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Acculturation, trust to health care system, and attitudes to COVID-19 vaccination: A comparative study between Polish immigrants in Norway, Polish in Poland, and Norwegians in Norway

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ABSTRACT

Fast deployment of safe and efficient COVID-19 vaccines has changed the course of the pandemic in many countries reducing COVID-19 death rates and allowing countries to abandon strict measures such as social distancing and restrictions to public events. The vaccination strategy, however, is based on the expected high vaccination rate in the population. Several studies have indicated vaccination hesitancy to be higher in ethnic minority communities, which can lead to unnecessary suffering and loss of lives, worsening pre-existing health inequalities and marginalization of ethnic minority groups. The aim of the present study was to investigate the relationships between acculturation to Norwegian culture, trust in health authorities, and attitude to COVID-19 vaccine among Polish immigrants in Norway. An internet-based survey including questions about attitude to COVID-19 vaccination and trust in the health care system was filled by 150 Polish immigrants in Norway, 256 Polish living in Poland, and 264 Norwegians living in Norway. In addition, the Polish immigrants also answered questions about acculturation to Norway. The results showed that the Polish immigrants in Norway had less positive attitudes to COVID-19 vaccination than the Norwegians, while they did not differ from Polish living in Poland. The Polish immigrants also indicated lower trust in the Norwegian health care system than the Norwegians. In regression analysis, the trust in the values of the health care system was the most important predictor of COVID-19 vaccination attitudes in all three samples. A path model showed that trust in the values of the health care system mediated the effects of acculturation to Norway on COVID-19 vaccination attitudes among Polish immigrants. These results underline the importance of taking ethnic minorities and immigrants into account in the health care system to reduce COVID-19 vaccination hesitancy.

1. Introduction

The development of COVID-19 vaccines has been a great success of science and collaboration of governments, the pharmaceutical industry, and academic laboratories. Only one year after the first case of COVID-19 was identified, multiple safe and efficient SARS-CoV-2 vaccines were available (Golob, Lugogo, Lauring, and Lok, 2021). Up to date (October 29 2021,), 49.4% of the world population has received at least one dose of a COVID-19 vaccine, 7.04 billion doses have been administered globally, and 25.49 million are now administered each day (Ritchie, et al., 2020). Together with the other measures such as mask use, heightened hygienic practices and social distancing, fast deployment of COVID-19 vaccines has changed the course of the pandemic in many countries: the global rate of confirmed COVID-19 deaths has dropped from 14,703 deaths on January 26, 2021, to 7324 deaths on October 29 2021, (Ritchie, et al., 2020). The reduction of deaths can be attributed to the fact that the vaccines have achieved an approximate 85%–95% reduction in the risk of symptomatic COVID-19 (Golob, et al., 2021). In addition, many counties have lifted the restrictions such as obligatory use of face masks or restrictions for public events, which gives positive signals about the recovery of economic activities.

While the development of vaccines has been a breath-taking achievement, it has become clear that there is a gap from vaccine to vaccinations. While about half of the world population has received at least one dose of vaccine, the same figure for low-income countries is only as low as 3.6% (Ritchie, et al., 2020). There are also considerable differences in vaccination rates even among European countries, with Portugal having 87.16% of the population vaccinated fully compared to Russia with 32.53% (Ritchie, et al., 2020). Moreover, the vaccination rate can vary considerably within a county among different minority groups including first-generation immigrants. A recent survey conducted across 43 states in the USA shows that the percent of White people who have received at

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least one COVID-19 vaccine dose (54%) was 1.2 times higher than the rate for Black people (47%) and 1.1 times higher than the rate for Hispanic people (52%) (Ndugga, Hill, Artiga, and Haldar, 2021). Surveys conducted in the U.K. have indicated much greater vaccine hesitancy among people from some ethnic minorities, vaccine hesitancy being highest among black, Bangladeshi, and Pakistani populations compared with people from a white ethnic background (M. S. Razai, Osama, McKechnie, and Majeed, 2021). Similar findings of lower uptake of COVID-19 vaccine has also been reported in other countries, including Israel (Rosen, Dine, and Davidovitch, 2021). Vaccination hesitancy and, consequently, lower rollout rate among minorities is clearly a health risk for these groups but also compromises the national vaccination strategy, which is based on a high vaccination rate. A recent study suggests that the value of vaccination rate of 50.91 doses per 100 people is a minimum requirement for avoiding the aggravation of the pandemic in society, and intensive vaccination programmes are needed to prevent the resurgence of COVID-19 infection (Chen, 2021). Clusters of non-vaccinated minorities often living in closed communities can jeopardize these aims and worsen pre-existing health inequalities and marginalization of ethnic minority groups (M. S. Razai, et al., 2021).

Taken that lower vaccination rate among minorities in terms of COVID-19 (Chaudhuri, Chakrabarti, Chandan, and Bandyopadhyay, 2022) vaccine but also with other vaccination such as human papillomavirus (HPV) (Zhang and Tang, 2021), it is essential to investigate why minorities are less eager to get vaccinated. There are probably many reasons why minorities community members may not prefer to get vaccinated with the COVID-19 vaccine. Some of the reasons are very likely the same as among “anti-vaxxers” in general who question the seriousness or the existence of the COVID-19 epidemic or the efficacy of the vaccines, believe that vaccines cause many harmful side effects and illnesses, criticize the vaccination strategy (e.g., vaccination of children), or believe in various conspiracy theories (Wang and Liu, 2022). Küçükali & al. (2022) studied vaccine hesitancy by using Twitter data, which should reflect widespread attitudes towards vaccines. The most occurring anti-vaccine themes were “poor scientific process”, “suspicion towards manufacturers”, and “suspicion towards health authorities” (Küçükali, Ataç, Palteki, Tokaç, and Hayran, 2022). Similarly, a study conducted in Poland showed that the main arguments against vaccinations were that the vaccination was not needed, the vaccine was not effective, supposedly low quality of the research on vaccines, harmful side effects, and the intention of pharmaceutical industry and medical profession (Stasiuk, Maciuszek, Polak, and Doliński, 2021). In another Polish study, religious fundamentalism was positively related to coronavirus conspiracy beliefs, which could promote non-adherence to safety guidelines (Łowicki, Marchlewska, Molenda, Karakula, and Szczepańska, 2022). The connection between religious fundamentalism and conspiracy beliefs might partly explain why certain religious minorities are more prone to anti-vaccine attitudes.

One simple reason for lower vaccination rates among minorities might be related to health information and knowledge level in general. Minorities, especially immigrants, might not be able to follow the information campaigns provided by the health authorities and follow the media because of lacking language skills. Vaccine hesitancy as uncertainty whether to have the vaccination or not indicates that the public health messaging has not been effective and tailored to all groups (M. S. Razai, et al., 2021). Vaccine hesitancy includes uncertainty about the vaccine’s effectiveness, safety, and necessity of the vaccine (Mills, Rahal, Brazel, Yan, and Gieysztor, 2020). National health authorities address these concerns almost in every country. One main reason why this message is not received well by certain minorities could be the mistrust of government and public health bodies, which might have deep historical roots (M. S. Razai, et al., 2021). This mistrust is understandable taken that health care systems have often been besmirched by systemic racism and discrimination, under-representation of minorities in health research, and negative experiences within a culturally insensitive healthcare system (Mohammad S Razai, Kankam, Majeed, Esmail, and Williams, 2021; M. S. Razai, et al., 2021). Hence, vaccine hesitancy might actually reflect mistrust in the health care system rather than the vaccine itself. In this way, vaccination hesitancy could be only one indicator of deeply rooted mistrust. A recent study from Cyprus shows that vaccine acceptance is influenced by trust in authorities (Konstantinou, Nicolaou, Petrou, and Pieri, 2021). It can be assumed that trust in the health care system’s values, ethics, and competence directly influences the trust in the information about the COVID-19 vaccine provided by the national health authorities.

It can be assumed that immigrants are especially prone to mistrust health authorities because the health authorities represent the same body (state), which controls immigration and grants residence, and work permits. Immigrants might see the health authorities and social services as part of the same official network as immigration services and, therefore, may fear negative consequences, i.e., sanctions in relation to their residence permit or being stigmatised as trouble-makers (Liebkind and Jasinskaja-Lahti, 2000). In addition to this systematic discrepancy in power, immigrants can experience discrimination by officers representing these services. Liebkind and Jasinskaja-Lahti (2000) studied the effects of experienced discrimination on trust in authorities among different immigrant groups in Finland (Liebkind and Jasinskaja-Lahti, 2000). According to the results, experiences of discrimination were highly predictive of lack of trust in authorities as well as of stress symptoms among all immigrants (Liebkind and Jasinskaja-Lahti, 2000). Liebkind and Jasinskaja-Lahti (2000) also note that experiences of discrimination can greatly influence the acculturation stress and the outcomes of the process. Experiences of discrimination underline the "otherness" of the immigrant, which makes the acculturation stress higher and, consequently, trust in the host country’s institutions lower. On the other hand, immigrants identifying themselves with the majority culture of the host country can be expected to rely more on the information from the health authorities representing that country. Thus, the level of trust on authorities and, consequently, the willingness to follow the official health recommendations such as getting vaccinated with COVID-19 vaccine could be closely related to the acculturation process which the immigrants are living through.

As acculturation is a process in which self-identity is modified to accommodate information about the new culture (Ryder, Alden, and Paulhus, 2000), we can expect that acculturation to the host country is positively related to trust and acceptance COVID-19 vaccine as recommended by health authorities. According to Berry’s model of acculturation, acculturation is a bidimensional process in which both heritage culture (culture of birth or upbringing, e.g., Polish for Polish immigrants in Norway) and the mainstream or host culture (predominant cultural environment, e.g., Norwegian in Norway) can vary independently (Berry, 1992; Ryder, et al., 2000; Sam and Berry, 2016). Thus, individuals can have multiple cultural identities, each of which can vary in strength (Ryder, et al., 2000). For example, Polish immigrants in Norway may identify themselves with Polish and Norwegian cultures in various degrees. Depending on the balance between the heritage culture and the mainstream culture, Berry (1992) has presented four strategies of acculturation: Assimilation (adoption of the cultural norms of the mainstream culture over the heritage culture), separation (rejection of the mainstream culture in favor of preserving the heritage culture), integration (adoption of the mainstream culture while maintaining the heritage culture), and marginalization (rejection of both mainstream and heritage culture). Ryder et al. (2000) applied this bidimensional approach in the Vancouver Index of Acculturation (VIA), which they developed for measuring acculturation as the degree of identification to the heritage and mainstream (host) culture. It can be assumed that a high score in adoption of mainstream culture reflecting assimilation or integration strategies should be related to the similar pattern in COVID-19 vaccine attitudes and acceptance among immigrants as among the members of the surrounding mainstream culture (Norwegians in this study). A low level of adoption of the mainstream culture typical to separation strategy should lead to COVID-19 vaccine attitudes

similar to those of the members of the heritage culture (Polish in this study).

The present study focused on the Polish immigrants in Norway and compared their COVID-19 vaccination attitudes to Polish in Poland (heritage culture) and Norwegians in Norway (mainstream host culture). The Polish immigrants were chosen as the study population because three reasons. Firstly, the Polish immigrants are the largest immigrant group with 110,300 individuals in Norway (18.3% of all immigrants) (Norwegian Ministries, 2022). Secondly, immigrants are overrepresented COVID-19 infection statistics in Norway (October 31, 2021): 41% of persons with confirmed COVID-19 infection had immigrant background while people with immigrant background account for 18.5% of Norway's population (Norwegian Ministries, 2022). Persons with confirmed COVID-19 infection include 6450 immigrants with Polish background. Thirdly, the Polish immigrants have had the lowest vaccination rate (46.7% with at least one dose on October 31, 2021) among all immigrant groups in Norway. The comparable vaccination rate among all persons aged 18 years or older was 91% in Norway (at least one dose) (Norwegian Ministries, 2022). The data of the present study was collected between 29 March and May 24, 2021, when the population vaccination rate ranged from 11.7% to 30.0% and the daily confirmed COVID-19 cases per million people varied from 159.54 to 82.39 (Ritchie, et al., 2020). At the same time period, the vaccination rate ranged from 26.0% to 43.0% in Poland while the daily confirmed COVID-19 cases per million people varied from 736.40 to 41.54 (Ritchie, et al., 2020). Unfortunately, vaccination and infection rates for Polish immigrants in Norway are not available for the time period when the data were collected.

In conclusion, Norwegian Statistics show that the Polish immigrants are over-represented in COVID-19 infection statistics while they have the lowest vaccination rate among all immigrant groups in Norway. Earlier literature shows that the general vaccination hesitancy and especially the hesitancy related to COVID-19 vaccine are in higher level among immigrants than in the general population. Vaccination hesitancy could be related to lower trust in authorities, which in turn might be reflected in trust in health information and, finally, vaccination acceptance. The present study aimed to investigate the relationships between acculturation to Norwegian culture, trust in health authorities, and attitude to COVID-19 vaccine among Polish immigrants in Norway.

2. Methods

2.1. Procedure and participants

Participants were recruited via Facebook advertisements in Poland and Norway between March and May 2021. Advertisements were targeted in Norwegian to Norwegians in Norway (target population 3.3–4.0 million people), in Polish to Polish in Norway (target population 73,300–77,600 people), and in Polish to Polish in Poland (target population 19.5–21.7 million people). The final reach of the advertisements were 14,220 views for the ad in Norwegian in Norway, 708,783 views for the ad in Polish in Poland, and 32,921 views in Polish in Norway. While the Facebook ads reach a high proportion of community members specified by selection criteria (e.g., age, language, place of residence), it still can be considered as "convenience sampling" since not every member of the community uses Facebook. The advertisements included a short invitation text, a picture about a covid-19 vaccine syringe, and a link to a web-based anonymous survey. By continuing the survey, the participants accepted the conditions detailed in the informed consent form.

To take part, participants had to be at least 18 years old, but no other criteria for participation were set. Participants did not receive any monetary or other rewards for taking part. The sample consisted of 150 Polish immigrants in Norway (47.7% women; mean age=42.2 years; standard deviation= 11.8 years), 256 Polish residents in Poland (52.3% women; mean age=42.9 years; standard deviation= 11.8 years), and 264 Norwegian residents in Norway (63.2% women; mean age=38.9 years; standard deviation= 18.4 years). Except for one person who had lived all his/her life in Norway, the Polish immigrants were first-generation immigrants who had immigrated to Norway in one stage of their life. The completion rates were 72%, 91%, and 77% for Polish immigrants in Norway, Norwegians in Norway, and Polish in Poland, respectively. Pairwise deletion of missing values was used for correlations whereas listwise deletion was used for regression.

Ethical review and approval were waived for this study due to regulations of the Norwegian Centre for Research Data (NSD). Since the study was conducted on the internet and no identification data were collected and since the survey does not contain any sensitive data as defined by NSD, no ethical permission was required.

2.2. Materials

2.2.1. Attitudes to COVID-19 vaccine

A scale for measuring attitudes to COVID-19 vaccine was constructed as the average of answers to eight items about COVID-19 vaccine such as "The vaccine is a good way to protect oneself against COVID-19″, "I trust the producers of COVID-19 vaccine", and "I am worried about the long-term effects of the COVID-19″ (reversed item). The answers were recorded with a five-point Likert scale from "totally disagree" (1) to "totally agree" (5). The responses were subjected to exploratory factor analysis (principal axis method), and the number of factors was determined by the parallel analysis and Scree plot of eigenvalues. The factor analysis yielded a clear single factor solution in which all items had high factor loadings ranging from 0.58 to 0.91. The Cronbach alpha coeffects were 0.95 for Polish in Norway, 0.93 for Polish in Poland, and 0.86 for Norwegians in Norway, indicating high internal consistency.

2.2.2. Attitudes to the national health care system

Attitudes to the national health care authorities can be expected to predict attitudes to covid-19 vaccination and, consequently, the likelihood of getting vaccinated. Attitudes to national health care authorities (Polish in Poland and Norwegian in Norway) were measured with two items. Trust to authorities was measured with questions "in general, how much do you trust Norwegian/Polish health personnel?". The answer scale ranged from "no trust at all" (1) to "full trust" (5). Respondents were also asked how they see the professional competence of the local health care personnel with the question "in general, how would you rank the competence of Norwegian/Polish health care personnel?". The answer scale ranged from "very low competence" (1) to "very high competence" (5).

2.2.3. Revised health care system distrust scale (HCSDS-R)

In addition to the above described two questions, trust to Health Care System was measured with a standardised measure named Revised Health Care System Distrust Scale (HCSDS) (Shea, et al., 2008). The scale includes domains of technical competence and value congruence and has been used in studies among racial minorities in the U.S. (Armstrong, et al., 2008). The values domain represents the subthemes of honesty, motives, and equity (e.g., "The Health Care System covers up its mistakes", whereas the competence scale measures perceptions of technical competence (e.g., The Health Care System gives excellent medical Care. The answers were recorded with a five-point Likert scale from "totally disagree" (1) to "totally agree" (5).

The Cronbach alpha reliability coefficients for the HCSDS value scale (5-items) were 0.82, 0.84, and 0.74 for Polish in Norway, Polish in Poland, and Norwegians in Norway, respectively. The alpha reliability coefficients for the (4-items) HCSDS competence scale were 0.90, 0.85, and 0.74 for Polish in Norway, Polish in Poland, and Norwegians in Norway, respectively.

The original HCSDS measures distrust in the health care system, i.e., a high score indicates distrust. In this study, the items were reversed so that a high score indicates high trust in the health care system.

Table 1
Descriptive statistics and group comparisons.

	Polish in Norway (PN)		Polish in Poland (P)		Norwegians in Norway (N)		Comparison of samples		
	M	SD	M	SD	M	SD	F	df	Group differences
Attitude to vaccine	3.08	1.29	3.29	1.14	4.31	0.55	69.00*	2498	N>P***; N>PN***
Healthcare: Trust	3.30	0.92	3.10	1.10	4.47	0.57	143.46**	2468	N>P***; N>PN***
Healthcare: Competence	3.34	0.91	3.42	0.97	4.39	0.65	55.56*	2438	N>P***; N>PN***
HCSDS-Competence	3.36	0.83	2.60	0.87	4.27	0.48	694.63**	2469	N>P***; N>PN***;PN>P***
HCSDS-Values	3.46	0.78	2.92	0.89	4.21	0.52	73.24*	2469	N>P***; N>PN***;PN>P***
HCSDS	3.41	0.75	2.78	0.81	4.24	0.46	177.09**	2469	N>P***; N>PN***; PN>P***
Acculturation to Poland	3.60	0.71	–	–	–	–	–	–	–
Acculturation to Norway	3.30	0.62	–	–	–	–	–	–	–
Acculturation: preference	−0.30	0.86	–	–	–	–	–	–	–

Notes: HCSDS=Health Care System Distrust Scale; *$p<0.05$; **$p<0.01$; ***$p<0.001$.

2.2.4. The Vancouver index of acculturation (VIA)

The 20-item VIA (Ryder, et al., 2000) was used to measure acculturation levels among Polish immigrants in Norway. The scale was not applied among ethnic Norwegians living in Norway or among ethnic Polish living in Poland, so the analyses presented here apply only to the Polish immigrant sample in Norway. Two scales were calculated for the heritage (i.e., Polish) and mainstream (i.e., Norwegian) culture identification. The answers were recorded with a five-point Likert scale from "totally disagree" (1) to "totally agree" (5).

The Cronbach alpha reliability coefficients for the Norwegian culture identification were 0.89 and for the Polish culture identification 0.85. In addition to these two separate identification scores, a sum identification score was calculated by distracting the Polish identification score from the Norwegian identification score. This score was supposed to measure if the identification is more oriented towards the Norwegian mainstream culture or to the Polish heritage. A positive score indicates stronger identification with the Norwegian culture and a negative score for Polish heritage.

2.2.5. Background variables

The questionnaire also included questions about gender ("woman", "man", "other"), age, level of Norwegian language skills ("Polish skills better", "Norwegian skills better", "both equally good"), Norwegian citizenship (yes, no, dual citizenship), years lived in Norway, and the country in which the respondent spends most of the time during a typical year ("Norway", "Poland").

2.3. Statistical analyses

The data were analysed with SPSS version 27 and Stata version 17. The analysis techniques were ANCOVA (attitude to COVID-19 vaccine score as the dependent variable; sample x gender with age as a covariate) with Bonferroni correction for group differences (Polish in Norway, Polish in Poland, and Norwegians in Norway), Pearson correlation coefficients, hierarchical regression analysis, and path analysis for mediation.

3. Results

3.1. Group differences in attitudes to COVID-19 vaccine and evaluations of the health care system

Differences between the Polish immigrants in Norway, Polish in Poland, and Norwegians in Norway were investigated by using ANCOVA (group x gender), in which age was controlled by entering it into the model as a covariate. In post-hoc pairwise comparisons, Bonferroni correction was applied to adjust the significance levels.

Table 1 shows the descriptive statistics (M, SD), ANCOVA results and pairwise comparisons of three groups (Norwegians in Norway, Polish in Poland, and Polish in Norway). The main effects of the group were statistically significant for all variables listed in Table 1. Moreover, the main effects of gender were not significant for any of the dependent variables. Moreover, the effect of age (covariate) was not significant for any of the variables.

Table 2
Correlations between the variables among Norwegian in Norway.

		1	2	3	4	5
1.	Attitude to vaccine	1.00				
2.	Healthcare: Trust	.45***	1.00			
3.	Healthcare: Competence	.43***	.57***	1.00		
4.	HCSDS-Competence	.52***	.61***	.66***	1.00	
5.	HCSDS-Values	.54***	.52***	.42***	.63***	1.00
6.	HCSDS	.59***	.62***	.58***	.87***	.93***

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

The Bonferroni adjusted group comparisons showed that Norwegians had more positive attitudes to the COVID-19 vaccine than Polish immigrants in Norway and Polish living in Poland. Similarly, Norwegians trusted the national health care personnel more and evaluated their competence higher than Polish immigrants in Norway and Polish living in Poland (Table 1). Revised Health Care System Distrust Scale scores (HCSDS-R) were higher (i.e., indicating higher trust) for Norwegians than for Polish immigrants and Polish living in Poland, both in terms of values and technical competence. Polish immigrants in Norway had more trust in the health care system than Polish people living in Poland and evaluated the competence to be higher. Hence, ethnically Norwegian respondents evaluated the Norwegian health care system to be more trustworthy and competent than the Polish immigrants did.

Table 1 also shows descriptive statistics for acculturation to Norway and Poland separately for the Polish immigrants in Norway. The Polish immigrants scored higher in identification to Poland than Norway ($t_{108}=-3.64$, $p<0.001$).

3.2. Correlation between attitude to the COVID-19 vaccine, evaluation of the health care sector, and acculturation

Table 2 shows the correlation between the attitude to the vaccine and the independent variables (trust and competence of health care personnel and the HCSDS scales) among Norwegians in Norway. Attitudes to the vaccine had moderate positive correlations to the one-item trust and competence measures but stronger correlations to HCSDS scale scores.

Table 3 shows the correlations between the attitude to the vaccine and different measures of trust and competence of the health care system among Polish respondents living in Poland. The correlations are slightly higher than among Norwegians but about at the same level in general.

Table 4 presents the same correlations as tables 2 and 3 and correlations to different acculturation measures. Correlations between the attitude to the vaccine and different measures of trust and competence are at the same level as among Norwegians and Polish in Poland. How-

Table 3
Correlations between the variables among Polish in Poland.

		1	2	3	4	5
1.	Attitude to vaccine	1.00				
2.	Healthcare: Trust	.58***	1.00			
3.	Healthcare: Competence	.49***	.61***	1.00		
4.	HCSDS-Competence	.52***	.58***	.58***	1.00	
5.	HCSDS-Values	.66***	.61***	.58***	.69***	1.00
6.	HCSDS	.65***	.65***	.63***	.90***	.93***

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

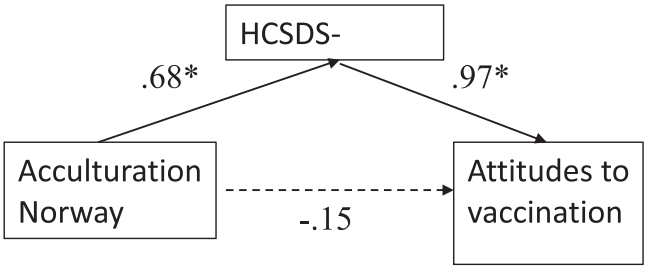

Fig. 1. Model for the Polish immigrants in Norway: Health Care System Distrust Scale Values (HCSDS-Values) fully mediate the effects of acculturation to Norway on attitudes to COVID-19 vaccination.

ever, different acculturation measures show a very different pattern of correlations to attitudes to the COVID-19 vaccine. Having Norwegian citizenship, knowing the Norwegian language, years lived in Norway, or annual time spent in Norway have no statistically significant relationship to attitudes to the COVID19 vaccine, whereas identification to Norwegian culture correlated weakly but significantly with positive attitudes to the vaccine. Identification to Polish heritage did not correlate with attitudes to the vaccine. Interestingly, "hard measures" of acculturation such as language skills, citizenship or time spent as total, or every year did not correlate with the VIA scores.

In general, these correlations show that a positive evaluation of the health care system or professionals correlate positively and moderately with positive attitudes to the COVID-19 vaccine in each sample regardless of the country. Moreover, one-item measures of trust and competence correlated with the HCSDS scales strongly but not perfectly, indicating that while overlapping, these variables measure slightly different aspects of trust and competence. Therefore, these four measures of trust and competence were entered into the regression models.

3.3. Predictors of positive attitudes to COVID-19 vaccination: hierarchical regression analysis and path analysis

Three separate hierarchical regression analyses were conducted. Age, gender, and health care trust measures for the Norwegians and Polish in Poland were entered into the model. For the Polish immigrants in Norway, acculturation measures (Table 5) were also entered into the model.

Results of the regression analyses are presented in Table 5. Among the Norwegians, the regression model explained 40% of the variance in COVID-19 vaccination attitudes. Age was negatively, and the trust measures (single-item measure, HCSDS Competence, HCSDS Values) positively related to the COVID-19 vaccination attitudes. The most important predictor was the HCSDS Value scale. The regression model explained 50% of the variance in COVID-19 vaccination attitudes among the Polish in Poland. Similarly, as in the Norwegian sample, the single-item measure of trust and the HCSDS Value scores were positively related to COVID-19 vaccination attitudes. Unlike in the Norwegian sample, competence evaluations did not predict COVID-19 vaccination attitudes. The third regression analysis was conducted among Polish immigrants in Norway. In the first model, all other variables except two acculturation scores were entered into model. The variables accounted for 36% of the variance in COVID-19 vaccination attitudes. In the second model, acculturation variables (VIA scores) were added to the model. The second model accounted for 37% of the variance. Only HCSDS Value scores predicted COVID-19 vaccination attitudes significantly.

Since the correlation analysis showed statistically significant correlations between COVID-19 vaccination attitudes, HCSDS scales, and identification to Norwegian culture at the same time when acculturation variables did not appear as significant predictors in the regression analysis, we expect HCSDS scores to mediate the effects of cultural identification on COVID-19 vaccination attitudes. Since the hierarchical regression analysis showed that only HCSDS Values predicted COVID-19 vaccination attitudes, we tested a mediation model in which HCSDS Value scores mediated the effects of acculturation to Norway on COVID-19 vaccination attitudes. The path model is displayed in Fig. 1. Fig. 1 shows a full mediation of HCSDS values between acculturation to Norway and attitudes to the COVID-19 vaccination. This result means that acculturation to Norway increases the trust in ethical values of the Norwegian health care system, which in turn predicts the positive attitudes to the COVID-19 vaccination.

4. Discussion

Countries struggling with the COVID-19 pandemic have tried to mitigate the adverse effects of COVID-19 by using a great variety of measures. Some of the measures, such as increased level of hygiene or face mask do not have drastic effects on people's everyday lifestyle while others, such as social distancing, restrictions for public gatherings and travel, can have strong adverse effects on the individual, social rela-

Table 4
Correlations between the variables among Polish in Norway.

		1	2	3	4	5	6	7	8	9	10	11	12
1.	Attitude to vaccine	1.00											
2.	Healthcare: Trust	.49***	1.00										
3.	Healthcare: Competence	.45***	.62***	1.00									
4.	HCSDS-Competence	.44***	.60***	.70***	1.00								
5.	HCSDS-Values	.55***	.63***	.63***	.75***	1.00							
6.	HCSDS	.53***	.66***	.71***	.93***	.94***	1.00						
7	Norwegian language	.00	.04	−0.01	−0.02	.08	.04	1.00					
8	Norwegian Citizenship	−0.02	.06	.06	.07	.03	.05	.31***	1.00				
9	Time spent in Norway	−0.09	−0.04	.02	−0.14	.01	−0.06	.05	−0.10	1.00			
10	Years living in Norway	.16	.17	.15	.15	.19*	.18*	.28***	.39***	−0.12	1.00		
11	Acculturation to Poland	−0.08	−0.10	−0.11	−0.01	.03	.01	−0.18	.05	.04	.05	1.00	
12	Acculturation to Norway	.24*	.42***	.36***	.51***	.54***	.56***	.24*	.36***	.06	.39***	.17	1.00
13	Acculturation: preference	.25**	.38***	.35***	.38***	.37***	.40***	.32***	.22*	.01	.24*	−0.70***	.59***

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

Table 5
Hierarchical regression analysis results for different samples.

	B	Std. Error	Beta	t	95.0% CI for B
Norwegians in Norway (R^2=0.40; $F_{6,208}$=22.72***)					
Age	.00	.00	−0.16	−2.79**	−0.01; 0.00
Gender	.02	.06	.02	.42	−0.09; 0.14
Healthcare: Trust	.14	.07	.16	2.11*	.01; 0.28
Healthcare: Competence	.07	.06	.08	1.08	−0.05; 0.19
HCSDS-Competence	.24	.09	.22	2.49*	.05; 0.42
HCSDS-Values	.25	.07	.26	3.44***	.11; 0.39
Polish in Poland (R^2=0.50; $F_{6,172}$=27.47***)					
Age	.00	.00	.04	.73	.00; 0.01
Gender	−0.25	.14	−0.11	−1.80	−0.53; 0.02
Healthcare: Trust	.22	.08	.21	2.75**	.06; 0.38
Healthcare: Competence	.06	.09	.05	.67	−0.12; 0.25
HCSDS-Competence	.06	.11	.05	.60	−0.15; 0.28
HCSDS-Values	.64	.11	.49	6.00***	.43; 0.85
Polish in Norway					
Model 1. Acculturation variables excluded (R^2=0.36; $F_{6,85}$=7.45***)					
Age	.01	.01	.07	.79	−0.01; 0.03
Gender	−0.09	.24	−0.03	−0.36	−0.56; 0.39
Healthcare: Trust	.18	.17	.13	1.03	−0.17; 0.52
Healthcare: Competence	.22	.19	.16	1.15	−0.16; 0.60
HCSDS-Competence	−0.21	.24	−0.14	−0.87	−0.70; 0.27
HCSDS-Values	.76	.25	.48	3.08**	.30; 1.25
Model 2. Acculturation variables included (R^2=0.37; $F_{8,85}$=5.55***)					
Age	.01	.01	.08	.83	−0.01; 0.03
Gender	−0.09	.24	−0.03	−0.35	−0.57; 0.40
Healthcare: Trust	.18	.18	.13	1.02	−0.17; 0.53
Healthcare: Competence	.21	.20	.15	1.05	−0.18; 0.60
HCSDS-Competence	−0.20	.25	−0.13	−0.79	−0.69; 0.30
HCSDS-Values	.83	.27	.52	3.10**	.30; 1.36
Acculturation to Poland	.02	.17	.01	.14	−0.32; 0.37
Acculturation to Norway	−0.18	.25	−0.08	−0.73	−0.67; 0.31

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

tions, and public life in addition to economic activities. For example, social distancing can increase social rejection, growing impersonality, and the loss of a sense of community (Sikali, 2020). As proposed by (Orben, Tomova, and Blakemore, 2020), physical interactions are an essential part of human social experience and particularly important for the social development of young people. Therefore, distance education and restrictions in free time hobbies can have long-lasting negative effects, especially for children and adolescents. COVID-19 vaccines are effective and safe (Golob, et al., 2021) and do not have such long-lasting adverse effects on people and the economy as social distancing. The COVID-19 vaccine is simply the most effective way to reduce the health impact of the pandemic and to secure the return to normal life.

Vaccine, however, is not the same as vaccination. Now when several COVID-19 vaccines have been proven safe and effective, the effectiveness of the vaccination strategy in curbing the COVID-19 pandemic depends solely on the proportion of fully vaccinated people (Chen, 2021) as well as the efficiency of the vaccines against possible new virus variants. Recent studies conducted in different countries show that vaccination hesitancy and, consequently, the number of people opting not to get vaccinated is especially high among certain ethnic minorities and immigrants (Carson, et al., 2021; Hildreth and Alcendor, 2021; Iacobucci, 2021; Kadambari and Vanderslott, 2021; Ndugga, et al., 2021). In the present study, we investigated attitudes to COVID-19 vaccination among Polish immigrants in Norway, Polish living in Poland and Norwegians living in Norway. ANCOVA results indicated significant group differences when gender and age were controlled. Norwegians had a significantly more positive attitude to COVID-19 vaccination than the Polish immigrants in Norway, but they also scored higher than Polish living in Poland. The Polish immigrants did not differ from the Polish living in Poland. These results confirm the earlier findings of higher vaccination hesitancy among immigrants. While the earlier studies have been limited only to the inhabitants of one country (majority vs minority), the present study included both the majority group (Norwegians) and the non-immigrants (Polish in Poland) from the country where the immigrants came from. Interestingly, immigrants' attitudes to COVID-19 vaccination were at the same level as the attitudes of the Polish people living in Poland, i.e., more negative than the attitudes of Norwegians. This might indicate that the Polish immigrants' attitudes to COVID-19 vaccination reflect the attitudes of the Polish people in general and, thus, might not originate from the minority status and discrimination. Kachurka et al. (2021) found that nearly 45% of the Polish respondents were unwilling to be vaccinated, and none of the popular messages we used was effective in reducing this hesitancy (Kachurka, Krawczyk, and Rachubik, 2021). Some studies have demonstrated that anti-vaccine attitudes are related to anti-establishment attitudes and reflect the political polarization in Poland (Oleksy, et al., 2022). Moreover, believe in conspiracy theories seem to be common among Polish and, thus, one of the most important factors reducing willingness to undergo vaccination (Sowa, et al., 2021).The high vaccination hesitancy observed in Poland might be reflected in the attitudes among those Polish immigrants in Norway who mostly follow Polish media.

Several studies conducted in different countries have demonstrated that trust in the vaccine and in governmental health authorities are strongly related to acceptance of the COVID-19 vaccination (Ebrahimi, et al., 2021; Jennings, et al., 2021; Konstantinou, et al., 2021; Lamot, Krecic, and Kirbiš, 2021; Park, Ham, Jang, Lee, and Jang, 2021; Szilagyi, et al., 2021). These studies show that trust in the safety and effectiveness and the importance of getting vaccinated reflect trust in the authorities. In our study, Norwegians had higher trust in the Norwegian health authorities than the Polish immigrants had, and Norwegians trusted the national health authorities more than the Polish living in Poland, who evaluated their trust in the Polish health care system. The Health Care System Distrust Scale (Shea, et al., 2008) scores showed the same pattern both in trust in values and trust in the competence of the health care system with one exception; the Polish immigrants evaluated the Norwegian health care system to be more trustworthy

than their Polish counterparts did when asked about the Polish health care system. This finding can reflect two mechanisms: especially first-generation immigrants tend to evaluate the institutions of their host country higher than those in the country of origin (Röder and Mühlau, 2011, 2012). Almost all participants in the present study were first-generation immigrants and, therefore, the HSCDS scale scores for them were higher than for Polish in Poland but lower than for Norwegians. On the other hand, experiences of discrimination might lead to distrust (Liebkind and Jasinskaja-Lahti, 2000), which can be reflected in mean values. Low trust scores among Polish living in Poland can reflect the finding from the World Value Survey (WVS) that the former Soviet Bloc countries including Poland score lower in social trust and health than Nordic countries including Norway (Jen, Sund, Johnston, and Jones, 2010).

It should be noted, however, that the acculturation to Polish heritage was not related to the health care trust scores or vaccination attitude scores among immigrants. Therefore, such characteristics observed in Poland as religiousness or low social trust should not explain Polish immigrants' trust scores or negative attitudes to the COVID-19 vaccination in the present study in a significant degree. One possible explanation why the Polish immigrants in Norway evaluated the Norwegian health-care system to be more trustworthy than the Polish inhabitants did evaluate the Polish system is very simple: Norway is one of the wealthiest countries in Europe and, thus, can provide better health care services to its population than Poland. Norway has 4.7 physicians per 1000 population while the same number for Poland is 2.4. Norway spends 6187 USD per capita on health care, while the corresponding figure for Poland is 2056 (OECD, 2019). Differences in trust measures between Norwegians and Polish might simply reflect the citizens' level of services from their government.

The aim of this study was to investigate the relationship between trust, acculturation, attitudes to COVID-19 vaccination. Correlation analyses conducted separately in each sample show that trust in the competence and values measured with both single-item measures and Revised Health Care System Distrust Scales correlated moderately with the attitudes to COVID-19 vaccination. Interestingly, the correlations were about in the same level in each sample, i.e., trust in health care personnel/system was an equally important factor among Norwegians, Polish immigrants in Norway, and Polish in Poland. In hierarchical regression analyses, especially the Health Care System Distrust Value scale appeared as an important predictor of COVID-19 vaccination attitudes. These results indicate that high trust in the health care system promotes positive attitudes to COVID-19 vaccination regardless of the actual quality of the system. It is crucial, therefore, that the national governments put effort on their ways of communicating with the public about health issues. Designing effective and transparent communication about COVID-19 is not easy. A study conducted among Americans and Danes shows that transparent negative communication about the COVID-19 vaccination can harm vaccine acceptance while increasing trust in health authorities (Petersen, Bor, Jørgensen, and Lindholt, 2021). Vague and reassuring communication, on the other hand, did not increase vaccine acceptance either and led to both lower trust and higher endorsement of conspiracy theories.

Interestingly, among the Polish immigrants, the "hard measures" of acculturation such as Norwegian language skills, citizenship or years lived in Norway did not correlate with trust in the health care system, while these measures correlated significantly with acculturation scores measured with VIA. The VIA acculturation measure "Norwegian culture identification" correlated significantly with attitudes to COVID-19 vaccination and moderately to trust in the Norwegian health care system. Polish culture identification did not correlate significantly with the trust measures or COVID-19 vaccination attitudes. These results seem to indicate that identification with the majority culture matters. Somehow this is a hopeful message for immigrants: a successful acculturation process – at least in terms of trust in the health care system – does not require abandoning one's original culture but instead requires embracing the new culture. According to acculturation literature, integration in which the immigrant adopts the mainstream culture while maintaining the heritage culture is the most preferred acculturation strategy among immigrants (Sam and Berry, 2016). Integration of two cultures seems to be the optimal adoption status providing the best health outcomes and psychological wellbeing (Berry and Sabatier, 2011; Brand, et al., 2017). The path analysis indicated that the effects of identification to Norwegian culture on COVID-19 vaccination attitudes were mediated by the trust (values) in the health care system. Hence, the acculturation process characterized by assimilation or integration leads to higher trust in health authorities, which is reflected as positive attitudes to COVID-19 vaccination.

The present study has some limitations which should be acknowledged. Firstly, the data set was collected by using Facebook advertisements and internet-based surveys. While this data collection method has many benefits, such as being fast, inexpensive, anonymous, and offering the possibility to reach a large number of community members, the sample of Facebook and Instagram users might not represent the population well. In future studies, population-based random selection methods could be used. The problem with these methods is that immigrants might not be willing to participate in postal studies or telephone interviews. Participation in anonymous surveys via social media might be experienced less threatening than a survey sent by a research institute. Second, the Polish sample collected in Norway was far too small to allow subgroup analysis and the Polish immigrants were treated as a single entity while we can assume that an immigrant population of 110,000 people is a very heterogeneous group with various lifestyles and backgrounds. A larger sample would allow a detailed analysis of various reasons for vaccine hesitancy or anti-vaccine attitudes. Third, this study showed that Polish immigrants vaccine attitudes differed from those of Norwegian speaking Norwegians but not from Polish living in Poland. Further analysis showed that these attitudes were influenced by trust in the health care system, which was influenced by acculturation to Norwegian culture, reflecting either integration or assimilation. However, the present study does not finally describe the mechanisms of how the negative attitudes to vaccinations or to health care system are adopted. In future studies, the use of Polish and Norwegian media (e.g., newspapers, magazines, TV, internet) and social media should be measured in detail. It is possible that the type of media channels followed by the immigrant are the most important factors determining the attitudes to health and social issues.

The conclusion of the study is straightforward. Polish immigrants in Norway have significantly lower trust in the competence and values of the Norwegian health care system than the ethnically Norwegian population. This mistrust is reflected in attitudes to COVID-19 vaccination and can result in a lower vaccination rate among Polish immigrants. Low vaccination rates, on the other hand, can lead to unnecessary suffering and increase health inequalities. Norwegian health authorities should design specially targeted interventions and communication strategies to address the distrust among Polish immigrants. When designing these interventions, community members from the Polish immigrant community should have a central role in every stage of the project to secure the accuracy and relevance of the interventions.

Declaration of Competing Interest

None.

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