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PERSUASIVE MESSAGES WILL NOT RAISE
COVID-19 VACCINE ACCEPTANCE.
EVIDENCE FROM A NATION-WIDE
ONLINE EXPERIMENT

RAMAN KACHURKA
MICHAŁ W. KRAWCZYK
JOANNA RACHUBIK

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Persuasive messages will not raise COVID-19 vaccine acceptance. Evidence from a nation-wide online experiment

Raman Kachurka, Michał W. Krawczyk, Joanna Rachubik

University of Warsaw, Faculty of Economic Sciences

*Corresponding authors: r.kachurka@uw.edu.pl, mkrawczyk@wne.uw.edu.pl,
j.rachubik@uw.edu.pl*

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Abstract: Although mass vaccination is the best way out of the pandemic, the share of sceptics is very substantial in most countries. Social campaigns can emphasize the many arguments that potentially raise acceptance for vaccines: e.g., that they have been developed, tested, and recommended by doctors and scientists; that they are safe, effective and in demand. We verified the effectiveness of such messages in an online experiment conducted in February and March 2021 with a sample of almost six thousand adult Poles, which was nationally representative in terms of key demographic variables. We presented responders with different sets of information about vaccination against COVID-19. After reading the information bundle, they indicated whether they would be willing to be vaccinated. We also asked them to justify their answers and indicate who or what might change their opinion. Finally, we elicited a number of individual characteristics and opinions. We found that nearly 45% of the responders were unwilling to be vaccinated and none of the popular messages we used was effective in reducing this hesitancy. We also observed a number of significant correlates of vaccination attitudes, with men, older, richer, and non-religious individuals, those with higher education, trusting science rather than COVID-19 conspiracy theories being more willing to be vaccinated. We discuss important

Keywords: COVID-19, vaccine refusal, vaccination hesitancy, persuasion

JEL codes: D91, I18

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1. Introduction

In many countries, a significant percentage of the population opts out of vaccinations, even mandatory ones, partly inspired by anti-vaccine movements. This situation leads to health risks, also for third parties, as is the case with measles. Reluctance to vaccinate has become striking during the COVID-19 pandemic, with a significant number of people refusing to take a shot protecting against the virus. For the time being, the insufficient number of vaccines available is, in most countries, the primary binding constraint on an expeditious vaccination campaign. Still, vaccinations are already available for high-priority groups (such as health workers) and will become available for the general population in the coming months. It is thus of great importance that the vaccines are broadly accepted.

Social campaigns can emphasize various arguments that potentially raise vaccination acceptance. For example, they may portray them as safe, effective, developed, tested and recommended by doctors and scientists, free of charge, voluntary, demanded by others, and available in limited numbers (therefore psychologically more valuable). Vaccine “passports” may also promise greater freedom to travel.

The effectiveness of these messages is not measured systematically and precisely enough. For example, the increase in vaccination acceptance rates after a social ad campaign may result from other circumstances. Moreover, it is not known which aspect of the campaign was particularly effective. Our study seeks to close this gap using a randomized controlled trial with between-subject manipulation of pro-vax persuasive messages addressing the dimensions mentioned before.

We conduct our study in Poland; while the country is experiencing extreme excess mortality during the pandemic (Grabowski et al., 2021), anti-vaccination attitudes have been on the rise in recent years (Grabowski et al., 2021; National Institute of Public Health, 2016) and are currently very common, compared to other countries (Lazarus et al., 2021; Sallam, 2021).

2. Literature review

Extensive literature has studied the numerous factors which may affect vaccine acceptance. A comprehensive review can be found in Betsch et al. (2015, 2018), who categorize them using the “five C”: Confidence in the vaccine, Convenience to obtain it, Calculation of pros and cons based on available information, Complacency (triggered by the assessment that the disease is not very dangerous) and Collective responsibility (willingness to protect others). We focus

predominantly on the confidence factors, which are easy to address with a social campaign or an online experiment like ours but hard to influence vaccine-resistant individuals. This is so because confidence in the effectiveness and safety of the vaccines strongly depends on deeply ingrained beliefs and attitudes, misinformation about vaccines, and trust in institutions, including the health care system (Betsch et al., 2015). Naturally, that does not exclude vaccination attitudes being affected by others; propagation of conspiracy theories may lead to negative attitudes and intentions (Betsch et al., 2015), whereas if vaccines enjoy high acceptance levels in society, others are likely to follow suit (Hershey et al., 1994). Universal acceptance is unlikely, though, because with high vaccination rates calculating individuals may want to free ride on herd immunity (Vietri et al., 2012).

A similar set of mechanisms and vaccination attitude factors is identified in the recent studies investigating resistance or hesitancy towards COVID-19 vaccines; see Sallam (2021) for a review. Individuals trusting the health care system and the government are more likely to be acceptant (Edwards et al., 2021; Karlsson et al., 2021; Lazarus et al., 2021). Important predictors of anti-vax attitudes include beliefs that the SARS-CoV-2 virus does not pose a risk (Loomba et al., 2020) and that it was purposefully developed by big pharma (Bitar et al., 2021)

Several studies have also looked at demographic determinants of COVID-19 vaccine attitudes, see Lin et al (2021) for the review. They typically found it to be more negative among low-income (Bitar et al., 2021; Edwards et al., 2021; Murphy et al., 2020), less educated (Lazarus et al., 2021; Paul et al., 2021) populaces, among ethnic minorities (Murphy et al., 2020; Paul et al., 2021), and the young (Lazarus et al., 2021; Murphy et al., 2020). Some authors (Bitar et al., 2021; Edwards et al., 2021; Murphy et al., 2020) find higher COVID-19 vaccine acceptance in males but the major study by Lazarus et al (2021) shows the opposite. International comparisons suggest most positive attitudes in Asian countries with high trust towards the central government and more negative in Central and Eastern Europe (Lazarus et al., 2021; Sallam, 2021).

In Poland, we are aware of surveys ordered by newspapers, which typically confirm demographic effects mentioned above, namely higher COVID-19 vaccine acceptance in older individuals, males, people living in big cities (Medonet, 2021) and those with higher education (Danielewski & Jedrysik, 2021).

All of the patterns reported above are correlations, so we cannot establish any causal links. While for demographic variables, we can be confident that, for example, age and gender

are more likely to affect attitudes towards vaccines than vice versa, establishing this effect is not immediately helpful in crafting policies that would increase vaccine take-up rate.

These considerations highlight the value of the few studies employing random assignment to treatments, permitting identification of causality. In a recent “mega-study”, Milkman et al (2021) partnered with Walmart to target 700 000 pharmacy section customers and encouraged them to get a flu shot. The most effective messages (those emphasizing that the vaccine was “waiting for them”) increased pharmacy vaccination rates by ca. 8.3% compared to the least effective messages. Another large and excellent recent study is that by Bannerjee et al. (2021) focusing on vaccination of toddlers in India. While vast majority of parents are in favor of vaccinations, they often fail to follow through. Bannerjee and colleagues employed an innovative econometric technique to pool some of the numerous treatments and estimate the effect of the best combination of treatments (incentives, reminders, and recruitment of local advocates of the campaign).

We are aware of three experimental studies addressing hesitancy to vaccinate against COVID-19. In the study by Palm et al (2021), a convenience sample of US-based Amazon MTurk workers was targeted in August 2020. Compared to the control group receiving no additional information, those who obtained a message about the safety and efficacy of the vaccine were more likely to say they would take it (and, of less practical importance, some manipulations decreased the willingness to be vaccinated).

In the perhaps most comprehensive study to date, conducted in July 2020, Schwarzingger et al (2021) surveyed a representative sample of French citizens aged 18 to 64. The authors implemented a discrete choice experiment approach, presenting the responders with a series of eight choice tasks, differing in terms of the hypothetical vaccine’s efficacy (50% to 100%), the risk of serious side-effects (1 in 10 000 vs 1 in 100 000), location of the producer (the EU vs the USA vs China), and place of administration (general practitioner vs local pharmacy vs mass vaccination center). All of these dimensions, except for the last one, were found to have some effect, yielding a difference in vaccine acceptance of approximately 15 percentage points between the most favored treatment (100% efficacy, 1:100 000 side effects, vaccines from the EU) and the least favored condition (50% efficacy, 1:10 000 side effects, vaccines from China).

It should be emphasized that these two studies were conducted before the COVID-19 vaccines were actually available. One can suspect that some responders could thus perceive the question about their vaccination intentions as speculative and premature; it is likely, that many

had given the vaccines very little thought so that their opinions were relatively malleable. This could be one reason for the positive effects of experimental manipulations.

Most recently, Serra-Garcia and Szech (2021) asked American MTurk workers to make hypothetical choices between COVID-19 vaccination and gift cards of different values (within-subject), manipulating the default option (between-subject). They found that, compared to the baseline of 70% with no incentives, modest incentives (\$20) reduced the declared take-up rate by 4.5 p.p., whereas substantial incentives (up to \$500) increased it by up 13.6 p.p.

Klüber et al (2021) addressed a large nationally representative sample in Germany. They exposed each of their responders to two consequent choices about vaccine acceptance, manipulating three dimensions: whether there are financial incentives to vaccinate; whether vaccines are available at the local doctor or only vaccination centers; whether those vaccinated can enjoy freedom of travel. They found that the combined effects of all three strategies can increase vaccination uptake as high as 13 percentage points among the undecided.

Our own study build upon these but investigates a much larger set of persuasive messages. It also uses a between-subject design, making it less susceptible to social desirability bias and other types of spill-overs (at a cost of requiring a large number of observations to account for individual heterogeneity). In any case, we believe that the topicality of the issue, the dynamism of the pandemic situation, and cultural factors potentially affecting the results call for many more studies of this kind.

3. Design and procedures

We conducted a randomized online study with an emulated representative sample of nearly six thousand adult Poles ($n=3117$ in Wave 1, $n=2814$ in Wave 2). The sample comes from a nationwide 110 000-strong survey panel Ariadna. Each panel member's identity is verified, with personal data being confidential and responses to individual surveys - anonymous. Ariadna's security measures exclude the activity of bots or any other virtual subjects. For each survey they fill in, the responders earn virtual points that can be later spent in an online shop.

In Wave 1, the questions were appended to a longer questionnaire developed for another project. In that project, we asked a number of questions about COVID-19 (but not specifically about vaccines), unemployment, or the common cold (between-subject random assignment). Wave 2 was a stand-alone study, with some further changes and additions as explored below (see Appendix A for both questionnaires).

In both waves, prior to being asked about their willingness to get vaccinated, the respondents were exposed to a randomized information package presented in Table 1. In Wave 1, exactly three out of seven messages unrelated to the price were always displayed (and always followed the same order as in Table 1). This makes the total length roughly constant but allows us to compare the efficacy of different types of messages only, not to tell if they are effective compared to no message at all. In Wave 2 thus, for each potential message there was an independent 50% chance that it is actually displayed (full factorial design). For example, only a randomly selected half of the subjects were told that the vaccine was developed by scientists from an international research consortium.

In both waves, one of the four prices was always shown (multi-arm design). The price message was always placed at the end because three out of its four variants were, by necessity, counterfactual. We were afraid that whatever message following it could also be considered counterfactual. Other than that, the order of the messages was random.

Table 1: Messages employed in the study

<i>Common sentence for all subjects: A vaccine for coronavirus has recently become available in Poland. Vaccination is voluntary.</i>	
<i>Then, the following persuasive messages – each could be present or not.</i>	
<i>Wave 1: exactly three randomly selected messages were shown</i>	
<i>Wave 2: each message was independently drawn with 50% chance</i>	
<i>v_producer_reputation</i>	The vaccine was developed by scientists from the American Pfizer and the German company Biontech. [Wave 1]/ The vaccine was developed by scientists from an international research consortium. [Wave 2]
<i>v_efficiency</i>	The vaccine's effectiveness has been estimated at over 90%, which means that a vaccinated person is more than ten times less likely to get the disease than an unvaccinated person.
<i>v_safety</i>	The European Medicines Agency confirms that the vaccine is safe. Possible side effects are mild to moderate, can be treated with paracetamol, and disappear within a few days.
<i>v_other_want_it</i>	Research conducted by IPSOS on 18,000 people in 15 countries shows that about 75% want to get vaccinated as soon as possible.

<i>v_scientific_autho rity</i>	According to the COVID-19 team at the Polish Academy of Sciences, "vaccination is the only rational choice, thanks to which we will be able to exit the pandemic faster." The use of the vaccine is also recommended by the Supreme Medical Chamber and many other medical and scientific societies.
<i>v_vax_passport</i>	It should be assumed that vaccination will make everyday life easier: vaccinated people will not have to quarantine after contact with an infected person, will be able to travel freely abroad, will not have to wear a face mask, etc.
<i>v_scarcity*</i>	In the initial stages, there will not be enough vaccines for everyone.
<i>v_tested**</i>	Development work on the vaccines began immediately after the pandemic outbreak and was treated as a priority. It drew on the vast experience of the research teams involved and used some of the solutions that had been used in vaccines for years. In total, more than 100,000 people were tested in clinical trials.

Price information: one of four versions was randomly shown:

<i>v_p_pays0</i>	Now suppose that the vaccine will be free for the person who wants to be vaccinated.
<i>v_p_gets70</i>	Now suppose that the vaccine will be free for a person who wants to be vaccinated, and as an incentive for mass vaccination, the government will pay everyone who wants to be vaccinated 70 PLN [ca. 15 euro].
<i>v_p_pays10</i>	Now suppose that the vaccine will be fee-based and will cost about 10 PLN per person.
<i>v_p_pays70</i>	Now suppose that the vaccine will be fee-based and will cost about 70 PLN per person.

* included in Wave 1 only.

** included in Wave 2 only.

The two waves used slightly different sets of messages, as indicated in Table 1. Specifically, the vaccines available in Poland during Wave 1 were only those produced by Pfizer/Biontech. By contrast, Moderna and AstraZeneca vaccines were widely used by the time Wave 2 started. We thus opted for a more general formulation of *v_producer_reputation*. Moreover, the message emphasizing the scarcity of vaccines was dropped because it was rather obvious anyway that the vaccines are scarce. Instead, a message directly addressing common concerns that the vaccines are insufficiently tested was introduced.

The respondents were then asked if, provided the information they just read was confirmed, they would be willing to get vaccinated. They could choose between “definitely not”, “rather not”, “rather yes”, and “definitely yes”. To discourage mindless clicking, the respondents were not allowed to choose an answer in less than 10 seconds, but in practice, the median time spent on this question was much longer, namely 33 seconds (which is quite enough to read a few short sentences). In two follow-up open questions, they were asked to justify their response and indicate who or what could change their opinion. Those who said “definitely not” or “rather not” to the vaccination question were also asked whether they might change their opinion if they saw that the vaccine was effective and safe after the first few months of vaccinations. Additionally, they were asked about their attitude toward conspiracy theories propounded by anti-vaccinationists and pandemic non-believers.

On top of standard demographic features and questions pertaining to emotions and risk attitudes, we elicited political orientation, feeling of control over the situation, feeling of being informed, and feeling worried (the latter three concerning the COVID-19 pandemic), religiosity, health condition, mask-wearing, keeping a physical distance, whether they or someone they know had COVID-19 and, if so, was hospitalized due to it. We also elicited predictions of the total number of confirmed COVID-19 cases and deaths due to COVID-19 during the next 12 months.

Additionally, in the second wave, we asked about various trust levels (in the government, the neighbors, doctors, media, family, scientists) and about smoking.

While the two waves were only a few weeks apart, the pandemic situation was developing dynamically. By the onset of Wave 1 (Jan 27th), 1.5 million COVID-19 cases had been detected in Poland, 36 thousand people had died, and just 2.2% of the population had been vaccinated with at least one dose. The 7-day average was 5 538 new cases and 273 deaths per day. By the time the second wave started (Mar 8th), there were *in addition to numbers reported above*, 300 thousand cases, nine thousand deaths, and 2.3% vaccinated with at least one dose. The 7-day average was 12 759 new cases and 218 deaths per day.

4. Hypotheses

We seek to verify the following hypotheses, pre-registered prior to Wave 2; see www.osf.io/e9cb2.

H1 concerns experimental effects: compared to the missing message, each of the seven types of pro-vaccine messages will increase vaccination acceptance.

H2 deals with main demographic effects: we expect that old age, male gender, higher education level, higher socio-economic status, living in a big city, supporting left-wing/opposition parties, average subjective health (compared to better than average and lower than average), individual COVID-19 complications risk factors, lack of individual vaccination side effects risk factors will increase vaccination acceptance.

Nearly all of the above are well-grounded in existing theoretical and empirical literature; what is perhaps the least trivial is the non-monotonous effect of subjective health. The logic here is that very good health might make vaccines seemingly less necessary, whereas poor health might make it seem dangerous.

Finally, H3 deals with interaction effects. We expect subjects believing in conspiracy theories to be less affected by experimental manipulations; older subjects and those in poor health to be more affected by manipulation concerning vaccinations' safety (rare, weak side effects); finally, EU-skeptical subjects to be less affected by manipulations mentioning the European Medicines Agency or (foreign) vaccination producers. Again, these hypotheses seem reasonably straightforward.

5. Results

5.1 Wave 1

We first report the distribution of our main variable `v_decision`. Unless otherwise stated, throughout the paper we report and analyze our data using post-stratification weights to better align the distribution of key demographic variables with those of the general population. However, this has no qualitative effect on the results. As shown in Table 2, our 3117 responders are very split on the issue, with similar shares choosing each of the four responses.

Table 2: Distribution of willingness to get vaccinated

Vaccination intention	Definitely yes	Rather yes	Rather not	Definitely not
Fraction	25.9%	26.6%	26.5%	21.6%

To simplify the exposition of the results concerning determinants of these choices, in this section, we merge the response “rather yes” with “definitely yes”, as well as the response “rather not” with “definitely not”, thereby creating a binary variable `vaxx_yes`, which we treat as a dependent variable in a logistic regression model. In Appendix C1, we present the ordered

logistics model taking the original four-level *v_decision* variable as a dependent variable as proposed in the pre-registered data analysis plan. The results are qualitatively analogous.

To verify the hypotheses and investigate the robustness of results found, we run a number of specifications with pre-registered sets of explanatory variables¹. In model (1), we include our experimental variables and basic demographic variables. In (2), we additionally control for political preferences (the party the responder would vote for should elections be held next Sunday), self-declared emotions, risk preferences, and the extent to which the responder worries and feels informed about covid. In further specifications, we build upon (2), seeking to verify interactions hypothesis H3: in (4) we additionally allow for interactions between experimental variables and key demographic variables; in (5) the interactions among experimental variables; in (6) those between self-reported material well-being and experimentally manipulated vaccination price; finally, in (7) interactions between experimental treatments and belief in conspiracy theories.

We also run some unregistered specifications suggested to us by early readers. These include interactions between gender and age as well as between political preference and education level (3) and interactions between selected experimental treatments (*v_producer_reputation* and *v_safety*) and political preference (8). Model (3) also gives rise to Figures 1 and 2. We report odds ratios calculated for specifications 1-4 in the main text (Table 3) and 5-8 in Appendix C1 (Table C1.1).

Because of the randomization procedure of Wave 1 described before, we can only investigate the effect of any experimental treatment compared to a reference treatment. We choose the seemingly most subtle message, namely *v_scarcity*, as our baseline so that estimates for other treatments should be understood as additional effects compared to that one.

Table 3: Logistic regression on vaccination decision (Wave 1), specifications 1-4

Variable	1_1	1_2	1_3	1_4
<i>v_prod_reputation</i>	0.905	0.970	0.973	0.962
<i>v_efficiency</i>	0.985	0.994	1.001	1.248

¹ A slight departure is that we skip age squared, which is anyway insignificant, to facilitate interpretation and visualization of Figure 1. This has no bearing on other results in all models except for (1). We also include 15 regional dummies that are jointly significant and that we overlooked in the pre-registered data analysis plan. Finally, we add per-capita COVID cases and deaths for the region and for the country as a whole from the preceding day (thus announced in the morning). They are not mentioned in the data analysis plan because it was not clear if they would be available. None of these changes has any qualitative bearing on the results.

v_safety	0.994	1.029	1.033	1.662
v_other_want_it	0.951	0.998	1.008	1.684
v_scientific_authority	0.994	1.063	1.061	1.770
v_vax_passport	1.171	1.279*	1.296*	1.957
v_p_gets70	0.739**	0.800	0.802	0.417*
v_p_pays10	0.866	0.829	0.826	0.944
v_p_pays70	0.585***	0.542***	0.540***	0.536
male	1.388***	1.464***	1.661	2.950*
age	1.033***	1.017***	1.018***	1.028
city_population				
small (<20k)	0.788*	0.689**	0.680**	0.714**
medium (20-99k)	0.887	0.836	0.826	0.846
big (100-500k)	1.013	0.834	0.839	0.841
large (>500k)	1.310*	0.993	0.996	0.995
secondary_edu	1.103	1.167	0.996	1.145
higher_edu	1.763***	1.686***	1.716*	1.721
wealth_low	0.782*	0.899	0.906	0.895
wealth_high	1.366***	1.291**	1.292**	1.285**
health_poor	0.602***	0.570***	0.572**	0.566***
health_good	0.677***	0.784**	0.782**	0.776**
tested_pos_covid	2.363	2.563	2.660	2.308
thinks_had_covid	0.798*	0.976	0.973	0.944
covid_hospitalized	0.697	0.721	0.708	0.763
covid_friends	2.009***	1.621***	1.627***	1.641***
religious	0.850	0.847	0.842	0.836
religious_freq				
less than once a year	0.963	0.960	0.977	0.987
few times a year	1.108	1.067	1.060	1.100
few times a month	0.909	0.843	0.847	0.878
few times a week	0.930	0.867	0.868	0.879
few times a day	0.697*	0.566**	0.571**	0.586**
status_unemployed	0.710**	0.792	0.787	0.781
status_pension	1.478***	1.314*	1.315*	1.265
status_student	1.896***	1.721**	1.739**	1.778**
treatment				
cold	0.893	0.948	0.945	0.930
unemployment	0.840	0.865	0.864	0.845
performance	0.998	1.548	1.556	1.512
voting_short				
left		1.415*	2.277	1.431*
PiS (ruling, right)		0.575***	0.390**	0.551***
ultra-right		0.177***	0.199**	0.174***
none or other		0.396***	0.397***	0.387***
e_happiness		0.993	0.991	0.992
e_fear		1.011	1.012	1.010
e_anger		1.001	1.001	1.003
e_disgust		1.054*	1.057*	1.051
e_sadness		0.941*	0.939**	0.940**
e_surprise		1.008	1.006	1.009
risk_overall		0.980	0.980	0.981

risk_work		0.985	0.986	0.985
risk_health		1.049**	1.049**	1.051**
worry_covid		1.105***	1.105***	1.107***
control_covid		1.120***	1.121***	1.119***
informed_covid		1.143***	1.142***	1.144***
informed_cold		0.900**	0.902**	0.902**
informed_unempl		0.980	0.977	0.976
conspiracy_score		0.696***	0.694***	0.691***
subj_est_cases_ln		1.036	1.029	1.040
subj_est_death_l		1.030	1.029	1.030
mask_wearing		1.280***	1.287***	1.275***
distancing		1.105***	1.105***	1.108***
regional dummies	NO	YES, sig.	YES, sig.	YES, sig.
infected_y_pc		41.546*	45.486*	58.150**
deceased_y_pc		4.684	13.185	3.321
PL_infected_yester~y		1.000	1.000	1.000
PL_deceased_yester~y		0.997	0.997	0.997
male#c.age			0.997	
interactions: political preference#education	NO	NO	YES, not sig	NO
interactions: experimental vars#demographic vars	NO	NO	NO	YES, not sig
cons		0.228***	0.150**	0.147**
	<i>N</i>	3105	3105	3105
	<i>r</i> ²	0.120	0.259	0.264

legend: odds ratios reported. * $p < .1$; ** $p < .05$; *** $p < .01$

Overall, our messages are ineffective. The only manipulation that makes a difference is that compared to the baseline of vaccines being available for free, the responders would be even less willing to get vaccinated if asked to pay a modest amount of 70 PLN.

We find strong demographic effects: being male, older, wealthier, and better educated (as well as worrying about COVID-19) makes it more likely to accept the vaccines. Those believing in conspiracy theories and those supporting right or ultra-right parties (or not voting at all), as well as those with the most intense religious practice tend to be more negative. The interaction terms in models 4-8 are jointly insignificant.

These key demographic effects are visualized in Figures 1 and 1. The first one shows that while gender and age are highly predictive, there is no interaction between them and no non-linear effect of the latter. The second figure confirms that voters of the extreme right are highly anti-vaxxers (especially those with only basic education), whereas other groups are more similar.

Figure 1: Predictive margins of sex and gender on vaccination decision

Predictive Margins of sex with 95% CIs

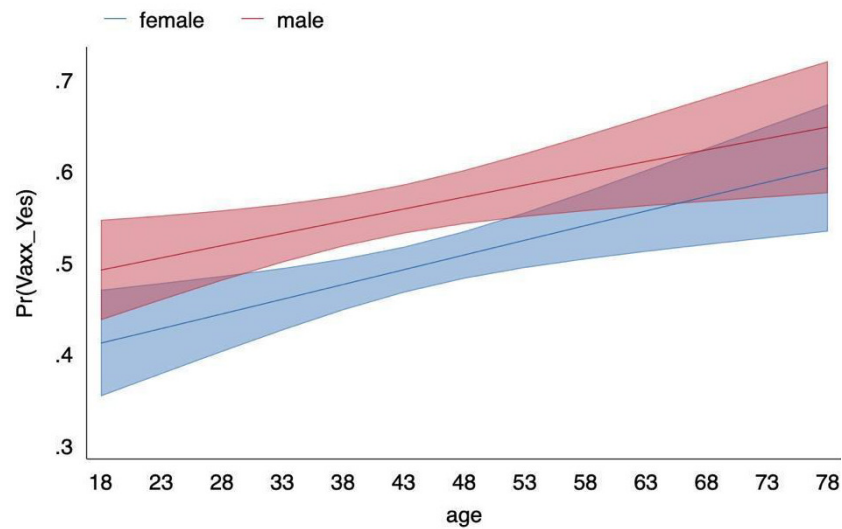
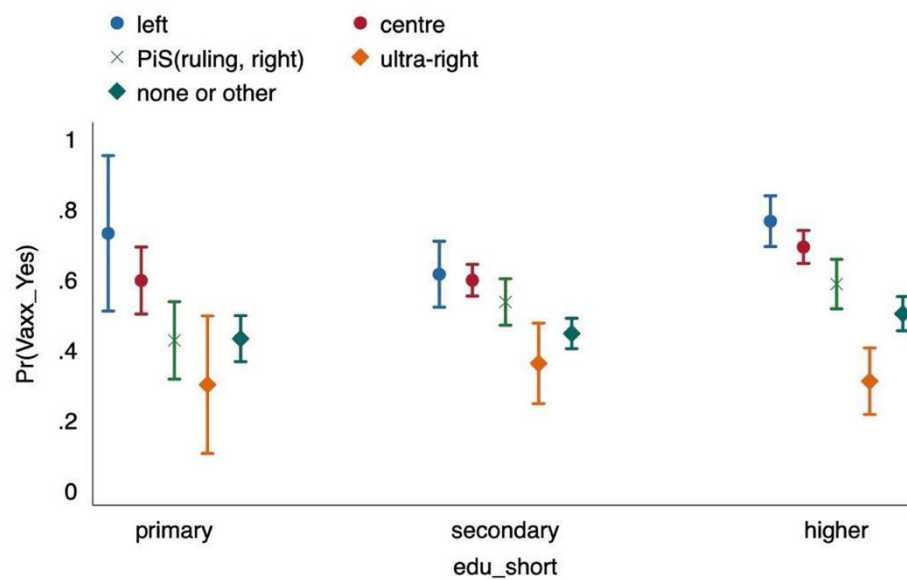


Figure 2: Predictive margins of education and voting preferences on vaccination decision

Predictive Margins of edu_short#voting_short with 95% CIs



5.2 Wave 2

In Wave 2, a sample of 2814 responders who have not taken part in Wave 1 was approached. In table 4, we show the distribution of the dependent variable. It is very similar to that of Wave 1.

Table 4: Distribution of willingness to get vaccinated

Vaccination intention	Definitely yes	Rather yes	Rather not	Definitely not
Fraction	24.1%	30.8%	24.6%	20.5%

The analysis of data from Wave 2 is also analogous to that of Wave 1, except that we do not need to treat any message as a baseline and that we incorporate additional explanatory variables available (notably trust towards various social groups). By contrast, given that Wave 2 was a stand-alone study, this time, we do not have variables related to the study preceding Wave 1. We are also able to add model (9) testing for order effects. It includes interactions between messages and their position among all messages shown to the given responder and interactions between messages and dummies for them being shown as the very first message. In this way, we can test if messages are more effective when shown early on (so that they are harder to be missed or ignored).

Again, we see in Table 5 that all messages are equally effective; this time, we can confirm our suspicion that all of them are indeed as effective as no message at all. In other words, they are *ineffective*. In none of the specifications is the effect of any of them on willingness to be vaccinated significant at 5% level, thus rejecting Hypothesis 1. Again, a price of 70 PLN strongly reduces the willingness to get a vaccine.

The demographic effects also match those reported in Wave 1, with males, older people, those with higher education, and greater wealth tending to be more pro-vaxx, although these variables are not significant in all the models. Again, political preferences and beliefs tend to be correlated with vaccination attitudes in predictable ways. For example, not voting or voting for the extreme-right Konfederacja (but this time not so for the right-wing ruling party PiS) is associated with a greater chance of opposing vaccines. Concerning the new variables, those trusting science, doctors, and the EU are more positive, as predicted. Respondents having friends who have had covid and believed to be in the risk group are more willing to be vaccinated, while those believing to be allergic to vaccines – less so. Thus, Hypothesis 2 is

generally confirmed; the exception is that the positive effect of supporting the political left is not significant. The effects of health are weak and usually not significant.

By contrast, Hypothesis 3 is soundly rejected, with interaction terms of models 4-7 being jointly insignificant (the only exception is that an unexpected *positive* interaction between conspiracy score and v_prod_reputation leads to conspiracy-experimental treatment interactions of the model (7) being significant). The interactions of the models (8) and (9) are likewise insignificant, see Appendix C2.

Overall, the results are very close to those of Wave 1. The fraction of respondents who will “rather” get vaccinated is slightly higher, mainly because the supporters of PiS develop a more positive attitude. One explanation for this trend is that while early on, the vaccines were probably primarily associated with the pharma companies that have produced them and the European Commission orchestrating their purchase. Over time, they have become more associated with the government organizing their distribution. Thus, those supporting the ruling party have become somewhat more convinced.

Table 5: Logistic regression on vaccination decision (wave 2), specifications 1-4

Variable	1_1	1_2	1_3	1_4
v_prod_reputation	1.041	1.053	1.042	1.469
v_efficiency	1.035	0.980	0.978	1.165
v_safety	1.047	1.107	1.110	1.099
v_other_want_it	1.039	0.902	0.902	0.809
v_scientific_authority	1.109	1.177	1.166	1.016
v_vax_passport	1.008	0.941	0.941	1.365
v_tested	1.172*	1.031	1.028	2.223**
v_p_gets70	1.122	1.082	1.060	0.923
v_p_pays10	0.997	1.009	1.005	0.819
v_p_pays70	0.748**	0.670**	0.659**	0.934
male	1.482***	1.973***	1.507	1.613
age	1.044***	1.027***	1.025***	1.046***
city_population				
small (<20k)	1.147	1.427*	1.435*	1.460**
medium (20-99k)	1.283*	1.286	1.305	1.264
big (99-500k)	1.296*	1.545***	1.570***	1.485**
large (>500k)	1.151	1.000	1.026	0.994
secondary_edu	1.283*	1.156	1.492	1.179
higher_edu	1.549***	1.189	1.808*	1.080
wealth_low	0.652***	0.817	0.822	0.788
wealth_high	1.247*	1.230	1.213	1.232
health_poor	0.798	0.651*	0.642*	0.636*
health_good	0.641***	0.766*	0.771*	0.766*
vaccine_extra_risky	0.503***	0.515***	0.515***	0.509***

covid_extra_risky	1.472***	1.230	1.219	1.233
health_smoking_light	0.789	0.759	0.713	0.813
health_smoking_mod~e	0.988	0.993	0.969	1.086
tested_pos_covid	3.382	8.499	9.329	7.632
thinks_had_covid	0.837	1.090	1.096	1.089
covid_hospitalized	0.555	0.324	0.310	0.339
covid_friends	2.520***	1.774***	1.768***	1.816***
religious	0.683**	0.542***	0.546***	0.508***
religious_freq				
less than once a year	1.270	1.375	1.407	1.444*
few times a year	1.217	1.276	1.296	1.327
few times a month	1.507**	1.407	1.423	1.444
few times a week	1.670***	1.649**	1.701**	1.750**
few times a day	0.929	0.925	0.952	0.994
status_unemployed	1.032	0.952	0.944	0.956
status_pension	1.093	0.999	1.006	1.014
status_student	1.695**	1.099	1.119	1.057
voting_short				
left		1.311	0.835	1.312
PiS(ruling,right)		0.915	1.530	0.935
ultra-right		0.428***	0.298	0.438***
none or other		0.551***	0.822	0.550***
				0.174***
e_happiness		0.955	0.956	0.954
e_fear		0.956	0.953	0.950
e_anger		0.997	0.994	0.998
e_disgust		1.037	1.041	1.037
e_sadness		1.027	1.031	1.026
e_surprise		0.980	0.981	0.980
risk_overall		0.966	0.968	0.967
risk_work		1.029	1.028	1.030
risk_health		1.012	1.013	1.012
worry_covid		1.165***	1.165***	1.172***
trust_EU_Y		1.900*	1.906*	2.047**
trust_EU_N		0.835	0.837	0.819
trust_gov_Y		0.669	0.677	0.646
trust_gov_N		0.760*	0.753*	0.770
trust_neigh_Y		0.828	0.837	0.780
trust_neigh_N		1.218	1.222	1.238
trust_doctors_Y		1.439*	1.423*	1.397
trust_doctors_N		0.537***	0.534***	0.523***
trust_media_Y		4.173***	4.102***	3.641**
trust_media_N		0.913	0.920	0.920
trust_family_Y		0.990	1.009	0.968
trust_family_N		1.011	1.023	1.007
trust_science_Y		1.718***	1.705***	1.831***
trust_science_N		0.815	0.813	0.844
control_covid		1.118***	1.122***	1.119***
informed_covid		1.133***	1.138***	1.144***

informed_cold		0.975	0.968	0.979
informed_unempl		0.953	0.951	0.950
conspiracy_score		0.708***	0.705***	0.701***
subj_est_cases_ln		0.952	0.951	0.951
subj_est_death_l		1.027	1.026	1.028
mask_wearing		1.179**	1.162**	1.166**
distancing		1.110***	1.110***	1.114***
regional dummies	NO	YES, sig.	YES, sig.	YES, sig.
infected_y_pc		0.827	0.808	0.846
deceased_y_pc		182.399	752.182	57.031
PL_infected_yester~y		1.000	1.000	1.000
PL_deceased_yester~y		1.001	1.001	1.001
male#c.age			1.006	
interactions: political preference#education	NO	NO	YES, n.s.	NO
interactions: experimental vars#demographic vars	NO	NO	NO	YES, n.s.
i_v_tested_age				0.985**
i_v_p_gets70_male				2.416***
_cons		0.058***	0.140***	0.119***
		0.062***		
	N	2814	2814	2814
	r2	0.143	0.348	0.350
			0.357	
legend: * p<.1; **p<.05; *** p<.01				

Figures 3 and 4 are analogous to 1 and 2, again showing no interaction between sex and age and very little between education and political preference.

Figure 3: Predictive margins of sex and gender on vaccination decision

Predictive Margins of sex with 95% CIs

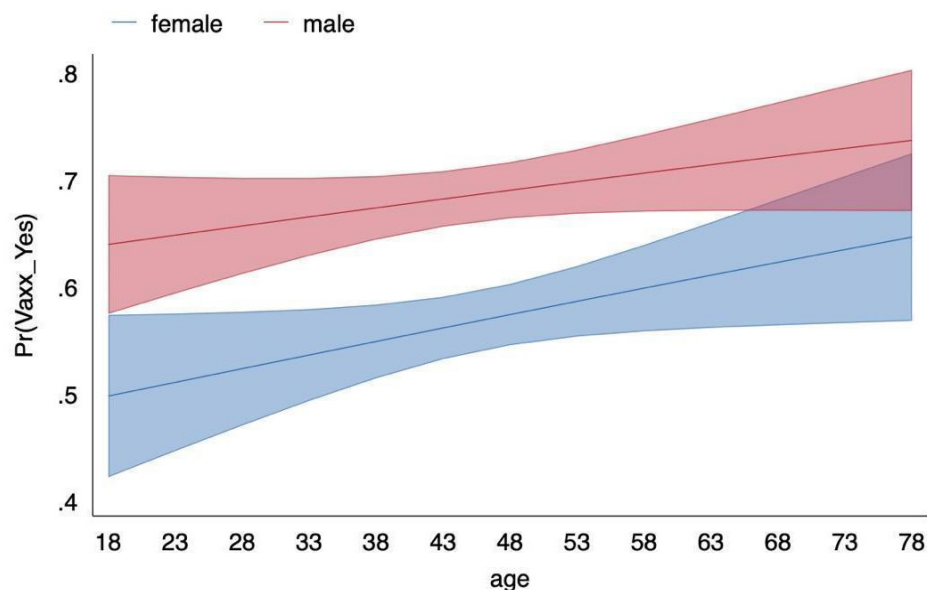
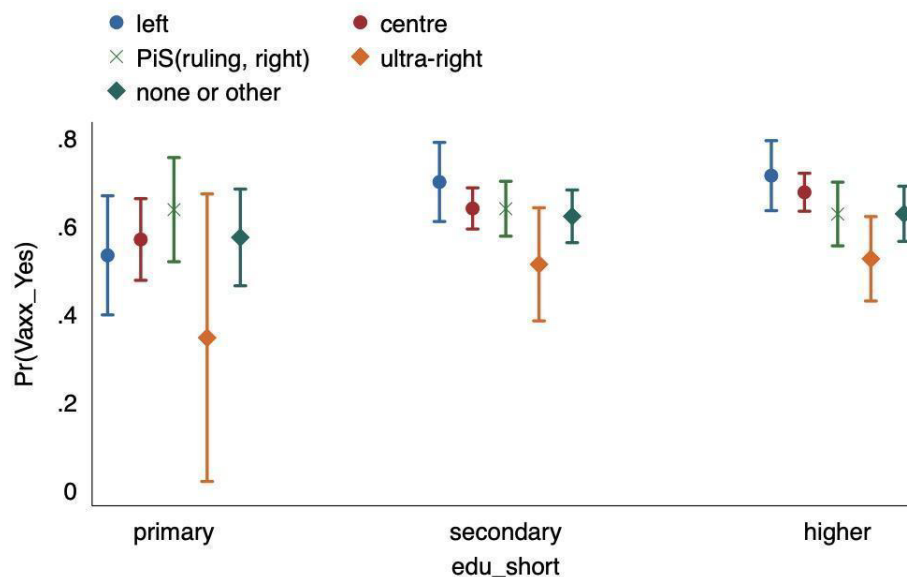


Figure 4: Predictive margins of education and voting preferences on vaccination decision

Predictive Margins of edu_short#voting_short with 95% CIs



5. Responses to open-ended questions

We seek further insight into responders' decisions by analyzing their answers to our open-ended question; see Appendix B for details of the classification procedure. Starting from the question about the main reasons behind the decision *not* to vaccinate, we report the prevalence of each response category in Table 6.

Overall, the most common concern is that of vaccines' safety (32% of responses fit into this category), possibly because they have been insufficiently tested (15.9% of responses). It can also be noted that vaccine safety concerns only *grew* from Wave 1 to Wave 2, possibly because of the media reports of the cases of blood clotting disorder in AstraZeneca vaccine patients and consequent decisions of some governments to suspend administration. Such news was indeed most numerous immediately prior to and during Wave 2.

There are also sizable groups just saying no (15.7%) or reporting mistrust towards those producing, distributing, or recommending COVID-19 vaccines (11.5%). Fraction of choice justifications relating to conspiracy theories was relatively low overall (5.4%), even though, when asked explicitly, as much as about 40 percent strongly agree (6 or 7 on a 0-7 scale) that official government information on COVID-19 is generally untrue, that government statistics on COVID-19 infections and deaths are deliberately falsified, and that most of the recommendations related to COVID-19 have no rationale for pandemic containment and actually serve other purposes. Interestingly (though perhaps unsurprisingly) those responses

categorized as manifestations of conspiracy theories were nearly four times more prevalent among those saying “definitely not” than those saying they would “rather not” be vaccinated. Likewise, the fraction of those saying they oppose vaccines, in general, was very low (2.2%).

Given the concern about side effects, it is not surprising that among those opposing COVID-19 vaccines, the most common “constructive” responses to the question who or what could change their mind, see Table 7, are those mentioning more evidence of safety (6.4%) or more information in general (5.8%). However, these figures are dwarfed by the prevalence of being unwilling to change one’s opinion no matter what (51.7%). Unsurprisingly, this statement was much more common among those who will “definitely” not get vaccinated. Relatedly, when asked if they could change their opinion if the early phase of the vaccination campaign confirmed that the COVID vaccines are safe and effective, as much as 86% of vaccine-opposing responders said no.

Table 6: Categorized answers to: “Why will you not get vaccinated?”

Why will you not get vaccinated?		Will you get vaccinated?				Average (weighed by N)
		definitely not		rather not		
		wave 1	wave 2	wave 1	wave 2	
Classified as:	Examples:					
safety_concerns	Vaccine unsafe; afraid of complications/of side effects; it's risky; afraid for my health/life	26.4%	29.9%	31.1%	40.6%	32.0%
efficacy_concerns	Vaccine ineffective; I don't know if it will work	5.6%	5.7%	5.1%	7.8%	6.0%
poorly_tested	Poorly tested; lack of accountability by pharmaceutical companies; I will not be a guinea pig	21.4%	19.4%	10.5%	13.9%	15.9%
not_afraid_virus	Virus is not dangerous; I am strong; I don't get sick; I have a high immunity; I am young	10.0%	10.6%	8.2%	7.0%	8.9%
just_no	Just no; I don't want to	18.0%	10.6%	22.2%	9.7%	15.7%
vaccine_too_costly	Vaccine is too costly; I don't have that much money	4.6%	5.8%	5.9%	5.0%	5.4%
conspiracy	Something about conspiracy theories: Gates, 5G; I don't believe in pandemics/COVID/fairy tales	7.9%	10.3%	1.6%	3.2%	5.4%

contraindications	I have medical contraindications (chronic diseases, allergies, sensitivities, chemotherapy)	2.8%	2.0%	5.0%	3.5%	3.4%
antibodies	I've already been through this; I have antibodies	0.5%	1.6%	0.5%	2.4%	1.2%
doubts_no	I have doubts; I don't know what to think about COVID vaccines; I have many unanswered questions	0.9%	0.9%	2.3%	2.4%	1.7%
mistrust_no	I don't trust vaccines; I don't trust pharmaceutical companies; I don't trust the government; I don't trust the media	12.9%	15.0%	7.2%	12.2%	11.5%
antivax	I do not vaccinate; I am against vaccines; vaccines are evil; vaccination is stupid	2.0%	2.6%	2.9%	2.2%	2.4%
<i>N</i>		632	529	745	628	2534

Note: The numbers in Tables 6-9 may add up to more than 100% because some responses belong to more than one category

Table 7: Categorized answers to: “Who or what might change your mind?”

Who or what might change your mind?		Will you get vaccinated?				Average (weighed by N)
		definitely not		rather not		
		wave 1	wave 2	wave 1	wave 2	
Classified as:	Examples:					
dont_know	I don't know	8.0%	4.7%	23.2%	13.9%	13.2%
nothing	No one; nothing; extreme (impossible) amounts of money; only me	63.7%	71.1%	35.3%	42.8%	51.7%
family	The close ones, relatives, family; their health state; if they ended up in a hospital	1.6%	2.1%	3.1%	4.8%	2.9%
doctor	Doctor	1.1%	0.4%	2.1%	2.8%	1.7%
else	Some other person/persons mentioned	0.9%	1.5%	2.0%	1.6%	1.5%
more_info	More information about the vaccine; more facts; more studies about the vaccine; better testing of a vaccine	4.1%	3.1%	6.6%	8.9%	5.8%
forced	Force; compulsion; punishment by imprisonment	3.5%	1.4%	3.1%	3.1%	2.8%
money	Money will convince me; if the vaccine is free; it depends on the price	2.8%	3.5%	2.6%	2.5%	2.8%
more_evidence_efficacy	More evidence of effectiveness	1.8%	1.5%	3.6%	3.7%	2.7%

more_evidence_safety	More evidence of safety	4.1%	4.6%	7.8%	8.5%	6.4%	
time	I just might decide differently someday; time; years of testing; positive vaccination statistics	4.2%	4.0%	6.6%	4.0%	4.8%	
		<i>N</i>	632	529	745	628	2534

Among responders willing to get vaccinated, see Table 8, safety was also of paramount importance, but, obviously, they predominantly claimed that the vaccines will provide protection from the virus for themselves (65%) and/or their loved ones (16.7%). Other popular reasons were convenience of travel etc. (12.3%) and somewhat diffuse “return to normality” (8.2%). Not surprisingly, those concerned about safety, when asked what could change their mind, see Table 9, were relatively likely to mention vaccines side effects (these variables correlate at $r = .21$) but, again, overall prevalence even of this most common specific category (22.3%) was much lower than that of “no-one”/“nothing” kind of response (44.0%).

Table 8: Categorized answers to: “Why will you get vaccinated?”

Why will you get vaccinated?		Will you get vaccinated?				Average (weighed by N)
		definitely yes		rather yes		
		wave 1	wave 2	wave 1	wave 2	
Classified as:	Examples:					
safety_general	Less risk; safety; security; more calm; peace of mind; for your own safety; covid is dangerous	60.0%	69.3%	47.3%	61.1%	65.0%
others_safety	For the safety of loved ones, for the safety of others	16.0%	18.8%	12.5%	14.8%	16.7%
normality	A return to normality; I want the pandemic to end; I want this situation to end	7.4%	9.6%	4.8%	6.9%	8.2%
just_yes	Because yes; more pros than cons; it's worth it	7.4%	3.1%	16.6%	8.7%	6.0%
belief_science	Because I believe in science; trust scientists	6.0%	6.1%	3.6%	3.7%	4.9%
no_alternatives	Because there are no alternatives; it is the only option	1.9%	1.7%	1.8%	0.9%	1.3%
morbidity_factors	Individual medical reasons for COVID to be risky (cancer, overweight, diabetes, pregnancy, I'm at risk)	4.9%	2.3%	2.6%	1.8%	2.0%

convenience	To travel; to have more privileges than those not vaccinated	10.6%	12.7%	11.1%	11.9%	12.3%
doubts_yes	I have doubts; I don't know what to think about COVID vaccines; I have many unanswered questions	0.0%	0.2%	2.7%	2.8%	1.5%
money	I don't want to pay; it should be free; I want to make money; I will get vaccinated but for free	0.8%	0.2%	0.7%	1.2%	0.7%
already_vac	Already vaccinated	1.0%	2.6%	0.1%	0.3%	1.4%
obligation	It is necessary; it should be done; it is necessary	1.7%	1.5%	0.9%	1.7%	1.6%
<i>N</i>		884	797	844	860	3385

Table 9: Categorized answers to: “Who or what might change your mind?”

Who or what might change your mind?		Will you get vaccinated?				Average (weighed by N)	
		definitely yes		rather yes			
		Wave 1	Wave 2	Wave 1	Wave 2		
Classified as:	Examples:						
dont_know	I don't know	8.2%	5.1%	17.4%	14.6%	11.4%	
nothing	No one; nothing; only me	56.0%	54.4%	36.2%	29.7%	44.0%	
family	The close ones, relatives, family; their health state; if they ended up in a hospital	2.1%	1.4%	3.3%	7.5%	3.6%	
doctor	Doctor	3.1%	4.4%	1.7%	2.6%	2.9%	
else	Some other person/persons mentioned	1.0%	1.3%	1.4%	1.3%	1.2%	
more_info	New facts about the vaccine	3.7%	1.5%	3.2%	2.2%	2.7%	
own_health	Illness, poor health, contraindications	1.5%	1.3%	1.0%	1.8%	1.4%	
more_evidence_inefficacy	evidence of ineffectiveness; negative vaccine test results	6.8%	8.1%	6.7%	10.4%	8.0%	
side_effects	Side effects; high mortality; the vaccine will prove harmful	18.5%	21.9%	24.6%	24.1%	22.3%	
		<i>N</i>	884	797	844	860	3385

5. Discussion and conclusion

In this paper, we report the results of two waves of a survey using a large and diverse sample. It thus allows investigation of even subtle effects, such as the evolution of attitudes towards

vaccines among supporters of a specific party over time. We also observe a number of strong main effects, largely confirming findings on determinants of attitude towards COVID-19 vaccines reported previously for other countries.

Still, the main experimental finding is negative – we were not able to persuade the responders to change their opinion. As always the case with surveys, one reason could be that respondents did not even bother to read our messages. This could be true for some of them, and these people may also be prone to ignoring persuasive messages sent via TV, radio, billboards, etc. In this sense, even if our null result is due to inattention, it may well have external validity. More importantly, we have clear evidence that a substantial fraction of our responders did read the messages carefully. First, median reading times did not suggest mindless clicking, as mentioned before. Second, our responders clearly did *not* miss the message about the vaccines costing 70 PLN – it made them substantially less likely to respond positively.

Third, more evidence comes from the responses to the open-ended questions. We observe that our manipulations could not have been altogether missed because they did affect these responses, as seen in the prevalence of some categories. Most spectacularly (and expectedly), the fraction of responders who complain about the vaccines being too costly is 6.6% in the condition where the hypothetical vaccine price was 70 PLN compared to just 1.0% otherwise. More than that, there are also significant differences for manipulations that do *not* affect declared intentions. For example, the mean of why_convenience is 9.6% with v_vax_passport manipulation and just 6.1% without, a significant difference.

Interestingly, some of these differences suggest another interpretation of the null result – in some responders, the manipulations could have backfired. For example, 8.0% of responders mentioned their concern that the vaccines might have been poorly tested (why_poor) when we explicitly addressed this issue (v_tested equal to one) compared to only 6.3% otherwise, $p = .039$ in a one-sided test of proportions. In other words, our manipulation actually made some responders consider the possibility that the vaccines may be insufficiently tested, most probably making their attitude more *negative*.

Likewise, given that 70 PLN is better than nothing, our observation that vaccine acceptance was identical in the free condition and in the patient_gets_70 condition suggests that the latter made the vaccine per se look less attractive in some responders' eyes. On top of the crowding-out of intrinsic motivation as suggested i.a. by Serra-Garcia and Szech (2021)

(a warm glow is lost if somebody is paid for their good deed), this condition could trigger suspiciousness (“there must be something wrong with it if they pay me to take it”).

There are other plausible reasons for the null result. People might have just heard too much about the virus and the vaccines over the last year; they might ignore or even avoid information (Soroya et al., 2020). Understandably, the virus and the pandemic it causes may evoke strong emotional reactions. It is then safe to assume that most people rely primarily on affective/experiential rather than analytic/rational systems (Slovic et al., 2004) to assess the risks and make decisions (Lazarević et al., 2021). This makes altering these decisions using rational arguments and statistics very difficult. Instead, campaigns could focus on changing the emotions associated with vaccinations. Given the design of our study, we did not include any audio or visuals. It is possible that an image of a celebrity or a physician or nurse could help build more positive associations of the COVID vaccines.

Finally, low levels of trust in Poland, particularly low level of trust towards public institutions, (Falk et al., 2016, 2018), makes effective public campaigning a challenge indeed. For example, in our sample, as much as 70% said “no” (rather than “yes, to a large extent”, yes, somewhat” or “no opinion”) when asked if they trusted the government.

In either case, our results suggest that info campaigns may be misguided. This finding backs up the conjectures made by several experts; “[I]t’s a reasonable thing not to have some giant national campaign,” as UCLA professor Hal Hershfield told USA Today (Weise, 2021).

We propose three alternative lines of action. First, persuasion could be tailored to individual reasons for vaccine hesitancy, identified using social media or personal interviews. For example, 3.5% of our responders declining vaccines (usually choosing “rather”, not “definitely not”) justified it in terms of individual contraindications, most typically allergies and asthma. These fears are overblown. Specifically, according to WHO, the prevalence of severe allergic reactions to COVID-19 vaccines is approximately one in a million, and asthma is not a contraindication. It seems very plausible that a short conversation with a trusted physician could change these people’s opinions. A study of elderly’s vaccination uptake in Poland indicates that this approach could indeed be effective (Malesza & Bozym, 2021). Likewise, in Turkey, a campaign involving face-to-face contacts with doctors and community leaders boosted the vaccine take-up rate by nearly 30% (The Guardian, 2021).

Second, it seems more promising to work indirectly, trying to turn those willing to be vaccinated into champions of the campaign. To some extent, this is already happening, with millions of people adding “I got my COVID-19 vaccine” or a similar frame to their Facebook profile picture. There is, however, no reason not to e.g. hand out physical stickers to those just vaccinated so that they can advertise beyond their social media bubbles. They could also be encouraged to talk about their experience, side effects included, with their friends and family members. As most people tend to infer too much from small samples, the fact that, say, five friends were vaccinated, and none of them had any serious symptoms could be more convincing than statistics covering millions of cases.

Third, more attention should perhaps be devoted to interventions that are more likely to work, such as making sure that those in principle willing to be vaccinated actually follow through. One very simple intervention that has been shown to work (Milkman et al., 2011) involves prompting individual patients to write down the date and time of the appointment. To the extent that these measures may prove insufficient to assure collective immunity, a serious discussion of various forms of coercion should probably be commenced.

All these, however, are partial, short-term solutions. A more fundamental change is needed, in Poland and elsewhere, in the education system that would effectively teach critical thinking and ability to assess trustworthiness of different sources of information in the complex digital world. Without it, we remain highly vulnerable to global threats requiring new types of large-scale voluntary collaboration based on scientific insights.

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Appendix A

Questionnaire (both waves)

[what's in the square brackets wasn't visible to the subjects]

We invite you to fill in the questionnaire as a part of the research conducted for the University of Warsaw. Please answer according to your beliefs. We guarantee full confidentiality of the collected data.

The survey will take you about 15 minutes to complete, and you will receive [xx] Ariadna points for it.

The survey consists of several different thematic blocks. Please complete the survey at once and do not take breaks. While completing the survey, it is not possible to return to the previous page.

To participate in the survey, please continue.

Greetings

In case of any problems with the survey, or if you would like to provide us with your comments on the survey, please contact us:...

[sex] What is your gender?

[rotate]
female
male

[age] What age are you?

18-24 years old
25-34 years old
35-44 years old
45-54 years old
55 years old or older

[year] What year were you born?

[19 . .]

[city_population] What is the size of the community you live in?

village
small town (up to 20 thousand inhabitants)

medium city (between 20,000 and 99,000 inhabitants)

large city (between 100,000 and 500,000 inhabitants)

large city (more than 500,000 inhabitants)

[woj] What voivodeship do you live in?

Dolnośląskie

Kujawsko-Pomorskie

Lubelskie

Lubuskie

Łódzkie

Małopolskie

Mazowieckie

Opolskie

Podkarpackie

Podlaskie

Pomorskie

Śląskie

Świętokrzyskie

Warmińsko-Mazurskie

Wielkopolskie

Zachodniopomorskie

[edu] What is your current education (the last school completed)?

Primary or lower secondary school

elementary

secondary

post-secondary or post-secondary school

currently studying

bachelor degree

higher education completed

[if in edu: bachelor or higher education]

[M7] What was your field of study?

[in if edu: currently studying]

[M7a] What is your field of study?

[P17] How strongly are you experiencing the following emotion at the moment?

[horizontal scale: 1 do not feel this emotion now, 10 I feel this emotion very strongly right now]

[rotate and register order]

Joy

Fear

Anger

Repulsion

Sadness

Surprise

[only in wave 2]

[trust_gov, trust_neighbours, trust_doctors, trust_media, trust_family, trust_scientists] Do you trust:

[rotate and register order]

representatives of the European Union
 the government
 your neighbors
 doctors
 the media (journalists)
 your family
 scientists

[scale:] YES, high
 YES, moderate
 NO
 I have no opinion

[P18] How do you perceive your willingness to take risks in general?

[horizontal scale: 1 totally risk-averse, 10 totally willing to take risks]

[P19] People may behave differently in different situations. How would you rate your willingness to take risks in the following cases?

[horizontal scale: 1 totally risk-averse, 10 totally willing to take risks]

[rotate and register order]

Your professional work

Taking care of your health, such as undergoing surgery that may bring complications, putting off recommended medical tests, changing a prescribed medication without consulting your doctor, having unprotected sex with someone other than a long-term, faithful partner.

[P37] Read the description below and then answer the related questions.

A vaccine for coronavirus has recently become available in Poland. Vaccination is voluntary.

[Randomized messages – each could be present or not. Exactly three randomly selected messages were shown in Wave 1: each message was independently drawn or not (50/50) in Wave 2]

[v_producer_reputation]

The vaccine was developed by scientists from the American Pfizer and the German company Biontech. [wave 1]/ The vaccine was developed by scientists from an international research consortium. [wave 2]

[v_efficiency] The vaccine's effectiveness has been estimated at over 90%, which means that a vaccinated person is more than ten times less likely to get the disease than an unvaccinated person.

[v_safety] The European Medicines Agency confirms that the vaccine is safe. Possible side effects are mild to moderate, can be treated with paracetamol, and disappear within a few days.

[v_other_want_it] Research conducted by IPSOS on 18,000 people in 15 countries shows that about 75% want to get vaccinated as soon as possible.

[v_scientific_authority] According to the COVID team at the Polish Academy of Sciences, "vaccination is the only rational choice, thanks to which we will be able to exit the pandemic faster." The use of the vaccine is also recommended by the Supreme Medical Chamber and many other medical and scientific societies.

[v_ease_personal_restrictions] It should be assumed that vaccination will make everyday life easier: vaccinated people will not have to quarantine after contact with an infected person, will be able to travel freely abroad, will not have to wear a face mask, etc.

[v_scarcity] [only in wave 1] In the initial stages, there will not be enough vaccines for everyone.

[v_tested] [only in wave 2] Development work on the vaccines began immediately after the pandemic outbreak and was treated as a priority. It drew on the vast experience of the research teams involved and used some of the solutions that had been used in vaccines for years. In total, more than 100,000 people were tested in clinical trials.

[Price information: one of four versions randomly shown:]

[v_p_pays0] Now, suppose that the vaccine will be free for the person who wants to be vaccinated.

[v_p_gets70] Now, suppose that the vaccine will be free for a person who wants to be vaccinated, and as an incentive for mass vaccination, the government will pay everyone who wants to be vaccinated 70 zł.

[v_p_pays10] Now, suppose that the vaccine will be fee-based and will cost about 10 zł per person.

[v_p_pays70] Now assume that the vaccine will be fee-based and will cost about 70 zł per person.

If, provided the information you just read was confirmed, would you be willing to get vaccinated?

definitely not

probably not

probably yes

definitely yes

[P38] Describe below the main reasons for your decision regarding coronavirus vaccination.

[P39] Who or what could change your decision regarding coronavirus vaccination?

[if previously indicated that they would probably or definitely not want to be vaccinated]

[P40] If the vaccine was confirmed to be effective and safe after the first few months of vaccinations, would you be willing to be vaccinated?

definitely not

probably not

probably yes

definitely yes

[P20] To what extent are you concerned or frightened with the current coronavirus pandemic?

[horizontal scale: 1 I am not concerned at all, 10 I am terrified]

[P21] What factors are major influences on the extent to which you are concerned about a coronavirus pandemic?

[P22] How would you rate your impact on whether you get infected with coronavirus?

[horizontal scale 1-7: 1 I have no influence, 7 I have a very high influence]

[P23] How well informed do you feel about the current coronavirus pandemic?

[horizontal scale 1-7: 1 do not feel informed at all, 7 I feel very well informed]

[Rotate the order of P24 and P25 and register order]

[P24] As of January 14th [wave 1]/February 27th [wave 2] of this year, approximately 1.4 [wave 1]/ 1.68 [wave 2] million people in Poland were confirmed to be infected with the coronavirus.

What do you think, how many NEW infections will be confirmed in Poland within the next 12 months?

[. . .] mln. people

[P25] As of January 14th [wave 1]/February 27th [wave 2] of this year, approximately 32 [wave 1]/ 43 [wave 2] thousand people in Poland have died as a result of coronavirus infection.

What do you think is the number of people who will die from COVID in Poland within the next 12 months?

[. . .] thousand people

[mask] Do you wear a mask when walking down an uncrowded sidewalk?

I never do
I sometimes do
mostly I do
I do every time

[hands] [only wave 2] How often do you wash, disinfect your hands (compared to before the pandemic)?

not more often than before the pandemic
a little more often
a lot more often

[P30] To what extent do you try to keep a physical distance from other people?

[horizontal scale 1 - 10: 1 I do not try to keep my distance at all, 10 I try as much as possible]

[P28] Would you like to add a comment or supplement your above answer (e.g., the reason for the change in a given matter)?

[rotate]
no
yes

[if yes]

[P29] Your comment:

Read the description below and then answer the related questions.

[conspiracy] Certain events, such as the COVID-19 pandemic, are subject to debate. Some people suggest that the official version of these events could be an attempt to hide the truth from the public. This official version could be covering up that these events were planned and secretly prepared by a secret alliance of influential people or organizations (for example, the secret service or the government). We are interested in your opinion on this subject.

To what extent do you agree or disagree with the following statements?

[scale 1-7: 1 strongly disagree, 7 strongly agree]

[rotate and register order]

[r1] I think that official government information on COVID-19 is generally untrue.

[r2] I think that government statistics on COVID-19 infections and deaths are deliberately falsified.

[r3] I think that most of the recommendations related to COVID-19 have no rationale for pandemic containment and actually serve other purposes.

[P31] Are you or have you been infected with coronavirus?

Yes, and this was confirmed by a test

I think yes

I don't think so

No

[if in P31: Yes, and this was confirmed by a test]

[P32] Have you been hospitalized due to coronavirus infection?

no

yes

[P33] Do you personally know anyone who has been infected with coronavirus?

no

yes

[if in P33: yes]

[P34] Have any of these people been hospitalized?

no

yes

We're changing the topic.

[M8] Which of the following terms best describes your household?

We live very poorly – we don't have enough for our basic needs

We live modestly – we have to manage economically every day

We live on average – we have enough money for everyday living, but we have to save for major purchases

We live well – we can afford much without saving

We live very well – we can afford some luxury

[M9] How would you rate your overall health?

very bad

bad

average

good

very good

[M9_1] [only wave 2] To your knowledge, does your health and medical history indicate a particularly high risk of side effects after receiving the COVID-19 vaccination? Such risk factors include certain chronic diseases and allergies.

Yes, I have particular risk factors

No, I do not have any

Don't know

[M9_2] [only wave 2] To your knowledge, does your health and medical history indicate a particularly high risk of severe course of illness if infected with coronavirus? Such risk factors include, but are not limited to, certain chronic diseases, a weakened immune system, cancer, being overweight, diabetes, pregnancy, and smoking.

Yes, I have specific risk factors

No, I do not have any

Don't know

[M9_3] [only wave 2] Do you smoke cigarettes?

yes

no

[M9_3a] If yes, how many cigarettes on average do you smoke per day?

[M9_3b] If no, have you ever smoked cigarettes in your life?

yes

no

[M10] Which description fits you best?

Not a believer

Believer

Believing deeply

[M11] How often do you privately engage in religious activities, for example, prayer, Bible reading, etc.?

Less than once a year

several times a year

Several times a month

Several times a week

several times a day

[M12] What is your current employment status?

I work under an employment contract

I work under a contract of commission

I am working on a task-specific contract

I have my own business

unemployed

pensioner

pupil or student

[M13] Did you participate in the Polish Parliament elections held on October 13th, 2019?

no

yes

I don't remember

[if M13: yes]

[M14] Which political group did you vote for in the Polish parliamentary elections that took place on October 13th, 2019?

[rotate]

Prawo i Sprawiedliwość + Solidarna Polska + Porozumienie

Koalicja Obywatelska (PO + Nowoczesna + Inicjatywa Polska + Zieloni)

SLD + Wiosna Roberta Biedronia + Lewica Razem, czyli Partia Razem, Unia Pracy, RSS

PSL + Kukiz 15

Konfederacja (KORWiN + Ruch Narodowy)

other (enter which one) [do not rotate]

I don't remember [do not rotate]

[everyone]

[M15] Did you participate in the 1st round of the presidential election held on June 28th, 2020?

[rotate]

no

yes

I don't remember [do not rotate]

[if yes]

[M16] Who did you vote for in the 1st round of the presidential election, held on June 28th, 2020?

[rotate]

Andrzej Duda

Szymon Hołownia

Władysław Kosiniak-Kamysz

Krzysztof Bosak

Rafał Trzaskowski

Robert Biedroń

Marek Jakubiak

Paweł Tanajno

Stanisław Żółtek

Mirosław Piotrowski

Waldemar Witkowski

I don't remember [do not rotate]

[everyone]

[M17] Did you participate in the 2nd round of the presidential election on July 12th, 2020?

[rotate]

no

yes

I don't remember [do not rotate]

[if participated in the 2nd round]

[M18] Who did you vote for in the 2nd round of the presidential election held on July 12th, 2020?

[rotate]

Andrzej Duda

Rafał Trzaskowski

I don't remember [do not rotate]

[everyone]

[M19] Would you participate in Polish parliamentary elections if they were held this Sunday and participation in them was safe from the perspective of epidemic risk?

definitely not
rather no
rather yes
definitely yes
hard to say

[if rather or definitely yes]

[M20] For which political group would you vote if the elections to the Polish parliament were held this Sunday?

[rotate]
Prawo i Sprawiedliwość + Solidarna Polska + Porozumienie
Koalicja Obywatelska (PO + Nowoczesna + Inicjatywa Polska + Zieloni)
Polska 2050 Szymona Hołowni
SLD + Wiosna Roberta Biedronia + Lewica Razem, czyli Partia Razem, Unia Pracy, RSS
PSL - Koalicja Polska
Kukiz'15
Konfederacja (KORWiN + Ruch Narodowy)
other (enter which one) [do not rotate]
hard to say [do not rotate]

Official and reliable information about the new coronavirus SARS-Cov-2 causing COVID-19 disease can be found, among others, at the following sites in Polish:

www.gov.pl/web/koronawirus, www.pacjent.gov.pl/koronawirusinformacje,
www.gis.gov.pl/kategoria/aktualnosci, www.nfz.gov.pl

and English: <https://www.who.int/health-topics/coronavirus>.

[standard end page with acknowledgments, etc.]

Appendix B

The open-ended questions were categorized using the following procedure. Firstly, a number of categories were proposed based on existing literature and manual inspection of a sample from the first wave. Initially, the two raters manually categorized the responses of 200 randomly selected subjects, see Table B.1.

Table B.1 - interrater agreement (kappa statistics) for manual classification of open-ended questions

Variable	Interrater agreement
<i>related to question "why?"</i> :	
safety_general	0.98
safety_concerns	0.98

belief_science	0.94
doubts_no	0.83
others_safety	0.97
not_afraid_virus	0.94
poorly_tested	0.96
contraindications	1.00
antibodies	1.00
convenience	0.89
normality	0.83
just_no	1.00
no_alternatives	1.00
just_yes	0.92
conspiracy	1.00
efficacy_concerns	1.00
morbidity_factors	1.00
vaccine_too_costly	1.00
side_effects	0.94
<i>related to question "who?":</i>	
nothing	1.00
doctor	1.00
dont_know	1.00
more_evidence_inefficacy	1.00
else	1.00
forced	1.00
more_evidence_efficacy	0.76
more_evidence_safety	1.00
money	1.00
time	0.85
family	0.94
average	0.96

Two reviewers, n=200

Thus, according to (Landis & Koch, 1977), all but one of our kappas could be considered “almost perfect”. Then the process of assigning the responses to categories was partly automatized for the sake of efficiency and objectivity. Specifically, a number of keywords were proposed for each category for the question concerning the main reasons behind the decision

(“why?”) and the question as to who or what could change the responders's decision (“who?”), see Table 6-9 in the main text. Whenever a keyword was found in the response, we initially assigned the response to the relevant category, allowing a response to belong to multiple categories. For example: category *conspiracy* was associated with words (and its inflections) “lie, made up, no pandemics, no COVID, Gates, nonsense”. If an algorithm found any of these words (or combinations of words), it classified such responses to the *conspiracy* category. The exact script is available at <https://github.com/becarefulwithmath/COVID-classification-of-open-ended-questions>. In such a way our script classified answers to “why?” and “who?”. It assigned a preliminary category to 3 716 answers to “why?” question; and to 4 784 answers to “who?” question.

This preliminary categorization was manually inspected by two independent raters and corrections were made if both raters sought them. This was the case for 2 652 initially categorized responses to “why?” and 1 814 of initially categorized responses to “who?” (but many of these changes involved correcting only one out of several categories identified automatically). Moreover, the two raters manually categorized the responses that were not assigned to any category (2 507 of responses to “why?” and 1 439 of responses to “who?”). Again, a response was assigned to a category if both raters agreed.

Appendix C: Additional tables

Appendix C1: Wave 1

Table C1.1: Logistic regression on vaccination decision, specifications 5-9

Variable	l_5	l_6	l_7	l_8
v_prod_reputation	0.511	0.956	0.913	0.958
v_efficiency	0.593	0.983	0.815	0.979
v_safety	0.754	1.024	1.193	0.865
v_other_want_it	0.624	0.989	1.413	1.001
v_scientific_autho~y	0.790	1.064	1.125	1.054
v_vax_passport	0.813	1.264*	1.150	1.284*
v_p_gets70	1.247	0.847	1.266	0.796
v_p_pays10	2.400	0.861	1.627	0.817
v_p_pays70	0.520	0.495***	1.126	0.537***
male	1.467***	1.472***	1.474***	1.468***
age	1.018***	1.017***	1.017***	1.016***
city small (<20k)	0.704**	0.684**	0.676**	0.687**
city medium (20-99k)	0.853	0.836	0.831	0.838
city big (100-500k)	0.839	0.832	0.820	0.839
city large (>500k)	1.010	0.995	0.988	1.007
secondary_edu	1.171	1.190	1.169	1.155

higher_edu	1.669***	1.714***	1.682***	1.693***
wealth_low	0.881	1.045	0.899	0.890
wealth_high	1.268*	1.179	1.300**	1.289**
health_poor	0.548***	0.553***	0.562***	0.573**
health_good	0.769**	0.789**	0.781**	0.782**
tested_pos_covid	2.928	2.684	2.528	2.684
thinks_had_covid	0.993	0.974	0.977	0.990
covid_hospitalized	0.685	0.703	0.725	0.694
covid_friends	1.607***	1.624***	1.629***	1.621***
religious	0.842	0.845	0.853	0.865
relig:less than once a year	0.948	0.967	0.953	0.954
relig:few times a year	1.071	1.068	1.068	1.043
relig:few times a month	0.819	0.849	0.838	0.832
relig:few times a week	0.884	0.863	0.854	0.842
relig:few times a day	0.567**	0.578**	0.574**	0.556**
status_unemployed	0.814	0.814	0.783	0.802
status_pension	1.321*	1.335*	1.310	1.338*
status_student	1.770**	1.724**	1.716**	1.720**
treatment:cold	0.958	0.939	0.946	0.950
treatment:unemployment	0.857	0.849	0.862	0.855
performance	1.551	1.481	1.551	1.462
voting_short				
left	1.381	1.400	1.402	1.660
PiS(ruling, right)	0.552***	0.577***	0.570***	0.661
ultra-right	0.172***	0.176***	0.173***	0.281***
none or other	0.392***	0.396***	0.394***	0.502***
e_happiness	0.991	0.992	0.993	0.992
e_fear	1.013	1.010	1.009	1.014
e_anger	0.998	1.003	1.003	1.001
e_disgust	1.051	1.055*	1.054	1.056*
e_sadness	0.948*	0.943*	0.943*	0.939**
e_surprise	1.010	1.005	1.006	1.004
risk_overall	0.977	0.978	0.980	0.978
risk_work	0.983	0.985	0.984	0.983
risk_health	1.051**	1.049**	1.048**	1.049**
worry_covid	1.103***	1.106***	1.107***	1.106***
control_covid	1.121***	1.122***	1.123***	1.116***
informed_covid	1.134***	1.142***	1.147***	1.146***
informed_cold	0.903**	0.899**	0.899**	0.902**
informed_unempl	0.988	0.983	0.979	0.983
conspiracy_score	0.691***	0.695***	0.782	0.697***
subj_est_cases_ln	1.040	1.038	1.028	1.032
subj_est_death_l	1.031	1.030	1.030	1.029
mask_wearing	1.284***	1.278***	1.274***	1.287***
distancing	1.110***	1.108***	1.104***	1.105***
regional dummies	YES, sig.	YES, sig.	YES, sig.	YES, sig.
infected_y_pc	42.536*	48.076*	39.511*	37.217*
deceased_y_pc	5.402	6.368	22.937	1.376
PL_infected_yester~y	1.000	1.000	1.000	1.000
PL_deceased_yester~y	0.997	0.997	0.997	0.998
interactions between experimental vars	YES, n.s.	NO	NO	NO
interaction: price#wealth	NO	YES, n.s.	NO	NO

interaction: experimental vars#belief in conspiracy	NO	NO	YES, n.s.	NO
interaction: experimental vars # political preference	NO	NO	NO	YES, n.s.
<u>_cons</u>	0.229	0.147**	0.089*	0.128**
<i>N</i>	3105	3105	3105	3105
<i>r2_p</i>	0.268	0.262	0.261	0.264

legend: * p<.1; **p<.05; *** p<.01

Table C1.2: Ordered logistics model, specifications 1-4

Variable	o_1	o_2	o_3	o_4
v_decision				
v_prod_reputation	0.880	0.926	0.932	1.075
v_efficiency	0.955	0.911	0.920	1.054
v_safety	0.967	0.968	0.977	1.746*
v_scientific_authority	0.934	0.949	0.963	1.783
v_scientific_autho~y	1.013	1.071	1.077	1.716
v_vax_passport	1.103	1.168	1.181	1.802*
v_p_gets70	0.806**	0.887	0.888	0.500*
v_p_pays10	0.897	0.888	0.880	0.917
v_p_pays70	0.629***	0.589***	0.591***	0.678
male	1.372***	1.428***	1.569*	2.423**
city_population				
small (<20k)	1.019	0.928	0.921	0.962
medium (20-99k)	0.960	0.941	0.934	0.955
big (100-500k)	1.002	0.807	0.815	0.814
large (>500k)	1.448***	1.082	1.087	1.103
secondary_edu	1.084	1.094	0.971	1.084
higher_edu	1.774***	1.550***	1.681*	1.193
wealth_low	0.758**	0.851	0.853	0.845
wealth_high	1.363***	1.311***	1.314***	1.283**
health_poor	0.593***	0.567***	0.570***	0.575***
health_good	0.668***	0.773***	0.773***	0.767***
tested_pos_covid	2.365	4.009	3.982	3.954
thinks_had_covid	0.825**	1.010	1.010	0.972
covid_hospitalized	0.716	0.577	0.585	0.590
covid_friends	1.807***	1.398***	1.401***	1.408***
religious	0.849	0.831	0.835	0.821
religious_freq				
less than once a year	0.963	0.978	0.986	0.994
few times a year	1.029	1.028	1.019	1.044
few times a month	0.927	1.014	1.013	1.045
few times a week	0.904	0.900	0.900	0.910
few times a day	0.727*	0.614**	0.614**	0.635**
status_unemployed	0.759**	0.901	0.899	0.882
status_pension	1.591***	1.316**	1.312**	1.295*
status_student	1.898***	1.647**	1.672**	1.693***
treatment				

cold	0.952	1.032	1.034	1.011
unemployment	0.886	0.922	0.922	0.900
performance	0.875	1.295	1.289	1.284
voting_short				
left		1.480**	1.571	1.486**
PiS(ruling,right)		0.540***	0.464**	0.174***
ultra-right		0.228***	0.282*	0.221***
none or other		0.408***	0.411***	0.396***
e_happiness		0.982	0.982	0.979
e_fear		0.996	0.999	0.993
e_anger		1.003	1.002	1.008
e_disgust		1.012	1.014	1.009
e_sadness		0.974	0.973	0.970
e_surprise		0.999	0.997	1.001
risk_overall		0.994	0.992	1.000
risk_work		0.986	0.987	0.985
risk_health		1.027	1.026	1.026
worry_covid		1.135***	1.135***	1.138***
control_covid		1.113***	1.114***	1.113***
informed_covid		1.132***	1.134***	1.134***
informed_cold		0.935*	0.936*	0.937*
informed_unempl		0.946	0.942	0.946
conspiracy_score		0.673***	0.672***	0.668***
subj_est_cases_ln		1.084	1.084	1.085
subj_est_death_l		1.047**	1.046**	1.048**
mask_wearing		1.241***	1.244***	1.242***
distancing		1.109***	1.109***	1.107***
regional dummies	NO	YES, sig.	YES, sig.	YES, sig.
infected_y_pc		8.165	8.960	9.464
deceased_y_pc		2.407	6.895	0.918
PL_infected_yester~y		1.000	1.000	1.000
PL_deceased_yester~y		0.998	0.998	0.998
male#c.age			0.998	
interactions: political preference#education	NO	NO	YES, n.s.	NO
interactions: experimental vars#demographic vars	NO	NO	NO	YES, n.s.
i_v_p_pays10_male				0.617**
i_v_p_pays70_male				0.603**
cut1	1.050	0.622	0.668	1.526
cut2	4.220***	3.453*	3.719*	8.579**
cut3	16.790***	18.362***	19.880***	46.187***
N	3105	3105	3105	3105
r2_p	0.080	0.185	0.186	0.189

legend: * p<.1; **p<.05; *** p<.01

Table C1.3: Ordered logistics model, specifications 5-8

Variable	o_5	o_6	o_7	o_8
v_decision				
v_prod_reputation	0.814	0.912	0.654	0.863
v_efficiency	0.477	0.902	0.887	0.903
v_safety	0.641	0.960	1.184	1.002
v_other_want_it	0.713	0.943	1.318	0.943
v_scientific_autho~y	0.877	1.066	1.391	1.065
v_vax_passport	0.943	1.159	1.040	1.167
v_p_gets70	1.237	0.833	1.633	0.880
v_p_pays10	1.811	0.871	1.517	0.876
v_p_pays70	0.768	0.484***	1.025	0.582***
male	1.433***	1.432***	1.430***	1.444***
age	1.019***	1.018***	1.018***	1.018***
city small (<20k)	0.930	0.926	0.917	0.932
city medium (20-99k)	0.942	0.946	0.942	0.944
city big (100-500k)	0.798*	0.803*	0.793*	0.813
city large (>500k)	1.084	1.083	1.060	1.090
secondary_edu	1.115	1.120	1.093	1.080
higher_edu	1.557***	1.576***	1.547***	1.545***
wealth_low	0.824	0.830	0.850	0.845
wealth_high	1.310***	1.018	1.320***	1.322***
health_poor	0.565***	0.554***	0.558***	0.570***
health_good	0.773***	0.777***	0.770***	0.772***
tested_pos_covid	3.695	4.376	3.835	4.004
thinks_had_covid	1.006	1.003	1.011	1.011
covid_hospitalized	0.609	0.548	0.589	0.572
covid_friends	1.368***	1.406***	1.409***	1.385***
religious	0.821	0.833	0.842	0.834
relig:less than once a year	0.953	0.978	0.967	0.974
relig:few times a year	1.017	1.022	1.020	1.031
relig:few times a month	1.001	1.021	0.997	1.008
relig:few times a week	0.898	0.892	0.879	0.895
relig:few times a day	0.609**	0.623**	0.624**	0.610**
status_unemployed	0.924	0.904	0.897	0.905
status_pension	1.365**	1.337**	1.323**	1.333**
status_student	1.652**	1.660**	1.665**	1.658**
treatment:cold	1.052	1.027	1.025	1.032
treatment:unemployment	0.923	0.913	0.916	0.924
performance	1.286	1.260	1.294	1.277
voting_short				
left	1.441**	1.477**	1.466**	1.866**
PiS(ruling, right)	0.529***	0.541***	0.538***	0.663*
ultra-right	0.223***	0.229***	0.224***	0.296***
none or other	0.404***	0.410***	0.407***	0.490***
e_happiness	0.981	0.982	0.981	0.983
e_fear	0.994	0.996	0.996	0.996
e_anger	1.001	1.003	1.004	1.004

e_disgust	1.010	1.014	1.011	1.013
e_sadness	0.980	0.976	0.974	0.975
e_surprise	1.001	0.996	0.997	0.997
risk_overall	0.990	0.992	0.991	0.992
risk_work	0.988	0.985	0.988	0.985
risk_health	1.028	1.027	1.027	1.025
worry_covid	1.139***	1.134***	1.138***	1.136***
control_covid	1.113***	1.116***	1.117***	1.110***
informed_covid	1.123***	1.131***	1.132***	1.131***
informed_cold	0.940	0.935*	0.935*	0.937*
informed_unempl	0.949	0.948	0.945	0.949
conspiracy_score	0.669***	0.672***	0.756*	0.672***
subj_est_cases_ln	1.087	1.087	1.077	1.078
subj_est_death_l	1.043**	1.046**	1.047**	1.049**
mask_wearing	1.245***	1.238***	1.236***	1.244***
distancing	1.108***	1.111***	1.106***	1.109***
regional dummies	YES, sig.	YES, sig.	YES, sig.	YES, sig.
infected_y_pc	7.114	9.365	8.019	8.446
deceased_y_pc	1.041	2.791	12.907	0.335
PL_infected_yester~y	1.000	1.000	1.000	1.000
PL_deceased_yester~y	0.998	0.998	0.998	0.998
interaction between experimental vars	YES, n.s.	NO	NO	NO
interaction: price#wealth	NO	YES, n.s.	NO	NO
wp_v_p_pays70_weal~h		1.768**		
interaction: experimental vars#belief in conspiracy	NO	NO	YES, n.s.	NO
interaction: experimental vars # political preference	NO	NO	NO	YES, n.s.
cut1	0.441	0.571	1.044	0.739
cut2	2.471	3.182*	5.816*	4.124**
cut3	13.333***	16.996***	30.996***	22.079***
<i>N</i>	3105	3105	3105	3105
<i>r</i> ² _p	0.189	0.187	0.186	0.187

legend: * p<.1; **p<.05; *** p<.01

Appendix C2: Wave 2

Table C2.1: Logistic regression on vaccination decision, specifications 5-9

Variable	1_5	1_6	1_7	1_8	1_9
v_prod_reputation	1.448	1.051	0.328***	1.010	1.096
v_efficiency	1.180	0.979	0.713	0.981	0.757
v_safety	0.843	1.109	1.624	1.276	1.134
v_other_want_it	1.024	0.916	1.098	0.875	1.060
v_scientific_autho~y	0.828	1.179	1.404	1.204	1.081
v_vax_passport	1.146	0.949	1.267	0.924	1.249
v_scientific_authority	0.610	1.033	0.722	1.050	1.495
v_p_gets70	2.273*	1.073	0.469	1.064	1.084

v_p_pays10	0.831	0.950	2.530	0.972	1.038
v_p_pays70	0.454*	0.553***	0.589	0.647***	0.688**
male	1.998***	1.993***	1.975***	1.966***	1.999***
age	1.027***	1.028***	1.029***	1.027***	1.027***
city small (<20k)	1.455**	1.415*	1.482**	1.385*	1.394*
city medium (20-99k)	1.337*	1.281	1.284	1.266	1.252
city big (100-500k)	1.584***	1.541***	1.591***	1.537**	1.551***
city large (>500k)	1.006	0.991	0.988	0.964	0.967
secondary_edu	1.189	1.157	1.157	1.165	1.175
higher_edu	1.233	1.203	1.204	1.170	1.196
wealth_low	0.827	0.720	0.796	0.816	0.814
wealth_high	1.225	1.055	1.221	1.248	1.215
health_poor	0.633*	0.653*	0.660	0.661	0.669
health_good	0.774*	0.762*	0.778*	0.753**	0.765*
vaccine_extra_risky	0.492***	0.508***	0.519***	0.517***	0.513***
covid_extra_risky	1.271	1.228	1.243	1.192	1.226
health_smoking_light	0.723	0.763	0.775	0.734	0.802
health_smoking_mod~e	0.984	0.995	1.021	0.992	1.046
health_smoking_heavy	1.010	1.061	1.094	1.088	1.119
tested_pos_covid	6.376	8.077	12.247*	8.307	8.136
thinks_had_covid	1.118	1.095	1.119	1.083	1.098
covid_hospitalized	0.380	0.330	0.265*	0.319	0.332
covid_friends	1.783***	1.769***	1.774***	1.813***	1.789***
religious	0.545***	0.549***	0.546***	0.570***	0.525***
relig:less than once a year	1.365	1.354	1.361	1.265	1.437*
relig:few times a year	1.211	1.248	1.274	1.215	1.312
relig:few times a month	1.337	1.396	1.389	1.328	1.437
relig:few times a week	1.583*	1.616**	1.677**	1.552*	1.722**
relig:few times a day	0.878	0.916	0.913	0.847	0.915
status_unemployed	0.943	0.972	0.964	0.983	0.982
status_pension	1.032	0.999	0.994	0.984	1.029
status_student	1.167	1.085	1.115	1.027	1.097
voting_short					
left	1.355	1.320	1.347	1.466	1.281
PiS(ruling, right)	0.921	0.909	0.964	1.230	0.914
ultra-right	0.421***	0.428***	0.426***	0.547	0.416***
none or other	0.564***	0.545***	0.577***	0.509**	0.548***
e_happiness	0.950*	0.955	0.952*	0.957	0.953*
e_fear	0.955	0.957	0.959	0.958	0.96
e_anger	1.006	0.996	0.997	0.998	0.997
e_disgust	1.022	1.037	1.040	1.045	1.034
e_sadness	1.032	1.026	1.020	1.022	1.026
e_surprise	0.990	0.981	0.979	0.978	0.981
risk_overall	0.959	0.966	0.968	0.963	0.968
risk_work	1.028	1.029	1.029	1.029	1.027
risk_health	1.013	1.012	1.015	1.014	1.014
worry_covid	1.165***	1.163***	1.166***	1.165***	1.163***
trust_EU_Y	1.987**	1.950**	1.901*	1.939*	1.935**
trust_EU_N	0.829	0.829	0.867	0.845	0.832

trust_gov_Y	0.636	0.673	0.614	0.667	0.669
trust_gov_N	0.728*	0.757*	0.780	0.739*	0.757*
trust_neigh_Y	0.843	0.833	0.865	0.830	0.831
trust_neigh_N	1.252	1.226	1.180	1.226	1.236
trust_doctors_Y	1.361	1.467*	1.422*	1.444*	1.454*
trust_doctors_N	0.559***	0.536***	0.549***	0.555***	0.536***
trust_media_Y	5.014***	4.342***	4.352***	4.160***	3.864**
trust_media_N	0.931	0.913	0.876	0.174***	0.928
trust_family_Y	1.048	0.985	0.988	0.967	1.000
trust_family_N	1.001	1.013	1.037	1.052	1.017
trust_science_Y	1.761***	1.701***	1.773***	1.671***	1.724***
trust_science_N	0.799	0.819	0.789	0.807	0.828
control_covid	1.117***	1.118***	1.118***	1.123***	1.118***
informed_covid	1.141***	1.141***	1.129***	1.136***	1.138***
informed_cold	0.960	0.973	0.978	0.971	0.977
informed_unempl	0.964	0.949	0.956	0.945	0.953
conspiracy_score	0.696***	0.707***	0.631***	0.703***	0.704***
subj_est_cases_ln	0.955	0.955	0.961	0.956	0.947
subj_est_death_l	1.021	1.026	1.032	1.029	1.028
mask_wearing	1.184**	1.181**	1.191***	1.171**	1.180**
distancing	1.113***	1.109***	1.108***	1.109***	1.114***
regional dummies	YES, sig.	YES, sig.	YES, sig.	YES, sig.	YES, sig.
infected_y_pc	0.828	0.828	0.787	0.838	0.797
deceased_y_pc	35.555	213.322	547.450	185.755	326.051
PL_infected_yester~y	1.000	1.000	1.000	1.000	1.000
PL_deceased_yester~y	1.001	1.001	1.001	1.001	1.001
interactions between experimental vars	YES, n.s.	NO	NO	NO	NO
interaction: price#wealth	NO	YES, n.s.	NO	NO	NO
interaction: experimental vars#belief in conspiracy	NO	NO	YES, n.s.	NO	NO
v_prod_reputat_con~y			1.282***		
interaction: experimental vars # political preference	NO	NO	NO	YES, n.s.	YES, n.s.
_cons	0.156**	0.146**	0.180*	0.132***	0.212*
N	2814	2814	2814	2814	2814
r ² p	0.363	0.350	0.356	0.356	0.352

legend: * p<.1; **p<.05; *** p<.01

Table C2.2: Ordered logistics model, specifications 1-4

Variable	o_1	o_2	o_3	o_4
v_decision				
v_prod_reputation	1.086	1.143	1.127	1.224
v_efficiency	1.096	1.059	1.054	1.132
v_safety	1.016	1.088	1.085	1.186
v_other_want_it	1.137	1.023	1.018	0.711
v_scientific_autho~y	1.021	1.038	1.031	1.188
v_vax_passport	1.046	1.027	1.028	1.629

v_tested	1.234***	1.069	1.075	1.551
v_p_gets70	1.056	0.988	0.965	0.906
v_p_pays10	0.982	0.911	0.903	0.782
v_p_pays70	0.724***	0.628***	0.618***	0.840
male	1.413***	1.760***	1.233	1.855**
age	1.043***	1.024***	1.021***	1.032***
city_population				
small (<20k)	1.122	1.335**	1.332**	1.370**
medium (20-99k)	1.124	1.052	1.064	1.030
big (100-500k)	1.203	1.294**	1.324**	1.257*
large (>500k)	1.140	0.981	1.011	0.991
secondary_edu	1.233*	1.118	1.630*	1.125
higher_edu	1.560***	1.188	1.945**	1.264
wealth_low	0.646***	0.856	0.860	0.866
wealth_high	1.273**	1.247**	1.242**	1.244*
health_poor	0.914	0.793	0.780	0.807
health_good	0.712***	0.892	0.897	0.899
vaccine_extra_risky	0.523***	0.597***	0.601***	0.599***
covid_extra_risky	1.602***	1.409***	1.395***	1.410***
health_smoking_light	0.845	0.911	0.851	0.945
health_smoking_mod~e	1.048	1.040	1.015	1.103
health_smoking_heavy	1.115	1.130	1.094	1.189
thinks_had_covid	0.907	1.172	1.190	1.171
covid_hospitalized	0.649	0.389*	0.379*	0.402*
covid_friends	2.277***	1.515***	1.516***	1.536***
religious	0.717**	0.638***	0.642***	0.614***
religious_freq				
less than once a year	1.202	1.323*	1.338*	1.331*
few times a year	1.127	1.213	1.223	1.236
few times a month	1.188	1.148	1.158	1.175
few times a week	1.349*	1.350*	1.389*	1.382*
few times a day	0.822	0.984	1.017	1.036
status_unemployed	1.058	0.967	0.955	0.960
status_pension	1.160	1.037	1.047	1.057
status_student	1.978***	1.170	1.207	1.166
voting_short				
left		1.112	1.001	1.118
PiS(ruling, right)		0.785	1.325	0.795
ultra-right		0.459***	0.353	0.471***
none or other		0.567***	0.947	0.573***
e_happiness		0.980	0.981	0.979
e_fear		0.954*	0.951*	0.952*
e_anger		0.983	0.981	0.980
e_disgust		1.022	1.022	1.026
e_sadness		1.033	1.039	1.029
e_surprise		0.976	0.979	0.979
risk_overall		0.959	0.961	0.955*
risk_work		1.015	1.014	1.018
risk_health		1.024	1.025	1.024
worry_covid		1.183***	1.183***	1.184***

trust_EU_Y		2.147***	2.135***	2.258***
trust_EU_N		0.794**	0.795**	0.789**
trust_gov_Y		0.585*	0.578*	0.606*
trust_gov_N		0.932	0.916	0.944
trust_neigh_Y		1.102	1.100	1.062
trust_neigh_N		1.171	1.169	1.178
trust_doctors_Y		1.387**	1.381**	1.338*
trust_doctors_N		0.579***	0.576***	0.568***
trust_media_Y		2.134	2.197	2.198
trust_media_N		0.879	0.884	0.867
trust_family_Y		0.861	0.875	0.857
trust_family_N		0.936	0.939	0.960
trust_science_Y		1.839***	1.836***	1.913***
trust_science_N		0.805	0.810	0.829
control_covid		1.099***	1.102***	1.100***
informed_covid		1.059	1.061	1.067*
informed_cold		0.977	0.972	0.976
informed_unempl		0.968	0.968	0.965
conspiracy_score		0.702***	0.699***	0.698***
subj_est_cases_ln		0.961	0.965	0.954
subj_est_death_l		1.021	1.021	1.020
mask_wearing		1.215***	1.198***	1.224***
distancing		1.104***	1.104***	1.104***
regional_dummies	NO	YES, sig.	YES, sig.	YES, sig.
infected_y_pc		0.950	0.919	0.982
deceased_y_pc		238342.666	1123990.115*	114008.661
PL_infected_yester~y		1.000	1.000	1.000
PL_deceased_yester~y		1.000	1.000	1.000
male#c.age			1.008	
interactions: political preference#education	NO	NO	YES, n.s.	NO
interactions: experimental vars#demographic vars	NO	NO	NO	YES, n.s.
i_v_vax_passport_m~c				0.651**
cut1	4.320***	1.216	1.467	1.930
cut2	17.048***	7.948***	9.625***	12.771***
cut3	86.588***	68.142***	83.134***	112.167***
<i>N</i>	2814	2814	2814	2814
<i>r2_p</i>	0.090	0.247	0.249	0.252

legend: * p<.1; **p<.05; *** p<.01

Table C2.3: Ordered logistics model, specifications 5-9

Variable	o_5	o_6	o_7	o_8	o_9
v_decision					
v_prod_reputation	1.336	1.143	0.714	1.157	1.222
v_efficiency	1.129	1.062	0.963	1.065	0.846
v_safety	0.701	1.086	1.293	1.135	1.150
v_other_want_it	0.990	1.037	1.114	0.997	1.198

v_scientific_autho~y	0.821	1.041	0.953	1.057	1.174
v_vax_passport	1.780**	1.028	0.837	1.020	1.085
v_tested	0.818	1.074	0.787	1.074	1.165
v_p_gets70	1.001	0.906	0.706	0.979	0.982
v_p_pays10	0.825	0.966	1.326	0.892	0.908
v_p_pays70	0.452**	0.518***	0.662	0.616***	0.630***
male	1.735***	1.784***	1.757***	1.749***	1.781***
age	1.025***	1.024***	1.024***	1.024***	1.024***
city small (<20k)	1.331**	1.328**	1.354**	1.311*	1.330**
city medium (20-99k)	1.054	1.054	1.057	1.053	1.045
city big (100-500k)	1.260*	1.298**	1.297**	1.294*	1.311**
city large (>500k)	0.979	0.976	0.976	0.954	0.965
secondary_edu	1.103	1.132	1.128	1.106	1.132
higher_edu	1.185	1.204	1.182	1.171	1.198
wealth_low	0.854	0.647*	0.857	0.861	0.850
wealth_high	1.247**	1.233	1.240**	1.256**	1.235*
health_poor	0.790	0.817	0.805	0.796	0.800
health_good	0.882	0.890	0.902	0.883	0.888
vaccine_extra_risky	0.586***	0.585***	0.597***	0.600***	0.592***
covid_extra_risky	1.424***	1.417***	1.419***	1.378***	1.406***
health_smoking_light	0.946	0.927	0.911	0.935	0.962
health_smoking_mod~e	1.060	1.045	1.050	1.058	1.076
health_smoking_heavy	1.139	1.152	1.139	1.169	1.172
tested_pos_covid	6.293*	5.797*	7.291*	6.184*	6.592*
thinks_had_covid	1.173	1.173	1.184	1.169	1.179
covid_hospitalized	0.395*	0.408*	0.359*	0.383*	0.385*
religious	0.649***	0.641***	0.633***	0.662***	0.631***
relig:less than once a year	1.321*	1.295	1.325*	1.257	1.340*
relig:few times a year	1.180	1.205	1.213	1.163	1.221
relig:few times a month	1.114	1.145	1.150	1.097	1.154
relig:few times a week	1.325	1.332	1.356*	1.287	1.372*
relig:few times a day	0.933	0.973	0.988	0.928	0.976
status_unemployed	0.967	0.965	0.975	0.999	0.987
status_pension	1.043	1.037	1.052	1.028	1.047
status_student	1.218	1.170	1.169	1.134	1.159
voting_short					
left	1.141	1.130	1.104	1.184	1.106
PiS(ruling, right)	0.783	0.792	0.785	1.015	0.795
ultra-right	0.459***	0.451***	0.455***	0.442**	0.454***
none or other	0.565***	0.565***	0.573***	0.542***	0.567***
e_happiness	0.979	0.982	0.977	0.981	0.980
e_fear	0.956*	0.954*	0.956*	0.955*	0.954*
e_anger	0.983	0.981	0.985	0.986	0.982
e_disgust	1.017	1.023	1.021	1.024	1.020
e_sadness	1.035	1.035	1.028	1.028	1.034
e_surprise	0.976	0.975	0.975	0.976	0.978
risk_overall	0.955*	0.960	0.960	0.957	0.959
risk_work	1.015	1.014	1.016	1.016	1.014
risk_health	1.025	1.023	1.026	1.024	1.025

worry_covid	1.181***	1.182***	1.185***	1.183***	1.182***
trust_EU_Y	2.156***	2.163***	2.128***	2.145***	2.190***
trust_EU_N	0.791**	0.794**	0.797**	0.794**	0.793**
trust_gov_Y	0.621*	0.581*	0.556**	0.583*	0.587*
trust_gov_N	0.929	0.925	0.940	0.921	0.929
trust_neigh_Y	1.094	1.111	1.112	1.121	1.094
trust_neigh_N	1.180	1.185	1.156	1.185	1.191
trust_doctors_Y	1.337*	1.389**	1.393**	1.404**	1.392**
trust_doctors_N	0.593***	0.582***	0.587***	0.584***	0.586***
trust_media_Y	2.309*	2.155	2.153	0.174***	2.095
trust_media_N	0.900	0.872	0.866	0.861	0.891
trust_family_Y	0.879	0.863	0.856	0.841*	0.867
trust_family_N	0.943	0.944	0.959	0.939	0.930
trust_science_Y	1.831***	1.827***	1.883***	1.829***	1.852***
trust_science_N	0.810	0.804	0.794*	0.808	0.807
control_covid	1.099***	1.098***	1.098***	1.098***	1.103***
informed_covid	1.061	1.063	1.053	1.057	1.058
informed_cold	0.975	0.975	0.980	0.975	0.978
informed_unempl	0.967	0.968	0.972	0.965	0.968
conspiracy_score	0.698***	0.701***	0.634***	0.702***	0.702***
subj_est_cases_ln	0.947	0.964	0.965	0.967	0.964
subj_est_death_l	1.017	1.021	1.023	1.023	1.020
mask_wearing	1.216***	1.217***	1.214***	1.212***	1.214***
distancing	1.108***	1.103***	1.104***	1.104***	1.106***
regional dummies	YES, sig.	YES, sig.	YES, sig.	YES, sig.	YES, sig.
infected_y_pc	0.992	0.946	0.929	0.975	0.947
deceased_y_pc	30285.575	423049.653*	448809.409*	209639.191	197672.969
PL_infected_yester~y	1.000	1.000	1.000	1.000	1.000
PL_deceased_yester~y	1.000	1.000	1.000	1.000	1.000
interaction between experimental vars	YES, n.s.	NO	NO	NO	NO
interaction: price#wealth	NO	YES, n.s.	NO	NO	NO
interaction: experimental vars#belief in conspiracy	NO	NO	YES, n.s.	NO	NO
interaction: experimental vars # political preference	NO	NO	NO	YES, n.s.	NO
interactions: experimental var shown#shown as 1st	NO	NO	NO	NO	YES, n.s.
interactions: experimental var shown#order of vars	NO	NO	NO	NO	YES, n.s.
cut1	1.072	1.187	0.797	1.276	1.062
cut2	7.157***	7.792***	5.262**	8.475***	6.985***
cut3	62.839***	67.289***	45.407***	73.573***	60.331***
<i>N</i>	2814	2814	2814	2814	2814
<i>r2_p</i>	0.253	0.249	0.249	0.251	0.249

legend: * p<.1; **p<.05; *** p<.01



UNIVERSITY OF WARSAW
FACULTY OF ECONOMIC SCIENCES
44/50 DŁUGA ST.
00-241 WARSAW
WWW.WNE.UW.EDU.PL