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SHARE, the Survey of Health, Ageing and Retirement in Europe, is a research infrastructure for studying the effects of health, social, economic and environmental policies over the life-course of European citizens and beyond. From 2004 until today, 380,000 in-depth interviews with 140,000 people aged 50 or older from 28 European countries and Israel have been conducted. Thus, SHARE is the largest pan-European social science panel study providing internationally comparable longitudinal micro data, which allows insights in the fields of public health and socio-economic living conditions of European individuals, both for scientists and policy makers. SHARE has global impact since it not only covers all EU member countries in a strictly harmonized way but additionally is embedded in a network of sister studies all over the world, from the Americas to Eastern Asia. Considering its focus on people aged 50 and older, international orientation, and thematic coverage, SHARE is perfectly suited to provide data on respondents' health, economic, and living situation all across Europe and Israel before and during the ongoing COVID-19 crisis.

Therefore, the aim of this project is to analyse and evaluate the non-intended consequences of the epidemic control decisions to contain the COVID-19 pandemic in 27 European countries using data from SHARE, and to devise improved health, economic and social policies with a transdisciplinary and international team of SHARE researchers from different European research institutions. To reach these aims, several objectives will be pursued: identify healthcare inequalities before, during and after the pandemic; understand the lockdown effects on health and health behaviours; analyse labour market implications of the lockdown; assess the impacts of pandemic and lockdown on income and wealth inequality; mitigate the effects of epidemic control decisions on social relationships; optimise future epidemic control measures by taking the geographical patterns of the disease and their relationship with social patterns into account; better manage housing and living arrangements choices between independence, co-residence or institutionalisation.

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## I. Executive summary

In this deliverable, WP3 uses data from the second SHARE Corona Survey (SCS) in order to detect the determinants of SARS-CoV-2 vaccinations in the European 50+ population; to analyse risk factors for long-term or lingering symptoms attributed to COVID-19 disease; to gain knowledge about the relationship between the frequency of praying and COVID-19 vaccine hesitancy in different European regions; to analyse cognitive resilience; and to observe developments in depression and loneliness.

### 1. Summary of projects and research aims

#### *Work package objective:*

Analyse the effects of living through the pandemic and lockdown on physical and mental health, cognition, quality of life and well-being. Assess whether social distance/constraints, use of personal protective equipment, and hygienic measures were used. Measure how the different EU MS's levels of lockdown have affected physical and mental health. Identify the health characteristics of resilient and fragile participants.

In this period we focused on the new items included in the second SHARE Covid-19 survey (SCS2), specifically the questions on vaccine uptake and lingering effects after a COVID-19 infection. We aimed at identifying the risk factors for having any lingering effects as well as specific symptoms using the SHARE panel data. Vaccines are among the most effective ways to prevent COVID-19 and the subsequent potential lingering effects. A SHARE study had already shown that vaccine uptake was lowest among the youngest old, those with a lower education, and in Eastern Europe, respectively (Bergmann, Hannemann, Bethmann, & Schumacher, 2021), however less is known about how personal beliefs affect COVID-19 vaccine uptake. We therefore aimed to investigate if vaccine hesitancy was associated with religiosity by comparing information of praying habits from the regular SHARE waves with information on vaccine willingness from CATI2.

### 2. Overview of all finished and/or started papers by all major WP participants

#### **a. Finished**

- Paper 1: Bergmann M, Hannemann T-V, Bethmann A, Schumacher A. Determinants of SARS-CoV-2 vaccinations in the 50+ population.

#### **b. Started/in progress**

- Paper 2:  
Bovil T, Scheel-Hincke LL, Wester CT, Andersen-Ranberg K: Risk factors for long-term or lingering symptoms attributed to COVID-19 disease in 50+ people in Europe and Israel  
*In progress*
- Paper 3:  
Wester CT, Andersen-Ranberg K, Bovil T, Scheel-Hincke LL: Frequency of praying and COVID-19 vaccine hesitancy among people 50+ – a comparison of European regions  
*In progress*

- Paper 4:  
Scheel-Hincke LL. et al.: Two Nordic countries with different approaches to handling the COVID-19 pandemic – a comparison of Sweden and Denmark  
*In progress*
- Paper 5:  
Rieckmann A et al.: Cognitive resilience did not protect against feelings of loneliness and isolation during the first wave COVID19 lock-down  
*In progress*
- Paper 6:  
Gruber S and Atzendorf J: Developments in depression and loneliness of older adults in Europe and Israel during the pandemic  
*In progress*

### 3. Description of results

**Paper 1:** In this paper the interrelation of a willingness to get vaccinated with socio-demographic and health factors as well as living conditions and economic situations were studied. The subjective and objective economic situation as well as diagnosed physical illnesses and education showed the strongest relation to vaccination hesitancy.

**Paper 2:** Based on SCS2 data we identified about one quarter (23.9%) of COVID-19 infected SHARE participants (N= 3,893) developed at least one post-COVID symptom, and the most common (above 10%) being fatigue, shortness of breath and coughs, body aches or joint aches, loss of smell or taste. Predictors of Post-COVID symptoms were high age (70+ years), current smokers, and medium or low educational level. Hospitalization due to COVID-19, used as a proxy for COVID-19 severity was also an important risk factor for developing Post-COVID symptoms.

**Paper 3:** In this paper SHARE data from waves 5-8, and SCS2 data were used. Vaccine hesitants comprised 15% of the SHARE population. Praying daily, irrespective of religious belief, is significantly associated with higher vaccine hesitancy compared to those praying weekly or never. In stratified analyses by regions, participants praying daily in the Northern/Western (together) region, and participants praying daily or weekly in the Eastern region were more likely to be vaccine hesitant, especially if they were older, male gender, or with a medium or low educational level. In contrast, praying was not associated with vaccine hesitancy in the Southern region.

**Paper 4:** The two sister-countries, Sweden and Denmark, had different approaches to the COVID-19 pandemic, especially during the first phase, where Denmark implemented stricter lockdown measures than Sweden. Using both Wave8, SCS1 and SCS2 this paper looked at short- and medium term differences between Sweden and Denmark regarding mental health, daily activities, and medical care. In both countries the short term changes were declines in the prevalence of feeling depressed or having sleep problems, but the decline was unexpectedly larger in Denmark than in Sweden. In contrast, Danes were more likely to have a medical appointment postponed in SCS1. The medium-term changes were less prominent, and country-differences more or less even out.

**Paper 5:** Cognitive resilience, measured as both high level and stable performance prior to the pandemic, was not a predictor of self-reported increase in loneliness following restriction measures.

These results suggest that cognitive resilience by itself does not render an individual less likely to experience adverse effects on mental health from restriction measures. Rather, the stringency of the restriction measures and demographic variables are major predictors of increased loneliness. Further analyses will explore whether some cognitive vulnerable individuals are at greater risk for feelings of loneliness (e.g. older individuals).

**Paper 6:** In SCS1, only 30 percent of respondents reported to have contact to members of their social network at least once a week while in the SCS2, the share of those having personal contact at least once a week increased to more than 50 percent. Nevertheless, the prevalence of depressive symptoms and loneliness did not change for the better, and further analyses show that the number of days in lockdown seem to significantly predict an increase in feelings of loneliness.

#### 4. Future research aims and next steps

Our future research within WP3 will deliver refined analyses of the medium-term health consequences of living through the pandemic using CATI2 data (SCS2), as well as the first analyses of the long-term effects using data from wave 9.

By extending our analyses to including CATI2 data (SCS2) as well as data from wave 9, we will look more in-depth into the longitudinal changes in mental health, in particular the mental health consequences of living through several waves of the pandemic. An important and major part of the next period will be the use of the wave 9 data to make longitudinal analyses of cognitive decline pre, during, and hopefully post pandemic, depending on the timing of data collection in relation to the end of the pandemic.

**II. Papers and drafts of Work Package 3 based on the second SHARE Corona Survey**

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## SHARE WORKING PAPER SERIES

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# Determinants of SARS-CoV-2 vaccinations in the 50+ population

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

*Working Paper Series 72-2021*

DOI: [10.17617/2.3345550](https://doi.org/10.17617/2.3345550)

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## About the SHARE Working Paper Series

The series is designed to provide a timely discussion of results based on SHARE data within the SHARE family, i.e., members of the SHARE Country Teams, Area Coordination Teams and other SHARE bodies. The papers are not peer reviewed; the authors are solely responsible for the scientific content and the graphical layout of their submissions. The respective Country Team Leaders and Area Coordinators are encouraged to look over the submissions by their team members.

The publisher (SHARE ERIC) checks working papers in this series for formal issues such as proper acknowledgements to the funders of SHARE. The publisher takes no responsibility for the scientific content of the paper.

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# DETERMINANTS OF SARS-CoV-2 VACCINATIONS IN THE 50+ POPULATION

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A FIRST OVERVIEW ACROSS EUROPE AND ISRAEL USING THE SURVEY OF HEALTH, AGEING AND RETIREMENT IN EUROPE

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October 5, 2021

## Abstract

With the arrival of effective COVID-19 vaccines, the main issue in the fight against the pandemic became how to quickly vaccinate as many people as possible to contain the pandemic and especially to protect those most at risk, e.g. the older population. After initial problems with vaccine supply have been overcome, the focus now is on a slowdown in vaccination uptake. The Survey on Health, Ageing and Retirement in Europe (SHARE) is in a unique position to provide insights into the reasons for vaccination hesitancy, as it very recently collected data on vaccination uptake and a number of influential factors from about 47,000 individuals in the high-risk 50+ age group across Europe and Israel. In this paper we will look at the interrelation of a willingness to get vaccinated with socio-demographic and health factors as well as living conditions and economic situations. The subjective and objective economic situation as well as diagnosed physical illnesses and education show the strongest relation to vaccination hesitancy. The results in this paper provide a comprehensive picture of influential factors that might be helpful to further the success of the immunization campaigns in Europe.

**Keywords** COVID-19 · vaccination · SHARE · Europe

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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 and 8 (DOIs: 10.6103/SHARE.w1.710, 10.6103/SHARE.w2.710, 10.6103/SHARE.w3.710, 10.6103/SHARE.w4.710, 10.6103/SHARE.w5.710, 10.6103/SHARE.w6.710, 10.6103/SHARE.w7.710, 10.6103/SHARE.w8.100, 10.6103/SHARE.w8ca.100), 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,

## 1 Introduction

As the novel coronavirus has affected daily life in a severe and lasting way, vaccination programmes have been underway in most European countries in an attempt to curb the spread of COVID-19. They have been especially important for older individuals, as they are at higher risk for severe infection outcomes (see, e.g., CDC, 2020; WHO, 2020; Williamson et al., 2020; Zhou et al., 2020).

The Survey on Health, Ageing and Retirement in Europe (SHARE) has conducted telephone interviews supplementary to the regular panel survey with respondents 50+ which addressed health, employment, care, and life adjustments during the current pandemic across 27 European countries and Israel. During the second iteration of the corona-specific interviews conducted between July and August 2021, respondents were asked whether they had been or intended to be vaccinated against the virus. In addition, a broad range of respondent characteristics can be used to shed light on the question of who has actually been vaccinated or not, as well as who had the intention to get vaccinated in the weeks after the interview.

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 to 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, in the second half of 2021 the focus of public and scientific discourse shifted more towards a slowdown in vaccination uptake in spite of the supply issues being resolved.

Research on the reasons people get vaccinated, or rather refuse to, is picking up speed quickly. But while there are a number of single country studies (e.g. 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 (e.g. Lazarus et al., 2020; Lindholt et al., 2020) comprehensive European comparisons are still scarce. At the moment, SHARE’s second Corona Survey remains the only large-scale study that covers most European countries and has collected data on individuals’ situation during the pandemic, including their intention to receive a vaccination and vaccination status, respectively.

This paper will give an overview of some of the most important variables related to the (un)willingness to be vaccinated against COVID-19. After a brief description of the dataset, we will look at 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 indicators like feelings of loneliness, 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, living in a nursing home, household size, the ability to “make ends meet,” household income, and employment status

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SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782) 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](http://www.share-project.org)).

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

We will conclude with a discussion of these results in the context of the ongoing pandemic and stagnating vaccination rates—in some European countries on a rather low level—and will finish with some ideas for further analyses of the reasons influencing the willingness to get vaccinated.

## 2 Data

The following analyses used preliminary data from the second SHARE Corona Survey (Börsch-Supan, 2021c), fielded from June to beginning of August 2021 in all 28 countries participating in SHARE. The SHARE Corona Survey is a special study, which has been designed as a reaction to the COVID-19 crisis last year and was conducted by telephone (Computer-Assisted Telephone Interview; CATI; see Scherpenzeel et al., 2020 for further information). It is targeted specifically at collecting data on the living situation of people who are 50 years and older during the pandemic across Europe and Israel.

The second SHARE Corona Survey (Börsch-Supan, 2021c) re-interviewed respondents of the first SHARE Corona Survey (Börsch-Supan, 2021b), enabling the examination of (intra-individual) changes between the start of the pandemic and the situation one year later in a cross-national perspective. As such, it adds valuable insights to recent studies, which are frequently restricted to the national level. Moreover, the SHARE Corona Survey can be complemented with background information from the regular SHARE panel study, providing a wealth of information on health, socioeconomic status, and social and family networks of respondents aged 50 and over since 2004 on a biannual basis (see Börsch-Supan et al., 2013).

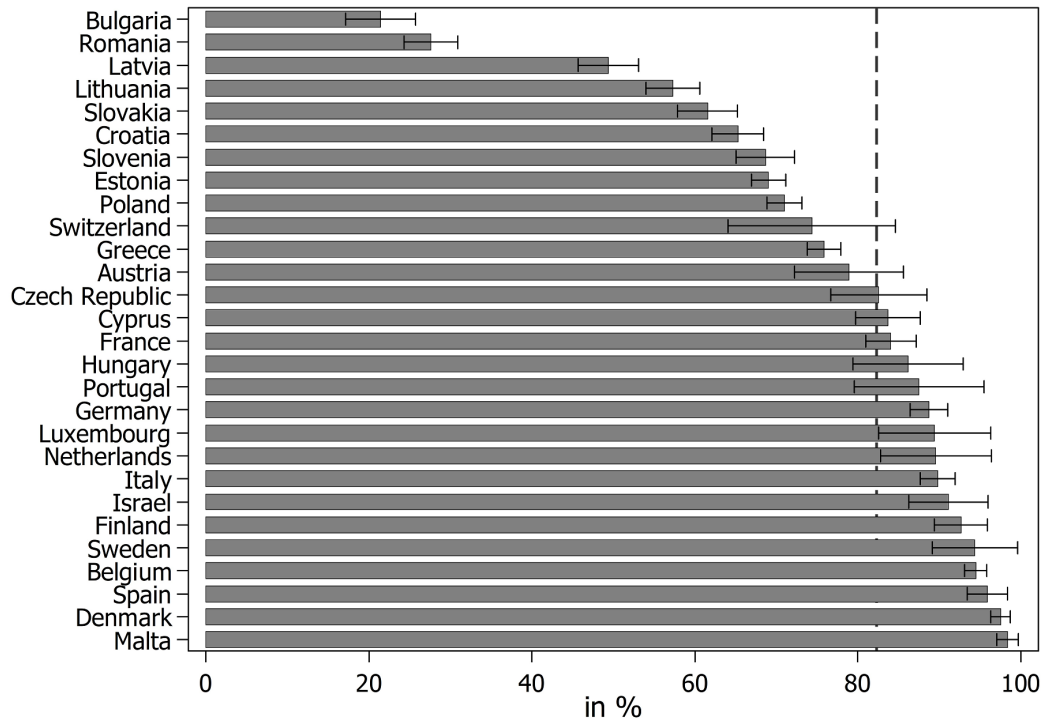
The SHARE data are without exception based on full probability samples (Bergmann et al., 2019a, 2019b), providing internationally comparable data that allow for the comparison of how national governments, health care systems and individuals responded to the pandemic, and which lessons should be drawn for the future from the divergence between countries. Both the methodological rigor and the cross-country harmonization of SHARE are hence prerequisites to properly investigate the effects of a global pandemic like COVID-19 and further support evidence-based policy making in Europe and beyond.

Our analyses are based on data from 46,989 respondents aged 50 years and older. The preliminary individual retention rate based on eligible participants of the first SHARE Corona Survey was, on average, 85%, ranging from 67% (Denmark) to 96% (Romania). Data for all variables used were collected during the second SHARE Corona Survey in summer 2021, except data on household income, which was taken from the first SHARE Corona Survey (Börsch-Supan, 2021b), and data on educational level and rural or urban housing, which both were based on data collected in Wave 8 of the regular SHARE face-to-face questionnaire in late 2019 to early 2020, as well as previous SHARE waves to impute stable information (Börsch-Supan, 2020a-g; 2021a).

### 2.1 Vaccination against SARS-CoV-2

Vaccination status and intent to get vaccinated were examined in two consecutive steps: First, respondents answered whether they had been vaccinated against COVID-19 at least once. Of those who had not yet been vaccinated, information on their intention to do so was requested—inquiring whether they already had scheduled an appointment for vaccination, wanted to get vaccinated, did not want to get vaccinated, or were still undecided.

In our analyses, we used these two questions in three separate combinations: The first question alone was sufficient to describe the respondents' vaccination status (step 1). For a general picture of vaccination intent, we split the two variables into four categories: already vaccinated, wants to get vaccinated (combining scheduled appointments and sole intent), still undecided, and does not want to get vaccinated. Respondents who answered “Don't know” in the question on vaccination intent were categorized as undecided (step 2). Finally, for a more detailed look at those sceptical towards vaccination, we used a binary variable distinguishing those who are vaccinated or want to be from those who are undecided or do not want to get the vaccine (step 3).



Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (n=46,989; weighted) with 95%-confidence intervals.

Figure 1: Proportion of actually vaccinated respondents accross countries

### 3 Analysis

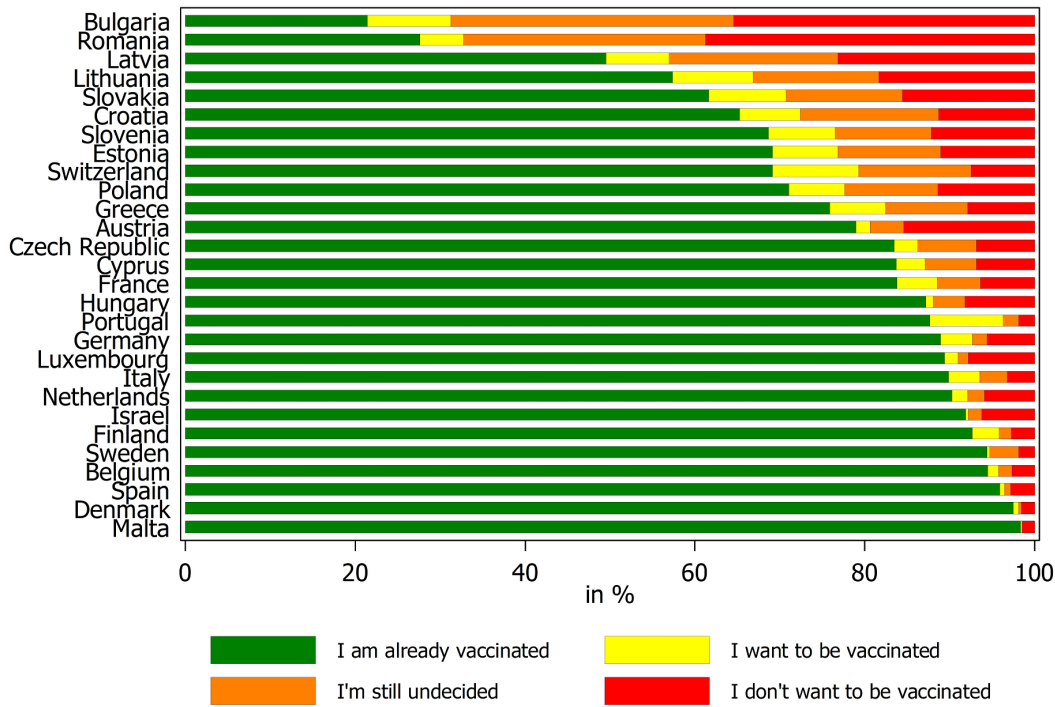
In the following, we put emphasis on the most crucial differences with respect to socio-demographic and economic characteristics, respondents' living situation, as well as respondents' health condition and personal exposure to COVID-19, shedding light on country differences regarding vaccination across Europe and Israel.

#### 3.1 Country Differences in Vaccination Rates and Attitudes

Among SHARE's 50+ population about 82% of the respondents reported—by the survey period in summer 2021—already having been vaccinated. While this is a fairly high number, there was great variation accross countries. As shown in figure 1, Malta, Denmark and Spain were in the lead with over 95% of respondents vaccinated and Romania and Bulgaria trailing behind with about 28% and 21% respectively.

These numbers correspond rather well with the country level vaccination rates reported by the European Centre for Disease Prevention and Control for the 50+ populations in a similar timeframe (see ECDC, 2021). Even though SHARE is a long running panel study, we are confident that by using survey weights we are able to make sufficiently precise and unbiased projections that reflect the state of our population of interest and can safely go into more detailed analyses.

The low vaccination rates in Romania and Bulgaria seem even more severe when considering the intention to get vaccinated more closely, as depicted in figure 2. In addition to 29% of the Romanian and 33% of the Bulgarian SHARE respondents having been undecided about the vaccination, 39% and 35%, respectively, stated that they did not want to get vaccinated at all. 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. The same applies to other countries, in which the



Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (n=46,968; weighted).

Figure 2: Vaccination status and intentions across countries

group of vaccination refusers is rather large, such as in Latvia (23%), Lithuania (18%), Slovakia (16%), or Austria (15%).

When additionally exploring the proportion of respondents who were still undecided and thus might be convinced in the middle or long run to get the vaccination, there was also a huge variation across countries: While almost no one was still undecided in Malta (however, based on a very small number of unvaccinated individuals), the ratio based on those respondents who were not vaccinated ranged from 11% in Luxembourg to about 30% in Italy, France, Belgium, or Hungary and nearly 50% in Croatia (see Table A1 in the Appendix for more information). The weighted average across all countries was 33%.

What is also striking is the high rate of vaccination refusals accross most of the Eastern European and Baltic states and the clear and significant distinction from the other European regions in the West, South and North of Europe. Figure 3 illustrates this West-East gradient. On average, 45% of all unvaccinated respondents, across all countries, stated that they did not want to get vaccinated.

### 3.2 Socio-demographic differences

In the following analyses, we will focus on those respondents who are not yet vaccinated, either because they are still undecided or indicated that they do not want to get the shot. In the current situation, where vaccination rates are stagnating in most European countries, this is certainly the most debated group of people. Against the background of incidence rates likely rising again in autumn/winter 2021, it is crucial to know more about the characteristics of these people in order to design appropriate strategies on how to reach and ultimately convince them to get vaccinated.

With respect to socio-demographic characteristics, we primarily explored age, gender and education. Age was recoded to three categories with ranges for the older working age population (50-64 years), the young

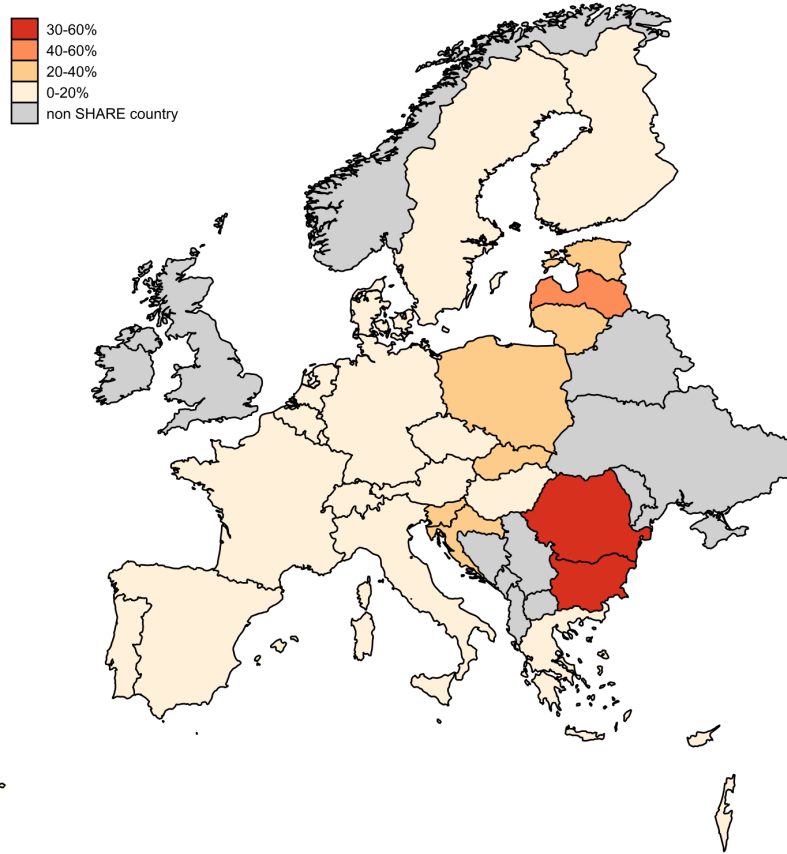


Figure 3: Prevalence of respondents that have not been vaccinated/do not intend to get vaccinated by country

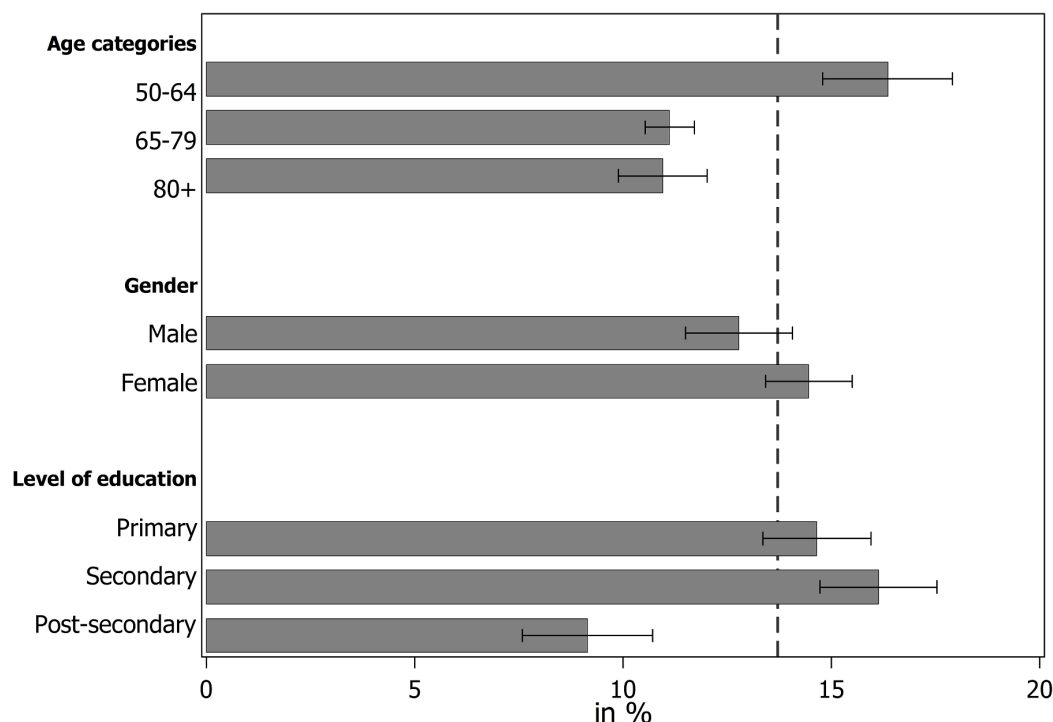
retiree age group (65-79 years) and the oldest old (80 years and over). Gender was recoded to a dichotomous variable with “1” being female participants.

Data on education were derived from the regular Wave 8 questionnaire, with stable information imputed from previous waves. We coded the level of education attained based on the International Standard Classification of Education 1997 (ISCED-97). Respondents were then grouped into three categories (see, e.g., Avendano et al., 2009): primary education (ISCED-97 score: 0–2), secondary education (ISCED-97 score: 3), and post-secondary education (ISCED-97 score: 4–6).

Previous studies have found that the risk of a severe adverse outcome of a COVID-19 infection increases with age (e.g. CDC, 2020; Davies et al., 2020; Palmer et al. 2021). We assume that this higher risk might translate into less vaccination hesitancy. 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 (16.4%) was undecided about or critical of being vaccinated than of the young retirees (65-79, 11.1%) or the oldest old (80+, 11.0%). The latter two groups showed no significant differences. However, it has to be noted that many of the refusals among respondents of working age are 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+ combined) varied somewhat (detailed information on country-specific differences can be found in the appendix). The only—however, statistically insignificant—exception was Romania, where older respondents stated being undecided or opposed to getting vaccinated more frequently than younger respondents.

We also saw a rather clear gender divide with 14.5% of the women being undecided or refusing the vaccination, as opposed to 12.8% among men. However, there was some variation across countries, both regarding the



Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (n=46,111-46.968; weighted) with 95%-confidence intervals.

Figure 4: Proportion of undecided/refusals by demographic groups

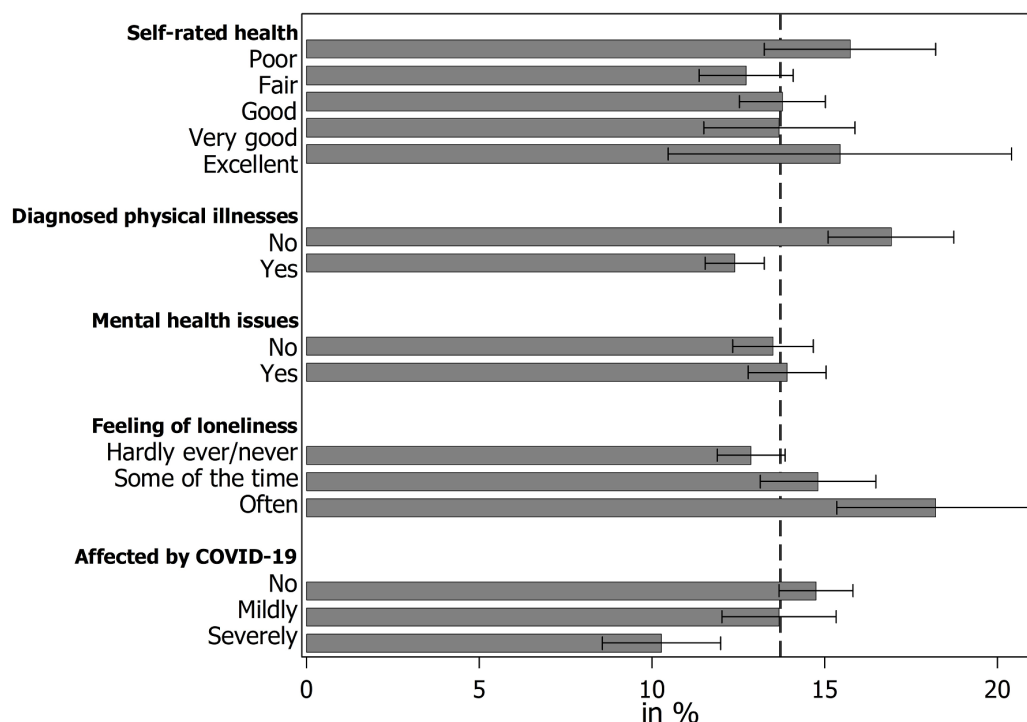
proportion of respondents reporting to be still undecided or unwilling to be vaccinated and the ratio of male and female respondents within a specific country. For example, in Hungary, Portugal and Switzerland there were more males—although not a statistically significant difference—who were still undecided or didn't want to get vaccinated.

The level of education showed a non-linear relationship with being undecided or refusing vaccinations: While among respondents with only primary education the proportion was about 14.7%, it was 16.1%—a small, but statistically significant difference—in the group with secondary education, but only around 9.2% among individuals with post-secondary education, an even larger difference. This latter finding of higher educated respondents having a, vice versa, higher probability of being vaccinated compared to less educated was strongest in Bulgaria, Romania and Slovakia.

### 3.3 Health-related differences

Health issues might influence the decision to be vaccinated against SARS-CoV-2. The likelihood to get vaccinated might be increased for individuals with pre-existing conditions wanting to decrease their risk for severe consequences of an infection. In contrast, some might also fear adverse reactions to the vaccination and would therefore be less likely to get vaccinated.

To address this issue, we first used the reversed 5-point scale on respondents' self-rated health (0: poor, 1: fair, 2: good, 3: very good, and 4: excellent) as a subjective health indicator. As a more objective measure, we classified respondents with at least one diagnosed illness in a binary variable. In another binary variable, we categorized all those respondents who reported feeling depressed or anxious in the previous month or having had trouble sleeping recently as affected by mental health issues. Further, indications of loneliness were measured by a question differentiating between feeling lonely "often," "some of the time," or "hardly ever or never."



Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (n=46,880-46,968; weighted) with 95%-confidence intervals.

Figure 5: Proportion of undecided/refusals by health indicators

To assess how respondents had been affected by the COVID-19 disease, we distinguished three categories: Firstly, we rated those cases who had been hospitalized for COVID-19 themselves, or knew people close to them (e.g. spouse/partner, parent, child, neighbor, friend or colleague) that had been hospitalized or died from COVID-19 as “severely affected.” We rated as “mildly affected” those cases in which the respondents themselves or people close to them had had COVID-19 symptoms or had been tested positive for SARS-CoV-2. Finally, cases in which no positive tests or symptoms had occurred among the people close to the respondent were categorized as “not affected.”

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). The proportion of undecided and unwilling to get vaccinated was highest amongst the respondents that rated their health as poor, as well as those considering it to be excellent, as opposed to the respondents that rated their health as fair to very good. However, the confidence intervals are very large indicating a potential contrast between different perceptions regarding the risk of being infected with SARS-CoV-2 for people without any (subjective) health conditions. In addition, country differences might also play a role. In this respect, there were some hints that respondents reporting poor health more frequently stated to be undecided or unwilling to be vaccinated. This pattern was significant in Bulgaria, Estonia, Latvia and Slovenia. The opposite, however, was found in Finland, where respondents with poor health were significantly more likely to be vaccinated.

When considering more objective health measures like the presence of diagnosed physical illnesses, the interpretation is more straightforward: Respondents without such illnesses had a significantly higher probability of being undecided or unwilling to be vaccinated (16.9%) compared to respondents with at least one diagnosed illness (12.4%). This difference was strongest in Hungary, Lithuania, Luxembourg and Switzerland.

In contrast, there was no strong difference between respondents with mental health issues, such as feeling depressed and anxious or having sleeping problems, with respect to being vaccinated or not. A more clear-cut



pattern emerged from the question about feelings of loneliness. Here, we found that it related fairly linearly to the proportion of respondents reporting indecision or unwillingness to get vaccinated. The smallest proportion of undecided or unwilling respondents was found in those stating to hardly ever or never feeling lonely (12.9%). This number was significantly higher when respondents answered “some of the time” (14.8%) or “often” (18.2%). This pattern was most visible and statistically significant in Latvia, Lithuania and Romania.

Even if respondents themselves were not infected they might have known somebody who was, which in turn may have influenced their attitudes towards the COVID-19 vaccination. There was indeed a difference between respondents who stated that they didn’t know anyone physically affected by COVID-19 and those who did. Of the former, 14.7% reported to be undecided or unwilling to get vaccinated. In contrast, this number was 13.7% for SHARE respondents that knew somebody mildly affected (any symptoms or positive test) and only 10.3% for those who knew somebody severely affected (hospitalization or even death in close vicinity). This latter difference was most pronounced in Eastern Europe (esp. Poland, Romania and Slovakia) and the Baltic States.

### 3.4 Differences related to living conditions and economic situation

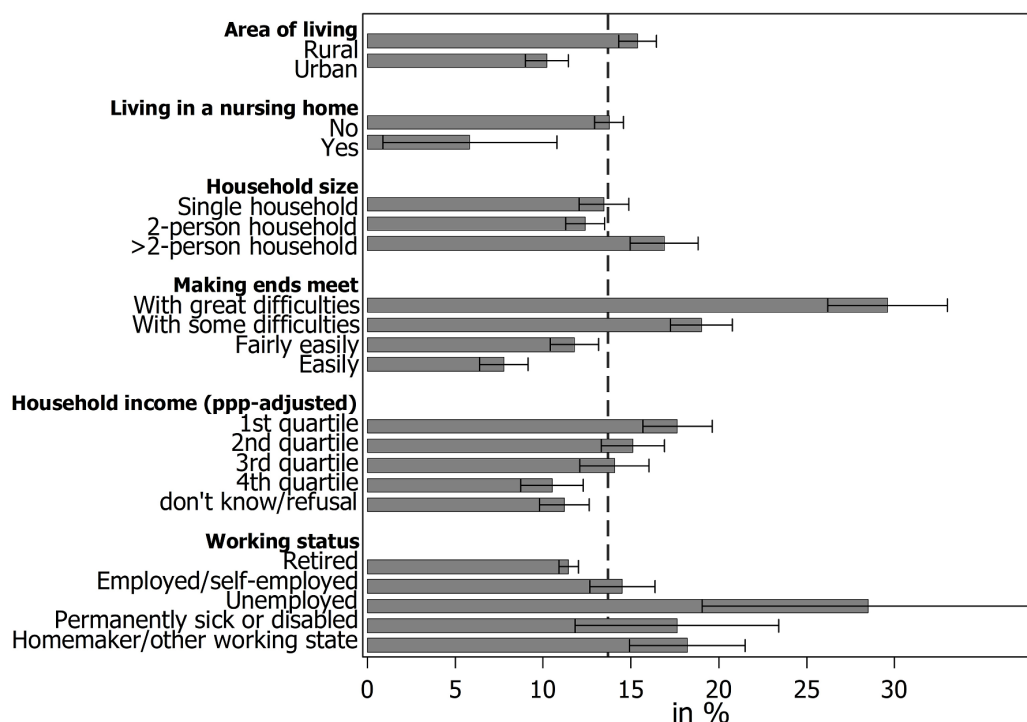
Data on the respondents’ area of living was retrieved from SHARE Wave 8, using stable information from previous waves and additional information from the second SHARE Corona Survey in case of moves, where available. The variables’ values were categorized to “rural” for rural areas or villages as well as small towns, and “urban” for large towns, suburbs and big cities. We further used information on the respondents’ household size (single households, 2-person households, households with more than 2 persons) and whether the individual was living in a nursing home.

We measured each respondent’s (subjective) economic situation by a question that asked for the degree to which respondents could make ends meet (with great difficulties, with some difficulties, fairly easily, or easily). In addition we used the respondent’s household income as a second more objective economic measure. Because respondents in the second SHARE Corona Survey were only asked whether their income increased, decreased, or stayed the same compared to one year before, we used information from the first SHARE Corona Survey, which asked for each respondent’s household income before the outbreak of the pandemic. Incomes were then PPP-adjusted and categorized into country-specific income quartiles. Finally, we included a measure related to whether the respondent was currently retired, employed or self-employed, or had another working status, such as unemployed, permanently sick or disabled, or homemaker.

Figure 6 below first shows that respondents living in urban areas were considerably less likely to state that they were undecided or did not want to get vaccinated (10.2%) than those in rural areas (15.4%). This finding illustrates a clear urban-rural gap possibly due to better or more comprehensive medical services in urban areas. Such a pattern was evident in most SHARE countries, with Austria, Croatia, Romania, Slovakia and Switzerland exhibiting the strongest divide. In contrast, in Estonia the opposite was found, i.e. significantly more undecided and unwilling respondents towards the vaccination were living in urban areas.

Likewise, with respect to living in a nursing home, the pattern was as expected: Throughout Europe, nursing home respondents were among the first to receive a vaccination, which translated into the very low proportion of non-vaccinated respondents living in nursing homes, that can be seen in figure 6. Although standard errors were very large due to the small sample size in some countries, the difference was significant when not distinguishing between countries.

Looking at household size, there was a non-linear effect, with single households and, in particular, households with more than two persons exhibiting a somewhat larger proportion of not being vaccinated compared to two-person households. This finding might, however, be related to the economic situation of the households. In this respect, the subjective economic situation, measured via respondents’ reports of how hard it was to “make ends meet,” had a very pronounced relation to the percentage of respondents who were undecided about the vaccination or did not want to get it. On the far end there was the group of respondents who could



Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (n=45,206-46,968; weighted) with 95%-confidence intervals.

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

make ends meet only “with great difficulties.” For them the percentage was nearly 30%, while it was only 7.8% for those that reported they were able to make ends meet “easily.” This clear pattern remained when looking at country differences, with Estonia, Latvia, Lithuania, Poland, Romania and Slovakia showing the largest significant differences.

When further comparing the different country-specific household income quartiles as a more objective measure of respondents’ economic situation, a very similar pattern emerged. Again, the lower quartiles of the income distribution more frequently did not want to be vaccinated or were undecided to do so, while the opposite was true for higher income quartiles.

Finally, being retired, as opposed to employed or self-employed and especially being unemployed did make a significant difference for being undecided or unwilling to get vaccinated. While the latter particularly adds to the picture of a higher probability of not yet having been vaccinated amongst unemployed respondents (28.5%), the significantly lower proportion of retired respondents (11.5%) who were undecided or against getting vaccinated could be explained by both an age effect (retired people are older on average) and being more flexible in their time. This general pattern holds for essentially all countries in SHARE, with France, Germany, Greece and Poland exhibiting the largest significant differences between retired and (self-)employed respondents and Austria, Germany, Lithuania, the Netherlands and Switzerland showing the largest significant differences between retired and unemployed respondents.

### 3.5 Multivariate model with all predictors

To take into account possible correlations between the different predictors depicted so far, we finally ran a multivariate logistic model with country predictors as controls to explain why respondents at the time of fieldwork were still undecided or did not want to be vaccinated. The model hence included all predictors

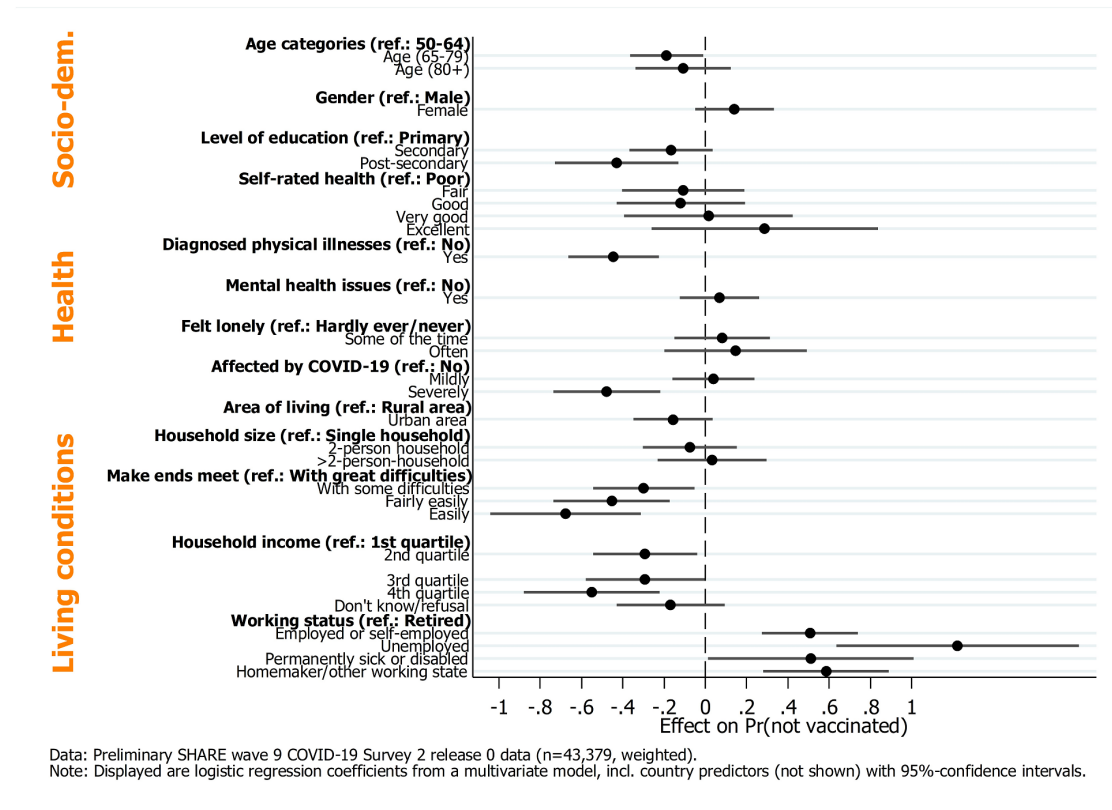


Figure 7: Multivariate logistic regression coefficients of respondent characteristics on being undecided/unwilling to be vaccinated

from the previous sections, apart from living in a nursing home, which was excluded on the basis of very large standard errors due to the small overall number of nursing home respondents.

As can be seen in figure 7, the same picture derived from the bivariate analyses largely holds true for the multivariate analysis: Younger respondents, female respondents and respondents from rural areas still had a higher probability of being unvaccinated. However, only the age effect still reached a significant level when controlling for other characteristics, such as education. The latter was a key driver for getting the vaccine, as respondents that reported post-secondary education had been vaccinated more frequently, to a statistically significant extent. While self-rated health did not have a significant impact on being vaccinated or not, diagnosed physical illnesses as well as affectedness with a severe COVID-19 infection within the close vicinity both significantly decreased the likelihood of not being vaccinated. Further, the economic status of respondents was another key predictor. Respondents who reported more difficulties in making ends meet, had a lower household income, or reported unemployment had a significantly higher probability of not having been vaccinated. These findings confirmed a recent study regarding the relation between socio-economic position and testing, hospitalization as well as mortality (Riou et al., 2021) and adds further evidence also with respect to vaccination.

## 4 Conclusion

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 (e.g. Malta, Denmark, Spain, Belgium, Sweden), prompting governments to lift corona restrictions, others are still far away from sufficient vaccination rates, especially Bulgaria and Romania, but also other Eastern European and Baltic Countries, like Latvia, Lithuania or Slovakia.

In this paper we tried to shed some light on possible reasons why people across Europe might be hesitant to get vaccinated. Country differences in vaccination rates seem to be in large parts driven by scepticism towards the vaccine, as 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. We are however unable to tell to what extent that relation is reciprocal, i.e. whether a progressing immunization campaign can persuade erstwhile sceptics.

Regarding socio-demographics we found that age seems to be a significant factor in respondents' willingness to receive the vaccine, with the population below the age of 65 more likely to refuse than older respondents. We suspect this is due to their lower priority in vaccination campaigns and their lower risk for a severe progression of the COVID-19 disease. This squares in part with the result that diagnosed health conditions, which are more prevalent in older populations, are connected to a lower likelihood to refuse the vaccine. Gender is another factor that plays a role in attitudes towards immunization, as we found that women were more likely to be hesitant than men, although the effect did not reach a significant level anymore when controlling for other important characteristics. A possible explanation for the bivariate difference could be the—in some countries at times heated—debate about potential negative side effects of vector vaccines, like the ones by AstraZeneca or Johnson & Johnson, for (younger) women. However, this debate, although still visible to some extent, has largely subsided, which could also reflect an underlying correlation with education. As such, educational differences were particularly prominent when comparing the highest level of education with the two other groups, showing that the latter were substantially more sceptic towards the vaccination.

As stated above, prior illnesses as an objective health indicator were associated with a higher willingness to get vaccinated. Yet, subjective, self-rated health did not seem to have a clear and significant effect. We also did not see strong effects with regards to reported mental health issues. In contrast, close contact with COVID-19 patients—or having been infected oneself—had an effect under limited conditions: While it could be argued that knowing someone mildly affected by COVID-19 did not make a huge difference regarding the probability of being vaccinated or not, severe outcomes of a COVID-19 disease in the vicinity substantially reduced the proportion of being undecided or not willing to be vaccinated.

Respondents' living conditions exhibited substantial effects on their vaccination scepticism—at least for some variables. On average, respondents from urban areas were less likely to be sceptical towards vaccination, possibly due to differences in health care coverage. Further, households with more than two members were slightly more likely to be hesitant to get vaccinated. However, both predictors did not show a significant effect when controlling for other respondent characteristics. Much more influential is the economic situation, especially the ability to make ends meet as well as the respondents' working status. These were the strongest predictors of vaccination refusals, with respondents in financially deprived households or facing unemployment being least likely to agree with vaccination. Together with a similar finding for the income situation and the effect of education this highlights the importance of socio-economic circumstances in the context of vaccination hesitancy. These results would support the assumption that mobility, health education and general access to health care are important influences on the willingness to get vaccinated. This in turn points to strategies to convince current vaccination sceptics.

#### 4.1 Limitations

Some caveats apply to the results presented here. For one, our results can only hold for the 50+ population included in SHARE. Further, panel attrition could have skewed the representativity of our analysis. However, since the vaccination rates from our survey data match official statistics, we are quite confident that our further analyses are equally representative.

While the cross-country dimension of the SHARE Corona Survey is a great advantage of our study, we have not yet been able to establish in detail the specific challenges of the immunization campaigns in all 28 participating countries. 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 is strictly cross-sectional and can therefore not depict changes over time that are often vital for causal analyses. Nevertheless, we hope to have provided a sound overview of country differences in vaccination rates and refusal as well as groups that are especially sceptical of the immunization efforts, thereby supporting some first ideas of the reasons behind that scepticism. 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). Further work will thus have to include 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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## 6 Appendix

Table A1: Distribution of not vaccinated respondents across countries

Country	Number of not vaccinated respondents	I want to be vaccinated (in %)	I'm still undecided (in %)	I don't want to be vaccinated (in %)
Austria	286	8.1	18.5	73.3
Belgium	164	23.6	28.0	48.4
Bulgaria	524	12.5	42.5	45.1
Croatia	537	20.4	47.1	32.4
Cyprus	91	21.0	37.0	42.0
Czech Republic	342	16.5	41.9	41.5
Denmark	29	23.7	12.1	64.3
Estonia	1086	24.8	39.3	35.9
Finland	74	43.4	19.2	37.4
France	246	29.4	31.1	39.5
Germany	183	33.4	16.2	50.4
Greece	755	27.0	40.3	32.7
Hungary	94	6.9	28.6	64.4
Israel	74	3.8	19.2	77.0
Italy	305	36.1	31.7	32.2
Latvia	435	14.7	39.4	45.8
Lithuania	450	22.4	34.6	43.0
Luxembourg	56	14.9	11.3	73.8
Malta	8	7.3	0.0	92.7
Netherlands	30	19.3	20.1	60.6
Poland	707	22.9	37.9	39.3
Portugal	67	70.1	14.9	15.0
Romania	941	7.1	39.4	53.5
Slovakia	303	23.6	35.8	40.6
Slovenia	805	25.0	36.1	38.9
Spain	52	13.4	16.7	70.0
Sweden	23	6.3	59.6	34.1
Switzerland	290	32.9	42.8	24.3
Avg.	-	22.8	32.7	44.5
N	8957	1834	3158	3944

Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (weighted).



Table A2: Socio-demographic differences of respondents undecided/unwilling to be vaccinated by country

Country	Difference in percentage points (standard errors in parentheses)			
	65+ vs. 50-64 years	Male vs. female	Primary vs. secondary education	Primary vs. post-secondary education
Austria	17.0** (6.5)	2.9 (6.9)	-21.3* (10.4)	-27.8** (10.7)
Belgium	1.3 (0.9)	0.4 (1.0)	-0.8 (1.5)	-1.2 (1.3)
Bulgaria	1.0 (5.0)	3.0 (4.9)	-14.9** (4.7)	-37.1*** (6.8)
Croatia	9.2** (3.1)	3.7 (3.2)	-2.5 (3.4)	-16.4*** (3.9)
Cyprus	2.4 (3.6)	5.9 (3.5)	-0.1 (4.6)	-8.0 (3.6)
Czech Republic	7.2 (6.1)	9.5 (5.3)	8.3 (4.6)	4.9 (8.5)
Denmark	1.6 (1.2)	0.6 (1.1)	-1.8 (2.7)	-1.8 (2.6)
Estonia	3.4 (2.0)	-0.4 (2.0)	-2.6 (2.7)	-10.2*** (2.5)
Finland	1.6 (1.9)	-0.3 (1.8)	-5.1 (3.0)	-4.9 (2.9)
France	5.6* (2.7)	3.6 (2.8)	0.2 (3.5)	-6.2* (2.9)
Germany	6.7*** (1.9)	3.1 (1.9)	1.1 (2.7)	-0.9 (2.7)
Greece	6.2** (2.0)	-0.7 (2.0)	6.0* (2.4)	0.5 (2.4)
Hungary	11.9 (8.4)	-10.2 (8.2)	9.8 (6.4)	-0.4 (3.5)
Israel	0.3 (5.3)	7.3 (4.4)	-15.5* (7.4)	-15.8* (7.3)
Italy	3.2 (1.7)	1.7 (1.8)	-2.3 (1.6)	4.0 (5.1)
Latvia	5.9 (3.8)	-4.4 (4.0)	-3.4 (5.8)	-11.6* (5.5)
Lithuania	15.9*** (3.2)	-2.2 (3.5)	0.1 (5.0)	-11.5* (4.5)
Luxembourg	8.0 (6.0)	-2.5 (7.1)	1.2 (4.9)	7.9 (8.6)
Malta	1.9 (1.4)	1.3 (1.3)	2.3 (1.4)	0.3 (0.8)
Netherlands	10.0 (6.5)	1.5 (6.6)	-4.5 (8.6)	-9.7 (6.7)
Poland	5.9** (2.0)	0.3 (2.1)	-8.5** (2.6)	-20.2*** (2.7)
Portugal	8.6 (4.9)	-5.8 (4.3)	11.6 (11.2)	5.7 (8.1)
Romania	-5.0 (3.6)	2.6 (3.7)	-12.8*** (3.9)	-34.6*** (5.5)
Slovakia	2.1 (3.5)	-1.5 (3.6)	-29.7*** (6.1)	-43.1*** (7.7)
Slovenia	2.5 (3.1)	7.2* (3.0)	-2.0 (3.8)	-17.3*** (3.3)
Spain	4.0 (2.5)	1.5 (2.3)	1.5 (3.6)	4.4 (6.4)
Sweden	7.3 (5.7)	-3.5 (5.4)	0.9 (4.0)	2.3 (4.7)
Switzerland	10.2 (8.7)	-5.7 (9.2)	-2.0 (6.4)	2.7 (11.8)

Reading example: In Austria, significantly more younger respondents (50-64 years), compared to older respondents (65+ years), are still undecided or unwilling to be vaccinated; the difference between these two groups is 17.0 %-points. Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (weighted).

Table A3: Health-related differences of respondents undecided/unwilling to be vaccinated by country

Country	Difference in percentage points (standard errors in parentheses)					
	Better than poor vs. poor health	Not having vs. having physical illnesses	Not having vs. having mental health issues	Hardly ever/never vs. often feeling lonely	Not vs. mildly affected	Not vs. severely affected
Austria	-2.4 (8.8)	-12.2 (8.3)	-4.5 (6.7)	-6.8 (6.7)	7.2 (7.9)	2.6 (8.6)
Belgium	2.6 (3.1)	-1.9 (1.2)	1.8 (1.0)	1.2 (1.1)	-1.5 (1.2)	-3.3** (1.2)
Bulgaria	11.8* (5.9)	5.3 (6.2)	12.0* (4.9)	4.8 (4.7)	1.0 (5.7)	-12.4* (5.8)
Croatia	5.7 (4.1)	-3.1 (4.0)	-1.1 (3.1)	5.2 (3.1)	0.2 (3.4)	-8.7 (4.6)
Cyprus	12.3 (7.7)	-0.6 (3.8)	0.02 (3.5)	0.4 (3.8)	-4.4 (3.8)	-2.1 (4.9)
Czech Republic	-2.8 (7.3)	-9.2 (7.2)	-6.5 (5.5)	-5.3 (4.7)	-5.1 (6.7)	-7.9 (7.3)
Denmark	1.1 (2.2)	-3.4* (1.5)	-0.2 (1.1)	1.4 (2.1)	2.1 (1.3)	
Estonia	8.5** (2.6)	-2.9 (2.4)	-2.7 (2.0)	-0.3 (2.0)	-4.4* (2.1)	-10.1** (3.1)
Finland	-3.2* (1.3)	-1.6 (2.3)	-2.0 (1.9)	4.0 (2.6)	-1.5 (1.9)	-0.1 (3.3)
France	-5.2 (2.7)	-9.2** (3.3)	6.3* (2.4)	4.0 (3.1)	6.8* (3.4)	1.8 (3.5)
Germany	2.5 (4.6)	-5.6* (2.6)	2.0 (1.9)	1.1 (2.2)	0.9 (2.2)	-1.1 (3.6)
Greece	-0.8 (3.2)	-7.9*** (2.3)	-0.6 (1.9)	1.1 (1.9)	0.3 (2.6)	-3.4 (2.6)
Hungary	-7.5 (4.4)	-21.8 (10.8)	-15.9* (6.7)	-0.7 (7.4)	-7.1 (6.1)	-13.8* (5.4)
Israel	4.5 (4.8)	2.5 (5.3)	8.8* (4.1)	11.1 (5.8)	-6.1 (4.3)	-7.8 (4.2)
Italy	1.4 (3.2)	-0.5 (1.8)	-1.2 (1.8)	-2.0 (1.7)	-0.0 (2.2)	-4.5** (1.6)
Latvia	18.7*** (5.0)	-0.8 (4.9)	-0.3 (3.9)	12.6*** (3.8)	-10.1* (4.1)	-22.3*** (5.8)
Lithuania	4.6 (5.1)	-11.4** (4.2)	-1.7 (3.4)	9.5** (3.6)	-5.7 (3.6)	-11.8** (4.4)
Luxembourg	-4.1 (4.5)	-14.1* (7.3)	9.4 (5.8)	-7.1 (4.7)	8.3 (7.3)	7.4 (5.8)
Malta		1.5 (1.0)	0.7 (1.1)	1.4 (1.7)	0.1 (0.8)	6.3 (4.9)
Netherlands		2.1 (5.9)	4.4 (6.9)	9.9 (10.8)	0.9 (7.3)	
Poland	3.2 (3.1)	-3.9 (2.7)	2.4 (2.1)	2.0 (2.2)	-5.7* (2.3)	-10.5*** (2.7)
Portugal	2.9 (5.7)	-7.6 (6.7)	-10.6 (6.3)	4.00 (4.0)	0.7 (4.7)	-4.8 (2.9)
Romania	4.5 (4.0)	-5.3 (4.0)	3.6 (3.5)	7.2* (3.5)	-10.7* (4.5)	-12.1* (5.5)
Slovakia	13.6 (10.4)	-2.3 (3.7)	0.6 (3.6)	4.04 (3.6)	1.5 (4.5)	-16.8*** (4.2)
Slovenia	9.2* (4.7)	1.4 (3.3)	-1.4 (3.0)	2.1 (3.1)	0.4 (3.3)	-5.5 (4.6)
Spain	-1.8 (1.7)	-3.2 (3.5)	-2.9 (2.3)	3.1 (3.0)	-4.3* (2.0)	-3.5 (2.3)
Sweden	0.02 (4.6)	3.8 (4.0)	-5.7 (4.4)	-3.9 (3.4)	6.1 (4.9)	-1.2 (1.1)
Switzerland	-4.4 (6.7)	-17.5* (7.7)	-6.9 (7.5)	-1.1 (6.5)	1.6 (9.2)	-7.0 (4.9)

Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (weighted).

*Table A4: Differences related to living conditions and economic situation of respondents undecided/unwilling to be vaccinated by country*

Country	Difference in percentage points (standard errors in parentheses)					
	Rural vs. urban	Single vs. 2-person hh	Single vs. >2-person hh	(Fairly) easily vs. with (great) difficulties making ends meet	Retired vs. (self) employed	Retired vs. unemployed
Austria	-15.0* (5.7)	8.1 (5.3)	5.4 (8.7)	12.4 (9.4)	9.9 (8.3)	70.7*** (18.0)
Belgium	2.1 (1.1)	-4.5*** (1.3)	-3.7* (1.5)	5.4** (1.8)	0.5 (1.1)	5.4 (4.6)
Bulgaria	-7.3 (5.5)	3.2 (5.3)	0.3 (7.9)	7.1 (5.3)	-9.5 (5.7)	19.8*** (5.9)
Croatia	-12.9*** (3.3)	-3.7 (3.6)	3.8 (4.3)	9.6** (3.2)	2.1 (4.6)	16.1 (9.4)
Cyprus	2.6 (3.7)	-0.8 (5.7)	-7.2 (5.5)	-0.8 (4.0)	2.8 (4.1)	16.3 (21.8)
Czech Republic	-5.1 (5.5)	-1.0 (5.4)	-1.6 (7.7)	5.9 (6.8)	10.6 (8.0)	5.3 (17.5)
Denmark	-0.4 (1.1)	0.4 (1.1)	-1.4 (0.7)	9.7 (6.2)	2.1 (1.3)	-
Estonia	8.3*** (2.0)	-2.5 (2.1)	-5.1 (3.2)	12.2*** (2.1)	-2.2 (2.0)	5.8 (8.4)
Finland	3.1 (2.4)	-4.7 (2.1)	4.3 (5.7)	6.5 (3.7)	1.5 (1.8)	33.8* (15.4)
France	-0.3 (3.4)	-3.6 (3.0)	-3.4 (4.2)	5.3 (3.9)	8.7* (3.7)	-1.8 (4.9)
Germany	-0.7 (2.0)	-1.3 (1.9)	0.5 (4.3)	7.1* (3.5)	5.6** (1.9)	43.3** (13.2)
Greece	0.9 (2.3)	-3.3 (2.2)	1.4 (2.9)	2.8 (3.0)	8.9*** (2.6)	15.7 (8.5)
Hungary	-6.0 (5.7)	11.1 (7.1)	2.3 (4.3)	8.8 (5.6)	18.1 (11.5)	1.8 (10.3)
Israel	-4.4 (4.6)	-5.6 (3.0)	4.8 (8.2)	0.8 (5.5)	-2.4 (1.5)	
Italy	1.6 (2.4)	-2.5 (2.6)	-0.4 (2.9)	3.9* (1.8)	1.0 (1.3)	19.4 (12.9)
Latvia	2.7 (4.0)	0.4 (4.2)	-6.8 (5.9)	13.1*** (3.8)	-2.0 (4.1)	15.4 (12.1)
Lithuania	-1.3 (3.5)	1.1 (3.6)	3.5 (5.0)	17.9*** (3.3)	6.5 (3.4)	46.4*** (6.8)
Luxembourg	-6.0 (5.7)	-5.5 (5.8)	1.8 (9.3)	-3.7 (4.9)	13.3 (8.6)	
Malta	0.3 (0.9)	-1.0 (2.0)	-0.5 (1.9)	-0.8 (1.3)	2.3 (2.3)	
Netherlands	-5.6 (6.7)	-6.1 (7.3)	-11.7* (5.4)	5.4 (7.1)	1.7 (4.1)	82.9*** (11.8)
Poland	-8.4*** (2.0)	0.4 (2.5)	7.4* (2.9)	11.4*** (2.0)	5.9* (2.5)	18.0* (8.3)
Portugal	-2.3 (4.1)	4.2 (2.8)	5.2 (3.3)	-2.4 (3.7)	7.9 (5.2)	
Romania	-18.9*** (5.2)	-11.9** (4.3)	0.7 (4.8)	15.0*** (3.8)	-4.2 (5.4)	-37.0 (24.9)
Slovakia	-13.8*** (4.0)	-12.5** (4.5)	-6.9 (5.4)	14.6*** (3.7)	-2.3 (3.9)	4.5 (12.0)
Slovenia	-6.1* (2.9)	-4.9 (3.2)	-1.6 (4.0)	7.7* (3.1)	0.8 (4.4)	12.3 (11.8)
Spain	2.4 (2.2)	-0.7 (2.0)	3.0 (3.8)	-2.1 (2.0)	5.9 (4.4)	7.4 (6.2)
Sweden	4.2 (2.6)	4.2 (4.2)		-4.3 (3.2)	7.5 (5.6)	
Switzerland	-12.9* (5.6)	5.6 (6.9)	-4.1 (6.1)	-6.3 (7.1)	12.7 (9.2)	49.6 (22.2)

*Data: Preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data (weighted).*

**Title:** Risk factors of post COVID-19 condition attributed to COVID-19 disease in 50+ people in Europe and Israel

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**Key points:**

- This chapter examines the determinants of post COVID-19 condition among among 50+ people who tested positive for COVID-19
- Higher age, lower and medium education level, smoking and hospitalisation (due to COVID-19) are determinats of post COVID-19 condition

**Introduction:** COVID-19 strikes in all age-groups, but with an increased risk of a critical disease course with increasing age, specific morbidities, male sex (Gasmi et al., 2021; Liu, Spokes, He, & Kaldor, 2021) and smoking (Zheng et al., 2020). Following COVID-19 disease many people experience lingering symptoms lasting from weeks to months. This phenomenon was recently coined by WHO as “post COVID-19 condition” and defined as a condition that *“occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis”* (WHO, 2021). Studies describing risk factors of post-COVID-19 health conditions (or lingering symptoms) are limited, and with conflicting results. While one study did not identify any baseline clinical features to be associated with post COVID-19 condition (Moreno-Perez et al., 2021), others found increasing age, multimorbidity, high BMI, having 5 or more symptoms during COVID-19 infection, and hospitalisation for COVID-19, to be associated with “post COVID-19” health characteristics (Bliddal et al., 2021; Jones et al., 2021; Sudre et al., 2021; Tenforde et al., 2020). Also, female gender was associated with post COVID-19 symptoms (Jones et al., 2021), even one year after hospital discharge from COVID-19 infection (Huang et al., 2021). In a large study from Ghana on patients hospitalized due to COVID-19 women had lower risk for post COVID-19 symptoms in univariate analyses, but in subgroup analyses of medium or high educated populations men were less likely than women to develop post COVID-19 symptoms (Crankson, Pokhrel, & Anokye, 2022). The same study also showed a clear gradient with lower odds of post COVID-19 symptoms with higher educational attainment where the reference was no education at all. To our knowledge, no previous studies have explored the possible risk factors in a large population-based sample of middle-aged and older adults covering 27 European countries. With this study, we aim at describing the prevalence of post-COVID-19 condition in European countries, and to identify potential risk factors while accounting for relevant confounders.

**Methods:** Participants in the 2<sup>nd</sup> SHARE COVID-19 survey (CATI 2) who previously had tested positive with COVID-19 were asked about experiencing the following lingering symptoms: 'Fatigue', 'cough or congestion', 'shortness of breath', 'loss of taste or smell', 'headache', 'body aches or joint pain', 'chest or abdominal pain', 'diarrhoea or nausea', and 'confusion'. A dichotomous variable indicating whether the respondents had at least one symptom (vs. no symptoms at all) was created. Based on existing literature, and biological or clinical plausibility the following explainable variables were selected as potential risk factors for post-COVID-19 condition: age (50-69 and 70+ years), sex (male/female), and educational level (high, medium, and lower). The following diseases or conditions were included to assess comorbidity: 'hip fracture', 'diabetes or high blood sugar', 'high blood pressure or hypertension', 'heart attack or other heart problem', 'chronic lung disease', 'cancer or malignant tumour', and 'other disease or health condition'. Each condition counted as one. The sum scores were divided into three categories: 'no diseases', 'one or two diseases', and 'three or more diseases (multimorbidity)'. Information about smoking was drawn from the latest wave possible and categorised as 'not smoking', 'smoking now' or if they had 'previously smoked'. BMI was computed and classified into 'normal weight' ( $BMI \geq 18.5$  and  $< 25$  kg/m<sup>2</sup>), 'underweight' ( $BMI < 18.5$  kg/m<sup>2</sup>), 'overweight' ( $BMI \geq 25$  and  $< 30$  kg/m<sup>2</sup>) and 'obese' ( $BMI \geq 30$  kg/m<sup>2</sup>) (CDC, 2021). To estimate the influence of the severity of the COVID-19 disease a dummy variable was created based on whether the participant had been hospitalised (severe COVID-19 disease) or not.

Only respondents who reported being tested positive for COVID-19 were included. Crude analyses were performed to test each explainable variable individually, and multiple logistic regression models were used to assess the cross-sectional association among respondents who reported to have tested positive in CATI2. The analysis was performed in three steps. First, we included all explanatory variables simultaneously (model 1), secondly, we added a 'country' variable to the model (model 2), and finally we included a variable indicating severity of COVID-19-infection (hospitalized, not hospitalized due to COVID-19 infection) (model 3) (Table 1). Weights were used throughout the analyses to yield a representative sample.

**Results:** Of all CATI2 participants (n=47,155), 3,009 reported that they were tested positive for COVID-19 and were thus included in the final analysis. The crude analysis showed that respondents with medium and lower education, multimorbidity, underweight and obesity were in higher risk of post-COVID-19 condition. However, in the multi logistic model (model 1), where all variables are included in the model, results show that older participants (70+) (OR 1.59), and those with a medium (OR = 2.56) or lower education (OR 5.54), had a significantly higher risk of post COVID-19 condition (table 1). When adding the country variable to the model (model 2), the risk persisted but lowered the odds: age 70+, OR 1.63 (95% CI 1.07-2.49), and medium or lower education, OR 2.37 (95% CI 1.36-4.14) and OR 2.15 (95% CI 1.15-4.00), respectively. Also, smokers

had a higher risk (OR 2.35) compared to non-smokers (table 1), but only in model 1 and 2. Additionally, when considering the severity of the COVID-19 disease (model 3), those who were hospitalised due to COVID-19 had a 25 times higher risk of post-COVID-19 condition compared to those who were only tested positive, but not hospitalised (OR 25.7) (table 1).

**Discussion and policy implications:** About one quarter (23.9%) of COVID-19 infected 50+ year old people living in 27 European countries reported at least one post COVID symptom. Identified risk factors are higher age, having a lower or medium educational level, and being smoker. Moreover, the risk is higher for those hospitalised due to COVID-19. Our findings of an increased risk of post COVID-19 condition with lower educational level is not well described in the literature. However, as lower educational level has been associated with lower health literacy (van der Heide et al., 2013), i.e. the ability to reflect upon one's illness and understand how to distinguish between existing symptoms from chronic disease and symptoms related to COVID-19, poorer health literacy could be one explanation, as this might lead to an over-reporting of symptoms. With this study we shed light on health disparities across educational levels and suggest policy makers to increase their focus on educational interventions to increase health literacy. This would also lead to reduction of inequalities in health.

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**Table 1. The risk of having at least one post COVID symptom – adding variables to different models of those tested positive**

Variables	Crude		Model 1		Model 2 <sup>a</sup>		Model 3 <sup>a</sup>	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age								
50-69	-		-		-		-	
70+	1.32	0.92 - 1.90	1.59*	1.06-2.40	1.63*	1.07-2.49	1.05	0.61-1.81
Sex								
Male	-		-		-		-	
Female	0.89	0.57 - 1.39	1.10	0.72-1.68	1.14	0.75-1.73	1.25	0.75-2.08
Education								
Higher	-		-		-		-	
Medium	2.83***	1.64 - 4.87	2.56***	1.51-4.36	2.37**	1.36-4.14	2.77**	1.49-5.14
Lower	2.71***	1.66 - 4.41	5.54***	1.43-4.53	2.15*	1.15-4.00	2.43**	1.26-4.70
Disease/health condition								
0	-		-		-		-	
1-2	1.55	0.87 - 2.78	1.26	0.69-2.28	1.17	0.66-2.08	0.99	0.56-1.73
3 +	5.60***	2.83 - 11.1	1.81	0.90-3.64	1.75	0.90-3.38	1.80	0.86-3.77
Smoking								
Not smoking	-		-		-		-	
Previous smoker	1.15	0.75 - 1.75	1.11	0.73-1.69	1.14	0.75-1.75	1.14	0.66-1.94
Smoker	1.43	0.66 - 3.06	2.30	1.00-5.32	2.35*	1.00-5.54	1.77	0.75-4.17
BMI								
Normal	-		-		-		-	
Underweight	8.54*	1.12 - 65.1	0.27	0.04-1.81	0.24	0.03-1.78	0.37	0.05-2.97
Overweight	1.37	0.87 - 2.14	1.17	0.74-1.85	1.21	0.76-1.92	1.11	0.65-1.87
Obese	1.91**	1.22 - 3.01	1.52	0.92-2.51	1.55	0.92-2.61	1.22	0.63-2.37
Severity								
Not hospitalised							ref	
Hospitalised							25.7***	15.2-43.6
Pseudo R <sup>2</sup>			0.062		0.083		0.275	
Observations			2,693		2,693		2,693	

<sup>a</sup> adjusted for Country (Model 2+3)

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05



## Extended abstract

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**Title:** *Frequency of praying and COVID-19 vaccine hesitancy among people 50+, – a comparison of European regions*

### Key points

- This chapter examines the association between religiosity, measured by praying frequency, and COVID-19 hesitancy across European regions
- A frequent prayers is associated with increased vaccine hesitancy in Northern/Western Europe, in Eastern Europe, as well as for male sex, low education and if aged 65+
- The lack of vaccine hesitancy among frequent prayers in Southern Europe is likely explained by the fact that the Pope recommended vaccination

**Background:** Vaccination is the main tool for obtaining herd immunity and to stop the COVID-19 pandemic. However, vaccination uptake differs greatly across Europe mainly by hesitancy or refusal of the COVID-19 vaccines. A recent SHARE report showed that those refusing the vaccines are the young old (50-65 years), those with a lower education and people from eastern Europe (1). Studies suggest that religious groups may be more hesitant (2), but with variations (3, 4). Moreover, among religious people, those being hesitant towards the COVID-19 vaccination may be the religious minority groups and groups with a strong faith such as Christian nationalists, evangelical protestants, ultra-orthodox Jews and Muslim groups, possibly explained by lower levels of trust in science as well as the national government and a higher belief in god as a protector than the vaccine (Corcoran et al., 2021; de Figueiredo et al., 2020; Rosen, Waitzberg, Israeli, Hartal, & Davidovitch, 2021). However, literature exploring religiosity and COVID-19 vaccine hesitancy is scarce and mostly descriptive.

**Aim:** We aimed at studying a possible link between religiosity, measured by frequency of praying, and vaccine hesitancy across Europe, and further investigate whether the possible association between religiosity and vaccine hesitancy is modified by European regions as well as age, sex and educational level.

**Methods:** Data on frequency of praying were drawn from SHARE wave 5-8, and vaccine hesitancy from the SHARE COVID-19 Survey 2. The outcome variable, vaccine hesitancy, was retrieved from the SHARE COVID-19 Survey 2 and was based on two questions, one regarding whether the respondents had been vaccinated ('yes', 'no'), and if they replied 'no', they were asked whether they wanted to get vaccinated and could reply 'yes, I have a vaccination scheduled', 'yes, I want to get vaccinated', 'I am still undecided' and 'no I do not

want to get vaccinated'. Vaccine hesitancy was dichotomised as 'yes' ('not vaccinated', 'still undecided', 'does not want vaccination') and 'no' ('vaccinated', 'vaccination scheduled', 'not vaccinated but wants vaccination'). The explanatory variable 'frequency of praying' was drawn from the SHARE waves 5-8 and was categorised as 'never', 'weekly' (including: less than weekly, once weekly, multiple times weekly), and 'daily' (including: once daily, multiple times daily). Possible confounders included for the analyses were age (50-65, 65+), sex (male, female), educational level (higher, medium, low), marital status (married/registered partner, unmarried/divorced, widowed), partner in household ('yes', 'no'), employment status were categorised as employed (incl. self-employed), retired and not working (unemployed, sick, disabled, homemaker, other) and chronic diseases (0, 1, 2-3, 4 or more).

We conducted multiple logistic regression models to investigate the association between praying frequency and COVID-19 vaccine hesitancy. Moreover, we carried out interaction analysis between vaccine hesitancy and praying frequency in relation European regions. Furthermore we stratified the analyses on European regions (north/west\*, south and east), age (under/over 65 years), sex (male/female) and education (low, medium, high), respectively. The analyses were adjusted for age, sex, educational level, marital status, employment status, and European region.

**Results:** The final study population comprised 37,594 individuals, with a mean age of 70.85 years and a majority of women (58.7%) and people aged 65+ years (72.5%). Vaccine hesitants comprised 15% of the population and remarkably more women (37.1%) than men (19.4%) reported a daily frequency of praying (Table 1). Moreover at a regional level, in Eastern Europe there is a remarkably higher number of vaccine hesitant people among those who has a daily praying frequency (36.0%) compared to those with a weekly frequency or those who never prays. Despite a lower number of vaccine hesitants in general, the same pattern is shown for Western/Northern Europe with more vaccine hesitants among those praying daily (Table 2).

Results from the logistic regression models are shown in table 3 and show that daily praying is significantly associated with a higher vaccine hesitancy (OR 1.79, 95%CI 1.4-2.2) compared to those praying weekly or never, however the fully adjusted model, show a remarkably reduction in OR at 1.36 (95%CI 1.1-1.8) for those praying daily which is caused by European regions being a highly significant effect modifier.

The stratified results show that in Northern/Western Europe those who pray daily are more likely to be vaccine hesitant (OR = 1.73, 95%CI), while it in Eastern Europe were those praying both weekly (OR = 1.49, 95%CI 1.1-2.0) or daily (OR = 2.05, 95%CI 1.6-2.7) (Table 4). Moreover, among those praying daily a higher vaccine hesitancy was significantly and independently associated with being 65+ years old (OR = 1.78, 95%CI

1.5-2.1), being male (OR = 1.60, 95%CI 1.1-2.3), and having a medium (OR = 1.39, 95%CI 1.0-1.9) or low (OR = 1.78, 95%CI 1.1-2.7) educational level.

**Discussion and policy implications:** This study indicates that some religious people tend to be more vaccine hesitant, and contributes to specify the first faith related characteristics in the COVID-19 vaccine hesitant older population in Europe. Specifically the lack of vaccine hesitancy among frequent prayers in Southern Europe is likely explained by the fact that the Pope recommended vaccination, underlining the influence which a religious leader can have. More research are needed to investigate the cause of this religiosity related hesitancy and whether it actually relates to a general distrust in science, a lack of trust in the national government or other potential reasons. This information should be directed to the decision-makers about how to further inform and create trust-building strategies around the COVID-19 vaccines.

\*North (Denmark, Sweden and Finland) was merged with West due to small sample sizes

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## Vaccine hesitancy & Prayer frequency

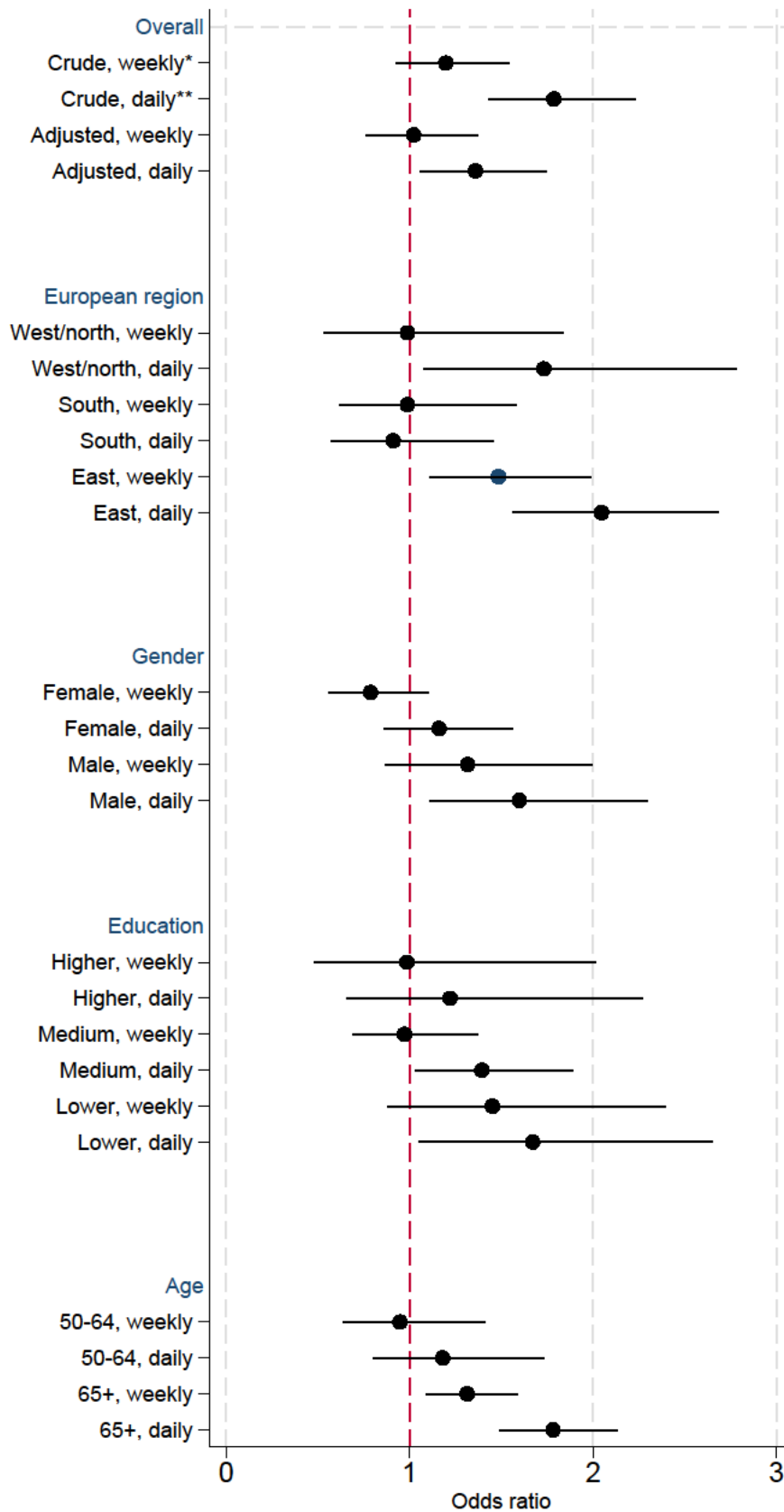


Figure 1  
Odds ratios for the association between vaccine hesitancy (outcome) and religiousness (praying, exposure)  
\*Weekly praying & \*\*Daily praying, compared to the reference category: 'Never praying'  
ORs were adjusted for sex, age, marital status, partner in household, educational level, chronic illnesses, employment status and region.  
Source: SHARE Wave 5, 6, 7, 8 and SHARE Corona Survey 2 (May/June 2021).  
Weighted data.

# Two Nordic countries with different approaches to handling the COVID-19 pandemic – a comparison of Sweden and Denmark

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## Introduction

Despite vaccines being distributed rapidly across Europe to combat COVID-19, new mutations of the virus have yet again forced governments to implement restrictions to reduce transmission. Although Denmark and Sweden share many cultural and structural similarities such as a universal healthcare system with free access, the two countries reacted very differently to the pandemic outbreak. The narrative that Swedish authorities either underreacted or sought herd immunity through natural infection has been told widely (1, 2). While stringent lockdowns have proven very effective, less intrusive strategies such as risk-communication can have had almost the same effect (3), however, the timing and effectiveness of the intervention policies play an important role (4). This has been demonstrated through the COVID-19 mortality rate with Sweden having a five-time ratio compared with Denmark during the first wave (5), but how the different lockdown strategies have influenced other health aspects remain unclear. Did the stricter lockdown measures in Denmark during the first wave of COVID-19 come with the price of more loneliness, or did the higher infection- and mortality rates in Sweden impose fear and more depressive symptoms among the middle-aged and older Swedish population?

This study aims to shed light on short- and medium-term differences between Sweden and Denmark following COVID-19 in terms of mental health, daily activities, and medical care. Results from this study will contribute to understanding how the governmental response during the pandemic in two economically and culturally comparable brother countries have affected different health domains. With the ongoing development of the pandemic only time will tell whether Sweden's initial high mortality rates will be aligned with Danish mortality rates in the long run.

## Methods

### *SHARE COVID-19 survey*

SHARE, a large cross-European survey, was launched in 2004 and repeated biannually until the fieldwork for wave 8 was suspended in March 2020 due to the COVID-19 pandemic. To resume fieldwork, it was decided to shorten and redesign the questionnaire to reflect the COVID-19 situation and to switch computer-assisted telephone interviews (6). Two waves of special COVID-19 surveys on a subset of the regular SHARE panel have been conducted from June to August 2020 (COVID-19 Survey 1) (7), and from June to August 2021 (COVID-19 Survey 2) (8).

We performed a longitudinal and cross-sectional analysis of the 4,514 Swedish and Danish SHARE participants aged 50+ years in SHARE Wave 8 (2019/2020) who further participated in COVID-19 Survey 1 (n = 1,981; 43.9 %) to investigate short term consequences of the pandemic, and in COVID-19 Survey 2 (n = 1,923; 42.6 %) to investigate the medium term consequences.

### *Outcome measures*

As the health-related questions and their answer categories differed between the two COVID-19 surveys, different questions were used to assess the short- and medium-term consequences, while some questions were similar in both surveys. Further, some of the questions were phrased so that they measured prevalences at the time of interview, enabling longitudinal comparisons. Other questions were phrased so that participants were asked to compare their current situation to before the pandemic or last interview. In these cases, cross-sectional comparisons was possible. Table 1 shows the outcome measures and the time point they were measured.

### *Short term outcomes*

The short term outcomes included are mental health (feeling sad or depressed, sleep problems, and feeling lonely), daily activities (going shopping, going out for a walk, meeting with more than 5 people from outside household, and visiting other family members), and postponement of medical medical appointments.

### *Medium term outcomes*

The short term outcomes included are mental health (feeling sad or depressed, sleep problems, and feeling lonely), self-rated health, and postponement of medical medical appointments.

### *Covariates*

Socio-demographic characteristics included sex, age at interview (categorical), highest obtained education [according to the International Standardized Classification of Education (ISCED) classified into low (ISCED groups 0–2), medium (ISCED groups 3–4) and high (ISCED groups 5–6)], marital status (married, divorced/separated/unmarried and widowed), limitations in activities of daily living (ADL) obtained from SHARE Wave 8 (no limitations vs. at least one limitation) and COVID-19 infections (positive COVID-19 test among respondent or respondent/close relatives hospitalized due to COVID-19).

### *Statistical analyses*

Longitudinal changes were investigated using multilevel logistic regression models with an individual-specific random intercept. To test the country differences, we included interactions between the country- and time-variables. To present the results as percentage point (%-point) changes, we further computed the marginal changes. These represent the absolute differences in the predicted probabilities of the outcome being present between the two time points. These were multiplied by 100 to represent %-point changes. Longitudinal results are shown as %-point changes with 95 % confidence intervals (CI). Cross-sectional changes were estimates using logistic regression models estimating odds ratios (ORs) with 95 % CI for a difference between SE and DK in the self-reported changes. The main analyses were adjusted for age in wave 8, gender, education, marital status, and activity (ADL) limitations at baseline. We further conducted a model further adjusting for COVID-19 infections in the near proximity of the respondents to take into account the differences in infection rates at the time of interview. For the cross-sectional analyses, we used the calibrated cross-sectional weights included in SHARE. Stata version 17 was used for the analyses. [Note: we might want to adjust for multiple testing]

## Results

Baseline characteristics of the participants is shown in Table 2, and prevalence of outcome variables by wave is shown in Table 3.

### *Short-term changes*

In both SE and DK preliminary results show that compared to wave 8 the proportions of participants in COVID-19 survey 1 being sad or depressed declined by 12.8 and 18.1 %-point, respectively. A similar decline was seen in having sleep problems (DK: 16.7 %-point; SE: 19.9 %-point). However, the decline in sad/depressed was significantly larger in Denmark ( $p = 0.019$ ). Both countries experienced an equal increase in loneliness, ( $p = 0.817$ ). For the daily activities, compared to Swedes, Danes were less likely to reduce their shopping habits (OR = 0.45, 95% CI 0.37 to 0.55) and to limit their family visits (OR = 0.75, 95% CI 0.59 to 0.96). No differences in ever leaving home, going for a walk or meeting with 5+ people was found. In contrast, Danes were more likely to have a medical appointment postponed during the first wave of the pandemic (OR = 1.80, 95% CI 1.44 to 2.25) (Table 4). Compared to the year before the COVID-19 survey 1, Danes were more likely than Swedes to never leave their home (OR = 4.06, 95% CI 2.32 to 7.10).

### *Medium-term changes*

The medium-term changes cover the changes between the summer 2020 and summer 2021. In this period, 4 %-point (95% CI 1.7 to 6.3) more of the Danes reported depressive symptoms, whereas no changes was found for the Swedish participants. Both the Swedish and Danish participants reported more sleep problems, but fewer reported being lonely. No country differences could be observed. When comparing wave 8 with COVID-19 survey 2, in both Sweden and Denmark a small but insignificant increase was observed in the proportions of participants reporting worsened self-rated health. In contrast to the COVID-19 survey 1, no differences in postponement of medical appointments was found in COVID-19 survey 2 (Table 4).

## Data statement

This publication is based on preliminary SHARE wave 9 COVID-19 Survey 2 release 0 data. Therefore, the analyses, conclusions and results are preliminary.

## Discussion

Further analyses are needed on pre-COVID-19 data to get a deeper understanding of the differences between DK and SE, before discussing the results described here. In-depth analyses is in progress and will appear later this year as a submitted scientific paper.

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**Table 1: Description of the outcome variables from the SHARE Wave 8, and COVID-19 survey 1 & 2 included in the study**

			<b>Waves included</b>		
<b>Item</b>	<b>Answer categories</b>	<b>Analyses</b>	<b>Wave 8 (baseline)</b>	<b>COVID-19 survey 1 (short term)</b>	<b>COVID-19 survey 2 (med. term)</b>
<b>Mental Health</b>					
In the last month, have you been sad or depressed?	1. Yes 2. No	Longitudinal	Yes	Yes	Yes
Have you had trouble sleeping recently?	1. Yes 2. No	Longitudinal	Yes	Yes	Yes
How much of the time do you feel lonely?	1. Often / Some of the time 2. Hardly ever or never	Longitudinal	Yes	Yes	Yes
<b>Self-rated health</b>					
Would you say your health is excellent, very good, good, fair, or poor?	1. Excellent, very good, or good 2. Fair or poor	Longitudinal	Yes	No	Yes
<b>Daily activities</b>					
Since the outbreak of Corona / during the last three months, have you ever left your home?	1. yes 2. No				
Since the outbreak of Corona, how often have you done the following activities, as compared to before the outbreak? - Going shopping - Going out for a walk - Meeting with more than 5 people from outside your household - Visiting other family members	1. About the same or more often 2. Not any more or less often	Cross-sectional	No	Yes	No
<b>Health care</b>					
Did you have a medical appointment scheduled, which the doctor or medical facility decided to postpone due to Corona?	1. Yes 2. No	Cross-sectional	No	Yes	Yes

**Table 2: Characteristics of study population at baseline stratified country**

	Sweden	Denmark
<b>N (%) individuals</b>		
50-64 years	137 (17.0)	372 (33.2)
65-79 years	523 (65.0)	614 (54.9)
80+ years	144 (17.9)	133 (11.9)
Total	804	1119
<b>Mean age (SD)</b>	72.2 (8.0)	68.7 (8.3)
<b>Gender, n (%)</b>		
Men	354 (44.0)	488 (43.6)
Women	450 (56.0)	631 (56.4)
<b>Education level, n (%)</b>		
Lower	220 (27.6)	137 (12.3)
Medium	251 (31.5)	425 (38.0)
Higher	325 (40.8)	555 (49.7)
Missing	8 (1.0)	2 (0.2)
<b>Marital status, n (%)</b>		
Married/registered partnership	564 (70.2)	764 (68.3)
Unmarried/divorced	141 (17.6)	208 (18.6)
Widowed	98 (12.2)	147 (13.1)
Missing	1 (0.1)	0 (0)
<b>ADL limitations</b>		
0	735 (91.4)	1,033 (92.5)
1+	69 (8.6)	84 (7.5)

**Table 3: Prevalence of outcome variables in SHARE wave 8, COVID-19 survey 1, and COVID-19 survey 2**

	Sweden	Denmark
<b>Mental health , n (%)</b>		
<i>Sad or depressed</i>		
Wave 8	254 (31.6)	335 (30.0)
COVID-19 survey 1	151 (18.8)	132 (11.8)
COVID-19 survey 2	137 (17.2)	175 (15.8)
<i>Sleep problems</i>		
Wave 8	271 (33.7)	393 (35.2)
COVID-19 survey 1	137 (17.0)	170 (15.2)
COVID-19 survey 2	183 (23.0)	230 (20.7)
<i>Feeling lonely</i>		
Wave 8	171 (21.3)	111 (9.9)
COVID-19 survey 1	203 (25.3)	151 (13.5)
COVID-19 survey 2	172 (21.6)	127 (11.4)
<b>Bad self-rated health, n (%)</b>		
Wave 8	204 (25.4)	224 (20.1)
COVID-19 survey 2	220 (27.5)	252 (22.7)
<b>Daily activities (not anymore/less often)</b>		
<i>Never left home</i>		
COVID-19 survey 1	20 (2.5)	16 (1.4)
COVID-19 survey 2	16 (2.0)	83 (7.5)
<i>Going shopping</i>		
COVID-19 survey 1	543 (69.6)	556 (50.5)
<i>Going for a walk</i>		
COVID-19 survey 1	92 (11.8)	119 (10.8)
<i>Meet 5+ people</i>		
COVID-19 survey 1	663 (84.8)	991 (82.6)
<i>Visiting family</i>		
COVID-19 survey 1	648 (83.1)	853 (77.6)
<b>Postponed medical appointment</b>		
COVID-19 survey 1	159 (19.8)	341 (30.5)
COVID-19 survey 2	99 (12.5)	128 (11.5)

**Table 4: Adjusted results (preliminary)**

Longitudinal analyses						
	COVID-19 Survey 1			COVID-19 Survey 2		
	%-point change (95 % CI) SE	%-point change (95 % CI) DK	P for interaction	%-point change (95 % CI) SE <sup>a</sup>	%-point change (95 % CI) DK <sup>a</sup>	P for interaction
<b>Mental health</b>						
<i>Sad or depressed</i>	-12.8 (-16.3 to -9.4)	-18.1 (-20.9 to -15.4)	0.019	-1.2 (-4.2 to 1.7)	4.0 (1.7 to 6.3)	0.007
<i>Sleep problems</i>	-16.7 (-20.3 to -13.2)	-19.9 (-22.8 to -17.0)	0.171	6.0 (2.9 to 9.1)	5.6 (3.0 to 8.1)	0.842
<i>Feeling lonely</i>	4.0 (0.1 to 7.0)	3.6 (1.6 to 5.5)	0.817	-3.2 (-6.0 to -0.5)	-2.2 (-4.1 to -0.3)	0.536
<i>Self-rated health<sup>b</sup></i>	-	-	-	2.2 (-0.4 to 4.8)	2.5 (0.2 to 4.7)	0.869
Cross-sectional analyses						
	COVID-19 Survey 1			COVID-19 Survey 2		
	OR (95 % CI) SE	OR(95 % CI) DK	P (DK vs. SE)	OR (95 % CI) SE	OR (95 % CI) DK	P (DK vs. SE)
<b>Daily activities</b>						
<i>Never left home</i>	Ref.	0.59 (0.30 to 1.19)	0.144	Ref.	4.06 (2.32 to 7.10)	<0.001
<i>Going shopping, less or never</i>	Ref.	0.45 (0.37 to 0.55)	<0.001	-	-	-
<i>Going for a walk, less or never</i>	Ref.	1.10 (0.80 to 1.50)	0.556	-	-	-
<i>Meet 5+ people, less or never</i>	Ref.	0.99 (0.76 to 1.28)	0.920	-	-	-
<i>Visit family, less or never</i>	Ref.	0.75 (0.59 to 0.96)	0.021	-	-	-
<b>Postponed medical appointment</b>	Ref.	1.80 (1.44 to 2.25)	<0.001	Ref.	0.91 (0.68 to 1.22)	0.535

a Changes at COVID-19 survey 2 are since COVID-19 Survey 1

b for self-rated health changes are since wave 8

## Work Package 3 Health and health behaviours – executive summary

### Planned paper

Working title: *Cognitive resilience did not protect against feelings of loneliness and isolation during the first wave COVID19 lock-down* (in preparation for submission)

This first set of results in preparation for task 3 uses SHARE data from individuals who had answered questions about loneliness during CATI-I-II and had also participated in in-person cognitive testing in at least 2018 (wave 7) *and* 2016 (wave 6). Logistic regression analyses are computed to explore whether individuals who experience greater loneliness during the lockdown differed in cognitive performance prior to the first outbreak of COVID19, after controlling for possible demographic, lifestyle and health-related confounders. We reasoned that if cognitive performance differed between groups prior to lockdown, this would indicate a special vulnerability of cognitively impaired individuals to feelings of loneliness (even if objective restriction measures are the same). These results will in turn inform the proposed analyses for WP3 (“task 3”) where we study whether social isolation from restriction measures has resulted in accelerated cognitive decline in the 50+ population from SHARE using wave 9 data.

#### Main results:

Cognitive resilience, measured as both high level and stable performance prior to the pandemic, was not a predictor of self-reported increase in loneliness following restriction measures. These results suggest that cognitive resilience by itself does not render an individual less likely to experience adverse effects on mental health from restriction measures. Rather, the stringency of the restriction measures and demographic variables are major predictors of increased loneliness. Further analyses will explore whether some cognitive vulnerable individuals are at greater risk for feelings of loneliness (e.g older individuals).

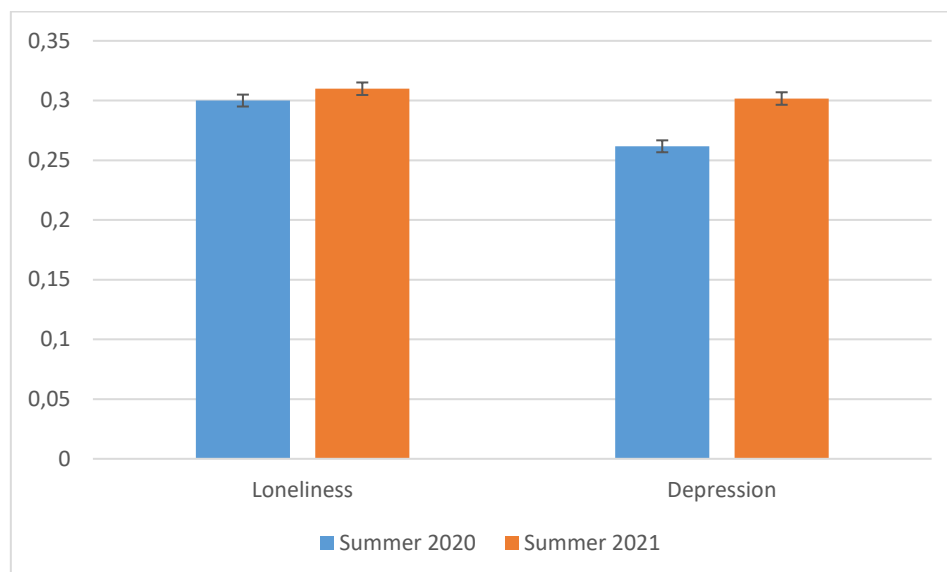
# DEVELOPMENTS IN DEPRESSION AND LONELINESS OF OLDER ADULTS IN EUROPE AND ISRAEL DURING THE PANDEMIC

Stefan Gruber & Josefine Atzendorf

## ***Draft for the SHARE First Results Book***

How did the mental well-being situation of older adults evolve between the initial phase of the COVID-19 pandemic and one year later and how did the influencing factors for peoples' well-being change in the course of the pandemic? These are the central research questions of our paper. Using data from both the first and the second SHARE Corona Survey (SCS), this paper analyses depression and loneliness of retired respondents aged 60 and above from 27 European countries plus Israel. Combining SHARE data with macro data from the Oxford COVID-19 Government Response Tracker allows us to include macro indicators at the country level, namely the mortality rate due to an infection with COVID-19 per country, the number of days with stringent epidemic control measures, and the number of days a country spent in lockdown, in addition to individual characteristics. Comparing the number of social contacts shows that the situation changed considerably between summer 2020 and summer 2021. In the 1<sup>st</sup> SCS, only 30 percent of respondents reported to have contact to members of their social network at least once a week while in the 2<sup>nd</sup> SCS, the share of those having personal contact at least once a week increased to more than 54 percent. Nevertheless, the prevalence of depressive symptoms and loneliness did not change for the better. Descriptive analyses reveal that across all countries especially the share of respondents with depressive symptoms increased significantly among the retired respondents while the share of lonely respondents increased only slightly.

### **Share of lonely respondents and depressed respondents in summer 2020 and in summer 2021**



Preliminary results based on SHARE Wave 8 COVID-19 data release 1.0.0 (n = 32,322) and preliminary SHARE Wave 9 COVID-19 data release 0 (n = 31,968)

Apart from those descriptive analyses, we apply multilevel models for the 2<sup>nd</sup> SCS data in a second analytical step. This allows us to compare our findings on influencing factors for increased feelings of loneliness and depression with results from analyses in a previous paper that was based on the 1<sup>st</sup> SCS. The multilevel models show that in the 2<sup>nd</sup> SCS the influence of macro indicators on depression and loneliness seems to be limited, while in the 1<sup>st</sup> SCS macro factors played a significant role for whether respondents felt more depressed or lonelier after the outbreak of the pandemic. In the 2<sup>nd</sup> SCS, macro factors have no significant influence on increased depressiveness. However, the number of days in lockdown seem to significantly predict an increase in feelings of loneliness.

## **Acknowledgments**

Research in this draft is a part of the EU Horizon 2020 SHARE-COVID19 project (Grant agreement ID: 101015924). This draft is based on the preliminary release 0 of SHARE Wave 9 Covid19 data (Börsch-Supan, 2021). Therefore, the analyses, conclusions and results are preliminary.