Original Article

Attitudes Toward Mandatory COVID-19 Vaccination in Germany

A Representative Analysis of Data From the Socio-Economic Panel for the Year 2021

Thomas Rieger, Christoph Schmidt-Petri, Carsten Schröder

Summary

Background: Adequate immunity to COVID-19 apparently cannot be attained in Germany by voluntary vaccination alone, and therefore the introduction of mandatory COVID-19 vaccination is still under consideration. We present findings on the potential acceptance of such a requirement by the German population, and we report on the reasons given for accepting or rejecting it and how these reasons vary according to population subgroup.

Methods: We used representative data from the Socio-Economic Panel for the period January to December 2021. We linked the respondents' answers concerning mandatory COVID-19 vaccination to information about their sociodemographic characteristics, state of health, political attitudes, and degree of confidence in the judicial and political systems. We analyzed these data using univariate, bivariate, and multivariate statistical methods.

Results: Just over half of the respondents (50.44% [49.08%; 51.79%]) favored mandatory COVID-19 vaccination. Among the supporters, the reason most frequently given (95.22% [94.45; 96.00]) was that, without such a requirement, not enough people would be vaccinated. Among the opponents of mandatory COVID-19 vaccination (49.56% [48.21%; 50.92%]), by far the most common reason given for opposing it was a desire to uphold individual freedom (91.36% [90.31%; 92.40%]). Persons supporting mandatory COVID-19 vaccination, on average, older than those who opposed it; they less commonly had an education beyond secondary school, were less healthy, tended to have no children, had centrist political views, and expressed more confidence in the political system. The largest difference between the two groups was that about 90% of supporters of mandatory COVID-19 vaccination were themselves vaccinated, compared to only about 62% of opponents.

Conclusion: The lack of consensus on this issue among politicians and physicians in Germany is reflected in a similar lack of consensus in the German population as a whole. A discussion of the appropriate understanding of individual freedom would be the most promising way to widen the acceptance of mandatory COVID-19 vaccination. A commonly expressed conception of freedom that permits the deliberate endangerment of other people's health seems morally questionable.

German Institute for Economic Research (DIW)/Socio-Economic Panel (SOEP), Berlin, Germany: Thomas Rieger, B. A.; Prof. Dr. Carsten Schröder

School of Business & Economics, Freie Universität Berlin, Berlin, Germany: Prof. Dr. Carsten Schröder

Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany: Christoph Schmidt-Petri, Ph. D.

Two years after the start of the COVID-19 pandemic, Germany's healthcare system is still still under serious pressure. Since January 2022, numbers of infections have repeatedly reached record highs. Intensive care wards were at times at capacity especially with non-vaccinated patients, to such an extent that regionally, adequate medical care was no longer guaranteed (1). People in need of care are massively affected by the fact that nursing staff and therapists either have to quarantine themselves or pose a high risk of infection. Nursing/old people's homes, in which the registered excess mortality was particularly high (2) also have to accept substantial additional efforts in order to lower the risk of infection for their residents. Future overload of the healthcare system is still a serious risk.

There are three main reasons for the fact that the degree of immunity in the population that is required for a return to social normality has not been achieved:

- A (small) part of the population cannot be vaccinated for medical reasons.
- Vaccine effectiveness wanes over time (3, 4).
- A part of the population is refusing vaccination.

Even though according to the Robert Koch-Institute, no exact data are available for the quantitative extent of the first problem in the list, experience suggests that it is probably of lesser importance. The second problem can be solved in principle by booster vaccinations and further development of vaccines. For the third problem, the lacking willingness of a large part of the population to be vaccinated, a solution would also be available: making COVID-19 vaccination mandatory by law. If applied consistently, this would reach almost the entire population and thus guarantee the widest possible vaccination coverage. Legally mandated vaccination is, however, highly controversial. It is especially controversial whether the right to physical integrity can be restricted for reasons of public health protection (5). An institution-specific vaccination mandate for employees working in the healthcare and nursing sectors (which was similarly introduced in Belgium, France, Greece, Great Britain, Italy, and Hungary) came into force in Germany on 15 March 2022, but its implementation is intended to be handled very differently in the different federal states (6). Mandatory vaccination was introduced in Austria in February 2022, but ceased to be implemented on 9 March 2022. Trends in other countries too are so dynamic that we are not going provide

TABLE 1

Seven reasons to support or oppose mandatory COVID-19 vaccination

Reason in brief	Why do you support mandatory vaccination against the coronavirus?	Why are you opposed to mandatory vaccination against the coronavirus?
Extent of willingness to be vaccinated	Because enough people would be vaccinated only if vaccination was mandatory.	Because enough people would be vaccinated anyway.
Health risk	Because most people underestimate the health risks associated with the virus.	Because most people overestimate the health risks associated with the virus.
Blanket vaccination coverage vs individual freedom	Because vaccinating many people is more important than individual freedom of choice	Because individual freedom of choice is more important than vaccinating many people
Vaccine safety	Because many people believe that the vaccine is not safe.	Because I believe that the vaccine is not safe.
Vaccine effectiveness	Because many people believe that the vaccine is not effective.	Because I believe that the vaccine is not effective.
Abstract vaccination mandate	Because mandatory vaccination makes sense for less dangerous diseases too.	Because mandatory vaccination is not allowed under any circumstances, not even for very dangerous diseases.
Other	For other reasons	For other reasons

Seven reasons to support/oppose mandatory COVID-19 vaccination, which supporters/opponents of mandatory vaccination were asked to answer subsequently to their response on mandatory vaccination in the Socio-economic Panel (SOEP). Answer categories are yes/no/not available. Multiple mentions are allowed.

a detailed outline here. The debate about the need for mandatory vaccination against SARS-CoV-19 therefore continues (7–9). Different draft laws were discussed in the German Federal Parliament on 17 March 2022.

The present article describes on the basis of a representative study the prevailing attitudes in 2021 towards the introduction of general mandatory COVID-19 vaccination in Germany and provides answers to the following questions:

- How widely accepted is mandatory vaccination against COVID-19?
- Which population groups are in favor and which are opposed to it?
- What are the central reasons of the supporters and opponents, and what is the role of people's trust in the political and judicial systems?

Our study is purely empirical and does not discuss whether mandatory vaccination is legitimate from a moral or legal perspective (10–13).

Methods

Data and central variables

The source of our data is the Socio-economic Panel (SOEP). This comprises a random sample of the population resident in Germany. As regards data quality and

research ethics, the SOEP meets the highest standards (14). For some years, the data collection has included some 25,000–30,000 adults in 15,000–20,000 households. In each year, the same participants provide answers regarding:

- Household composition
- Education and qualifications
- Economic status
- Health
- Political attitudes
- Trust in public institutions.

A loss of participants (so called panel mortality—for example, as a result of death or changes in address) is compensated for by refresher samples, which are randomly drawn from the underlying total. Furthermore, special samples are drawn to account for greater changes in the composition of the population (for example, the refugee wave in 2015) or to enable for smaller population groups to be analyzed (2019 sample of high-net-worth individuals). These are also random samples from the respective subpopulations. Conclusions about the total population of Germany are possible on the basis of the cross sectional projection factors on the individual and household levels that accompany these data and also on the basis of survival probabilities (15).

Because of the far-reaching consequences of the COVID-19 pandemic, the SOEP 2021 was extended to include a new COVID-19 survey module (16). Among other information, this module collects for all adult SOEP participants whether they are "in favor of or opposed to mandatory vaccination against coronavirus for all adults who are healthy enough to receive the vaccine" (response categories: yes/no/not available). Furthermore, participants were asked why they support mandatory vaccination or why they oppose it. Seven possible reasons were given in the questionnaire and were mirrored for both groups (*Table 1*). Multiple mentions were allowed.

Because of the topicality of the subject we used for our analyses directly the data delivered by the field office up to 11 March 2022. This means that especially the subsamples M3–M6 (refugee sample) and M7–M8a (refresher migrant sample) were not included in the analyses. In total we had 17 132 observations for 2021 available for our analyses; this number decreases according to the availability of the variables in these analyses.

Statistical methods

Participants in the SOEP are surveyed every year. For the COVID-19 survey module, which was introduced only in 2021, it was therefore not possible to study whether and how the attitudes of individual participants change over time (the *eFigure* shows results from different studies over time). We therefore describe the attitudes towards the possibility of mandatory vaccination on a particular date between January and December—which is, however, not identical for all
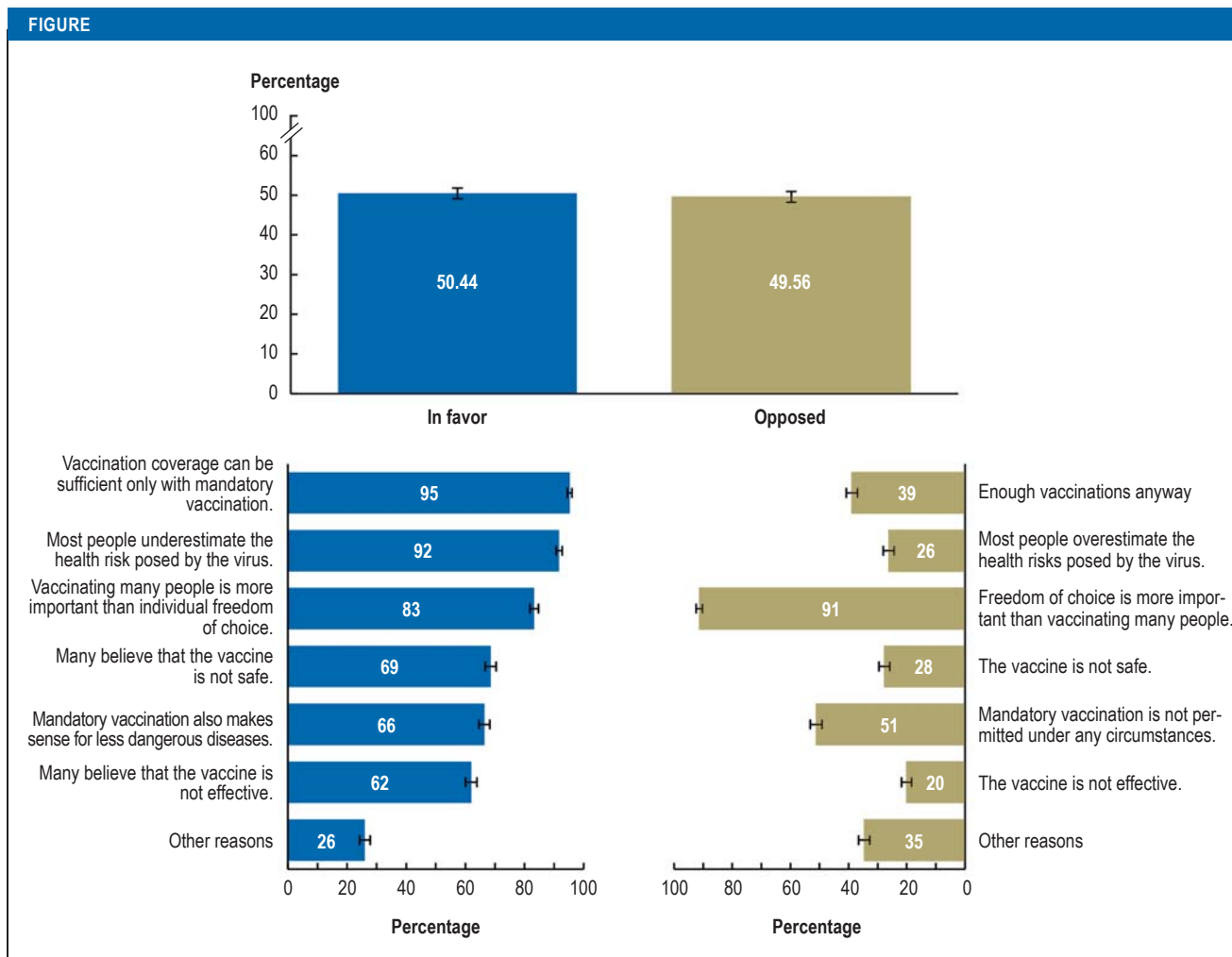
Rates (in percent) in support of/opposed to general mandatory COVID-19 vaccination (top) and respective reasons (bottom)
Blue bars show the data for advocates, olive green bars for opponents of mandatory vaccination. Whiskers stand for 95% confidence intervals of the point estimate shown as a bar chart. Top section: N = 15 992. Bottom section, left half: N between 7305 and 8319. Bottom section, right half: N between 8207 and 8676.
About 6% of people surveyed refused to answer the question on whether they agreed with mandatory vaccination for COVID-19. These participants were not shown the subsequent question for the seven reasons. Based on data from the Socio-economic Panel (SOEP). Mean values were calculated by using projection factors at the individual level.

participants—and studied their determinants. The univariate and bivariate results for the focal variables, the attitudes towards mandatory vaccination, and the underlying reasons are shown as mean values or percentages. The statistical evaluation of differences in attitudes or characteristics between different groups was based on Wald tests. As we tested for several differences, we used the Bonferroni-Holm method to correct these p values (*eTable 1*). We used projection factors to project all descriptive results on to the underlying population in the SOEP—the population resident in Germany.

We used logistic regression to estimate the probability that a survey participant (i) with given characteristics (X_i) supports mandatory vaccination. We used Stata Version 15 for all empirical analyses. All variables applied are defined in *eTable 2*.

Results

The *Figure* shows the proportions of the adult population who were supporters or opponents of mandatory COVID-19 vaccination (TOP section). It also illustrates the respective proportions in these two groups who agreed with the seven pre-defined reasons (bottom section).

Attitudes in the population towards mandatory vaccination against COVID-19 are divided: about 50% are opposed to, and about 50% are in favor of its introduction. Results are particularly controversial as regards the assessment of whether the restriction placed on individual freedoms is appropriate or not. Some 83% of those supporting mandatory vaccination agree with the statement that vaccinating many people is more important than making a free decision. Some 91% of opponents, however, argue that

TABLE 2

Results from logistic regressions

Explanatory variable	Support for mandatory vaccination	
	All survey participants	Survey participants in gainful employment
Sociodemographic data		
– Female	−0.036* [−0.054; −0.019]	−0.029* [−0.052; −0.005]
– German	−0.057* [−0.095; −0.019]	−0.060* [−0.105; −0.014]
– Age	0.004* [0.003; 0.004]	0.003* [0.002; 0.004]
– Tertiary education	−0.061* [−0.081; −0.041]	−0.041* [−0.066; −0.016]
– Net household income/month	0.001 [−0.003; 0.005]	0.004 [−0.001; 0.008]
– Resident in new German states	0.032* [0.011; 0.053]	0.015 [−0.013; 0.043]
– Children younger than 17 years	−0.064* [−0.085; −0.043]	−0.059* [−0.082; −0.035]
– Education/nursing home/healthcare sector		−0.034* [−0.060; −0.009]
Health		
– Self-reported health	−0.014* [−0.024; −0.003]	−0.014* [−0.027; −0.001]
– At least one COVID-19 vaccination received	0.307* [0.286; 0.328]	0.304* [0.278; 0.330]
– Number of COVID-19 risk diseases	0.026* [0.016; 0.035]	0.025* [0.011; 0.039]
Political attitude		
– Tending to the left	−0.023* [−0.043; −0.003]	−0.034* [−0.059; −0.009]
– Tending to the right	−0.013 [−0.036; 0.010]	−0.033* [−0.063; −0.003]
Confidence		
– In the judicial system	−0.001 [−0.006; 0.004]	-0.002 [-0.009; 0.004]
– In the political system	0.018* [0.013; 0.024]	0.019* [0.012; 0.026]
N	**11 065**	**7 153**

The table shows the results as average marginal effects. These show the average extent to which the probability of supporting mandatory vaccination changes when the respective characteristic changes by one unit (for example, age rises by one year) while all other characteristics are kept constant (under the same conditions —ie same vaccination status, same educational attainment, etc). The first column shows the results for all adult survey participants; the second column those for all participants in gainful employment. An example of how to interpret this: for all survey participants it is found that regarding the sociodemographic characteristics, supporting mandatory vaccination is 6.1 percentage points lower in people with a tertiary educational qualification (95% confidence interval [− 0.081; − 0.041]) than in people without a tertiary qualification. A person who is a year older is on average 0.4 percentage points more likely to support mandatory vaccination. The analysis did not use projection factors at the individual level. The dependent variable in both specifications is support for general mandatory COVID-19 vaccination. The 95% confidence interval of the respective effect is shown in brackets. * p < 0.05. This table is based on data from the Socio-economic Panel (SOEP). Definitions of the variables are in *eTable 2*.

individual freedom is more important. Those opposed to mandatory vaccination referenced free individual decision by far most commonly as the reason for their objection.

We used a logistic regression model to investigate the degree to which participants' attitudes supporting or opposing mandatory vaccination can be explained by means of their sociodemographic characteristics, their own perceived health status, their political orientation, and their trust in public sector institutions (on a scale from 0 ["do not trust at all"] to 10 ["trust completely"]). *Table 2* shows the results as average marginal effects. These indicate how the probability of supporting mandatory vaccination changes on average, if the respective characteristics change by one unit (for example, if age increases by one year) and all other characteristics are kept constant (under otherwise identical conditions—ie same vaccination

status, same educational attainment, etc). The first column shows the results for all adults in the survey, the second column for those in gainful employment. In the second column, an additional sociodemographic characteristic is included, namely whether the person works in the education sector, nursing home sector, or healthcare sector.

Regarding sociodemographic characteristics for all adults, we found that support for mandatory vaccination was 6.1 percentage points lower (95% confidence interval: [-0.081; –0.041]) in survey participants with tertiary education than in those without a tertiary qualification, keeping all other characteristics constant. It was lower when the household included children (−0.064 [−0.085; –0.043]) and rose with increasing age: if all other characteristics are kept constant, the probability that a person who is one year older will support mandatory vaccination is

TABLE 3

Correlations at federal state level

	Support for mandatory COVID vaccination	COVID-19 cases per 100 inhabitants	COVID-19 deaths per 100 inhabitants	Trust in legal system
COVID-19 cases per 100 inhabitants	−0.253 [−0.485; −0.035]			
COVID-19 deaths per 100 inhabitants	−0.248 [−0.456; −0.026]	0.835 [0.835; 0.835]		
Trust in legal system	0.147 [−0.091; 0.406]	−0.289 [−0.485; −0.124]	−0.588 [−0.747; −0.424]	
Trust in politics	0.217 [−0.094; 0.521]	−0.217 [−0.388; −0.032]	−0.529 [−0.694; −0.338]	0.902 [0.800; 0.965]

The table shows Spearman's rank correlation coefficients for all combinations of the variables under study at the level of the federal states. The 95% confidence interval of the respective correlation is shown in brackets. An example of how to interpret these: Spearman's rank correlation coefficient is in the interval from −1 to +1. A value of +1 (−1) describes a perfect positive (negative) association between ranks on the basis of two variables. The value − 0.248 (confidence interval [− 0.456; − 0.026]) indicates a negative association between the ranks of the federal states—on the basis of the COVID-19 cases per 100 inhabitants and on agreement with mandatory vaccination against COVID-19. COVID-19 cases and deaths were counted per 100 inhabitants for the time period through 30 November 2021 and are based on data from the Robert Koch-Institute. As this is a full data collection, no statistical uncertainty exists for the correlation of these last two values. All other values are average values at federal state level, calculated using projection factors at the individual level, based on data from the Socio-economic Panel (SOEP). Confidence intervals are based on 500 bootstraps of the SOEP average values.

on average 0.4 percentage points greater ([0.003; 0.004]). As regards health characteristics, support was higher in those who perceive their own health as worse (−0.014 [−0.024; −0.003]) and who have many disorders placing them at risk (0.026 [0.016; 0.035]) and who are themselves vaccinated: keeping all other characteristics constant, support from vaccinated participants is 30 percentage points greater ([0.286; 0.328]). In persons with a centrist political orientation and participants with greater trust in political systems (0.018; [0.013; 0.024]) the probability is greater that they will support mandatory vaccination.

Results for people in gainful employment are qualitatively largely consistent with those for all adults. Furthermore, support for mandatory vaccination for all those working in the education, nursing care, or healthcare sectors was slightly lower than in those in other employment sectors (−0.034 [−0.060; −0.009]). Of note, not all persons in this sector are teachers, nurses, or doctors who interact with many (in case of the nursing homes and healthcare sector vulnerable) people in the course of their daily lives. In these sectors too, many employees work in administration and other areas. *eTables 3* and *4* show the results of further specification while including or excluding individual subsets of the characteristics.

Table 3 shows how incidence rates, rates of support for mandatory vaccination, and average trust in the political and judiciary systems correlate at the federal level. In federal states (*Länder*) with many cases and deaths owing to COVID-19, support for mandatory vaccination is lower (−0.253 [−0.485; −0.035] and −0.248 [−0.456; −0.026]). Also lower is the confidence in the judiciary system (−0.289 [−0.485; −0.124] and −0.588 [−0.747; −0.424]) and the political system (−0.217 [−0.388; −0.032] and −0.529 [−0.694; −0.338]). Wherever confidence in the judiciary and political systems is high, support for mandatory vaccination is high (0.147 [−0.091; 0.406] und 0.217 [−0.094; 0.521]), and where trust in the judiciary system is high, this also applied to the political system (0.902 [0.800; 0.965]).

Discussion

Around 92% of those supporting mandatory vaccination agree with the argument that most people underestimate the health risks posed by the COVID-19 virus. In the opponents, the mirror argument—that the risk is being overestimated—plays a surprisingly small role, at 26%. The dangerousness of the virus and the low vaccine coverage that is to be expected hence seem to have been recognized by both sides. Since only few opponents to mandatory vaccination mentioned that the vaccination is ineffective or not safe, and only 39% argue that a sufficiently high number of people will be vaccinated anyway, the success of information campaigns on these topics seems questionable.

Those opposing mandatory vaccination do not seem to doubt the scientific facts; rather, they emphasize the overarching importance of individual freedom (91%). The fact that vaccination rates in this group are below average (62% rather than the 90% in advocates, *eTable 2*) illustrates how they used their completely unrestricted freedom in 2021: not by undergoing voluntary vaccination but by voluntary non-vaccination. Apparently, then, the reason why mandatory vaccination is rejected is not that only the mandate is rejected: Opponents to mandatory vaccination in many cases refuse the vaccination itself.

It may then be inferred that paradigmatic opponents to vaccination are apparently prepared—in full knowledge of the scientific facts—to expose others to substantial health risks. Such a conception of individual freedom seems morally questionable. Even for libertarian thinkers for whom liberty is the central moral value, individual liberty cannot entitle one to harm others (17). There is no such thing as a liberty to harm others.

Political actors should therefore place particular emphasis (18) on the fact that—in the same way as work-related mandatory vaccination—mandatory vaccination should not be conceived as paternalism: its purpose is not to protect apparently uninformed people from themselves—which is likely to be interpreted as thoughtlessly patronizing and therefore illegitimate. It serves to protect third parties who are at an increased risk of infection from unvaccinated people. To deliberately endanger other people's health is obviously ethically and morally much more problematic than a lack of self-protection. Because of the vaccines' waning effectiveness, this group of people at risk is not limited to those who do not want to get vaccinated themselves, which could potentially be considered acceptable. The number of those affected includes millions of people who are already vaccinated and were not able yet to receive a booster vaccine even though they would have wanted to (and the small number of persons who cannot be vaccinated for medical reasons). An adequate conception of individual liberty might allow a lack of self-protection, but it can certainly not allow the deliberate endangerment of the health of others to such a degree (19). The rate of acceptance of mandatory vaccination for COVID-19 would probably be boosted through communicating these facts in a comprehensible and clear manner (20, 21). Of course it needs to be taken into account how serious the risk to others actually is, which probably primarily depends on the virus variants circulating at any given time and the possible speed of vaccination.

Conclusions

The population in Germany is divided as regards the admissibility of mandatory vaccination. The rejection rate is higher than in many other European countries (22, 23). The differences between those opposed to mandatory vaccination and those supporting it is not particularly pronounced in terms of their socio-demographic, health, and political characteristics, but those in favor of mandatory vaccination are notably more likely to have been vaccinated themselves. The central arguments of their opponents, who emphasize individual freedom, is apparently based on a questionable understanding of freedom that exposing other people to substantial health risks—this is one way to interpret the large difference between the two groups in willingness to get vaccinated even though we do not observe a difference in their respective opinions concerning the scientific facts.

Future analyses should study the question of how attitudes in survey participants and the associations identified change and can be influenced over time. In this context it is likely to not only play a role whether mandatory vaccination is introduced in Germany, but also how it is implemented in detail. Clear communication of its legitimate basis and, ultimately, the form in which non-compliance would be sanctioned (for example, the amount of penalty charges and frequency of checks) are likely to be of major relevance for its acceptance.

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Corresponding author
Prof. Dr. Carsten Schröder
Deutsches Institut für Wirtschaftsforschung e.V. (DIW Berlin)
Mohrenstraße 58, 10117 Berlin
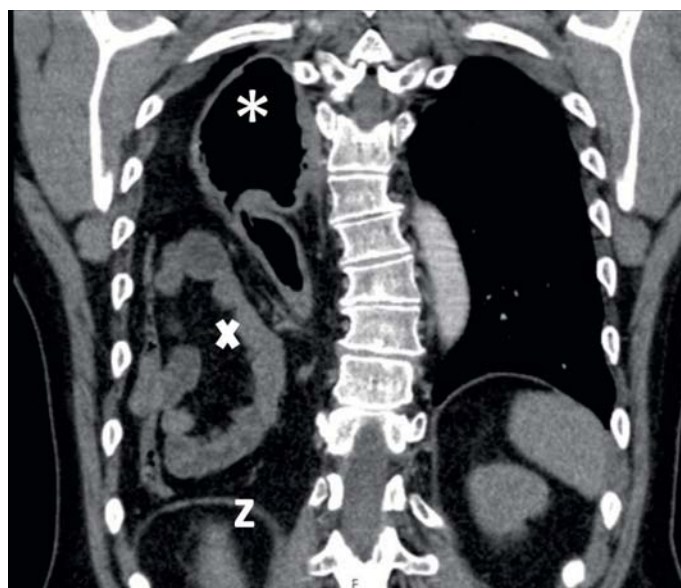cschroeder@diw.de

CLINICAL SNAPSHOT

Dysphagia and Dyspnea

A 62-year-old man with a large hiatus hernia underwent Dor fundoplication with posterior hiatoplasty in 2018. In the spring of 2021 he presented with worsening loss of appetite, describing a feeling of satiety, difficulty in swallowing, recurring regurgitation, and increasing shortness of breath over the past few weeks. On physical examination there were bowel sounds rather than breathing sounds on the right side of the chest. Computed tomography showed complete enterothorax with gastric volvulus and prolapse of large and small bowel into the thoracic cavity. The hernial content was repositioned laparoscopically and the large diaphragmatic hernia was closed with mesh. The patient was discharged free of symptoms 5 days later. A cardiological and pneumological work-up had been carried out in 2020 after the patient experienced stress dyspnea. The clinical picture of enterothorax may already have been emerging at that time. So-called type IV hiatus hernias are extremely rare and typically occur as a consequence of surgical or traumatic injury of the diaphragm, e.g., after reflux operations. This case is an example of the extreme event of enterothorax developing from a hiatus hernia.

Arrebola-Gerardi, MVZ CDT Strahleninstitut, Köln

Computed tomography of chest and upper abdomen, coronary reformatting. While the left hemithorax shows normally ventilated lung, the right hemithorax contains, from cranial to caudal, the gastric cavity (*), mesentery with loops of small intestine (×), and the diaphragm (Z)

Dr. med. Carlo Schneider, Patricia Faßbender, Refluxzentrum am evangelischen Klinikum Köln Weyertal, Innere Medizin, EVK Köln Weyertal, carlo. schneider@evk-koeln.de
Prof. Dr. med. Jessica Leers, Refluxzentrum am evangelischen Klinikum Köln Weyertal, Spezielle Viszeralmedizin und funktionelle Chirurgie des oberen Gastrointestinaltrakts, EVK Köln Weyertal

Conflict of interest statement: Dr. Schneider has received lecture fees from Falk. The other authors declare that no conflict of interest exists.

Translated from the original German by Christine Rye.
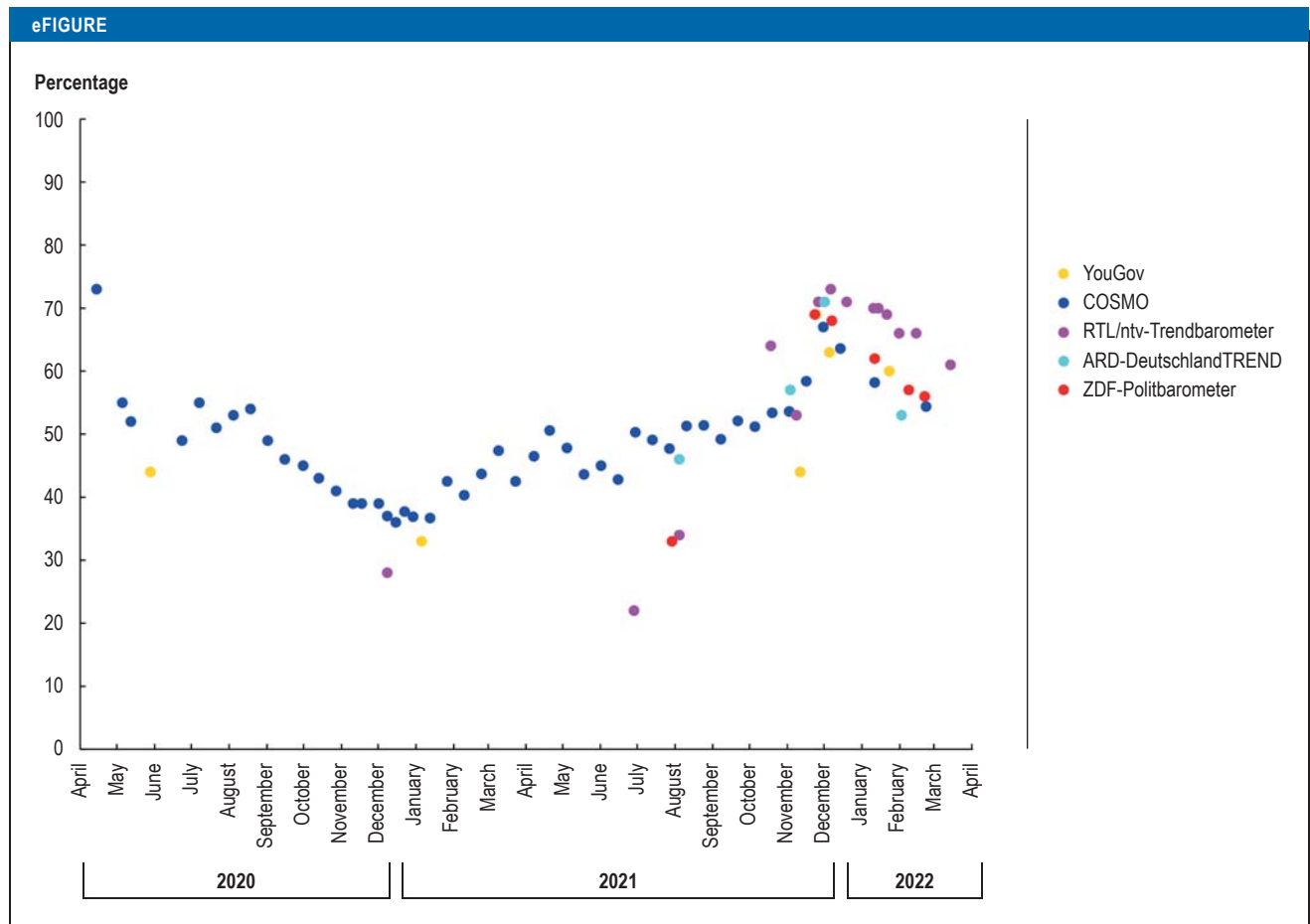
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eFIGURE

Rates of agreement with mandatory COVID-19 vaccination by source/media over time

The figure shows the rates of support for mandatory COVID-19 vaccination in Germany by source/medium. If a survey was carried out over two or three days, the end date is shown on the x axis.

The results presented here regarding attitudes of the population towards mandatory vaccination against COVID-19 were collected over the course of 2021.

What is shown are the results of further nationwide studies in Germany between 2020 and 2022. Although the results across studies are not 1:1 comparable (sample size, type of survey, how the questions were phrased), the picture that emerges is quite consistent: the agreement rate fluctuates around 50%; this proportion rises towards the end of the year after falling in the summer months and then falls again after peaking (to date) in December 2021.

eTABLE 1

Average characteristics of the sample

Explanatory variable	N	Average			p (Holm)
	Total	Total	In favor	Against	In favor versus against
Sociodemographic characteristics					
– Proportion female (%)	16 446	49.76	48.96	49.94	1.000
– Proportion German as 1st nationality(%)	16 900	88.65	89.63	88.92	1.000
– Age	16 900	52.57	57.18	47.88	< 0.001
– Proportion tertiary education (2018/19, %)	16 153	25.27	23.72	27.22	0.043
– Net monthly household income (2018/19. 1000 EUR in 2015 prices)	16 494	3.12	3.14	3.14	0.943
– Proportion living in the new German states (2019, %)	16 900	16.23	15.92	16.82	1.000
– Proportion with children aged < 17 years (2019, %)	16 900	22.03	16.85	27.08	< 0.001
– Proportion in education/nursing home/healthcare sector(2019, %)	10 645	25.48	25.92	24.98	1.000
Health					
– Self reported health (2018/19)	16 379	3.38	3.29	3.48	< 0.001
– Vaccinated against COVID-19 at least once (2021, %)	16 833	75.58	89.53	61.58	< 0.001
– Number of COVID-19 risk diseases (2018/19)	14 232	0.90	1.10	0.70	< 0.001
Political views					
– Tending to the left (2019, %)	15 776	34.16	32.90	36.33	0.110
– Center (2019, %)	15 776	44.72	47.00	41.28	0.001
– Tending to the right (2019, %)	15 776	21.12	20.11	22.39	0.568
Confidence					
– In the judicial system (2021)	16 668	6.06	6.27	5.86	< 0.001
– In the political system (2021)	16 710	4.55	4.85	4.25	< 0.001

The table shows average characteristics of the entire sample ("total") as well as supporters ("In favor") and opponents of ("against") mandatory vaccination. Column "N" shows the unweighted number of complete observations. The "Average" column shows average values calculated using projection factors at the individual level. Column "p (Holm)" shows the Bonferroni-Holm adjusted p value of a test for differences in the average values for supporters and opponents. For binary variables we calculated the p-value by using a logistic model to regress the respective variable on the variable 'supporting mandatory vaccination'. The p value is the p value of the estimated coefficients. For continuous variables we used a two-tailed test for differences in average values. A p value below 0.05 means that the respective difference reaches significance at the 5% level. If a p value after Bonferroni adjustment is greater than 1, we set it equal to 1. This table is based on data from the Socio-economic Panel (SOEP). Definitions of the variables are in *eTable 2*.

eTABLE 2

Definition of variables at the individual level (data source: SOEP)

Variable	Definition	Year
Dependent variable		
– Support for mandatory vaccination against COVID-19	Indicator variable: 1: Support 0: Opposition	2021
Sociodemographic characteristics		
– Female sex	Indicator variable: 1: Female 0: Not female	2018/19
– 1st nationality: German	Indicator variable: 1: 1st nationality: German 0: Not the case	2019
– Age	Age in years	2019
– Tertiary education	Indicator variable: 1: Educational qualification 8 or 9 on the CASMIN scale 0: Lower-level educational qualification	2018/19
– Net monthly household income	Self-reported amount in 1000 Euro (2015 prices)	2018/19
– Resident in new German states	Indicator variable: 1: Resident in new German states (except Berlin) 0: Resident in the rest of Germany	2019
– Education/nursing home/healthcare sector	Indicator variable: 1: Employed in NACE2 sectors 85–88 0: Employed in other sectors	2019
– Children aged < 17 years	Indicator variable: 1: At least one child aged < 17 years lives in the household 0: No children in the household	2019
Sociodemographic characteristics		
– Self reported health	Self reported health status, measured on a scale from 1 "poor" to 5 "very good"	2018/19
– At least one COVID-19 vaccination received	Indicator variable: 1: Vaccinated against COVID-19 at least once 0: Not yet vaccinated against COVID-19	2021
– Anzahl COVID-19 risk diseases	Number of illnesses that are queried in the SOEP and are considered COVID risk factors: diabetes, asthma, cardiovascular disease, cancer, stroke, hypertension, dementia, joint disease, obesity	2018/19
Political views		
– Tending to the left	Self-reported political views from 1 to 4 on a scale from 1 "totally left" to 10 "totally right"	2019
– Tending to the right	Self reported political views from 6 to 10 on a scale from 1 "totally left" to 10 "totally right"	2019
Confidence		
– In the judicial system	Confidence in the legal system on a scale from 0 "no confidence at all" to 10 "complete confidence"	2021
– In the political system	Average from confidence in the federal parliament, politicians, political parties on a scale from 0 0 "no confidence at all" to 10 "complete confidence"	2021

CASMIN, Comparative Analysis of Social Mobility in Industrial Nations; NACE2, Nomenclature statistique des activités économiques;
SOEP, Socio-economic Panel

eTABLE 3

Results from different specified logistic regressions (Complete sample)

Explanatory variable	Support for general mandatory vaccination			
	Specification 1	Specification 2	Specification 3	Specification 4
Sociodemographic characteristics				
– Female	−0.036*	−0.034*	−0.037*	−0.036*
– German	−0.017	−0.062*	−0.061*	−0.057*
– Age	0.006*	0.004*	0.004*	0.004*
– Tertiary education	−0.033*	−0.056*	−0.051*	−0.061*
– Net monthly household income	0.006*	0.001	0.002	0.001
– Resident in new German states	−0.013	0.024*	0.025*	0.032*
– Children aged < 17 years	−0.075*	−0.060*	−0.064*	−0.064*
Health				
– Self reported health		−0.008	−0.009	−0.014*
– At least one vaccination against COVID-19 received		0.320*	0.320*	0.307*
– Number of COVID-19 risk diseases		0.024*	0.024*	0.026*
Political views				
– Tending to the left			−0.015	−0.023*
– Tending to the right			−0.016	−0.013
Confidence				
– In the judicial system				−0.001
– In the political system				0.018*
N	**13 345**	**11 597**	**11 172**	**11 065**

The table shows for all survey participants average marginal effects of the respective explanatory variable for four different logistic specifications. These document how on average the probability for supporting mandatory vaccination changes if the respective characteristic changes by one unit (for example, age increases by one year) and all other characteristics are kept constant (all conditions remain the same—for example, same vaccination status, same educational qualification, etc). Across the four columns, different sets of control variables are used. For all survey participants it was found that support for mandatory vaccination is lower by between 3.3 and 6.1 percentage points in participants with a tertiary educational qualification than in persons without tertiary education. The coefficients reach significance at the 5% level. The analysis includes all persons for whom all applied variables are available. No projection factors at the individual level were used in the analysis. The dependent variable in all four specifications is support for mandatory COVID-19 vaccination. *p < 0.05.
This table is based on data from the Socio-economic Panel (SOEP). Definitions of the variables are in *eTable 2.*

eTABLE 4

Results from differently specified logistic regressions (only persons in gainful employment)

Explanatory variable	Support for mandatory vaccination			
	Specification 1	Specification 2	Specification 3	Specification 4
Sociodemographic characteristics				
– Female	−0.039*	−0.027*	−0.030*	−0.029*
– German	−0.033	−0.069*	−0.062*	−0.060*
– Age	0.005*	0.003*	0.003*	0.003*
– Tertiary education	−0.017	−0.038*	−0.031*	−0.041*
– Net monthly household income	0.010*	0.005	0.005	0.004
– Resident in new German states	−0.024	0.012	0.009	0.015
– Children aged < 17 years	−0.069*	−0.055*	−0.059*	−0.059*
– Education/nursing home/healthcare sector	−0.005	−0.035*	−0.034*	−0.034*
Health				
– Self reported health		−0.008	−0.010	−0.014*
– At least one COVID-19 vaccination received		0.319*	0.316*	0.304*
– Number of COVID-19 risk diseases		0.024*	0.023*	0.025*
Political views				
– Tending to the left			−0.026*	−0.034*
– Tending to the right			−0.036*	−0.033*
Confidence				
– In the judicial system				−0.002
– In the political system				0.019*
N	**8 120**	**7 471**	**7 211**	**7 153**

The table shows for people in gainful employment the average marginal effects of the respective explanatory variable for four different logistic specifications. These document how on average the probability for agreement with mandatory vaccination changes if the respective characteristic changes by one unit (for example, age increases by one year) and all other characteristics are kept constant (while other conditions remain the same—that is, same vaccination status, same educational attainment, etc). Across the four columns different sets of control variables are used. An example for how to interpret this: for all people in gainful employment it was found that support for mandatory vaccination—depending on the specification—is between 1.7 and 4.1 percentage points lower in people with tertiary education than in those without tertiary qualification. Not all differences reach significance at the 5% level (*). We did not use projection factors at the individual level for this analysis. The dependent variable in all four specifications is support for mandatory COVID-19 vaccination. *p < 0.05. This table is based on data from the Socio-economic Panel (SOEP). Definitions of the variables are in *eTable 2*.