CHAPTER 3

Designing Strategic Communication Messages for Health in a High Trust Society: Analyzing the Factors Behind Vaccine Confidence in Norway

Audra Diers-Lawson Department of Communication, Kristiania University College
Nanna Alida Grit Fredheim Department of Communication, Kristiania University College

Abstract: The chapter aimed to identify factors influencing vaccine confidence in Norway. The findings revealed that several key factors explain more than 50% of the variation in vaccine attitudes offering valuable insights for policy and communication strategies to support vaccination programs. The study identified three noteworthy findings:

1. Age and childhood vaccination status were significant demographics affecting vaccine confidence. Younger individuals who did not receive childhood vaccinations expressed lower confidence in vaccines than older individuals who did.
2. Building health efficacy and maintaining the credibility of official sources of health information were found to be crucial for boosting vaccine confidence.
3. Two primary factors were found to be driving vaccine confidence in Norway: appealing to collectivist values and trust in science.

The research emphasized that Norway's institutional trustworthiness remained positive despite the COVID-19 pandemic and it highlighted that there was no significant difference between vaccine confidence and skepticism in the population. This suggests that skepticism should not be equated with vaccine hesitancy. Moreover, the findings suggest that public engagement and credible information are essential – even in high-trust societies like Norway.

Keywords: vaccination, Norway, high trust society, COVID-19, vaccine confidence

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The COVID-19 pandemic and the global priority placed on the development and distribution of vaccines to combat the spread and severity of the pandemic has again brought the topic of vaccination hesitancy to the forefront of people's minds. Despite the strategic communication efforts on the part of global public health agencies for vaccination, vaccine hesitancy was listed by the World Health Organization (WHO) as one of the top 10 threats to human health before the pandemic began (WHO, 2019). Within the COVID-19 context, reducing vaccine hesitancy through effective strategic communication campaigns has been identified as one of the critical threats to managing the disease globally (Palamenghi et al., 2020). Vaccine hesitancy and the anti-vaccination movement are often colloquially treated as more alike, with hesitant people being viewed as a milder version of the "anti-vaxxers". The "anti-vax" movement is often characterized as representing people on the fringe of society who believe in conspiracy theories and have an inherent institutional distrust (Allington et al., 2021; Featherstone & Zhang, 2020; Jennings et al., 2021; Sallam et al., 2021). Yet, the face of the vaccine hesitant are often parents who have concerns about vaccination safety for their children as well as ethnic minorities and people from poorer families (Poltorak et al., 2005; Robertson et al., 2021). Other research also identifies those who are younger, female, and consume higher amounts of information from social media as being more vaccine hesitant (Allington et al., 2021), so the assumed equivalence between them is both unfair and inaccurate.

This suggests there is a fundamental difference between people who are ideologically against vaccination (Kennedy, 2019; Wollebæk et al., 2022) and those who might be hesitant to take a particular vaccine out of concerns about safety, testing, and effectiveness (Kricorian et al., 2022; Mesch & Schwirian, 2015). Also, within the context of the COVID-19 pandemic and the race to find, test, and roll-out vaccinations globally, we must acknowledge that the uncertainty of the situation and uniqueness of this experience might have changed people's perceptions of risk, consumption of information, and confidence in vaccination as well (Bendau et al., 2021; Breakwell, 2000; Breakwell et al., 2021; Breakwell & Jaspal, 2020). Therefore, it may be more precise to think of vaccine hesitancy in terms of the confidence that people have in taking vaccines. This is also aligned with the significant role that efficacy plays in health decision-making (While, 2021). In a "post-COVID" context, the better question to ask may be what drives vaccine confidence rather than vaccine hesitancy. *Therefore, the first objective in this chapter is to identify key factors influencing Norwegian attitudes about vaccines.*

Globally, vaccine attitudes are well studied with research emerging in large cross-national comparisons (Cataldi & O'Leary, 2021; Streefland et al., 1999; Wagner et al., 2019) and in a variety of countries around the world both before the COVID-19 pandemic (Dubé et al., 2013; Kennedy, 2019; Sobo, 2015) and certainly after (Allington et al., 2021; Ihlen, 2020; Weinzierl & Harabagiu, 2022). In a 67-nation study, Larson et al. (2016) found that while vaccine confidence varied between countries it was generally correlated with perceptions of importance, safety, and religious compatibility. Yet, they also found that, as a region, Europe had the lowest confidence in vaccine safety. The evidence about vaccine confidence globally is mixed; likewise, the uptake of the COVID-19 vaccine has been mixed – even in Europe (see Figure 1) vaccination rates for COVID-19 range from 88% in Spain to 38% in Armenia. Regionally, Northern Europe on average has a meaningfully higher vaccination rate for COVID-19 compared to the

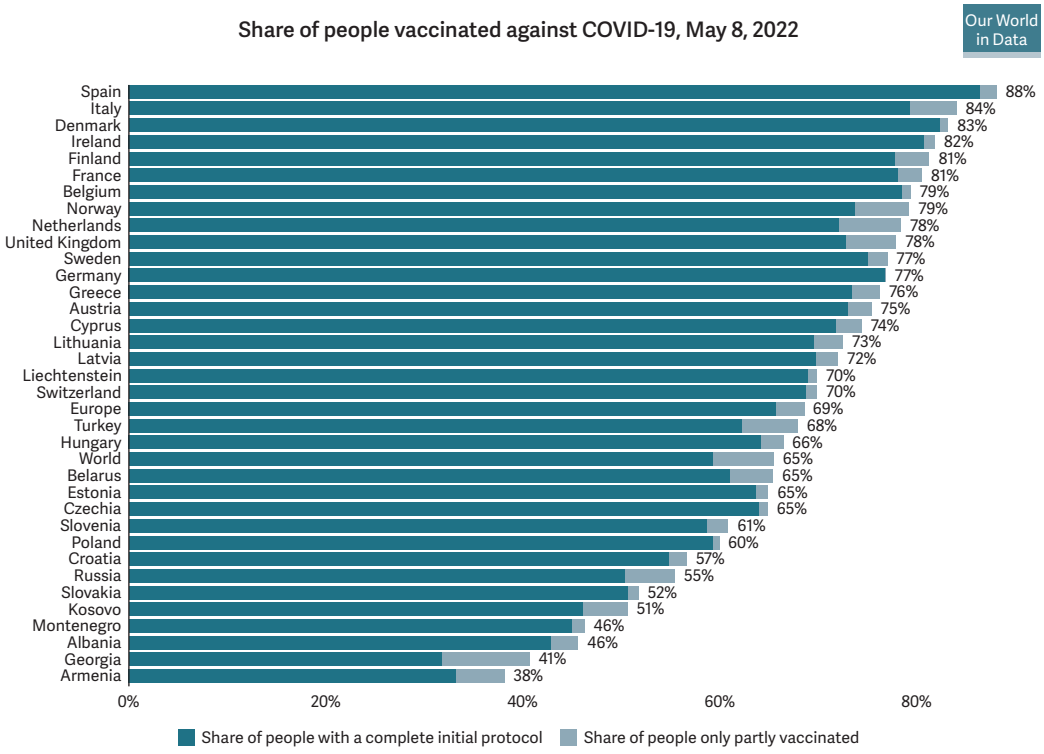

Figure 1 Summary of European Vaccination Rates Reported Relative to Population. Source: Official data collated by Our World in Data, CC BY

Note: Alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries.

rest of Europe and in the Nordics (i.e., Denmark, Finland, Norway, and Sweden) the vaccination rate has been very high with an average of 80% of the population vaccinated against COVID-19. *Thus, the second primary objective of this chapter is to make recommendations about possible theoretical perspectives to guide communication strategy about vaccines in a Norwegian context.*

Similarly, the Nordics experienced significantly fewer deaths per million compared to the European average throughout the COVID-19 pandemic (see Figure 2). In part, this can be attributed to high levels of compliance with government recommendations and rules throughout the pandemic (Helsingen et al., 2020) as well as a general willingness to follow government and health agency recommendations for both pharmaceutical and non-pharmaceutical interventions that were introduced throughout the pandemic (Helsingen et al., 2020; Juranek & Zoutman, 2021). Though there were significant differences in the death rates in Sweden that are attributable to less severe lockdown restrictions and more open government recommendations (Helsingen et al., 2020; Juranek & Zoutman, 2021), the principle that remains consistent across the Nordics is that they are high-trust societies (Andersen, 2018). Anderson (2018) points out that Nordic societies express the highest levels of institutional trust in the world, high levels of social cohesion, low corruption, and high levels of equality.

The conditions surrounding the pandemic, cultural attitudes, low COVID-19 death rates, and high vaccination rates make the Nordic region important for understanding positive vaccine attitudes. We suggest there are important lessons that can be learned for other countries about creating the conditions for improving health outcomes. Norway has the second-best vaccination rate in the Nordics, lowest number of COVID-19 related deaths, and highest levels of institutional trust (Norge, 2021) which makes it a potential model for building vaccine confidence. Traditionally, Norway has high levels of routine vaccination and especially high childhood vaccination rates (FHI, 2017; NIPH, 2022). There are also a number of recent studies that have explored vaccine "hesitancy" in Norway both independent of and related to the COVID-19 pandemic finding that demographics (Ebrahimi et al., 2021) concerns over vaccine safety and efficacy (Cataldi & O'Leary, 2021; Ebrahimi et al., 2021), vaccine-related information consumption (Ebrahimi et al., 2021; Fues Wahl et al., 2022), immigrant status (or family of immigrants) (Jenness et al., 2021; Skjesol & Tritter, 2022), perceptions of equity and social solidary

(Skjesol & Tritter, 2022), institutional trust (Norge, 2021; Skjesol & Tritter, 2022), and values or ideological culture (Wollebæk et al., 2022) all have influenced Norwegian participants' attitudes and/or behavioral intention to be vaccinated. Yet, most studies focus on attitudes of vaccine rejection instead of confidence.

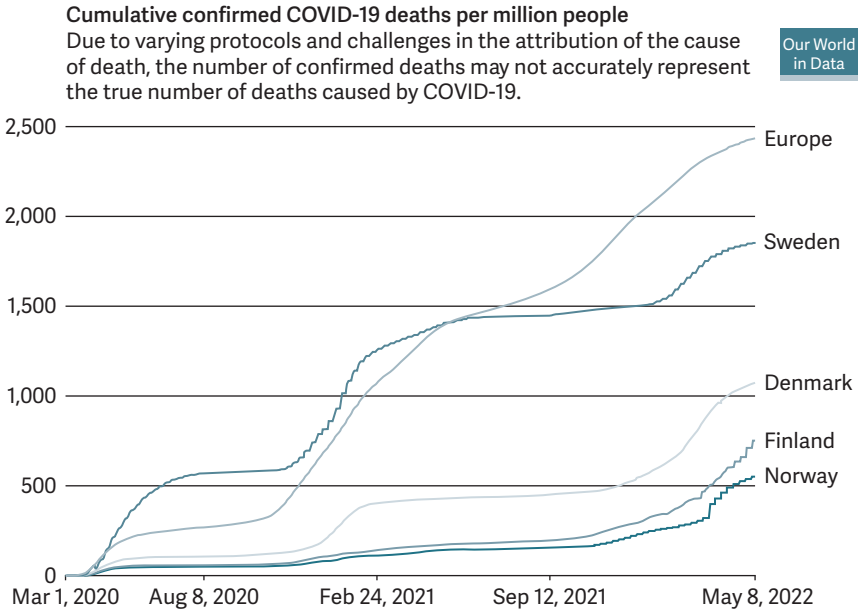

Figure 2 Cumulative COVID-19 Deaths Per Million in Scandinavia Compared to Europe. Source: Johns Hopkins University CSSE COVID-19 Data, CC BY

It is also evident that the Norwegian studies have not explored the predictive factors together nor have they explored other important factors like health efficacy (While, 2021) or attitudes about science (Palamenghi et al., 2020; Poltorak et al., 2005; Thaker, 2021), which previous research has found to influence vaccine attitudes in other countries like New Zealand, Belgium, and the UK.

Once a more complete picture of the factors influencing vaccine confidence are identified, then the question of how they inform communication strategy becomes relevant. Communication is inexorably linked to the processes of creating or overcoming vaccine hesitancy (Ihlen, 2020; Kricorian et al., 2022; Poltorak et al., 2005; Thaker, 2021). Yet, one of the challenges in creating effective communication strategy is that not only are there many possible factors that can affect Norwegians' vaccine attitudes, but there are

also many possible theories to guide communication recommendations (see Table 1). From a practical standpoint how to choose the best approach remains arguable.

Literature review

Different studies have conceptualized factors influencing vaccine attitudes in different ways. In this section, we provide a brief background on each of the five factors we are exploring in this study. Initially, we argued that the rationale for including demographics, values, health attitudes, institutional attitudes, and trusted sources of information in a Norwegian context was because they are consistent with previous research both about vaccine attitudes in general as well as within Norway. However, there are factors that we are not measuring such as belief in conspiracy theories within low trust environments (Allington et al., 2021; Featherstone & Zhang, 2020; Jennings et al., 2021; Sallam et al., 2021). We do not include these factors because as Wollebæk et al. (2022) suggest, it is likely the underlying levels of institutional trust and social values that ground political attitudes. Therefore, in identifying stable factors that predict vaccination attitudes, we should examine the underlying factors, not indicators of them. As such, our objective was to focus on underlying attitudes and identities that were also appropriate within a Norwegian context. Moreover, because the question of vaccine attitudes is typically expressed in the negative (i.e., hesitancy), we know less about the factors contributing to vaccine confidence, which is essential in a post-COVID-19 context.

Demographics

Across the study of vaccine attitudes, demographics that contribute to explaining or predicting vaccine hesitancy have been broadly inconclusive though there have been a few clear patterns emerging over time (Larson et al., 2016). For example, Ebrahimi et al. (2021) found that in Norway men, parents with children under 18, and those choosing to consume more information from unmonitored media platforms were more likely to be vaccine hesitant, whereas education and age did not influence vaccine hesitancy. Yet in recent studies other factors like whether people work in healthcare (Vergara et al., 2021) or have experience with other vaccines, like the flu vaccine, emerged as important predictors of vaccine hesitancy (Soares et al.,

2021). Within Norway, those who were born outside of Norway have also been found to be more vaccine hesitant (Jenness et al., 2021). However, in most countries, people from lower socio-economic status or who were economically unstable because of the pandemic were much more likely to be vaccine hesitant (Bendau et al., 2021; Deml et al., 2019; Kricorian et al., 2022; Soares et al., 2021; Wagner et al., 2019). Thus, the question remains in a high trust environment, what demographic factors contribute to vaccine confidence?

Values

Political and religious attitudes have a great level of variance by culture and country and are often difficult to equate and measure (Froese & Bader, 2008). Therefore, as we previously discussed, exploring ideological attitudes underlying political and religious attitudes may be a more useful way of exploring attitudes towards vaccination in a Norwegian context (Wollebæk et al., 2022). For example, it has been long established that egalitarianism characterized by highly valuing the collective good and social welfare is core to typical Norwegian cultural values and recent research suggests that the pandemic has only strengthened these attitudes (Greve, 2007; Greve et al., 2021). Therefore, measuring values in a Norwegian population directly may provide a stronger causal connection to vaccine attitudes than other measures of political and religious ideology.

Health attitudes

In Norway, health attitudes have also been found to influence vaccine attitudes where those who have a lower level of anxiety about disease, believe they have a higher level of natural immunity, or have lower levels of health efficacy (i.e., their belief in their ability to take action to improve or protect their health) are more likely hesitant to be vaccinated (Cataldi & O'Leary, 2021; de Vries et al., 2022; Ebrahimi et al., 2021). These findings are consistent with other research related to COVID-19, which suggests that vaccine hesitancy is reduced when people are more anxious about the disease and more generally health-related fears (Bendau et al., 2021), but increased when people have lower levels of health anxiety (Deml et al., 2019). For these reasons, health attitudes should be considered related to vaccine confidence.

Institutional trustworthiness

Overall, when key institutions like governments and health authorities are viewed as highly trustworthy, then people are less vaccine hesitant (Ebrahimi et al., 2021; Gilkey et al., 2014; Jennings et al., 2021; Kennedy, 2019; Mesch & Schwirian, 2015; Raude et al., 2016; Skjesol & Tritter, 2022; Troiano & Nardi, 2021). One of the barriers to vaccination globally during COVID-19 have been perceptions that the vaccination development and approval process has been rushed (Troiano & Nardi, 2021; Wollebæk et al., 2022). As such, institutional trustworthiness needs to be seen within the broader context of science communication and how attitudes about "science" as an institution, influence vaccine attitudes. For example, recent findings suggest that the more effectively the science behind vaccination recommendations is translated for citizens it not only reduces vaccine hesitance but also increases trust in science and improves compliance with scientifically based recommendations (Goldenberg, 2016; Ihlen, 2020; Palamenghi et al., 2020; Poltorak et al., 2005; Xu et al., 2021).

Trusted information sources

It is clear in Norway (Ebrahimi et al., 2021; Fues Wahl et al., 2022) and around the world that information quality and credibility are also key influencers of vaccine attitudes (see e.g., Bíró-Nagy & Szászi, 2022; Pierre, 2019; Šiđanin et al., 2021). This is the case for a host of reasons including: misinformation lingering in people's memories (Pluviano et al., 2017); the refutational process surrounding correcting misinformation creating emotional reactions (Featherstone & Zhang, 2020; Gehrau et al., 2021; Sun et al., 2020), and leading to the conclusion that social media consumption is a significant predictor of vaccine hesitancy (de Vries et al., 2022; Jennings et al., 2021). However, one of the challenges is that crises cause uncertainty, which heightens information consumption, so while people may try to consume information from credible sources, they may also look for any information possible (Diers-Lawson, 2020; Puri et al., 2020). Therefore, exploring the sources of information that Norwegians trust for health information is likely critical to understanding vaccine attitudes.

Based on the state of research on vaccine attitudes, particularly in a Norwegian context, we propose the following conceptual model for this study (see Figure 3):

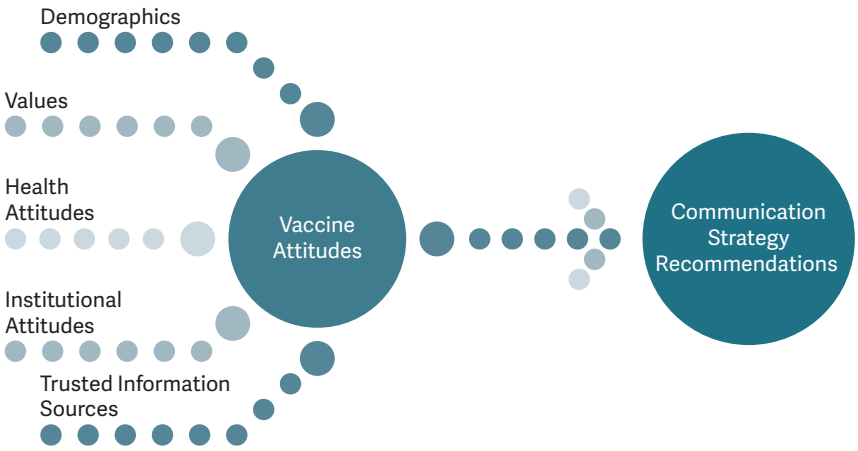

Figure 3 Conceptual Model for Study.

Our research objectives and this conceptual model then leads to one central research question with several sub-questions we explore in this chapter:

RQ: What factors influence vaccine confidence in Norway?
- RQ1A: To what extent do demographics (e.g., gender, age, education, etc.) influence vaccine confidence in Norway?
- RQ1B: To what extent do values influence vaccine confidence in Norway?
- RQ1C: To what extent do health attitudes influence vaccine confidence in Norway?
- RQ1D: To what extent do institutional attitudes influence vaccine confidence in Norway?
- RQ1E: To what extent do trusted sources of information influence vaccine confidence in Norway?

Methods

To identify the most viable communication strategies for engaging Norwegians to support vaccine confidence this study takes a broad view of the factors that might influence attitudes about vaccination. However, the factors group into five categories: demographics, values, health attitudes, institutional attitudes, and trusted sources of information. In the methods we will operationalize these variables and their measures, methods for data collection and the sample, and methods for data analysis.

Variable Operationalization

In the literature review, we have identified the central findings and gaps for each of the variables explored in this study. Table 1 summarizes the operationalization of the variables and reliability for each of them. We measured the following demographic factors in this study to determine their influence on vaccine attitudes: Norwegian nationality (i.e., born in Norway or not), gender, age, income, education, parental status of a child under 18, and whether people work in healthcare or a related industry. Each of these were tested for their influence on vaccine confidence. Second because we argue that values underlying concepts like belief in conspiracy theory, political ideology, and the like may be more effective measures of vaccine attitudes, we have used Schwartz's (2012) theory of basic values (see Table 1 for factor analysis results) to operationalize values in this study. Third, health attitudes driving vaccination confidence focus largely on people's belief that vaccines are safe and effective; therefore, we have operationalized health attitudes using Bandura's (1972) measures for efficacy to measure health attitudes. The factor analysis (see Table 1) revealed that health efficacy and health anxiety are viewed separately by Norwegians.

Fourth, we measured institutional trust using Diers-Lawson's (2020) scale for institutional trustworthiness (see Table 1). However, because Norway is a high trust context, we would expect high levels of institutional trust. To better analyze the data, we analyzed institutional trust as an overall measure, but we have also discretized the variable to categorize high, medium, and low trust individuals. Therefore, in the analysis, participants whose mean institutional trust factor score was 1.00–2.99 were rated as "low trust" (N = 60), those from 3.00–3.99 were rated as "neutral trust" (N = 132), and those from 4.00–5.00 were rated as "high trust" (N = 62). We also operationalized institutional trust in terms of trust in science and used Roberts et al's (2013) measure for trust in science.

Fifth, to explore trusted information sources, we asked participants about a number of information sources they relied on for information about vaccination. The factor analysis (see Table 1) demonstrates that there is a clear delineation in the use of "official" sources and advocacy or influencer sources of information about vaccines.

Finally, vaccine attitudes were measured in terms of Gilkey et al.'s (2014) vaccination confidence scale. The factor analysis (see Table 1) identified that Norwegians consider vaccine confidence as being distinctive from skepticism, so even when reverse coded the negative attitudes did not group with the confidence measures.

Table 1 Operationalisation of Study Variables

Variable	Questions	Author(s)	Eigen-value	Variance Explained	Factor Loading	Alpha
Values – Collectivist	Preventing pollution, protecting natural resources	Schwarz (2012)	5.54	46.17	.80	.92
	Equality, equal opportunity for all				.76	
	Protecting the environment, preserving nature				.81	
	Unity with nature, fitting into nature				.74	
	Helpfulness, working for the welfare of others				.78	
	Social justice, correcting injustice, care for the weak				.84	
	Peace, a world free of war and conflict				.82	
	Respecting the earth, harmony with other species				.80	
Values – Power/ Dominance	Authority, the right to lead or command		2.29	19.12	.89	.81
	Social power, control over others				.86	
	Influence, having an impact on people & events				.73	
	Wealth – material possessions, money				.66	
Institutional Trustworthi-ness	... are transparent	Diers-Lawson (2020)	4.35	39.57	.71	.90
	... provide all of the latest information with the public				.77	
	... share information freely with the public				.75	
	... give me a feeling of trust				.82	
	... demonstrate they are dedicated to being good				.84	
	... are typically truthful				.83	
	... give me a trustworthy impression				.79	
Trust in Science	...make our lives healthier, easier, more comfortable	Roberts, et al. (2013)	3.37	48.15	.75	.82
	...can solve nearly any problem				.72	
	...play an important role in economic and industrial development				.73	
	I would support the govt investing in more sci & technology				.75	
	Science is very effective in dealing with disease.				.73	

(*Continued*)

Table 1 (*Continued*)

Variable	Questions	Author(s)	Eigen-value	Variance Explained	Factor Loading	Alpha
Health Anxiety	I often have anxiety about m/ my family's health	Bandura (1982)	2.84	31.53	.83	.81
	Given the state of the world, I worry about my/my family's health regularly				.86	
	I often worry that I/my family will get sick out in public.				.81	
Health Efficacy	I try to live a generally healthy life.	Bandura (1982)	1.73	19.23	.83	.65
	I encourage my friends/family to live a health life.				.68	
	When it comes to making decisions about healthcare, I am confident in my ability to make the right decision.				.74	
Source Trust: Advocates & Influencers	People on social media/ social media networks		1.74	21.73	.90	.78
	Social Media Influencers				.89	
	Health-related advocacy groups				.61	
Source Trust: Official Sources	Health-related non-profits or charities		3.21	40.10	.64	.72
	HelseNorge				.81	
	My local GP				.80	
	Government				.68	
Pro-Vaccination	Vaccines are necessary to protect public health.	Gilkey, et al. (2014)	3.93	49.17	.86	.88
	Vaccines do a good job in preventing the intended diseases.				.90	
	Vaccines are safe.				.75	
	If I don't vaccinate my child, s/ he may get a disease & cause others to also get the disease.				.72	
	In general, medical professionals in charge of vaccinations have people's best interests at heart.				.81	
Vaccine Skepticism	People receive too many vaccinations	Gilkey, et al. (2014)	1.33	16.56	.80	.60
	If my child were to get a vaccination s/he may have serious side effects.				.86	

Data collection and sample

Data were collected from a paid panel of participants in Norway using SmartSurvey, a paid survey panel, in January 2022. This yielded a total of 258 participants that were adequately representative of the Norwegian population. Because previous research found that Norwegian men were more likely to be vaccine hesitant, we ensured an adequate number of male participants, so have more men in the sample (N = 140, 54.3%) compared to women (N = 116, 45%), so men are slightly overrepresented in this sample. However, the median age in Norway is 39 (Review, 2022) and in our study sample it is 36. Similarly, the sample reflects Norway's relatively high level of education with approximately 35% of the population having at least a university degree (SSB, 2021) and in our sample it is 37.2%. Ethnically, 82% of Norway is Norwegian (Review, 2022) and in our sample 78% were Norwegian by birth. Therefore, the sample should be considered fairly representative of the Norwegian population with no meaningful systematic sample bias.

Moreover, in the sample 105 (40.7%) of the population were parents of a child under 18, 111 (43%) worked or had a family member who worked in a healthcare setting, and 228 (88.4%) of the population reported receiving routine vaccinations as a child. This suggests that there is both enough diversity in the sample regarding vaccination and health care experience to critically reflect on these factors.

Data analysis

Test data were analyzed in SPSS using correlation to establish that a relationship existed between independent and dependent variables. Then those independent variables that were significantly correlated were analyzed using hierarchical stepwise regression to identify the most stable models. To analyze the low, neutral, and high-trust respondents, the same analytic procedure was used but with only those participants selected whose institutional trust scores were in those categories.

Results and discussion

Our first objective was to identify the factors (see Figure 3) predicting Norwegian confidence in vaccination. Overall, these findings demonstrate that just a handful of factors account for more than 50% of the total variance in attitudes about vaccines (overall $R^2_{adj.} = .53$). This provides government

and public health with a powerful set of findings on which to build policy and communication strategy for supporting the vaccination programs into the future. In this section, we will both report the results from the analysis and discuss their relevance to the literature.

There are three minor findings that provide context for interpreting the strategic interventions to support or improve vaccine confidence. First, these findings suggest that segmenting the public in terms of age and whether people were fully vaccinated as children are the two most meaningful demographics that have significantly different attitudes. Specifically, people who are younger and did not receive vaccinations as children are less confident in vaccination than those who are older and received all their vaccinations as children. Second, these data suggest that building overall health efficacy – supporting people's belief they have a reasonable amount of control over their health outcomes – is also helpful in building confidence in vaccinations as a part of the control they have. Third, maintaining or improving the credibility in official (i.e., government and public health) sources of health information is also important for improving vaccine confidence.

However, there are two primary factors driving vaccine confidence in Norway. First, activating and appealing to collectivist values is the single most important factor driving vaccine confidence in these findings. Second, more than just institutional trustworthiness, trust in science was the other critical factor driving Norwegian confidence in vaccination.

This section will provide the detailed findings and then discuss these findings within the context of previous research, theory, and practice.

Vaccination confidence versus vaccine skepticism

To put these findings into context, it is also important to note that by the "end" of the pandemic restrictions in early 2022, Norway's institutional trustworthiness remained positive (M = 3.38, SD = .79). This is not surprising given that Norway is a high trust society and the government's transparency throughout the pandemic supported public trust (Ihlen et al., 2022; Skjesol & Tritter, 2022). However, one of the most surprising findings is that there was no significant difference between vaccine confidence (M = 3.93, SD = .80) and vaccine skepticism (M = 3.84, SD = .63) in the sample $t(256) = 1.56$; $p = .12$ suggesting that the Norwegian population is both highly confident and skeptical about vaccines.

Yet, given the success of the vaccination programs in Norway – both for COVID-19 as well as traditional vaccines – these data suggest that rather

than being on the opposite end of the spectrum from vaccine confidence, skepticism about vaccines should not necessarily be equated with vaccine hesitancy or a behavioral intention to reject vaccination. Instead, these data suggest that the public's positive disposition towards vaccination should not be assumed; rather, the public requires good information and consistent engagement. In combination with the high trust environment, these data also suggest institutional legitimacy, transparency, and credible information are vital to managing a skeptical public's view of vaccination. In short even in a high trust society, like Norway, there is a careful balance between vaccine confidence and skepticism that must be managed.

These data also suggest that future research should focus on scale development for vaccine hesitancy as distinctive from just the "negative" side of vaccine confidence. These data reflect previous research that establishes that positive and negative attitudes are not merely polar ends of a continuous scale, but fundamentally different constructs (Mal et al., 2018).

Identifying factors related to vaccine confidence

Table 2 shows the significant correlations for the two dependent variables of vaccine confidence. They are separated for the overall findings as well

Table 2 Significant Correlations Between Test Variables

Independent Variables	Vaccine Confidence			
	Overall	Low Trust	Neutral Trust	High Trust
Demographics				
Age	–.27**	–.31**	NS	NS
Gender	NS	.31**	NS	NS
Income	.12*	NS	NS	NS
Work in HC	.15*	.27**	NS	NS
Vaccinated as child	.16**	–.34**	–.22**	NS
Values				
Collectivist	.52**	.72**	.40**	NS
Power/Dominance	NS	.33**	–.19*	NS
Health Attitudes				
Health Efficacy	.35**	.46**	.22**	NS
Institutional Attitudes				
Institutional Trustworthiness	.41**	NS	.25**	NS
Trust in Science	.64**	.65**	.50**	.49**
Trusted Information Sources				
Official or Institutional	.58**	.49**	.47**	.53**
Advocates & Influencers	NS	–.26**	–.25**	NS

Notes: All figures represent *r* values. NS = Not significant; *= $p < .05$; **= $p < .01$.

as among low, neutral, and high trust participants. The only variables included were those that were significant for at least one test. For example, while all the demographics identified in methods were analyzed, only age, income, work in health care, and childhood vaccination were significantly correlated and thus discussed in this section.

Predictors for vaccine confidence amongst Norwegians

The significant correlations suggest that while demographics are important for vaccine confidence overall and amongst low trust participants, they have little influence amongst neutral and high trust participants. These data support the relative difficulty in identifying demographic factors that reliably predict vaccine attitudes or behavioral intention (Larson et al., 2016). In fact, for high trust participants, only trust in science and official or institutional sources influenced their confidence in vaccines. For both low and neutral participants, values, health attitudes, institutional attitudes, and information sources all influence their confidence in vaccines. This section provides the detailed results and discussion for Norwegians overall, and then for low, neutral, and high trust groupings of Norwegians. It should be noted that while the overall study sample is representative and large enough to be reliable within a 95% confidence interval, the smaller sub-sets are not. However, they point to the value of analyzing low, neutral, and high institutional trust publics separately. These data also suggest that categorizing people's institutional trust should be a critical factor for segmenting audiences for strategic communication endeavors. While previous studies have not analyzed institutional trust in this way, these findings and this approach is consistent with previous research identifying institutional trust as central to vaccine attitudes and behavioral intention (Ebrahimi et al., 2021; Gilkey et al., 2014; Jennings et al., 2021; Kennedy, 2019; Mesch & Schwirian, 2015; Raude et al., 2016; Skjesol & Tritter, 2022; Troiano & Nardi, 2021).

Overall findings for vaccine confidence amongst Norwegians

In presenting the results in more detail, the data for the overall confidence in vaccines converged in a significant five-model hierarchical regression $F(9, 247) = 32.65$; $p < .001$ with an overall adjusted R^2 of .53 (see Figure 4) with all models significantly contributing the adjusted R^2. However, in the final model, only age $t(247) = -2.53$; $p < .01$, $\beta = -.12$; being vaccinated as

a child $t(247) = -2.02$; $p < .05$, $\beta = -.09$; collectivist values $t(247) = 3.97$; $p < .001$, $\beta = .21$; trust in science $t(247) = 5.84$; $p < .001$, $\beta = .34$; and relying on official or institutional sources of information about vaccination $t(247) = 4.89$; $p < .001$, $\beta = .29$ were significant predictors of vaccine confidence. These data suggest that older Norwegians who were vaccinated as children, have higher levels of collectivist values, trust science, and mostly rely on official or institutional sources of information about vaccination had highest levels of vaccine confidence.

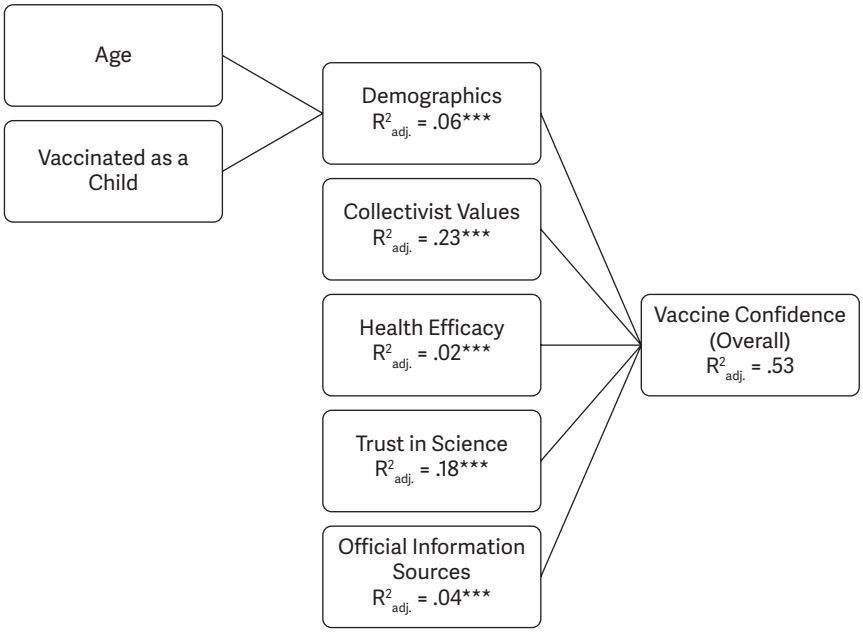

Figure 4 Summary of Results for Overall Vaccine Confidence.

Predictors of higher vaccine confidence amongst lower trust Norwegians

These data suggest that while overall vaccine confidence amongst Norwegians is relatively straight-forward, when we focus on lower trust Norwegians, the big picture seems to become more complex. While these data suggest that a bigger mix of variables influences vaccine confidence including demographics, trusted information sources about vaccination, and trust in science all influence vaccine confidence, the single biggest predictor of vaccine confidence is whether low trust Norwegians have collectivist social values.

The data for low trust participants' confidence in vaccines also converged in a significant five-model hierarchical regression $F(10, 48) = 12.54$; $p < .001$ with an overall adjusted R^2 of .67 (see Figure 5) with all models contributing the adjusted R^2. However, in the final model, only collectivist values $t(58) = 2.67$; $p < .01$, $\beta = .31$; trust in science $t(58) = 2.38$; $p < .02$, $\beta = .24$; and relying on official or institutional sources of information about vaccination $t(58) = 2.14$; $p < .04$, $\beta = .22$ were significant predictors of vaccine confidence amongst those with low institutional trust. The regression also demonstrates that it is the collectivist values that is contributing most

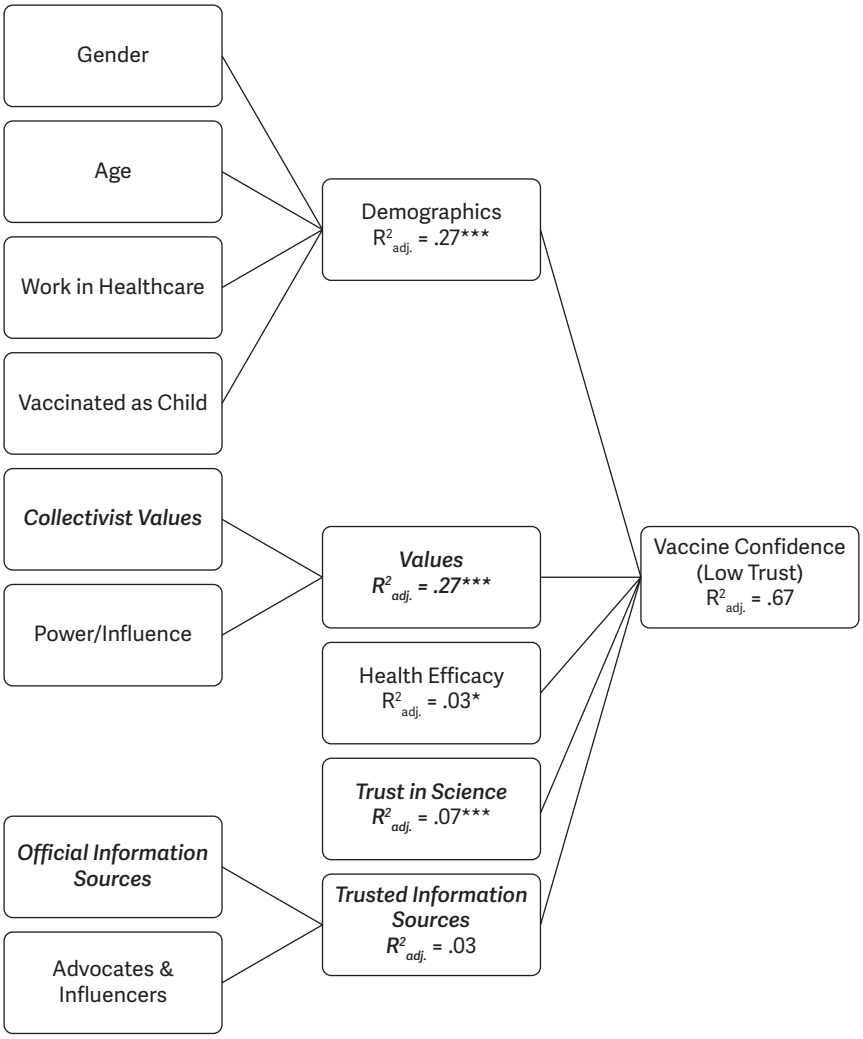

Figure 5 Summary of Results for Low Trust Participants' Vaccine Confidence.

to changes in low trust participant vaccine confidence. Therefore, low trust Norwegians who are: more collectivist, trust in science, and more likely to rely on official or institutional sources of information are most confident in vaccination.

These data also demonstrate that low trust participants might be the most susceptible to misinformation. Those who might value collectivism less or have slightly less trust in science might be more willing to consider vaccine information from other sources because they are already looking at them. From a risk management perspective, building institutional trust, trust in science, and most importantly building social solidarity is vital for engaging low trust Norwegians to ensure future compliance with vaccine recommendations and minimize the impact of misinformation. This is aligned with the strategy that the Norwegian government used throughout the pandemic (Skjesol & Tritter, 2022); however, these data suggest that it remains a risk.

Predictors of higher vaccine confidence amongst neutral trust Norwegians

The data for neutral trust participants' confidence in vaccines tells a similar story. Although it also converged in a significant five-model hierarchical regression $F(8, 126) = 13.38$; $p < .001$ with an overall adjusted R^2 of .43 with four of five models contributing the adjusted R^2; health attitudes did not. In the final model, though demographics significantly contributed to accounting for the variance ($R^2_{adj.} = .04$ $p < .01$), none of the variables were significant. However, values both significantly contributed to the model's explanation ($R^2_{adj.} = .18$ $p < .01$) and collectivist ($t(134) = 1.97$; $p < .05$, $\beta = .17$) and power/dominance ($t(134) = -2.46$; $p < .05$, $\beta = -.17$) were both significant predictors of vaccine confidence. Trust in science $t(134) = 2.96$; $p < .01$, $\beta = .25$ ($R^2_{adj.} = .12$ $p < .01$) was a significant predictor of vaccine confidence. Additionally, trusted sources of information were also significant contributors to the model ($R^2_{adj.} = .10$ $p < .01$) and both official or institutional sources of information about vaccination ($t(134) = 3.98$; $p < .01$, $\beta = .31$) and advocates and influencers ($t(134) = -3.32$; $p < .01$, $\beta = -.23$) were significant predictors of vaccine confidence amongst those with neutral levels of institutional trust.

These data suggest that, amongst neutral-trust Norwegians, collectivist values predict high confidence, so too does the rejection of values of wealth

and dominance. Furthermore, while trust in official or institutional sources also predicts high confidence, so too does the rejection of using advocate or influencer sources of information. While previous research identifies many different variables that lead to vaccine confidence or vaccine hesitancy, it does not talk about duality in values or information consumption. The neutral trust group represents a tipping point in vaccine confidence and may be pulled in different directions. Communication strategies for this group cannot, therefore, be the same as for low trust Norwegians because this groups needs more nuance. For example, building the credibility of official sources is not enough; they should also be more directly engaged on the risks of non-credible sources as well.

Predictors of higher vaccine confidence amongst high trust Norwegians

If significant persuasion is needed for low trust Norwegians and nuance is required for neutral trust Norwegians, the communicative efforts amongst high trust participants' is simpler – maintaining confidence in science and trust in official sources of information. This was because only these two variables significantly influenced their confidence in vaccines $F(2, 59) = 13.58$; $p < .001$ with an overall adjusted R^2 of .29. Though trust in science contributed significantly to the adjusted $R^2 = .24$), only official information, as a trusted source, significantly predicted changes in vaccine confidence for the high trust group ($t(61) = 2.53$; $p < .01$, $\beta = .37$, $R^2_{adj.} = .07$ $p < .01$).

This suggests that for high trust populations, institutional trust is the key to maintaining positive attitudes about vaccination. However, by itself this also represents a risk. If institutional trust is the key to vaccine confidence, then it is possible that a counter branding or advocacy campaigns targeted at harming the reputation of "science", public health, and the government could also influence vaccine attitudes, which is aligned with previous public health campaigns targeting trust for behavioral change (Farrelly et al., 2002, 2005).

Conclusions

In pulling these findings and discussion together, there are two types of reflections that we can make. The first is about what these findings suggest about this study and future research on vaccine confidence. The second is

about the conclusions drawn about communication strategy to improve vaccine confidence and thus behavioral intention regarding vaccination.

Critical reflections and future research on vaccination

Throughout our discussion we have identified some limitations, such as the small number of participants once we segmented for low, neutral, and high trust populations or distinctiveness between vaccine hesitancy and confidence. As such, we would suggest there are three important lessons to be learned for future research on vaccine attitudes from this study.

First, vaccine confidence and hesitancy seem to be two distinctive concepts – not just on a continuum. This suggests that it is important to develop better measures of vaccine hesitancy itself. Why vaccine hesitancy? Because existing measures focus on vaccine confidence and as these data suggest hesitancy and confidence are distinctive concepts and not merely two ends of the same continuum. Moreover, the literature needs to better distinguish between vaccine hesitancy as an attitude and behavioral intention to be vaccinated. The Norwegian population demonstrates no significant difference between vaccine confidence and skepticism (hesitancy), yet clearly demonstrate high levels of vaccination. In the context of high trust environments, like Norway and the other Nordic countries this is likely attributed to citizens' willingness to follow government recommendations, even if they are not completely sure about the positive outcome of the action recommended (see, e.g., Anderson, 2018).

Second, while institutional trust is necessary, it is not a sufficient measure for individual attitudes about vaccination. In fact, these data suggest that trust in science is a better single measure for vaccine confidence. This does not mean that institutional trust is unimportant as these data suggest it emerged as a critical disposition that changed the predictive models for vaccine confidence. We suggest this may be a more effective way to use institutional trust than within the regression models themselves.

Third, and related to institutional trust, demographics have long been identified as inconsistent predictors of vaccine attitudes. These data suggest that rather than looking for predictable demographics, exploring identities that provide a better explanation to people's attitudes is more valuable in predicting health attitudes and behavioral intention. So, the analysis regarding institutional trust and values in this study provide stronger insights connected to vaccine confidence compared to measures

of ethnicity, nationality, gender, religion, or political affiliation. Future research should explore values-based identities rather than demographics-based identities.

Inoculation for stronger vaccine communication strategy in Norway ... and beyond

Taken together, these data reveal that while looking at an overall population provides important and useful insights, segmenting populations based on their levels of institutional trust reveals far more about factors that foster confidence in vaccines. These data suggest that moving beyond clichéd assumptions about people who are vaccine hesitant being merely conspiracy loving right-wingers is important if we are to authentically engage with people about legitimate questions and concerns, they may have about vaccination. Most importantly, these data align with research from across Europe (see Jacob et al., 2023) that suggest: (1) institutional trust is the most important factor in predicting citizen willingness to follow guidance for self-protective behaviors; and (2) that within any population better understanding the factors that differentiate group attitudes will allow for more tailored communication practice. As such, the Norwegian vaccination case provides valuable insights for improving strategic communication to promote vaccination across Europe.

Specifically, our findings suggest that low trust populations are much more likely persuaded by appeals to their values, bolstering trust in science, and the use of official sources of information while being mindful of demographics. If public health advocates can better enact this kind of communicative strategy, there is the greatest potential for impact because just these few factors predict almost two-thirds of the variance in vaccine confidence in low trust Norwegians. This also helps to explain why Norway has had such a high success rate in both medical and non-medical interventions during COVID-19 – their communication strategy centered on translating science and transparency (see e.g., Ihlen, 2020; NIPH, 2022). This suggests this strategy is likely to be useful in other populations where institutional trust is lower because the literature base clearly demonstrates the overall success of this strategy (Bíró-Nagy & Szász, 2022; Kojan et al., 2022; Jacob et al., 2023; Jørgensen et al., 2021). These findings coincide with other best communication practices to improve self-protective behaviors emerging after the COVID-19

pandemic across Europe and therefore provide insights into effective communication strategy for lower trust populations.

This strategy, in part, is also important for groups whose trust in government and health institutions is relatively neutral as well because these data found that bolstering trust in science and emphasizing quality sources of information about vaccines helps to account for nearly half of variance in their attitudes. So, to this point it means that communicating transparently, translating the science, and providing consistent access to quality sources of information addresses the two groups that the extant body of research finds are most likely to be vaccine hesitant. Additionally, findings for both the low and neutral trust groups also identify the importance of communicating that personal self-protection measures, like getting vaccinated, make a positive contribution to community and society.

However, the findings for the neutral trust group also point out the importance of offering two-sided argumentation, suggesting that an inoculation theory-based communication strategy that does not judge people with questions about vaccination but engages them meaningfully about both sides of the argument may be essential in changing behaviors (Featherstone & Zhang, 2020; Pfau & Bockern, 1994; Rosenfeld & Tomiyama, 2022). These data suggest that trust neutral populations need more engagement, and they need a more complex strategy that identifies the common arguments used against a behavior (e.g., anti-vaccination arguments) and then provides fair and *credible* information from *trusted* sources providing the information to help them make better decisions for themselves and their families (Featherstone & Zhang, 2020).

Finally, these data also suggest that while high trust Norwegians may not need as much attention in building vaccine confidence, they have specific information needs to maintain or improve their attitudes towards vaccination. In part, it is because vaccine confidence seems reliant on multiple levels of institutional trust – including information credibility and trust in science – this group seems particularly susceptible to counter branding attacks on institutions to shake their confidence in vaccination. Also, in part it is because Norwegians – despite generally being categorized as a "high trust" society and a poster for effective health interventions – are equally confident and skeptical about vaccination. This means that public health and governments must be able to consistently demonstrate that the public can trust them, remain transparent, and provide the best

information possible. In short, compliance today does not guarantee compliance tomorrow.

High trust populations are meaningfully different – while trust in science will bolster vaccine confidence, ensuring these populations trust official or institutional sources of information is the most vital key to strategic communication success. However, the factors tested in this study only account for approximately one-third of changes in their confidence in vaccines. These findings suggest that while different appeals will be more important to different groups the two most important factors to support vaccine confidence are appeals to collectivist values and improving trust in science.

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