrustworthy, either because they are more informed as to what journalism involves, or because of the association between trust and liberal values.

Similarly, greater scientific knowledge is associated with more trust in journalists (and medical charities) and in academic scientists. Internet usage appears to have relatively weak association with trust, but a little usage is associated with more trust in journalism. Perhaps the notable feature here is that heavier users show similar levels of trust to those who would generally be considered to be digitally-excluded, even taking levels of education and scientific knowledge into account. While the heaviest users do not seem *less* trusting, it does not suggest either that more intensive use has similar effects to those of more formal education or greater scientific knowledge.

We next investigate how these different dimensions of trust in medical information sources are related, once our explanatory variables of interest have been taken into account. Specifically, we report the correlation matrix of residuals in Table 2. The residuals are all positively and significantly correlated, indicating that these measures of trust are all related. Some are more closely related than others. Trust in academic scientists and trust in government scientists are most closely related, followed by trust in government scientists and trust in government. Trust in medical charities and trust in academic scientists show some association, as do trust in journalists and trust in government. However, trust in medics appears to show weakest correlations overall with the other information sources, suggesting that they are more distinctive in public trust terms; the strongest correlation in residuals is between trust in medics and trust in medical charities.[6]

[5] This is similar to a multivariate multiple regression specification, although to maximise sample size for each model, we did not restrict the analyses to the same set of respondents.

[6] Cronbach's alpha for the 6 trust items for treating as a single medical research trust scale was 0.70, indicating reasonable reliability. An exploratory factor analysis (KMO = 0.72, Bartlett's test of sphericity rejects the null of no interrelatedness $X^2 = 1784.20$ (15), $p < 0.001$) suggested all items load positively on a generalised trust in medical research information factor accounting for 30 percent of the variance, but that trust in medics, medical charities and scientists load negatively on a second factor (3 percent of the variance) while trust in government and journalists load positively.

	Trust medics	Trust government	Trust journalists	Trust medical charities	Trust academic scientists
Trust government	0.278				
***p*-value**	<0.0001				
N	*1806*				
Trust journalists	0.090	0.338			
***p*-value**	0.0001	<0.0001			
N	*1805*	*1790*			
Trust medical charities	0.300	0.309	0.208		
***p*-value**	<0.0001	<0.0001	<0.0001		
N	*1800*	*1784*	*1783*		
Trust academic scientists	0.248	0.205	0.198	0.366	
***p*-value**	<0.0001	<0.0001	<0.0001	<0.0001	
N	*1792*	*1775*	*1777*	*1772*	
Trust government scientists	0.237	0.493	0.304	0.315	0.521
***p*-value**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
N	*1796*	*1779*	*1779*	*1774*	*1777*

Table 2: Correlation matrix of residuals from models summarised in Table 1.

As stated above, we lack good measures of cultural values relating to liberalism and authoritarianism. Our best proxies in this set of models are age, education and religious affiliation, known to correlate with basic values (see, for example, Heath et al 1994). There are some suggestive findings here. Anglicans report higher trust in medics and government than those without a religious affiliation; Catholics higher trust in government (in fact, the coefficient for 'Catholics' in this model is the largest across the six models). Other Christians exhibit significantly higher trust in government and in government scientists than the unaffiliated. More frequent church attendance appears to have no association with trust other than a significant positive association with trust in medical charities. Older respondents tend to trust government, medical charities and government scientists less than younger respondents. White respondents exhibit higher distrust in government and journalists than respondents who report a different ethnic identity.

3. Conclusions from Part 1

The models and correlations summarised in Table 1 and Table 2 provide some insight into how trust in medical research communication is structured. The graphical analysis in Figures 1-4 suggest that trust in the reliability of information provided by doctors, nurses and other health workers is high, as is trust in medical research charities and academic scientists, possibly because they are perceived as values-driven and less prone to commercial or political pressures. Trust in government scientists, government and journalists, is lower on average - in that order - and the model results suggest they are more clearly structured by social, knowledge-related and values-related variables.

It would naturally be difficult to alter average levels of trust for each of these dimensions in the short term. Those tasked with health messaging clearly already do draw on the trust in (and trustworthiness

of) medics, medical research charities and scientists, with the consistent use of medics and scientists in the British government's daily briefings an example.

4. Attitudes towards vaccines in cross-national context

One of the potential strategies to address COVID-19 involves creation of a vaccine and implementation of a widespread vaccination programme conferring herd immunity. Lack of confidence in vaccination accordingly constitutes an important public health risk, to the extent it reduces vaccine coverage below the level required to protect society, particularly those too vulnerable to be vaccinated.

A large and growing literature exists on the phenomenon of growing hesitancy in postindustrial societies. Outbreaks of diseases (notably measles and whooping cough) have become more common (Dubé et al 2013; Luyten et al 2018). Hesitancy is thought to range along a continuum from active demand for vaccination through concern (but support), delay in engagement with vaccination programmes, and rejection (Dubé et al 2013: 1764). The SAGE Working Group devised the following definition:

> Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence (MacDonald 2015: 4163).

Vaccine hesitancy also appears relatively prevalent. Luyten et al, drawing on a large online panel of British respondents, noted that of 10 items measuring vaccine hesitancy, more than half of the sample indicated a hesitant attitude to at least one and more than 90 per cent did so if the middle category of 'neither agree nor disagree' was also considered hesitant. Between 0.6 and 4 percent demonstrated hesitancy across all ten items, with especially high agreement with the statement that 'vaccines are not needed for diseases that are not common anymore'. They suggested that misunderstanding and complacency might be responsible. Larson et al (2018) modelled vaccine hesitancy across eight items for the European Commission using a vaccine confidence survey covering 20 member states. They found that 84 percent agreed that the MMR vaccine was important and 82 percent agreed it was safe, although rates were rather lower for the seasonal flu vaccine at 65 and 69 percent (Larson et al 2018: 15). However, their models were primarily structural, without taking differences in trust into account.

Trust in vaccines is considered to be shaped by both individual-level and contextual factors, including 'historical, political and socio-cultural context', wider institutional trust in health policy, and trust in the media (Dubé et al 2013: 1763). Dubé et al note in particular the widespread presence of anti-vaccination content online (2013: 1766). The appeal of such content and the mechanisms driving its prevalence have been summarised by Kata (2012):

> the infinite personalized truths presented online are each portrayed as legitimate... there are no objective facts,but rather multiple meanings and ways of "knowing"… evidence-based advice from qualified vaccine experts becomes just another opinion among many. Anti-vaccine groups have harnessed postmodern ideologies, and by combining them with Web 2.0 and social media technologies, are able to effectively spread their messages' (2012: 3779).

Kata also provides an overview of common tropes in the anti-vaccination online world: 'I'm not anti-vaccine, I'm pro-safe vaccines'; 'vaccines are toxic'; 'vaccines should be 100% safe'; 'science was wrong before'; 'you're in the pocket of Big Pharma'; and 'I'm an expert in my own child' among several (Kata 2012: 3781). Such tropes are effective, particularly those which appeal to a sense that patients should educate and empower themselves, and an ethos of democratic access to expertise,

which nevertheless serves to spread fear and heightened perception of risk (Kata 2012: 3784). Callaghan et al (2019), in a recent study of American parents, identified that conspiratorial thinking is positively associated with parental vaccine delay behaviours, indicating that online conspiracies and undermining of belief in the efficacy and safety of vaccines have detrimental public health effects.

Given the above, we examine the relationship between trust and acceptance in vaccines using the Wellcome Global Monitor 2018. Unfortunately, similar measures of scientific knowledge, internet use and conspiracism are not available in this survey, and so we focus on the trust-vaccine support relationship at the individual level, while taking national context into account in an additional model. Descriptive statistics for the samples used in this report are given in Table A2, below the bibliography.

Since this research note is primarily concerned with the British context, for simplicity we do as follows.[7] Attitudes in Britain are modelled as a function of gender, age, whether the respondent reports having a religious affiliation, level of education, whether the respondent lives in an urban environment, whether the respondent is employed to work full-time, whether the respondent is unemployed, household income, subjective sense of whether their income is adequate, whether the respondent would choose to follow religious advice over scientific or health advice, trust in scientists (included as an additive scale provided by the dataset depositors), trust in government medical and health advice, trust in medical and health advice from medical workers, trust in national government more generally, and trust in neighbours as a proxy for generalised social trust.

The 'trust in scientists' scale was derived from the following items:

How much do you trust scientists in this country? A lot, some, not much or not at all?

In general, how much do you trust scientists to find out accurate information about the world?

How much do you trust scientists working in colleges/universities in this country to do their work with the intention of benefiting the public?

How much do you trust scientists working in colleges/universities in this country to be open and honest about who is paying for their work?

How much do you trust scientists working for companies in this country to be open and honest about who is paying for their work?

Other trust measures were created from responses to the following:

In general, how much do you trust medical and health advice from the government in this country? A lot, some, not much, or not at all?

In general, how much do you trust medical and health advice from medical workers, such as doctors and nurses, in this country? A lot, some, not much, or not at all?

How much do you trust each of the following? How about the national government in this country? Do you trust them a lot, some, not much, or not at all?

How about the people in your neighbourhood? Do you trust them a lot, some, not much, or not at all?

[7] The variables publicly-available differ somewhat from those available in the Wellcome Trust UK Monitor datasets.

Question wording for other items can be found via the Wellcome Global Monitor website, which includes questionnaires, a detailed report, a report on methodology, and a copy of the dataset.[8]

Following estimation of the model for British respondents only, we then fit a similar model for respondents from Europe, the US, Canada, Australia and New Zealand as a set of relevant comparator and neighbouring countries, including country-level fixed effects setting Britain as the reference category. This allows us to examine how Britain ranks internationally once individual-level characteristics have been taken into account.[9]

We begin by examining the British sample to see how attitudes to vaccines vary by level of trust. Respondents were asked,

Do you strongly or somewhat agree, strongly or somewhat disagree or neither agree nor disagree with the following statement?

Vaccines are important for children to have.

Vaccines are safe.

Vaccines are effective.

Respondents were scored from 1-5, where 5 denoted strong agreement, 1 strong disagreement, and 3 neither agreement nor disagreement. Rates of agreement are high: 4.6 for 'vaccines are important for children to have', 4.1 for 'vaccines are safe', and 4.5 for 'vaccines are effective'. Pairwise correlations with our measures of scientific trust, trust in government, trust in neighbours, and trust in government and medics' medical advice were however all positive and significant, justifying inclusion in multiple regression analyses.

We then conducted linear regression analyses using the same set of explanatory variables, with results reported in full in Table 3 above. Across the three models, trust in scientists, trust in medics' health advice, and trust in neighbours are all associated with significantly greater support. By contrast, trust in governmental medical and health advice, and trust in government more generally, show no association with support for vaccines across any of the three measures. Surprisingly, we observe no association between education level and vaccine support. However, we do see that reporting that it is difficult to get by on present income, compared with reporting living comfortably, is associated with lower support for vaccines. By comparison, reported household income is only associated with vaccine support in the first model ('important for children to have') where the association is negative. In other words, a sense of being financially-squeezed explains rather more than a measure of objective financial position.

Finally, we examine how British respondents compare to others in comparative context. The survey is extremely rich, covering 149,014 individuals in 144 countries. Since it is difficult to graph or easily-interpret differences across 144 contexts, I model support for vaccines among respondents in Europe, North America, Australia and New Zealand (a subset of 43 countries), taking these as closest comparators for Britain. This gives a model N of 32,769. Rather than model responses to the three separate vaccine support measures, for simplicity I combine them in this case into a single measure by averaging the three scores into a vaccine support scale.[10]

[8] https://wellcome.ac.uk/reports/wellcome-global-monitor/2018

[9] The drivers are very likely to have differential effects within countries, but for simplicity we focus on how they operate within Britain and then report country effects, which we presume reflect national institutions and cultures.

[10] Cronbach's alpha for the three items is 0.76, indicating good reliability, and that they can be combined into a single scale.

	Vaccines important for children			Vaccines are safe			Vaccines are effective		
	Coefficient	SE	*p*	Coefficient	SE	p	Coefficient	SE	p
Female	0.042	0.052	0.421	0.072	0.076	0.346	0.017	0.059	0.773
Age	0.002	0.002	0.241	0.000	0.002	0.993	0.002	0.002	0.224
Has religious affiliation	-0.017	0.065	0.790	-0.027	0.085	0.746	0.046	0.070	0.515
Has primary education only	-0.043	0.080	0.592	0.097	0.111	0.384	0.021	0.081	0.799
Has degree-level education only	-0.072	0.055	0.194	0.047	0.078	0.542	0.074	0.062	0.231
Lives in urban area	0.016	0.057	0.781	-0.032	0.075	0.670	0.065	0.061	0.286
Employed full-time	-0.022	0.059	0.710	-0.008	0.081	0.919	0.052	0.063	0.408
Unemployed	-0.187	0.180	0.301	0.137	0.225	0.543	0.059	0.166	0.725
Household income	-0.041	0.020	0.043*	0.009	0.027	0.736	-0.043	0.022	0.054
Getting by on present income	-0.211	0.061	0.001*	-0.328	0.083	<0.001*	-0.175	0.067	0.009*
Difficult to get by on present income	-0.098	0.075	0.192	0.028	0.124	0.824	-0.031	0.087	0.720
Would follow religion over science	0.032	0.083	0.700	0.097	0.114	0.395	0.125	0.090	0.167
Trust in scientists	0.216	0.076	0.005*	0.427	0.099	<0.001*	0.189	0.071	0.008*
Trust government health advice	0.048	0.038	0.210	0.148	0.061	0.015	0.046	0.043	0.285
Trust medics' health advice	0.165	0.062	0.007*	0.146	0.072	0.041*	0.203	0.054	<0.001*
General trust in government	-0.013	0.027	0.620	0.041	0.039	0.290	-0.001	0.030	0.969
General trust in neighbours	0.092	0.045	0.043*	0.151	0.061	0.013*	0.133	0.061	0.030*
Constant	3.058	0.295	<0.001*	1.179	0.400	0.003*	2.495	0.293	<0.001*
R^2	0.129			0.178			0.132		
N	888			882			882		

Notes: Linear regression models of vaccine acceptance, Wellcome Global Monitor Survey 2018. British respondents only; country-specific weights applied. Reference category is respondent is male, has no religious affiliation, lives in a rural or small town area, has an economic status other than employed full-time or unemployed, reports that they are living comfortably on their present income, would not prioritise religion over science. * $p < 0.05$.

The full model results are given in Table A3 below the bibliography. For ease of interpretation, in Figure 5 below I graph the coefficients for each country compared to Britain, which as the reference category should be interpreted as having a score of zero. Coefficients are ranked from lowest or 'most negative' to highest. Where differences are not significantly different from zero (namely Britain), the relevant bar is plotted in a lighter blue. Figure 5 shows that French respondents score the lowest compared with British respondents once sociodemographic variables have been taken into account – a substantial difference, with the coefficient for France -0.6 on the 1-5 scale. By comparison, Hungarian respondents score highest, with scores of 0.48 higher on average than those of British respondents on the 1-5 scale, after controlling for third variables. Scores for British respondents are essentially similar to those of respondents in the United States, Ireland, Scandinavia, Spain and Italy, and a little higher than those of German respondents. Larson et al (2018) do note of France that there exists 'a historical context of vaccine controversies and mistrust' (2018: 44) which has recently motivated a systematic public communication strategy to restore trust following declining coverage and repeated measles outbreaks.

5. Conclusions from Part 2

Notably, support for vaccines in the British sample is associated with trust in scientists and in the medical and health advice provided by medics, rather than in government-provided medical advice, or government more broadly. It is interesting to note this in the context of declining trust in government; it also underlines the importance of trust in health care professionals for vaccine programme support. A further notable result was the effect of subjective income stress on support for vaccines. It appears that the effect is nonlinear in that those who report the highest level of subjective hardship are no different than those who perceive they are 'comfortable' in their vaccine support. It does leave open the possibility that vaccine hesitancy is partly a phenomenon of the 'squeezed middle', and additional research using richer measures of perceived economic insecurity should test this further.

Vaccine support in Britain also looks relatively good in comparison with a number of European states, although a thorough comparison should also examine vaccine take-up rates as behavioural measures as well as self-reported support or hesitancy. It is of course possible that the relationships and associations summarised above no longer hold, or have changed markedly in the wake of the crisis. However, we tend to see reasonable stability in values measures, and the 2018 survey in particular is relatively recent, at least in secondary data analysis terms.

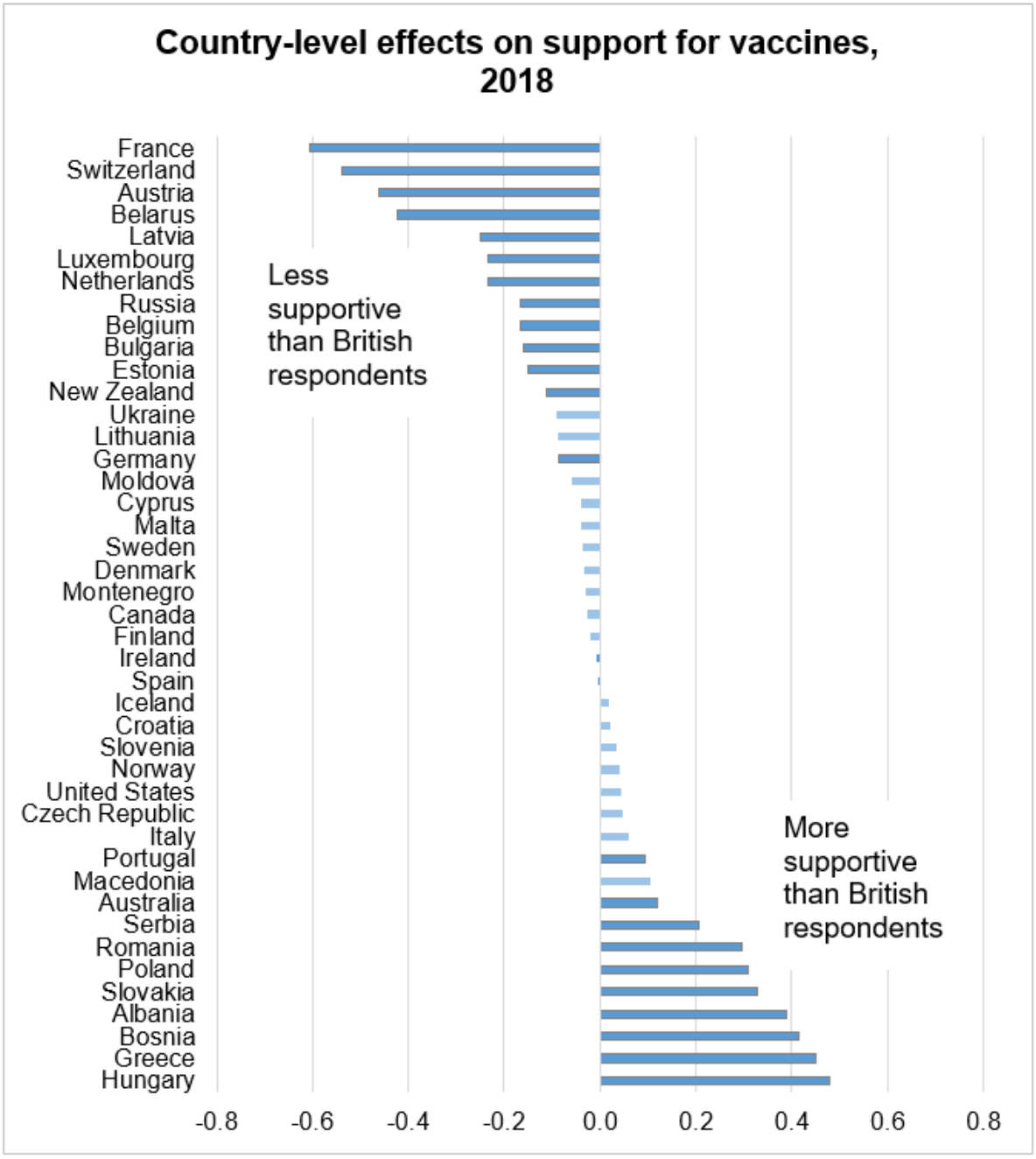

Figure 5: Coefficients for country dummies from model of vaccine support. See Table A3 for additional findings.

6. Suggestions for further research

The analyses above provide largely suggestive results. Ideally, good measures of internet usage and scientific knowledge would be available consistently, as would measures of agreement with conspiratorial beliefs, to allow testing for the potential sources of distrust and vaccine hesitancy in larger samples. Measures of liberalism and authoritarianism would also allow testing of whether differences in worldview account for some of the associations and differences observed here.

Nevertheless, the findings above provide additional evidence as to how trust might be conserved, and also suggest avenues for further work. A plausible ranking of trust in different medical research information sources was provided, and drivers of such trust identified. Although associations are not

consistent across different objects of trust, we do find that education level, internet usage and scientific knowledge are related to trust in different sources of medical research information. When examining support for vaccines, we find that levels are high and that trust in science and health professionals predict support. Further, trust in government has no significant association with such support. Support in Britain also looks reasonably high in comparative context. These dimensions of public attitudes will in turn play a role in the next stages of addressing COVID-19, where social isolation policies are likely to be wound down and ramped up again, and a vaccine programme eventually introduced, with public cooperation vital for their success.

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Table A1: Descriptive Statistics for Wellcome Trust Monitor UK Study Waves 1-2

Variable	***Percentage (%) or mean***	***N***
Female	51.5	1059 of 1835
Age	46.0	1835
Married or partnered	57.8	963
Professional/managerial	38.4	765
Intermediate occupation	20.9	369
Routine occupation	40.7	701
White ethnicity	89.3	1698
Respondent has a university degree	22.4	404
Respondent has no educational qualifications	21.9	372
No religious affiliation	46.2	849
Anglican	16.1	315
Catholic	8.7	160
Other Christian	22.1	429
Other Religion	6.9	82
Never attends a place of worship	66.0	1225
Attends less often than annually	3.6	73
Attends at least once a year	4.1	70
Attends at least twice a year	6.7	133
Attends at least monthly	4.3	77
Attends at least once in two weeks	2.6	43
Attends at least weekly	12.9	214
Very good self-reported health	38.6	698
Fairly good health	41.7	771
Fair health	14.2	259
Poor health	4.0	87
Very bad health	1.5	20
Average hours of self-reported internet usage per week	5.5	1835
Low level of scientific knowledge	20.1	331
Medium level of scientific knowledge	54.4	1054
Good level of scientific knowledge	25.6	450
Mean trust in medics as reliable source of medical research knowledge	3.8	1831
Trust in government	2.6	1810
Trust in medical research charities	3.7	1804
Trust in journalists	2.3	1809
Trust in academic scientists	3.7	1795
Trust in government scientists	3.1	1799

Note: Summary statistics available for set of respondents included in at least one model. Survey weights applied for percentages/mean values.

Table A2: Descriptive Statistics for Wellcome Global Monitor 2018: (a) British and (b) European/North American/Australia and New Zealand Model Samples

Variable	***Percentage (%) or mean: British sample only***	***N***	***Percentage (%) or mean: Europe/North America/ Australia/New Zealand sample (N = 32769 throughout)***
Female	51.7	891	50.7
Age	47.2	891	46.6
Has a religious affiliation	70.5	891	80.2
Primary education highest level achieved	16.3	891	11.7
Degree-level education	29.4	891	26.9
Lives in urban (vs rural or small town) area	44.2	891	48.5
Full-time employee	36.5	891	42.3
Unemployed	4.2	891	4.7
Living comfortably on present income	41.4	891	38.0
Getting by on present income	42.3	891	41.9
Finding it difficult on present income	16.3	891	20.2
Would follow religion above scientific advice	12.6	891	15.0
Trust in scientists index (1-4 scale)	3.3	891	3.1
Trust in government medical advice (1-4 scale)	3.2	891	2.9
Trust in health professionals' medical advice (1-4 scale)	3.6	891	3.4
General trust in government (1-4 scale)	2.4	891	2.4
General trust in neighbours (1-4 scale)	3.4	891	3.2
Vaccines are important for children to have	4.6	888	4.5
Vaccines are safe	4.1	882	4.0
Vaccines are effective	4.4	882	4.3
Support for vaccines (1-5 scale)	4.4	875	4.2

Note: Summary statistics available for set of respondents included in at least one model in the British case; for model respondents in the cross-national sample. Survey weights applied for percentages/mean values (wgt for the British summary statistics, PROJWT for the cross-national sample).

Table A3: Model Results for Cross-National Model of Support for Vaccines.

	Vaccine support scale (1-5 scale)		
	Coefficient	SE	*p*
Female	0.000	0.024	0.993
Age	0.001	0.001	0.385
Has religious affiliation	0.053	0.032	0.093
Has primary education only	-0.009	0.033	0.780
Has degree-level education only	0.068	0.027	0.013*
Lives in urban area	-0.005	0.025	0.845
Employed full-time	-0.094	0.026	<0.001*
Unemployed	-0.051	0.063	0.418
Household income	0.009	0.010	0.356
Getting by on present income	-0.099	0.031	0.001*
Difficult to get by on present income	-0.089	0.040	0.026*
Would follow religion over science	-0.211	0.045	<0.001*
Trust in scientists	0.267	0.027	<0.001*
Trust government health advice	0.135	0.018	<0.001*
Trust medics' health advice	0.273	0.026	<0.001*
General trust in government	0.011	0.015	0.462
General trust in neighbours	0.029	0.016	0.063
Constant	0.000	0.024	0.993
R^2	0.228		
N	32769		

Linear regression model of vaccine acceptance, Wellcome Global Monitor Survey 2018. European, North American, Australian and New Zealand respondents only; cross-national weights applied. Reference category is respondent is male, has no religious affiliation, lives in a rural or small-town area, has an economic status other than employed full-time or unemployed, reports that they are living comfortably on their present income, would not prioritise religion over science. Country fixed effects included but not reported; see Figure 5 above for graphical presentation of results. * $p < 0.05$.