The Social Side of Immunization: The Influence of Personal Social Networks on COVID-19 Vaccination in Romania

Oana Lup

1. Introduction[*]

Although the effects of the COVID-19 pandemic are diminishing, its specter is still haunting us. Its burst and rapid spread in the spring of 2020 took the entire world by surprise. Almost four years later, we are slightly more comfortably placed to take stock of what we have learned, at least in terms of preparing better for the future.

There is by now scientific consensus that the vaccination of extensive shares of the population worldwide was the most effective way to fight the COVID-19 pandemic – and any pandemic for that matter (Remy et al. 2015) – and to reduce its severe effects (Barouch 2022; Watson et al. 2022; Zheng et al. 2022). However, significant shares of the population refuse or hesitate to vaccinate, and scholars are still exploring the factors that influence the uptake of the vaccine and compliance with containment and sanitary measures set up for slowing the spread of the pandemic.

While at the outbreak of the COVID-19 pandemic scholars from medical fields were the most significant scientific contributors to research concerning the causes and effects of the pandemic, it soon became clear that social scientists should also lend their expertise to these investigations. People's hesitancy or outright refusal to vaccinate were analyzed in media and communication studies concerned with the effects of disinformation and increased polarization of opinions (Loomba et al. 2021; Romer et al. 2022; Jiang et al. 2021; Milani et al. 2020; Facciani et al. 2023), social behavior studies concerned with the decrease in the public's trust in authorities, traditional media channels, and science (Jennings et al. 2021; Viskupic et al. 2022; Seddig et al. 2022). Distrust in public authorities, media, and scientific knowledge came to be seen as the root of people's reluctance to

* Data collection for this article was supported by Lucian Blaga University of Sibiu & Hasso Plattner Foundation research action LBUS-RRC-2020-01.

observe the sanitary rules imposed to control the spread of the disease as well as of their distrust of COVID-19 vaccines and the vaccination process (Toshkov 2023; Winter et al. 2022).

Research has identified a set of factors associated with people's decision to vaccinate, namely socio-demographics, beliefs about the safety of the vaccines, endorsement of conspiracy theories, media consumption, with a special focus on social media, trust in public officials, doctors, and science, and political partisanship (Wang et al. 2021; Troiano/Nardi 2021; Seddig et al. 2022; Roberts et al. 2022; Jennings et al. 2021; Bertin et al. 2020; Burke et al. 2021). Some studies also added social norms, understood as people's belief that their relevant others would approve of a behavior, and moral concerns regarding vaccination as an individual contribution to a public crisis (Xiao/Wong 2020; Winter et al. 2022; Coffie et al. 2022; Bernados/Ocampo 2022). However, there is still very limited inquiry on the role played by personal social networks in shaping people's beliefs about the pandemic and the vaccines, as well as on their decision to receive or refuse the vaccine (Konstantinou et al. 2021; Hao/Shao 2022; Facciani et al. 2023). Yet, we know that people do not take decisions in isolation. On the contrary, most of our decisions are influenced by who we interact and speak with in our daily life: family members, friends, and work colleagues. In times of elevated stress people are even more likely to turn to their peers to make sense of what happens and what the best course of action is.

This article draws on theories of social networks to analyze the role played by people's personal social networks in their decisions to vaccinate against COVID-19. The study uses data collected in a nationally representative survey conducted in Romania in the fall of 2021. The contribution of different types of personal social networks to people's decisions to vaccinate is evaluated together with other influences evidenced by prior research, namely socio-demographics and beliefs about the COVID-19 pandemic and vaccines.

Results show that compared to those embedded in social networks in which few people received the vaccine, both those living in mixed settings – with both vaccinated and unvaccinated people – and those completely surrounded by vaccinated others are significantly more likely to declare they did receive the vaccine. These relationships remain significant after controlling for socio-demographics and people's beliefs on risks and benefits entailed by the COVID-19 vaccines.

2. Correlates of COVID-19 Vaccination

Attitudes and behaviors regarding vaccination, and especially vaccine hesitancy understood as refusal or delay in its acceptance, have been identified as a problem in the context of decreasing rates of vaccination worldwide (Dubé at al. 2014). Correlates of these attitudes and behaviors are grouped in three categories: 1. Contextual factors, such as religion, influential leaders, or media environments; 2. Individual and group influences, including risk perceptions on vaccination, trust in health system and health providers, lack of knowledge and misinformation regarding the vaccine; 3. Vaccine/vaccination-related issues, such as vaccine reliability and scientific evidence on its risks and benefits (Dubé et al. 2014).

Studies on attitudes and behaviors regarding COVID-19 vaccines have followed similar directions of investigation. While those conducted before COVID-19 vaccination started examined people's intention to vaccinate, those conducted after focused on the actual behavior. Vaccine acceptance and hesitancy became topics of scientific inquiry during the COVID-19 pandemic.

Given the extraordinary conditions surrounding the development of the COVID-19 vaccines, concerns related to their risks and benefits feature among the factors most frequently examined in studies of vaccine acceptance and hesitancy (Al-Amer et al. 2022; Roberts et al. 2022). Doubts about the process and the speed of developing COVID-19 vaccines, their usefulness and safety appear to be significant correlates of vaccination intentions (Troiano/Nardi 2021). People who believed that COVID-19 vaccines are safe, effective, and important were more likely to express their intention to vaccinate (Callaghan et al. 2021). Self- and family protection considerations also appear as strong predictors of the intention to vaccinate (Burke et al. 2021; Wang et al. 2021).

The unexpected start of the COVID-19 pandemic and the subsequent disturbances that it created, together with the hasty changes in the measures adopted by the authorities, culminating in complete lockdowns, created a fertile ground for the emergence of conspiracy theories about the cause of the pandemic as well as the purpose of the vaccines. The relatively quick – by previous standards – development of COVID-19 vaccines and the uncertainty surrounding their effects added to this (Uscinski et al. 2020). Belief in conspiracies was found to be among the strongest correlates of people's decision (not) to vaccinate (Eberhard/Ling 2021; Bertin et al. 2020; Haakonsen/Furnham 2023). Even before the COVID-19 pandemic,

concerns have been expressed with regard to the large spread of conspiracy theories related to vaccination in general and the increase in vaccine hesitancy as a result (Jolley/Douglas 2014; Poland/Jacobson 2011).

Socio-demographics analyzed as correlates of the decision to vaccinate are age, gender, education, income, employment status, marital status, residence, and religion. Most studies found older people to be more likely to vaccinate (Al-Amer et al. 2022; although see Guidry et al. 2021), and this matches the elderly population being prioritized as vaccine receivers worldwide. Gender differences in vaccination attitudes and behavior are not consistent across studies, although, in general, most studies found women less willing to receive the vaccine (Paul et al. 2021; Roberts et al. 2022). Women appear more concerned about the effects of the pandemic and more compliant with the sanitary rules but, nevertheless, less likely to opt for vaccination (Galasso et al. 2021). This could be due to the fact that women are shown to be more risk adverse, on the one hand, and more concerned with family members' health and well-being and thus more inclined to inform themselves on potential risks entailed by vaccination, on the other (Roberts et al. 2022). Moreover, potential effects of vaccines on fertility featured among the most widespread concerns surrounding COVID-19 vaccines (Merrick et al. 2022).

Although higher socio-economic status measured in terms of educational attainment and income is associated with an increased willingness to vaccinate in general (Paul et al. 2021; Roberts et al. 2022), there has been an increasing trend in health conscious, highly educated, affluent people to question and refuse vaccination (Makarovs/Achterberg 2017; Berezin/Eads 2016; Larson et al. 2014). Unemployed people are usually more hesitant about vaccination (Troiano/Nardi 2021), although this depends on their working intentions. Unemployed people seeking jobs appear more likely to vaccinate, an action thought to signal their true willingness to find a job, since many employers stated they would not hire unvaccinated people (Burke et al. 2021). Living with a partner increases people's willingness to vaccinate (Ruiz/Bell 2021); this effect is particularly relevant in the case of elderly people (Arpino et al. 2023). Rural dwellers are found to be more hesitant to vaccinate (Gerretsen et al. 2021), and religiosity appears to play a negative role on COVID-19 vaccination (Callaghan et al. 2021).

Trust is a key predictor of vaccine acceptance/refusal. Higher levels of general trust (Troiano/Nardi 2021), trust in experts (Callaghan et al. 2021), trust in science (Seddig et al. 2022), in national health systems (Al-Amer et

al. 2022; Jennings et al. 2021), and in medical and scientific experts (Kerr et al. 2020) correlate positively with people's decision to accept the vaccine.

Vaccines in general and COVID-19 vaccines in particular are heavily politicized issues (Facciani et al. 2023). Populist parties have endorsed conspiracy theories related to the pandemic and the vaccines, thus spreading distrust in vaccines and vaccination (Kennedy 2019; Eberl et al. 2021). Conservative attitudes are in general associated with more negative attitudes toward vaccination and, in the case of COVID-19 vaccines, conservative attitudes and support for conservative or populist right-wing parties were shown to reduce people's intention to vaccinate (Ruiz/Bell 2021; Roberts et al. 2022; Paul et al. 2021). Trust in government and information received from its representatives is also a strong positive correlate of the intention to vaccinate (Jennings et al. 2021; Lazarus et al. 2021).

Media exerted an influence as the main supplier of information about the COVID-19 pandemic and vaccines. Some media provided channels for spreading misinformation or contributed to furthering polarization of opinions on vaccines. Social media appeared as the main channel for the circulation of fake news (Al-Amer et al. 2022; Jennings et al. 2021), and studies showed that vaccinated and unvaccinated people occupy separate virtual spheres, where media messages distributed differed both in form and content (Milani et al. 2020). Problematic social media use, i.e. use of social media similar to behavioral addiction, correlates with anti-vaccination attitudes (Roberts et al. 2022), while reduced social media consumption is associated with an increased likelihood to receive the vaccine (Galanis et al. 2022).

3. Social Influences and COVID-19 Vaccination

Studies of vaccination behavior acknowledge the role played by social influences, yet personal social networks feature less prominently in the existing literature. Such neglect is not new; since choices are often discussed in terms of people's agency, the role of social contexts in which they are taken is frequently overlooked. However, people's attitudes, decisions, and behavior bear an important imprint of the social networks in which individuals are embedded, the subtle forms of social pressures they exert, the identities they create or strengthen, and the thoughts they stir in direct discussions and interactions.

In studies on vaccination behavior, social influences were most often considered in the form of subjective norms, understood as perceived social pressure stemming from close, relevant others to adopt a specific behavior (Dubé et al. 2013). These studies show that when people think that important others in their lives see vaccination as a desirable action, they are more likely to get vaccinated (Coffie et al. 2022). Moreover, subjective norms appear to mitigate the negative effect of conspiracy beliefs on COVID-19 vaccination decision (Winter et al. 2022). However, not all studies agree on their power (Seddig et al. 2022; Matute et al. 2022).

Some studies included elements of social support and social capital to account for social influences in vaccination behavior (Bernados/Ocampo 2022). People who benefit from stronger social support are more likely to engage in protective behavior and vaccinate against COVID-19 (Jaspal/Breakwell 2022). Observing rules aimed at decreasing the spread of the virus was also shown to be a function of high social capital that strengthens communities and to mitigate free-riding tendencies in the case of collective problems such as vaccination (Kokubun/Yamakawa 2021). Social capital is about trust, solidarity, and observance of social norms (Kokubun/Yamakawa 2021).

Social support is particularly relevant when provided by one's family. A study found that across European countries elderly people's behavior and especially the decision to vaccinate is affected by living with a partner (Arpino et al. 2023). This is consistent with previous studies emphasizing the relevant role of kin ties, and especially partners, on people's health behavior. There is no similar influence in the case of co-residing offspring (Arpino et al. 2023).

Social contagion theory identifies social networks as major drivers of people's attitudes and behaviors. Vaccination studies adopting this perspective have shown that belonging to social networks comprised of more vaccine supporters make people more likely to vaccinate, while being a member of social networks comprised of more unvaccinated or skeptical people decreases self- and children vaccination (Facciani et al. 2023; Konstantinou et al. 2021). These findings pertain to various types of vaccines. Influences exerted by family and friends were found to be stronger than those exerted by health experts and politicians (Konstantinou et al. 2021). However, research on COVID-19 vaccination attitudes and vaccine uptake paid very limited attention to personal social networks as providers of information and influence (Hao/Shao 2022; Facciani et al. 2023). When their role is considered, results indicate that people who have higher shares of

family members and close friends vaccinated are significantly more likely to be vaccinated themselves. Conversely, larger shares of unvaccinated people among family members and friends are related to an increased likelihood of respondents not being vaccinated (Facciani et al. 2023; Hao/Shao 2022).

Less is known though about the way exposure to conflicting views related to COVID-19 vaccines and divergent behavior regarding vaccine uptake shape people's decision to vaccinate. Research on interpersonal talk indicates that people who are exposed to conflicting views on political issues appear to become more politically tolerant and knowledgeable, but also more hesitant in their behavior, taking much longer to reach decisions and/or to engage in political activities (Schmitt-Beck/Lup 2013). Moreover, although the principle of homophily governs the way people adhere to various social networks and expose themselves to conversations on different topics such as politics in general (Schmitt-Beck/Lup 2013) or vaccination (Konstantinou et al. 2021), a certain amount of exposure to diverse and sometimes divergent opinions cannot be avoided, especially in those contexts that do not allow for a complete screening, such as workplaces. The topics of the pandemic and subsequently the vaccines were largely covered and widely discussed in people's close and less close social settings at the height of the pandemic (Wagner/Reifegerste 2023).

This chapter contributes to research on social influences on the COVID-19 vaccination uptake in two ways. First, it explores the role played by three different types of personal social networks, namely family members, friends, and work colleagues, in people's acceptance/hesitancy to vaccinate against COVID-19. While previous studies focused on either one type of network or combined information from various types of networks, I examine influences exerted by 'strong ties' – families and friends – and 'weak ties' – work colleagues – on people's vaccination behavior. Second, I analyze COVID-19 vaccination behavior as a function of three different composition patterns of the social networks in which people are embedded, namely networks in which the majority is vaccinated, about half are vaccinated, and only a few are vaccinated. In this way, I explore what happens when people are exposed to diverse and divergent behavior, thus expanding the insights of Schmitt-Beck and Lup (2013) to vaccination behavior.

The research was conducted in Romania, a country with one of the lowest rates of COVID-19 vaccination within the European Union. The vaccination campaign started in Romania on December 27, 2020, shortly after the vaccines became available. Vaccines were made available to the population in three stages. The first stage included employees from health

and social services sectors. They were followed by high-risk categories of the population, such as elderly people over 65 and people with chronic illnesses, people with disabilities and those without a shelter, and essential workers, such as employees from education, food industry, or public administration. Eventually, in the last stage, vaccines were made available to the general population. Although for a short while Romania was at the forefront of vaccination in the European Union, the summer and fall of 2021 witnessed a decline in the interest of Romanians to become vaccinated. At the time of data collection for this study, only 28 per cent of Romanians had received two doses of vaccines, relative to the mean in the European Union of 64 per cent, thus making Romania the laggard, together with Bulgaria.

4. Research Design and Data Collection

Data were collected in a nationally representative survey conducted in Romania between September 16 and October 22, 2021, using CATI-RDD. The study collected information on respondents' vaccination status. At the time of data collection vaccines had been available for the general population for a few months, so, in theory, anyone who wanted to receive a vaccine had been able to receive their first dose by then. Three categories of factors related to vaccination behavior were also collected. These included socio-demographics, perceptions of vaccine risks and benefits, including a statement tapping into conspiracy beliefs, and information on vaccination status in three social networks, namely family members, friends, and work colleagues.

The dependent variable is self-declared vaccination status. Respondents were asked whether they had received a COVID-19 vaccine (1=yes).

There are three sets of independent variables. First, socio-demographics include gender (male=1), age, education (seven-category variable recoded into three, namely low level < less than high school, medium level = high school, high level > high school studies), residence (urban=1), employment status (employed=1), marital status (five-category variable recoded to separate those who live with a partner=1 from others). Secondly, respondents' perceptions of COVID-19 vaccines were collected by recording their level of agreement with four statements about the nature, benefits, and risks associated with COVID-19 vaccines. The statements were: "COVID-19 vaccines can cause health problems in the future"; "COVID-19 vaccines protect us against severe forms of disease"; "COVID-19 vaccines protect those around

us"; "the SARS-CoV-2 virus and COVID-19 vaccines were created by pharmaceutical companies for their own profit". Each statement was rated on a four-point scale ranging from full agreement to full disagreement. I recoded each scale to separate those who fully or rather agree (=1) from those who fully or rather disagree. Since large numbers of respondents refrained from giving an answer (by answering "don't know"), I also constructed a category to include them. Thirdly, information on vaccination status in social networks was collected by asking respondents to estimate the proportion of family members, friends, and work colleagues who received a COVID-19 vaccine. They could answer (almost) none, a few, about half, (almost) all. I recoded these variables into ones with three categories, separating among those who have a few network members vaccinated (includes almost/none and a few), about half, and (almost) all.

5. Data Analysis and Results

From the total of 1104 respondents 561 (51 per cent) declared they had received a COVID-19 vaccine and 543 (49 per cent) declared that they had not. Compared to official figures this is an over-reporting of vaccination. Over-reports are indicative of a social desirability effect and have been recorded in other studies dealing with sensitive topics and normative behavior (Brenner 2020), such as self-reports of individual turnout (DeBell et al. 2020) and vaccination (Wolter et al. 2022).

I used a series of logistic regressions to assess the contribution of the three categories of factors – socio-demographics, beliefs about COVID-19 vaccines, and perceived vaccination status in respondents' personal social networks – to people's decision to vaccinate. Given the slight oversampling of urban residents the analysis is conducted on a weighted sample. Results are reported in Table 1.

Table 1: Likelihood to be vaccinated (Odds-ratios)

Variable name	Model 1	Model 2	Model 3	Model 4
Male	1.27	1.51*	1.44	.87
Education (reference: less than high school)				
High school	1.63*	1.36	.97	1.17
Grad/post-grad studies	2.86***	2.35***	1.51	1.86
Age	1.02 ***	1.02***	1.01	1.02*
Urban	1.87***	1.28	1.00	.83
Employed	1.25	1.48*	1.70*	-
Partner	.74*	.80	.70	.85
Vaccines create health problems (reference: agree)				
Disagree		3.55***	3.00***	4.07***
Don't know		1.93**	1.70*	1.55
Vaccines protect us (reference: disagree)				
Agree		3.68***	2.71**	2.12
Don't know		.67	.60	.28*
Vaccines protect those around us (reference: disagree)				
Agree		3.65***	2.33**	2.02*
Don't know		1.10	1.10	1.87
Vaccines profit companies (reference: agree)				
Disagree		1.69**	1.41	1.37
Don't know		1.42	1.45	2.49*
Family members vaccinated (reference: none or few)				
Half			2.62 ***	3.29**
(Almost) All			9.27***	13.96***
Don't know			3.33	5.17
Friends vaccinated (reference: none or few)				
Half			1.73*	1.62
(Almost) All			2.76***	1.50
Don't know			.65	.56
Work colleagues vaccinated (reference: none or few)				
Half				.99
(Almost) All				2.85**
Don't know				.60
Pseudo-R^2	.08	.35	.47	.51
N	1101	1085	1082	671

*p<0.05; ** p<0.01; ***p<0.001

The first model – as a baseline model – estimates vaccination status as a function of socio-demographics. Results indicate that older people, urban residents, and those who have higher levels of education are more likely to declare that they had received the vaccine. Respondents living with a

partner are less likely to be vaccinated compared to those who live alone. The explanatory power of the model is quite low (pseudo-R^2=.08).

The second model adds respondents' beliefs on the nature, benefits, and risks associated with COVID-19 vaccines. Respondents who do not believe that COVID-19 vaccines can create health problems in the future, those who agree that COVID-19 vaccines help them against severe forms of the disease, as well as those who believe that COVID-19 vaccines protect others, are more likely to be vaccinated. Those who disagree that COVID-19 vaccines were created to bring profits to pharmaceutical companies are more likely to be vaccinated compared to those who endorse this belief. From socio-demographics, only education and age retain a significant effect. Older, more educated respondents are more likely to be vaccinated. Gender and employment status become statistically significant in this model. Men appear more likely to be vaccinated and so do employed people. The model fit is highly improved with the addition of the set of beliefs on COVID-19 vaccines (pseudo-R^2=.35).

The third model jointly tests influences of socio-demographics, beliefs regarding COVID-19 vaccines, and vaccination status in social networks. This analysis includes all respondents, both employed and unemployed, and, for this reason, only vaccination status among family members and friends are included as predictors. Three out of four variables recording respondents' beliefs on COVID-19 vaccines retain their statistically significant effect. Respondents who believe that COVID-19 vaccines protect them and those around them, as well as those who do not think that vaccines can create health problems in the future, are more likely to be vaccinated. Social networks appear to have an impact on people's decision to vaccinate. Results indicate that compared to networks comprised of mostly unvaccinated family members and friends, those in which at least half of them are vaccinated exert a significant influence on respondents' decision to receive the vaccine (see Figure 1). People who have at least half of their family members and friends vaccinated are significantly more likely to be vaccinated themselves. Not surprisingly, this model has the highest explanatory power (pseudo-R^2=.47).

Figure 1: Vaccinations status as a function of the proportion of family members and friends vaccinated (all respondents)

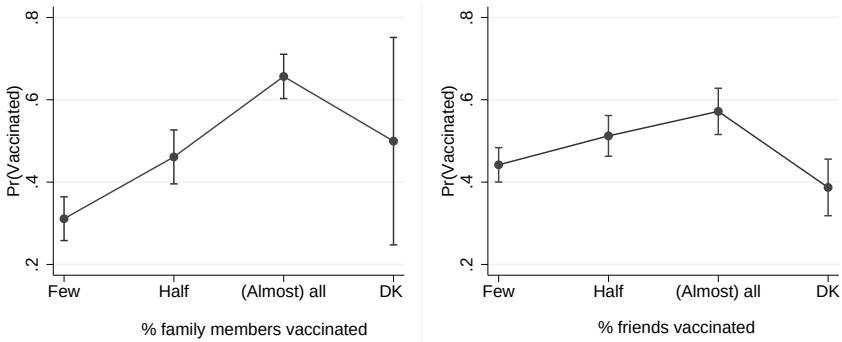
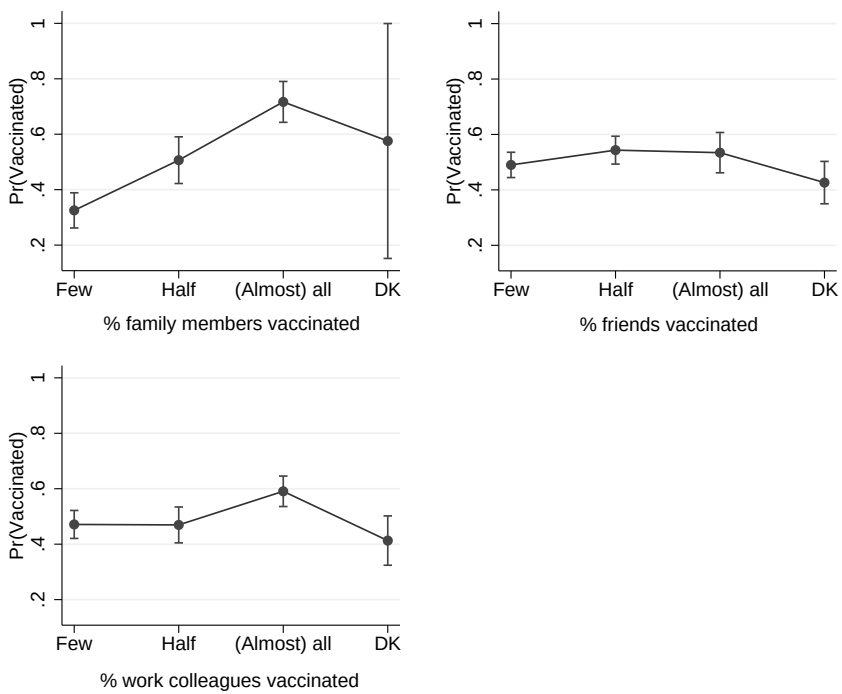


Figure 2: Vaccinations status as a function of the proportion of family members, friends, and work colleagues vaccinated (only employed people)



Finally, model 4 estimates influences exerted by all three types of personal social networks, namely family members, friends, and work colleagues, in addition to socio-demographics, and beliefs on vaccines. The model is estimated only for employed respondents and, therefore, includes a smaller number of cases. Only two out of the four statements regarding COVID-19 vaccines turn to be statistically significant. Specifically, disagreeing that vaccines can create health problems in the future and believing that vaccines protect those around them is associated with higher odds of respondents being vaccinated. With respect to networks' influences, family members and work colleagues appear to exert significant influences. Compared to those who are part of families and workplaces in which barely few are vaccinated, those who have at least half of family members vaccinated, as well as those who work in places where almost all colleagues are vaccinated are more likely to have received the vaccine (see Figure 2). From socio-demographics, age is the only significant variable. Even within the group of working age people, older respondents are more likely to be vaccinated.

To conclude, personal social networks appear to play a significant role in people's decisions to vaccinate, even after controlling for their beliefs regarding the risks and benefits of vaccination and socio-demographics. Vaccination status among family members and friends is significantly correlated with one's own vaccination status. Being part of social networks in which almost all members are vaccinated, highly increases the odds of respondents reporting they have received the vaccine. Even when only half of network members are vaccinated, respondents are more likely to be vaccinated.

Vaccinated work colleagues also appear to influence respondents' self-vaccination, but only in those cases where they represent the majority. Together with the finding that employed people are more likely to be vaccinated this illustrates the importance of vaccination policies adopted by employers.

6. Conclusions and Discussion

This study contributes to the research on decisions to vaccinate against COVID-19 by focusing on the role played by different types of social networks to which people belong. There is limited scholarship on influences exerted by personal social networks on vaccination, in general (Konstantinou et al. 2021), and on COVID-19 vaccination, in particular (Hao/Shao

2022). My research examined first, whether close and weak social ties exert similar influence, and secondly, the role played by mixed social settings, i.e. networks that include an equal number of vaccinated and unvaccinated peers.

Results indicate that all types of social networks, weak and strong, are relevant predictors of people's decision to vaccinate. Those who are surrounded by at least half family members and friends who are vaccinated are more likely to report being vaccinated. Compared to social settings in which few family members and friends are vaccinated, mixed networks of strong ties tilt one's decision in the direction of vaccination. Workplaces also appear to be influential social contexts for COVID-19 vaccination. When a majority of work colleagues received a COVID-19 vaccine, people are also more likely to be vaccinated, and employed people, in general, are more likely to be vaccinated.

These findings highlight the importance of using insights from social networks studies in the research of vaccination behavior, a phenomenon that has been predominantly studied from the perspective of individuals as the main loci of decision making. A review of the role played by communication within personal social networks in people's political attitudes and behavior showed that both the structure and the content of social networks matter (Schmitt-Beck/Lup 2013). I used these insights to explore the influence exerted by strong and weak social ties in people's decision to vaccinate, as well as the effects of exposure to divergent choices regarding vaccination in networks comprised of strong and weak ties.

Future studies should explore more features of social networks in research concerned with social phenomena such as vaccination behavior, considering also the role played by communication within these networks. Socio-centric networks should be also considered in addition to ego-centric ones in examining vaccination related decision making and behavior.

References

Al-Amer, R., Maneze, D., Everett, B., Montayre, J., Villarosa, A. R., Dwekat, E., & Salamonson, Y. (2022). COVID-19 vaccination intention in the first year of the pandemic: A systematic review. *Journal of Clinical Nursing*, *31*(1–2), 62–86. https://doi.org/10.1111/jocn.15951.

Arpino, B., Bordone, V., & Di Gessa, G. (2023). COVID-19 precautionary behaviors and vaccine acceptance among older individuals: The role of close kin. *Proceedings of the National Academy of Sciences*, *120*(13), e2214382120

https://doi.org/10.1073/pnas.2214382120.

Berezin, M., & Eads, A. (2016). Risk is for the rich? Childhood vaccination resistance and a Culture of Health. *Social Science & Medicine*, *165*(18), 233–245. https://doi.org/10.1016/j.socscimed.2016.07.009.

Bernados, S., & Ocampo, L. (2022). How Do People Decide on Getting Vaccinated? Evaluating the COVID-19 Vaccination Program through the Lens of Social Capital Theory. *Social Sciences, 11*(4), https://doi.org/10.3390/socsci11040145.

Bertin, P., Nera, K., & Delouvée, S. (2020). Conspiracy Beliefs, Rejection of Vaccination, and Support for hydroxychloroquine: A Conceptual Replication-Extension in the COVID-19 Pandemic Context. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.565128.

Barouch, D. H. (2022). Covid-19 Vaccines—Immunity, Variants, Boosters. *New England Journal of Medicine*, *387*(11), 1011–1020. https://doi.org/10.1056/NEJMra2206573.

Burke, P. F., Masters, D., & Massey, G. (2021). Enablers and barriers to COVID-19 vaccine uptake: An international study of perceptions and intentions. *Vaccine*, *39*(36), 5116–5128. https://doi.org/10.1016/j.vaccine.2021.07.056.

Brenner, P. S. (2020). Advancing Theories of Socially Desirable Responding: How Identity Processes Influence Answers to "Sensitive Questions." In P. S. Brenner (Ed.), *Understanding Survey Methodology: Sociological Theory and Applications* (pp. 45–65). Springer International Publishing. https://doi.org/10.1007/978-3-030-47256-6_3.

Callaghan, T., Moghtaderi, A., Lueck, J. A., Hotez, P., Strych, U., Dor, A., Fowler, E. F., & Motta, M. (2021). Correlates and disparities of intention to vaccinate against COVID-19. *Social Science & Medicine (1982)*, *272*, 113638. https://doi.org/10.1016/j.socscimed.2020.113638.

Coffie, I. S., Nkukpornu, A., Kankam, W. A., & Ocloo, C. E. (2022). Using Social Marketing to Demystify the Myths Surrounding Covid-19 Vaccination: The Mediating Role of Important Others. *Social Marketing Quarterly*, *28*(2), 169–183. https://doi.org/10.1177/15245004221097802.

DeBell, M., Krosnick, J. A., Gera, K., Yeager, D. S., & McDonald, M. P. (2020). The Turnout Gap in Surveys: Explanations and Solutions. *Sociological Methods & Research*, *49*(4), 1133–1162. https://doi.org/10.1177/0049124118769085.

Dubé, E., Gagnon, D., Nickels, E., Jeram, S., & Schuster, M. (2014). Mapping vaccine hesitancy—Country-specific characteristics of a global phenomenon. *Vaccine*, *32*(49), 6649–6654. https://doi.org/10.1016/j.vaccine.2014.09.039.

Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. (2013). Vaccine hesitancy: An overview. *Human Vaccines & Immunotherapeutics*, *9*(8), 1763–1773. https://doi.org/10.4161/hv.24657.

Eberhardt, J., & Ling, J. (2021). Predicting COVID-19 vaccination intention using protection motivation theory and conspiracy beliefs. *Vaccine*, *39*(42), 6269–6275. https://doi.org/10.1016/j.vaccine.2021.09.010.

Eberl, J.-M., Huber, R. A., & Greussing, E. (2021). From populism to the "plandemic": Why populists believe in COVID-19 conspiracies. *Journal of Elections, Public Opinion and Parties*, *31*(sup1), 272–284. https://doi.org/10.1080/17457289.2021.1924730.

Facciani, M., Lazić, A., Viggiano, G., & McKay, T. (2023). Political network composition predicts vaccination attitudes. *Social Science & Medicine*, *328*, 116004. https://doi.org/10.1016/j.socscimed.2023.116004.

Galanis, P., Moisoglou, I., Vraka, I., Siskou, O., Konstantakopoulou, O., Katsiroumpa, A., & Kaitelidou, D. (2022). Predictors of COVID-19 Vaccine Uptake in Healthcare Workers: A Cross-Sectional Study in Greece. *Journal of Occupational and Environmental Medicine*, *64*(4), e191–e196. https://doi.org/10.1097/JOM.0000000000002463.

Galasso, V., Profeta, P., Foucault, M., & Pons, V. (2021). *COVID-19 Vaccine's Gender Paradox* (p. 2021.03.26.21254380). medRxiv. https://doi.org/10.1101/2021.03.26.21254380.

Gerretsen, P., Kim, J., Caravaggio, F., Quilty, L., Sanches, M., Wells, S., Brown, E. E., Agic, B., Pollock, B. G., & Graff-Guerrero, A. (2021). Individual determinants of COVID-19 vaccine hesitancy. *PLOS ONE*, *16*(11), e0258462. https://doi.org/10.1371/journal.pone.0258462.

Guidry, J. P. D., Laestadius, L. I., Vraga, E. K., Miller, C. A., Perrin, P. B., Burton, C. W., Ryan, M., Fuemmeler, B. F., & Carlyle, K. E. (2021). Willingness to get the COVID-19 vaccine with and without emergency use authorization. *American Journal of Infection Control*, *49*(2), 137–142. https://doi.org/10.1016/j.ajic.2020.11.018.

Haakonsen, J. M. F., & Furnham, A. (2023). COVID-19 vaccination: Conspiracy theories, demography, ideology, and personality disorders. *Health Psychology*, *42*(3), 205–212. https://doi.org/10.1037/hea0001222.

Hao, F., & Shao, W. (2022). Understanding the influence of political orientation, social network, and economic recovery on COVID-19 vaccine uptake among Americans. *Vaccine*, *40*(14), 2191–2201. https://doi.org/10.1016/j.vaccine.2022.02.066.

Jaspal, R., & Breakwell, G. M. (2022). Social support, perceived risk and the likelihood of COVID-19 testing and vaccination: Cross-sectional data from the United Kingdom. *Current Psychology*, *41*(1), 492–504. https://doi.org/10.1007/s12144-021-01681-z.

Jennings, W., Stoker, G., Bunting, H., Valgarðsson, V. O., Gaskell, J., Devine, D., McKay, L., & Mills, M. C. (2021). Lack of Trust, Conspiracy Beliefs, and Social Media Use Predict COVID-19 Vaccine Hesitancy. *Vaccines*, *9*(6), 593. https://doi.org/10.3390/vaccines9060593.

Jiang, X., Su, M.-H., Hwang, J., Lian, R., Brauer, M., Kim, S., & Shah, D. (2021). Polarization Over Vaccination: Ideological Differences in Twitter Expression About COVID-19 Vaccine Favorability and Specific Hesitancy Concerns. *Social Media + Society*, *7*(3), https://doi.org/10.1177/20563051211048413.

Jolley, D., & Douglas, K. M. (2014). The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions. *PLOS ONE*, *9*(2), e89177. https://doi.org/10.1371/journal.pone.0089177.

Kennedy, J. (2019). Populist politics and vaccine hesitancy in Western Europe: An analysis of national-level data. *European Journal of Public Health*, *29*(3), 512–516. https://doi.org/10.1093/eurpub/ckz004.

Kerr, J. R., Schneider, C. R., Recchia, G., Dryhurst, S., Sahlin, U., Dufouil, C., Arwidson, P., Freeman, A. L. J., & Linden, S. van der. (2020). Predictors of COVID-19 vaccine acceptance across time and countries. *MedRxiv*, 2020.12.09.20246439. https://doi.org/10.1101/2020.12.09.20246439.

Kokubun, K., & Yamakawa, Y. (2021). Social Capital Mediates the Relationship between Social Distancing and COVID-19 Prevalence in Japan. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *58*(1), 1-11. https://doi.org/10.1177/00469580211005189.

Konstantinou, P., Georgiou, K., Kumar, N., Kyprianidou, M., Nicolaides, C., Karekla, M., & Kassianos, A. P. (2021). Transmission of Vaccination Attitudes and Uptake Based on Social Contagion Theory: A Scoping Review. *Vaccines*, *9*(6), Article 6. https://doi.org/10.3390/vaccines9060607.

Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M. D., & Paterson, P. (2014). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine*, *32*(19), 2150–2159. https://doi.org/10.1016/j.vaccine.2014.01.081.

Lazarus, J. V., Ratzan, S. C., Palayew, A., Gostin, L. O., Larson, H. J., Rabin, K., Kimball, S., & El-Mohandes, A. (2021). A global survey of potential acceptance of a COVID-19 vaccine. *Nature Medicine*, *27*(2), Article 2. https://doi.org/10.1038/s41591-020-1124-9.

Loomba, S., de Figueiredo, A., Piatek, S. J., de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature Human Behaviour*, *5*(3), Article 3. https://doi.org/10.1038/s41562-021-01056-1.

Makarovs, K., & Achterberg, P. (2017). Contextualizing educational differences in "vaccination uptake": A thirty nation survey. *Social Science & Medicine*, *188*(17), 1–10. https://doi.org/10.1016/j.socscimed.2017.06.039.

Matute, J., Palau-Saumell, R., Meyer, J., Derqui, B., & Jiménez-Asenjo, N. (2022). Are you getting it? Integrating theories to explain intentions to get vaccinated against COVID-19 in Spain. *Journal of Risk Research*, *25*(9), 1055–1074. https://doi.org/10.1080/13669877.2021.1958044.

Merrick, E., Weissman, J. P., & Patel, S. J. (2022). Utilizing Google trends to monitor coronavirus vaccine interest and hesitancies. *Vaccine, 40*(30), 4057–4063 https://doi.org/10.1016/j.vaccine.2022.05.070.

Milani, E., Weitkamp, E., & Webb, P. (2020). The Visual Vaccine Debate on Twitter: A Social Network Analysis. *Media and Communication*, *8*(2), 364–375. https://doi.org/10.17645/mac.v8i2.2847.

Paul, K. T., Eberl, J.-M., & Partheymüller, J. (2021). Policy-Relevant Attitudes Toward COVID-19 Vaccination: Associations with Demography, Health Risk, and Social and Political Factors. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.671896.

Poland, G. A., & Jacobson, R. M. (2011). The Age-Old Struggle against the Antivaccinationists. *New England Journal of Medicine*, *364*(2), 97–99. https://doi.org/10.1056/NEJMp1010594.

Rémy, V., Zöllner, Y., & Heckmann, U. (2015). Vaccination: The cornerstone of an efficient healthcare system. *Journal of Market Access & Health Policy*, *3*(1), 27041. https://doi.org/10.3402/jmahp.v3.27041.

Roberts, H. A., Clark, D. A., Kalina, C., Sherman, C., Brislin, S., Heitzeg, M. M., & Hicks, B. M. (2022). To vax or not to vax: Predictors of anti-vax attitudes and COVID-19 vaccine hesitancy prior to widespread vaccine availability. *PLOS ONE*, *17*(2), e0264019. https://doi.org/10.1371/journal.pone.0264019.

Romer, D., Winneg, K. M., Jamieson, P. E., Brensinger, C., & Jamieson, K. H. (2022). Misinformation about vaccine safety and uptake of COVID-19 vaccines among adults and 5–11-year-olds in the United States. *Vaccine*, *40*(45), 6463–6470. https://doi.org/10.1016/j.vaccine.2022.09.046.

Ruiz, J. B., & Bell, R. A. (2021). Predictors of intention to vaccinate against COVID-19: Results of a nationwide survey. *Vaccine*, *39*(7), 1080–1086. https://doi.org/10.1016/j.vaccine.2021.01.010.

Schmitt-Beck, R., & Lup, O. (2013). Seeking the Soul of Democracy: A Review of Recent Research into Citizens' Political Talk Culture. *Swiss Political Science Review*, *19*(4), 513–538. https://doi.org/10.1111/spsr.12051.

Seddig, D., Maskileyson, D., Davidov, E., Ajzen, I., & Schmidt, P. (2022). Correlates of COVID-19 vaccination intentions: Attitudes, institutional trust, fear, conspiracy beliefs, and vaccine skepticism. *Social Science & Medicine*, *302*, 114981. https://doi.org/10.1016/j.socscimed.2022.114981.

Toshkov, D. (2023). What accounts for the variation in COVID-19 vaccine hesitancy in Eastern, Southern and Western Europe? *Vaccine*, *41*(20), 3178–3188. https://doi.org/10.1016/j.vaccine.2023.03.030.

Troiano, G., & Nardi, A. (2021). Vaccine hesitancy in the era of COVID-19. *Public Health*, *194*, 245–251. https://doi.org/10.1016/j.puhe.2021.02.025.

Uscinski, J. E., Enders, A. M., Klofstad, C., Seelig, M., Funchion, J., Everett, C., Wuchty, S., Premaratne, K., & Murthi, M. (2020). Why do people believe COVID-19 conspiracy theories? *Harvard Kennedy School Misinformation Review*, *1*(3). https://doi.org/10.37016/mr-2020-015.

Viskupič, F., Wiltse, D. L., & Meyer, B. A. (2022). Trust in physicians and trust in government predict COVID-19 vaccine uptake. *Social Science Quarterly*, *103*(3), 509-520. https://doi.org/10.1111/ssqu.13147.

Wagner, A., & Reifegerste, D. (2023). "The Part Played by People" in Times of COVID-19: Interpersonal Communication about Media Coverage in a Pandemic Crisis. *Health Communication*, *38*(5), 1014–1021. https://doi.org/10.1080/10410236.2021.1989786.

Wang, Q., Yang, L., Jin, H., & Lin, L. (2021). Vaccination against COVID-19: A systematic review and meta-analysis of acceptability and its predictors. *Preventive Medicine*, *150*(9), 106694. https://doi.org/10.1016/j.ypmed.2021.106694.

Watson, O. J., Barnsley, G., Toor, J., Hogan, A. B., Winskill, P., & Ghani, A. C. (2022). Global impact of the first year of COVID-19 vaccination: A mathematical modelling study. The Lancet Infectious Diseases, 22(9), 1293–1302. https://doi.org/10.1016/S1473309(22)00320-6.

Winter, K., Pummerer, L., Hornsey, M. J., & Sassenberg, K. (2022). Pro-vaccination subjective norms moderate the relationship between conspiracy mentality and vaccination intentions. *British Journal of Health Psychology*, *27*(2), 390–405. https://doi.org/10.1111/bjhp.12550.

Wolter, F., Mayerl, J., Andersen, H. K., Wieland, T., & Junkermann, J. (2022). Overestimation of COVID-19 Vaccination Coverage in Population Surveys Due to Social Desirability Bias: Results of an Experimental Methods Study in Germany. *Socius*, *8*(1), 23780231221094748. https://doi.org/10.1177/23780231221094749.

Xiao, X., & Wong, R. M. (2020). Vaccine hesitancy and perceived behavioral control: A meta-analysis. Vaccine, 38(33), 5131–5138. https://doi.org/10.1016/j.vaccine.2020.04.076.

Zheng, C., Shao, W., Chen, X., Zhang, B., Wang, G., & Zhang, W. (2022). Real-world effectiveness of COVID-19 vaccines: A literature review and meta-analysis. *International Journal of Infectious Diseases*, *114*(1), 252–260. https://doi.org/10.1016/j.ijid.2021.11.009.