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Veröffentlichungsversion / Published Version

Zeitschriftenartikel / journal article

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:

GESIS - Leibniz-Institut für Sozialwissenschaften

Empfohlene Zitierung / Suggested Citation:

Bergmann, M., Bethmann, A., Hannemann, T.-V., & Schumacher, A. T. (2022). Who are the Unvaccinated? Determinants of SARS-CoV-2 Vaccinations Among Older Adults Across Europe. *easy_social_sciences*, Mixed 1, 1-11. <https://doi.org/10.15464/easy.2022.01>

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Who are the Unvaccinated?

Determinants of SARS-CoV-2 Vaccinations Among Older Adults Across Europe

Michael Bergmann, Arne Bethmann, Tessa-Virginia Hannemann & Alexander Tobias Schumacher

With the arrival of effective COVID-19 vaccines, the fight against the ongoing global pandemic entered a new stage. The question shifted towards how to vaccinate as many people as quickly as possible. Understanding the reasons people choose to get vaccinated or not is integral in informing immunization campaigns. But who are the unvaccinated? This is determined by using cross-national data from the Survey of Health, Ageing and Retirement in Europe (SHARE). We investigate the interrelation of the (un)willingness to be vaccinated with social and health aspects as well as the economic situation of our sample of adults in Europe, aged 50 and above. We find that respondents' economic situation as well as diagnosed physical illnesses and education show the strongest relation to vaccination hesitancy. Our results provide a comprehensive picture of influential factors of older adults' vaccination behaviour that can advance the success of the immunisation campaigns in Europe.

Keywords: COVID-19; vaccination hesitancy; older people; SHARE; Europe; country differences

Dank effektiver COVID-19-Impfstoffe begann eine neue Phase des Kampfes gegen die Pandemie. Die Frage lautet nun: Wie können wir viele Menschen schnellstmöglich impfen? Hierbei ist im Hinblick auf die Verbesserung der Impfkampagnen entscheidend zu verstehen, warum Menschen sich für oder gegen eine Impfung entscheiden. Aber wer sind die Ungeimpften? Das soll anhand einer Untersuchung der Beziehung zwischen der Impfbereitschaft von älteren Befragten und sozialen, gesundheitlichen und wirtschaftlichen Faktoren festgestellt werden. Basierend auf Daten des Survey of Health, Ageing and Retirement in Europe (SHARE), kommen wir zu dem Schluss, dass die finanzielle Lage von Befragten, diagnostizierte physische Krankheiten und der Bildungsstand die stärksten Zusammenhänge zur Impfskepsis aufweisen. Unsere Ergebnisse stellen ein umfassendes Bild der relevanten Faktoren für die ältere Bevölkerung dar und könnten zu wachsendem Erfolg der Impfkampagnen in Europa beitragen.

Keywords: COVID-19, Impfskepsis, ältere Menschen, SHARE, Europa, Länderunterschiede

Identifying the Unvaccinated

As the novel coronavirus has affected daily life in a severe and lasting way, the arrival of vaccination programmes in European countries have been welcome tools in an attempt to curb the spread of COVID-19. They have been especially important for older individuals, who are generally at a higher risk for severe infection outcomes (Davies et al., 2020; Palmer et al., 2021; Williamson et al., 2020; Zhou et al., 2020). With the arrival of effective COVID-19 vaccines in late 2020, the fight against the pandemic entered a new stage: How to quickly vaccinate as many people as possible to reduce individual infection risks as well as contain the pandemic to a degree that allows for a (new) normal extent of social interaction? While at first the process was hindered in many countries by insufficient vaccine production capacities, these supply issues had been resolved by the second half of 2021 and the focus of public and scientific discourse shifted more towards a slowdown in vaccination uptake. This leads to the question: Who is refusing to get vaccinated?

Research on the reasons people are deciding against the vaccine is quickly picking up speed. But while there are a number of single country studies (Betsch et al., 2020; Detoc et al., 2020; Dror et al., 2020; Galanis et al., 2021; Holzmann-Littig et al., 2021; Kühne et al., 2020; Malik et al., 2020; RKI, 2021; Soares et al., 2021; Ward et al., 2020) and first international analyses (Lazarus et al., 2021; Lindholt et al., 2021; Solís Arce et al., 2021), comprehensive European comparisons are still scarce. Against this background, this paper will give an overview of some of the most important variables related to the (un)willingness to be vaccinated against COVID-19 across Europe, including three domains of potentially influential factors:

- Socio-demographics, namely age, gender, and education
- Health, including physical health measured by subjective as well as objective conditions,

mental health, and having people in one's social vicinity affected by a COVID-19 infection

- Living conditions and economic situation, specifically living in rural vs. urban areas, the ability to “make ends meet”, household income, and employment status

We will conclude with a discussion of the results in the context of the ongoing pandemic and stagnating vaccination rates and will finish with some ideas for further analyses of the reasons influencing the willingness to get vaccinated.

SHARE Sheds Light on this Socially Explosive Topic

The analyses used data from the second SHARE Corona Survey (Börsch-Supan, 2022a), fielded from June to early August 2021 in 28 countries (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and Switzerland) and are based on 49,063 survey respondents aged 50 years and older.

» ***The SHARE Corona Survey allows us to examine the (un)willingness to vaccinate in an evidence-based way.*** «

The SHARE Corona Survey is a computer assisted telephone interview that was created in reaction to the emerging COVID-19 crisis in 2020 and intended to collect data on the living situation during the pandemic of people aged 50 years and above across Europe and Israel (see Scherpenzeel et al., 2020).

The main outcome, vaccination status and intent to get vaccinated against SARS-CoV-2, was assessed in two consecutive steps. First, respondents answered whether they had received at least one vaccination. Those that negated the question were then asked about their intention to get vaccinated: had they already scheduled an appointment; were they planning on getting vaccinated; did they not want to get vaccinated or were they still undecided. Respondents who answered “don’t know” were categorized as undecided. Those who refused an answer or provided insufficient information ($n=102$; 0.2% of the sample) were excluded from our analyses.

The primarily explored socio-demographic characteristics were age, gender, and education. Age was divided into three categories with ranges for the older working age population (50-64 years), the young retiree age group (65-79 years), and the oldest group of respondents (80 years and over). Regarding education, respondents were grouped into three categories (see Avendano et al., 2009): primary education, secondary education, and post-secondary education.

Subjective and objective physical health as well as mental health were considered in our analyses. Three categories for self-rated health were created: poor/fair, good, and very good/excellent. In addition, we categorized respondents based on whether or not they had at least one diagnosed illness. Similarly, we looked at whether or not respondents were affected by mental health issues, such as feeling depressed, anxious, lonely, or having had trouble sleeping. To assess the extent to which respondents had been affected by COVID-19, we created a 3-point variable, namely “not affected” (no one affected close to the respondent), “mildly affected” (someone close to the respondent tested positive or developed symptoms for COVID-19), and “severely affected” (someone close to the respondent had been hospitalized or died due to COVID-19).

Information on whether respondents lived in a rural or urban residential area was retrieved from previous SHARE waves (Börsch-Supan,

2020a-g; Börsch-Supan, 2021b) as well as the second SHARE Corona Survey in case respondents had reported moving to a new home. We further measured each respondent’s subjective economic situation by asking whether the respondents could make ends meet (fairly) easily or with some/great difficulties. To measure personal economic situations more objectively, we used the respondent’s latest household income from the first SHARE Corona Survey in 2020 (Börsch-Supan, 2021c). Following the definition of the European Union, all respondents who reported less disposable income than the equivalence of 60% of the national median were classified as at risk of poverty. Finally, we included a measure related to whether the respondent was currently retired, employed or self-employed, or had another non-working status, including unemployed, permanently sick/disabled, or homemaker.

What the Data Tell us

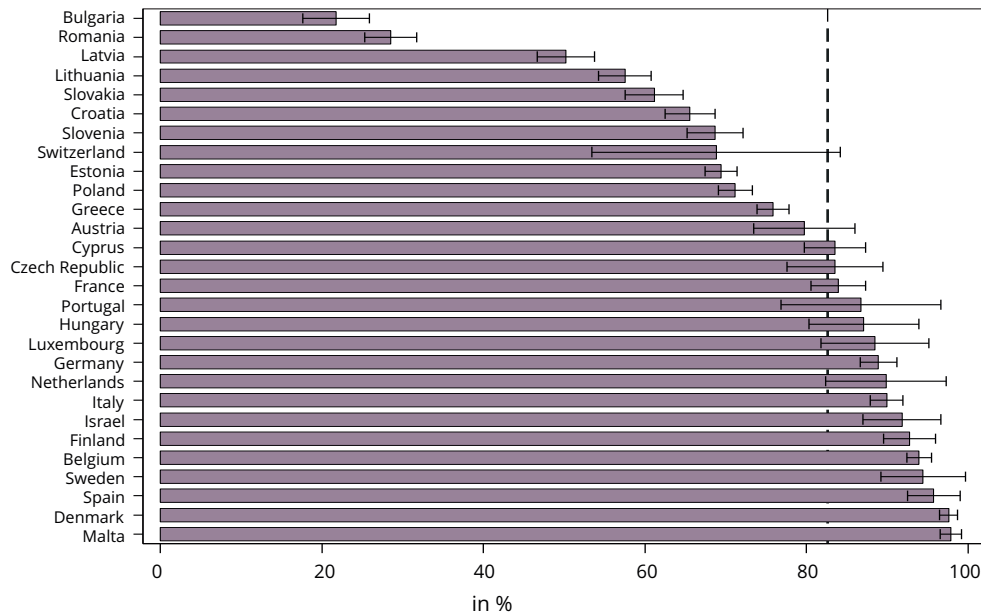
Country Differences: Vaccine Hesitancy in Eastern Europe

Among the 50+ population asked in SHARE, about 83% of the respondents reported having been vaccinated by the time they completed the survey in summer 2021. While this is a fairly high number, there was substantial variation across countries. As shown in figure 1, Malta, Denmark, and Spain were in the lead with over 95% of respondents vaccinated while Romania and Bulgaria trailed behind with about 29% and 22% vaccinated respectively (see table A1 in the appendix).

These numbers correspond rather well with the country-level vaccination rates reported by the European Centre for Disease Prevention and Control (ECDC) for the 50+ populations in a similar timeframe.

The low rates in Romania and Bulgaria seem even more severe when considering the intention to get vaccinated more closely, as depicted in figure 2: Of the Romanian and Bulgarian SHARE respondents, not only did

Figure 1 Proportion of actually vaccinated respondents by country



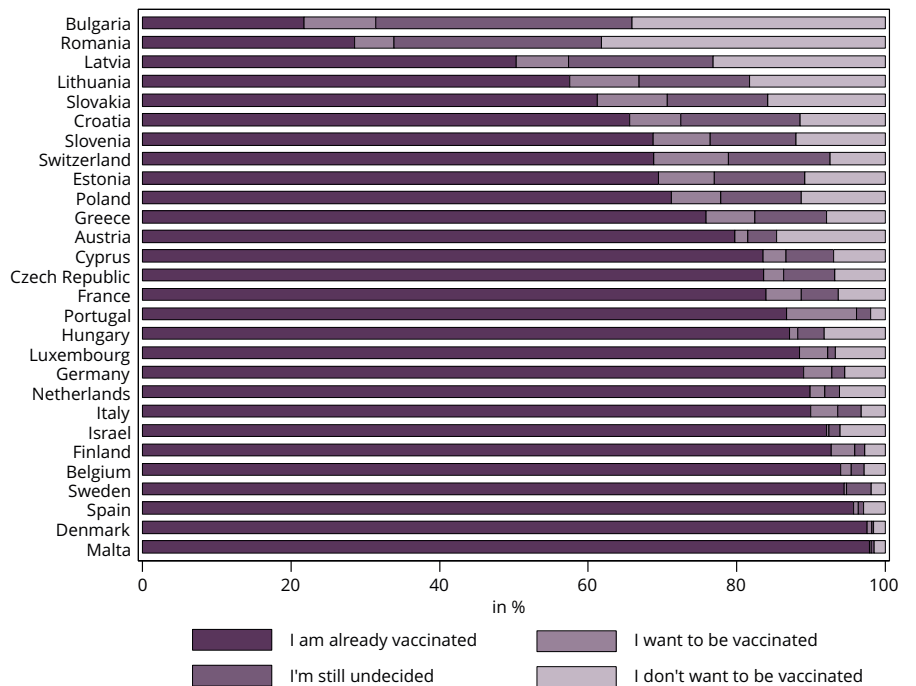
Data: SHARE Wave 9 COVID-19 Survey 2, release 8.0.0 (n=48,982; weighted) with 95%-confidence intervals.

28% and 35% respectively report being undecided about getting vaccinated, 38% and 34%, respectively, stated that they did not want to get vaccinated at all. The group of vaccination refusers was large in several other countries as well, such as Latvia (23%), Lithuania (18%), Slovakia (16%), and Austria (15%). Overall, the weighted average of vaccination refusers across all countries was about 8% (see table A1).

While almost no one was undecided on whether or not to get vaccinated in Denmark and Malta, a much greater number of respondents seemed to still be on the fence in Latvia (19%), Croatia (16%), and Lithuania (15%). The weighted average of undecided respondents across all countries, however, was only about 6% (see table A1).

Overall, there was a clear and significant distinction between most of the eastern European and Baltic countries and other countries in western, southern, and northern Europe in

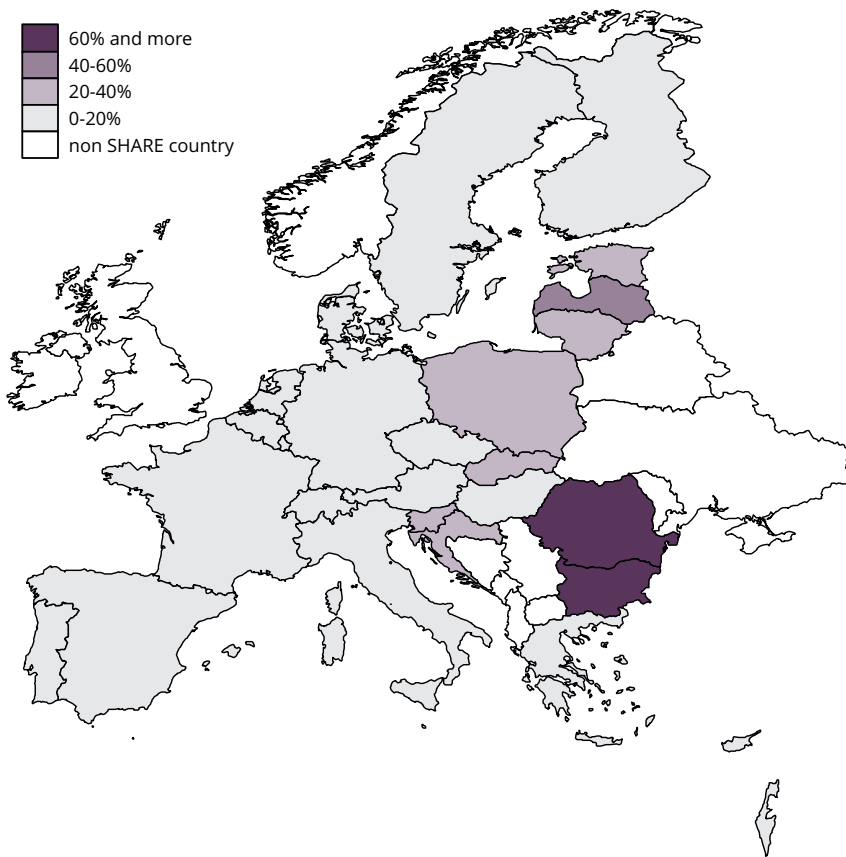
Figure 2 Vaccination status and intentions by country



Data: SHARE Wave 9 COVID-19 Survey 2, release 8.0.0 (n=48,961; weighted).

terms of unvaccinated respondents. Figure 3 illustrates this West-East gradient: Especially in Romania and Bulgaria, the proportion of respondents that stated they were undecided or refused to get vaccinated was much higher than the average (13%) across all countries.

Figure 3 Prevalence of respondents that have not been vaccinated by country



The Effects of Age, Gender, and Education

In the following analyses, we focused on those respondents who had not yet been vaccinated, either because they were still undecided or did not intend to get the inoculation. Even within the SHARE sample, which is restricted to the 50+ population, there were clear age group differences (see figure 4). Of the group considered to be of working age for the purpose of our analysis (50-64 years of age), a far larger number (15.5%) was undecided about or critical of being vaccinated than of the young retirees (65-79, 11.1%) or the oldest age group (80+, 10.9%). The latter two groups showed no significant difference. However, it should be noted that many of the refusals among respondents of working age

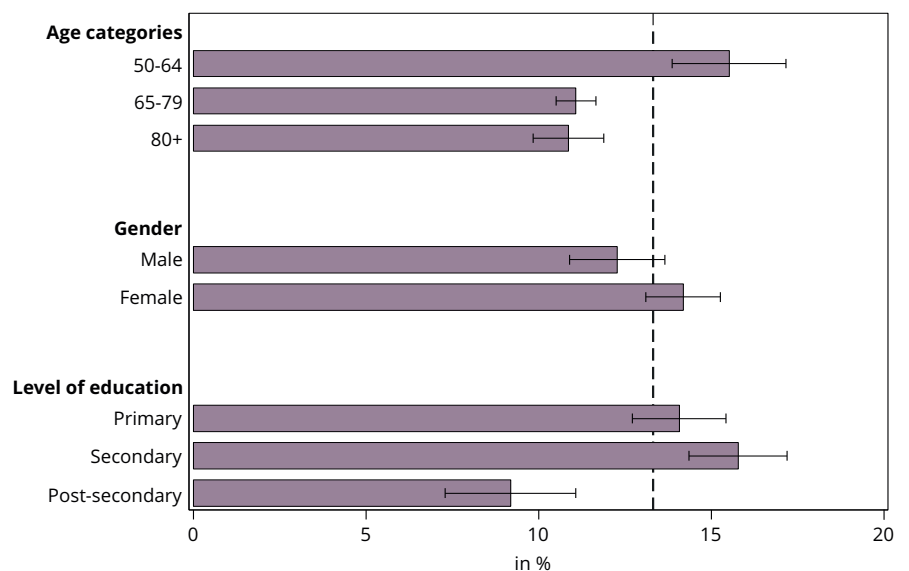
were in fact not gainfully employed, as will be shown below. The age pattern was similar in most participating countries, although the absolute differences between younger (50-64) and older respondents (65-79 and 80+) varied somewhat (detailed information on country-specific differences regarding socio-demographics can be found in table A5 in the appendix).

We also saw a small gender divide, as 14.2% of women were undecided or refused the vaccination, as opposed to 12.3% among men. However, there was some variation across countries in this regard. For example, there were more males than females who were still

undecided or did not want to get vaccinated in Hungary, Portugal, and Switzerland, although these differences were not statistically significant.

The level of education correlates with being undecided or refusing vaccinations: Amongst respondents with a primary education, 14.1%

Figure 4 Proportion of undecided/refusals by socio-demographic groups



Data: SHARE Wave 9 COVID-19 Survey 2, release 8.0.0 (n=48,022-48,961; weighted) with 95%-confidence intervals.

were undecided or unwilling to get vaccinated while 15.8% of respondents with a secondary education, and only 9.2% of respondents with post-secondary education, were undecided or unwilling to get vaccinated. The difference between respondents with a secondary education and those with a primary or post-secondary education was statistically significant. This relationship was strongest in Bulgaria, Romania, and Slovakia.

The Impact of Health and Affectedness

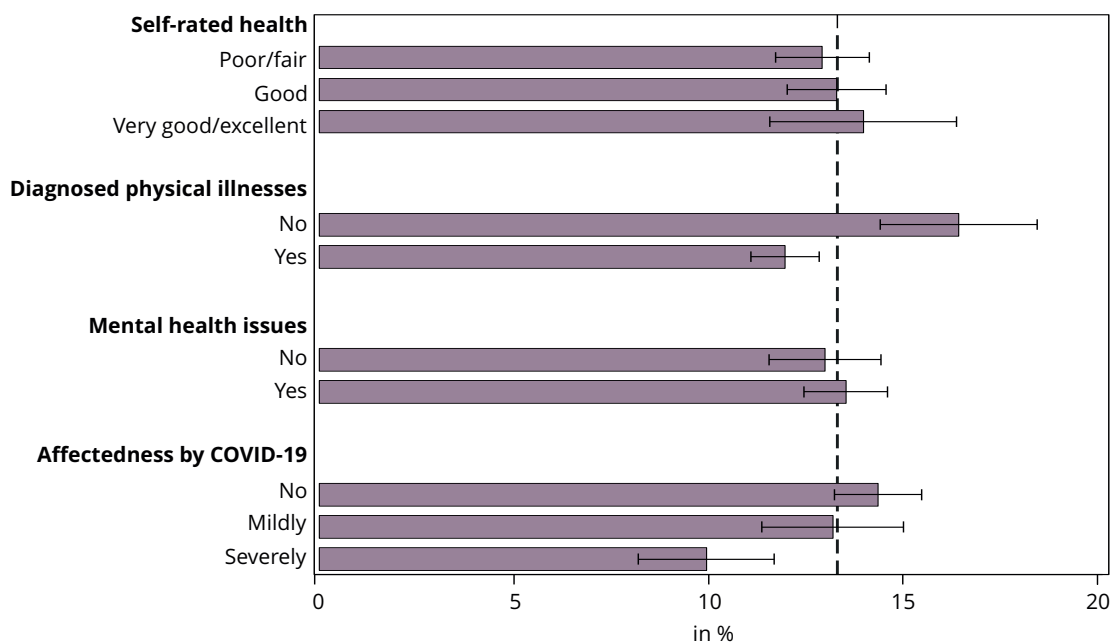
Looking at respondents' self-rated health, there was no clear pattern to the proportion of individuals undecided or unwilling to get vaccinated (see figure 5), with opposing results across different countries.

When considering the objective health measure, respondents without any diagnosed physical illness were significantly more likely to be undecided or unwilling to be vaccinated (16.4%) compared to respondents with at least one diagnosed illness (12.0%). This difference was strongest in Hungary, Lithuania, and Switzerland (see table A6). Difficulties with

mental health did not make a significant difference to vaccination status in most countries (13.5% with mental health issues compared to 13.0% without). Only in France and Israel were respondents affected by mental health issues significantly less likely to be vaccinated than respondents that were not affected by these issues.

Even if respondents themselves had not been infected, they might have known somebody who had been, which in turn may have influenced their attitudes towards the COVID-19 vaccination. There was indeed a difference between respondents who stated that they did not know anyone physically affected by COVID-19 and those who did. Of the former, 14.4% reported to be undecided or unwilling to get vaccinated. In contrast, 13.2% of respondents that knew someone mildly affected (any symptoms or positive test) and only 9.9% of those who knew someone severely affected (hospitalization or even death in close vicinity) were undecided or unwilling to get vaccinated. This latter difference was most pronounced in eastern Europe (esp. Bulgaria, Hungary, and Slovakia) and the Baltic States (see table A6).

Figure 5 Proportion of undecided/refusals by health indicators



Data: SHARE Wave 9 COVID-19 Survey 2, release 8.0.0 (n=48,863-48,955; weighted) with 95%-confidence intervals.

Urban-Rural Gap, Financial Difficulties, and Employment Status

Respondents living in urban areas were considerably less likely to be undecided or unwilling to get vaccinated (9.9%) than those in rural areas (15.1%).

» **People from rural areas have a significantly different intention than city residents.** «

Such an urban-rural gap was evident in most SHARE countries, with Austria, Croatia, Romania, Slovakia, and Switzerland exhibiting the strongest divide. The opposite was found in Estonia where more undecided and unwilling respondents lived in urban areas (see table A7).

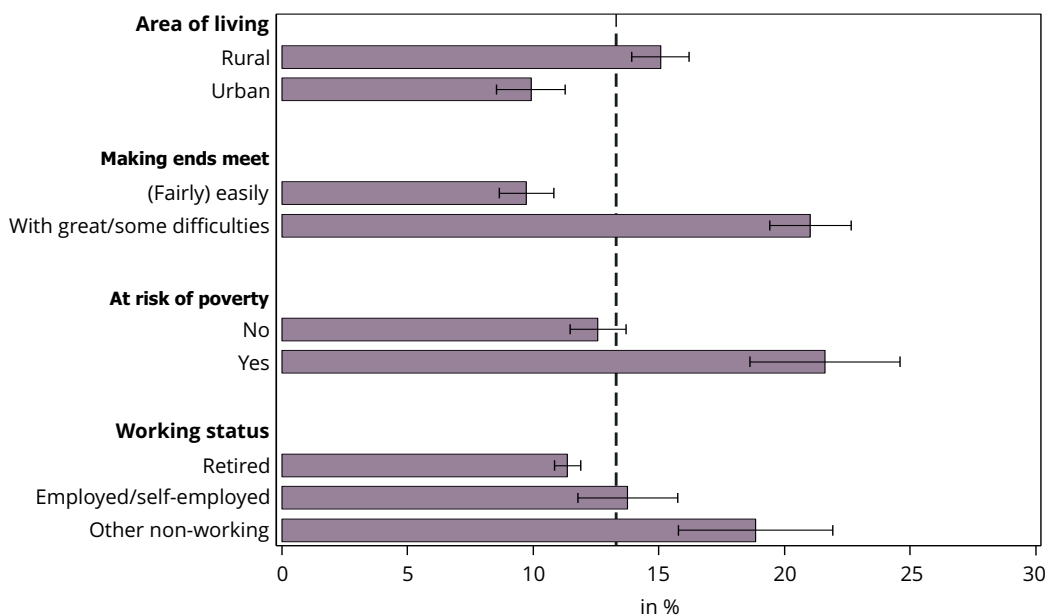
The subjective economic situation, measured via respondents' reports of how hard it was to "make ends meet", played a significant role in the decision and willingness to be vaccinated. About 10% of respondents that could make ends meet (fairly) easily were undecided or unwilling to be vaccinated. This increased to

21% for respondents that reported difficulties making ends meet. The pattern persisted when looking at country differences, with Latvia, Lithuania, Romania, and Slovakia showing the largest significant differences.

When further inspecting the objective measure of respondents' risk of poverty, a very similar pattern emerged. Again, respondents in more precarious financial situations reported not wanting to get vaccinated or being undecided more frequently (21.6%) than respondents with greater disposable household income (12.6%). Again, this finding was strongest in eastern European countries, but it was also substantial in Finland and France (see table A7).

Finally, employment status had a significant effect on vaccination status and intention. In particular, unemployed respondents added to the higher probability of being undecided or refusing a vaccine amongst the non-working (18.9%). The significantly lower proportion of retired respondents (11.4%) who were undecided or against getting vaccinated could be explained by both an age effect and being more flexible in their time compared to (self-) employed respondents. This general pattern held for essentially all investigated countries.

Figure 6 Proportion of undecided/refusals by living conditions and economic situation



Data: SHARE Wave 9 COVID-19 Survey 2, release 8.0.0 (n=47,072-48,924; weighted) with 95%-confidence intervals.

Who Exactly are the Unvaccinated?

The stagnation of the COVID-19 vaccination process jeopardizes the attempt to contain the pandemic in many European countries. While some countries have progressed rather far with regard to the at-risk group of older people (e.g., Malta, Denmark, Spain, Belgium, or Sweden), prompting governments to lift corona restrictions, others are still far away from sufficient vaccination rates, in particular eastern European and Baltic Countries.

How can these country differences in vaccination rates be explained? They seem to be in large parts driven by scepticism towards the vaccine and not lack of availability: The share of willing respondents who have not yet been vaccinated is low in most countries, while the share of undecided and refusing respondents is very high in countries with low vaccination rates, especially in Bulgaria and Romania. Even if a considerable number of the undecided could be swayed to get the vaccination shot, the high number of vaccination refusers will make it very hard to reach herd immunity via vaccination in these two countries. We are however unable to tell whether a progressing immunization campaign can persuade erstwhile sceptics. For post-Communist countries, a lower social capital and in particular less trust in both other people and the national government could explain lower vaccination rates (Berniell et al., 2021; Lazarus et al., 2021).

What impact do age, gender, and education have? Regarding socio-demographics, we found that age played a significant role in respondents' willingness to receive the vaccine, with younger respondents more likely to refuse than older respondents. We suspect that this is, at least partly, due to a reduced risk of severe progressions of COVID-19 and hence their lower priority in vaccination campaigns. Additionally, we found that respondents with lower education were substantially more hesitant to receive the vaccination.

What about health? As stated above, prior illnesses were associated with a higher willingness to get vaccinated. Yet subjective self-rated health did not seem to have a clear and significant effect. Furthermore, there were no strong effects with regard to being affected by mental health issues. In contrast, close contact with COVID-19 patients had an effect under limited conditions. While it could be argued that knowing someone mildly affected by COVID-19 did majorly impact the decision to vaccinate, severe outcomes of a COVID-19 disease in the close vicinity substantially reduced the likelihood of an unvaccinated status.

What role do respondents' living conditions play? Vaccination acceptance was higher amongst respondents living in urban areas, possibly due to differences in healthcare coverage. Respondents' economic situation proved to be very influential. Respondents in financially deprived households (according to both objective and subjective measures) as well as those facing unemployment were least likely to get vaccinated. Along with education, this highlights the importance of socioeconomic circumstances in the context of vaccination hesitancy.

» ***Socioeconomic circumstances are key to vaccination hesitancy.*** «

What potential caveats regarding these results should be kept in mind? For one, our results only hold true for the 50+ population included in SHARE. While the cross-country dimension of the SHARE Corona Survey is a great advantage of our study, the details and the specific challenges of the immunization campaigns in all 28 participating countries add complexity beyond the scope of this paper. A more detailed look at the circumstances on a national level will take more time but will certainly be beneficial for the understanding of the specific issues. It is furthermore important to stress

that our results have to be interpreted carefully when it comes to causal interpretations. Our data on vaccination rates and willingness cannot depict changes over time that are vital for causal analyses. Nevertheless, we have provided a sound overview of country differences in decision and willingness to vaccinate as well as groups that are especially hesitant to participate in the immunization efforts. The majority of these bivariate findings were also confirmed in a multivariate model, which considers the potential correlations between the predictors. Thereby we support some first ideas of the reasons behind that hesitancy and give an insight into who the unvaccinated are. Previous research has already shown the importance of pandemic severity and perceived governmental protection against COVID-19 for the adoption of preventive behaviour (Sand & Bristle, 2021). The present work provides the foundation for future investigation into individual and country-level indicators, such as trust in government and health care systems, stringency of lockdown measures, and pandemic severity to draw comprehensive conclusions.

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[https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)

Statements and Declarations

Competing Interests

The authors declare no competing interests.

Data Availability

All data used in our study are available free of charge to all scientific users worldwide after individual registration (<http://www.share-project.org/data-access/user-registration.html>). SHARE data are DOI registered datasets (<http://www.share-project.org/data-documentation/share-data-releases.html>). Each wave and each release is assigned a persistent DOI. In our manuscript, we use SHARE data from Waves 1, 2, 3, 4, 5, 6, 7, 8, and the two SHARE Corona Surveys, which are fully available without restrictions.

Compliance with Ethical Standards

The SHARE study is subject to continuous ethics review. During Waves 1 to 4, SHARE was reviewed and approved by the Ethics Committee of the University of Mannheim. Wave 4 of SHARE and the continuation of the project were reviewed and approved by the Ethics Council of the Max Planck Society. For more details please see: http://www.shareproject.org/fileadmin/pdf_documentation/MPG_Ethics_Council_SHARE_overall_approval_29.05.2020__en_.pdf

Informed Consent

All participants have given their consent before the start of the interview after having been fully informed about the survey details. Participation in the survey is voluntary and the information is kept confidential.

Acknowledgements

Research in this article is a part of the EU Horizon 2020 SHARE-COVID19 project (Grant agreement ID: 101015924).

This paper uses data from SHARE Waves 1, 2, 3, 4, 5, 6, 7, 8 and 9 (DOIs: 10.6103/SHARE.w1.800, 10.6103/SHARE.w2.800, 10.6103/SHARE.w3.800, 10.6103/SHARE.w4.800, 10.6103/SHARE.w5.800, 10.6103/SHARE.w6.800, 10.6103/SHARE.w7.800, 10.6103/SHARE.w8.800, 10.6103/SHARE.w8ca.800, 10.6103/SHARE.w9ca.800; see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been funded by the European Commission, DG RTD through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-

PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782, SHARE-COVID19: GA N°101015924) and by DG Employment, Social Affairs & Inclusion through VS 2015/0195, VS 2016/0135, VS 2018/0285, VS 2019/0332, and VS 2020/0313. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C, RAG052527A) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

The authors would like to thank Julia Amorim, Charlotte Hunsicker, and Claudia Weiler for their valuable support in improving the quality of the paper.

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Published by

GESIS – Leibniz Institute for the Social Sciences
Knowledge Exchange & Outreach (KEO)
Unter Sachsenhausen 6-8
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GESIS is member of Leibniz Association

ISSN 2199-9082 (Online)
