The intention to be vaccinated against COVID-19: Stated preferences before vaccines were available

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Abstract

The goal of this note is to better understand determinants that can explain the willingness to vaccinate against COVID-19. For this purpose, we conduct a survey in Germany in which we ask ourselves whether this “time is different” from the willingness to be vaccinated against infection by influenza viruses. Our sample does not only comprise students with and without healthcare background, we also analyze a notable amount of healthcare professionals. We find that healthcare professionals exhibit a considerably greater willingness to vaccinate against flu than healthcare and non-healthcare students. In contrast, the willingness to vaccinate against COVID-19 is quite similar among the populations. In both contexts, COVID-19 and flu, trust (e.g. media, activities of the government) seems to play a central role in the decision whether to vaccinate or not.

Keywords

Willingness to be vaccinated; Trust; COVID-19; Healthcare professionals

1 Introduction

During the course of the COVID-19 pandemic, the world has faced a race to develop a vaccine to protect people and to return to something resembling a normal life. People anticipated vaccine shortages and ethical debates arose about the global vaccine allocation (Emanuel et al. 2020; STIKO 2020). As a consequence, many countries purchased millions of doses of *potential* vaccines, which was intensified by, for example, the US election campaign in 2020. However, it is necessary but not sufficient that vaccines are safe and effective—people must also be willing to be vaccinated. De Figueiredo et al. (2020) estimate global trends in vaccine confidence in a large-scale study for 149 countries between 2015 and 2019. They argue that there is growing evidence that the willingness to vaccinate is reduced or delayed because of a lack of trust in relevance, safety, and efficacy of vaccines. Therefore, it is no surprise that the WHO declared vaccine hesitancy as one of the ten biggest global health threats in 2019 (WHO-Online 2019). What’s about the willingness to be vaccinated against COVID-19? Neumann-Böhme et al. (2020) analyze the willingness to be vaccinated between 2 and 15 April 2020 in a multi-country European study. The authors find that a relatively high proportion of the population being opposed to a COVID-19 vaccination are located in Germany: 10% of the respondents refuse vaccination and 20% are unsure. Respondents from Italy, United Kingdom, Netherlands, and other countries stated a higher willingness to be vaccinated. There is a plenty of reasons why people may refuse vaccination. For example, Carrieri et al. (2019) emphasize the distribution of false news stories. According to Baumgaertner et al. (2018), ideology influences who we trust in and, accordingly, what information we rely on.

The goal of this note is to better understand determinants that can explain the willingness to vaccinate against COVID-19. For this purpose, we conduct a survey in Germany in which we ask ourselves whether this “time is different” from the willingness to be vaccinated against infection by influenza viruses. On the one hand, both COVID-19 and flu have the same main risk group (i.e., elderly people and people with underlying diseases). On the other hand, COVID-19 is entirely new, whereas flu is a more known and seasonal phenomenon. Moreover, we add value to the literature by considering a wide range of subjects, some of which with training in medicine. Our sample does not only comprise students with and without healthcare background, we also analyze a notably amount of healthcare professionals (most notably physicians).

2 Data and Methods

Variable of interest, constructs, and approach to data analysis

To analyze the willingness to be vaccinated against COVID-19 and flu, we consider the constructs population, risk group, anxiety, trust, and other variables. We are interested in university students who are enrolled in medicine or a healthcare degree program (*Healthcare students*) and university students who are not (*Non-healthcare students*). Moreover, we want to learn something about people who are working in the healthcare sector (*Healthcare professionals*). Variables to capture risk group include the current health status (*Health*), suppression of one’s immune system (*Immunosuppression*), suppression of the immune system of a family member (*Immunosuppression family*), whether there are people over 60 years living in the household (*Household > 60*), and smoking activity (*Smoker*). Anxiety includes fears about health threats (*Worry virus*) and whether subjects increasingly use homeopathy or naturopathy (*Reaction homeopathy*). Trust is measured via the general trust in media (*Trust in media*), trust in the information received from the government (*Statement government*), and trust in the German healthcare system (*Quality health system*). The other variables are *CRT*, *Residence* (capturing the main residence of the subjects), and *Gender* (gender of the subjects). The cognitive reflection test (CRT), which was introduced by Frederick (2005), measures the extent to which people engage in analytical thinking. A high score in this test is associated with reflective thinking, whereas a low score indicates intuitive thinking.

Since our dependent variables are binary, we estimate logit regressions. To interpret the results meaningfully, we provide average marginal effects (cf., Cameron and Trivedi 2010).

Recruitment of the subjects

The recruitment of the subjects was carried out in the period 18.5.2020-2.8.2020. During this period, no vaccine against corona was approved for full use (according to “Coronavirus Vaccine Tracker.”¹). The respondents were recruited as follows: We have contacted the deans/deans of studies as well as several professors and lecturers of different degree programs of the largest universities in Germany (with spite to the number of students) and asked to advertise our study. To our surprise, many of them also joined the study. The healthcare professionals were recruited via the publicly available physician lists of the Association of Statutory Health Insurance Physicians of various federal states of Germany. Our total sample comprises 2,077 subjects. Of them a total of 1,249 subjects identified themselves as non- healthcare students and 208 as healthcare students. We recruited 213 healthcare professionals (of which 128 subjects associated themselves as a physician) and 367 professionals of the non-healthcare sector.

¹ <https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html>

3 Results

In Table 1, we depict the respondents' stated willingness to be vaccinated against COVID-19 and flu. The willingness to be vaccinated against COVID-19 is relatively homogeneous across the respective populations.² In contrast, the willingness to be vaccinated against flu is considerably higher among the healthcare professionals.

Table 1 Respondents' willingness to be vaccinated (in %)

	Willingness to vaccinate against COVID-19	Willingness to vaccinate against Flu
Healthcare professionals (N=213)	83.10	67.61
Healthcare students (N=208)	79.81	38.46
Non-healthcare students (N=1,249)	85.67	39.15

The regression results to explain the willingness to vaccinate against COVID-19 (panel I) and flu (panel II) are summarized in Table 2. As indicated above, we find that healthcare professionals are more willing to be vaccinated against flu. The differences among the populations in the willingness to be vaccinated against COVID-19 seem to be negligible. The higher the respondents rate their health status, the lower is the willingness to be vaccinated against COVID-19. Its effect size is small and seems to vanish in the context of flu vaccination. If the respondents' immune system or the immune system of a person from the close family is weakened the more likely the respondents are to intend to be vaccinated. The effect size reveals, however, that it seems to matter only in the context of flu. Whether there are people over 60 in the household or not does not seem to play a role in both panels. The same holds for smoking activities. The more respondents fear health threats due to the virus, the higher is the willingness to vaccinate (both against COVID-19 and flu). The more respondents use homeopathy or naturopathy, the less likely is the intention to be vaccinated in both panels. Trust seems to play an important role. The more respondents trust in the mass media, health-related information from the government, and the German healthcare system in general, the more positive they are towards vaccination. The willingness the think deliberately is positively associated with the willingness to be vaccinated in both panels. Interestingly, people from East Germany reveal a higher willingness to be vaccinated against flu, but not against COVID-19. The willingness to be vaccinated is higher for men than for women. The effect is more pronounced in the context of flu.

² In an open question, we asked the subjects who refuse to vaccinate against COVID-19 to give reasons. In total, we received 272 answers. The most frequent answers given by healthcare students, non-healthcare students, and healthcare professionals were lack of knowledge (e.g. only short-term research available, lack of evidence, unknown long term consequences, lack of experiences, shorted approval procedure) and very low risk for themselves (e.g. trust in own immune system, no risk group, no severe consequences after infection to be expected).

Table 2 Regressions to explain the respondents' willingness to vaccinate (N = 2,053) ^{(1), (2)}

Y=1 (yes), Y=0 (no)		I COVID-19		II Flu	
		dy/dx (Std. Err.)	P> z	dy/dx (Std. Err.)	P> z
Population	Healthcare professionals	0.0211 (0.0232)	0.364	0.1994 (0.0406)	0.000
	Healthcare students	-0.0259 (0.0297)	0.383	-0.0447 (0.0515)	0.386
	Non-healthcare students	-0.0207 (0.0237)	0.381	-0.0991 (0.0411)	0.016
Health		-0.0140 (0.0046)	0.003	-0.0053 (0.0072)	0.457
Immunosuppression		0.0151 (0.0261)	0.563	0.0774 (0.0360)	0.032
Immunosuppression family		0.0052 (0.0133)	0.692	0.0373 (0.0214)	0.081
Household > 60		0.0010 (0.0202)	0.959	-0.0237 (0.0322)	0.461
Smoker		-0.0026 (0.0186)	0.886	-0.0136 (0.0330)	0.681
Worry virus		0.0351 (0.0040)	0.000	0.0315 (0.0059)	0.000
Reaction homeopathy		-0.0381 (0.0059)	0.000	-0.0233 (0.0127)	0.068
Trust in media		0.0440 (0.0072)	0.000	0.0271 (0.0120)	0.025
Statement government		0.0381 (0.0048)	0.000	0.0261 (0.0087)	0.003
Quality health system		0.0107 (0.0042)	0.010	0.0277 (0.0075)	0.000
CRT		0.0271 (0.0064)	0.000	0.0347 (0.0108)	0.001
Residence (East=1)		0.0014 (0.0145)	0.918	0.0890 (0.0232)	0.000
Gender	Male	0.0237 (0.0144)	0.100	0.0725 (0.0229)	0.002
	Diverse	-0.0949 (0.0735)	0.196	0.0422 (0.0915)	0.644
Prob > chi2 (LR-test)		0.0000		0.0000	
Pseudo R2		0.3226		0.0919	

(1) We control for education, age, daily media consumption, and the date when the subjects joined the study.

(2) We lost a couple of subjects because the question whether there are people older than 60 in the household was not answered by all subjects.

4 Discussion

We find that healthcare professionals exhibit a considerably greater willingness to vaccinate against flu than healthcare and non-healthcare students. In contrast, the willingness to vaccinate against COVID-19 is quite similar among the populations. In both contexts, COVID-19 and flu, trust (e.g. media, activities of the government) seems to play a central role in the decision whether to vaccinate or not. If our results are robust, there are a number of policy implications linked to trust. A high level of willingness to vaccinate presupposes trust in media and state institutions. It is therefore important to communicate information in an accessible, transparent, and comprehensible manner and, if necessary, to combat false news stories. However, our study suffers from some drawbacks. We do not have a representative sample and, therefore, the findings should be considered as preliminary.

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Appendix

Table A1. Codebook of the collected variables and their measurement

Variable	Question / Statement	Values
CRT 1	A safety mask and a disinfectant product cost together €11.10. The protective mask costs €10 more than the disinfectant. How much does the disinfectant cost?	1 (correct answer) if = €0.55, 0 else
CRT 2	Five machines need five minutes to produce five protective masks. How long do 100 machines need to produce 100 protective masks?	1 (correct answer) if 5, 0 else
CRT 3	A virus is spreading in a city. Every day the number of infected people doubles. It takes 48 days for the virus to infect the entire population. How long would it take for the virus to infect half of the population?	1 (correct answer) if 47, 0 else
Gender	What gender would you associate yourself with?	0 = Female, 1 = Male, 2 = Diverse
Health	How do you assess your current state of health?	0 = worst imaginable state of health, ..., 10 = best imaginable state of health
Household > 60	Do people over 60 live in your household?	1 = yes, 0 = else
Immunosuppression	Is your immune system weakened (e.g. by the intake of certain drugs) and/or do you suffer from at least one of the following pre-existing conditions: Disease of the cardiovascular system (e.g. coronary heart disease and high blood pressure), diseases of the lungs (e.g. COPD), chronic liver disease, diabetes mellitus (diabetes), cancer	1 = yes, 0 = else
Immunosuppression family	Is the immune system of a person from your close family and/or circle of friends weakened or does such a person suffer from one of the above-mentioned pre-existing conditions?	1 = yes, 0 = else
Population	I am currently...	1 = working in the healthcare sector. 2 = working in the non-healthcare sector. 3 = enrolled as a student in a college/university. 4 = college/university. 5 = not employed. 6 = retired. 7 = other Follow up question: If identified as student: healthcare sector or not
Quality health system	How do you evaluate the quality of the German healthcare system in general?	0 = very worse, ..., 10 = very good
Reaction homeopathy	Indicate the extent to which you agree with the following statements: In response to COVID-19 (coronavirus) I have made increasing use of homeopathy and naturopathy.	1 = Not applicable at all, ..., 7 = Fully applicable
Residence (East=1)	In which federal state do you live?	East = 1 if Saxony or Saxony-Anhalt or Mecklenburg-Western Pomerania or Thuringia or Brandenburg, West = 0 if else
Smoker	Do you smoke?	1 = yes, 0 = else
Statement government	Indicate how you evaluate the following statements in connection with COVID-19 (coronavirus): I feel safe with the information I receive from the government.	1 = Not applicable at all, ..., 7 = Fully applicable
Trust in media	How much do you trust the mass media - such as newspapers, television and radio - to report the news completely, accurately and fairly?	1 = very low, ..., 5 = very high
Worry virus	What are your concerns about COVID-19 (coronavirus)? Immediate health threat due to the virus.	1 = Not applicable at all, ..., 7 = Fully applicable