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# DIFFERENCES IN VACCINATED AND UNVACCINATED PERSONS' INFORMATION BEHAVIOR

Analyzing information sources' impact on  
Covid-19 vaccination outcomes in Sweden

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# **Abstract**

The Covid-19 pandemic has had devastating consequences, but as of the end of 2021 vaccines are now readily available in many countries, meaning that there could be an end in sight to the pandemic. Yet, portions of the global population are still hesitant towards vaccines, choosing to reject them in favor staying unvaccinated. This thesis examined this phenomenon in the Swedish context by measuring Covid-19 vaccination outcomes against sociodemographic, trust, risk, and information factors. Online convenience and snowball sampling was used in order to collect 274 responses during the month of March 2022. These responses were analyzed using descriptive analytics as well as a binary logistic regression model with the intent of finding out how different information sources impacted vaccinated and unvaccinated persons' decisions regarding their vaccination status. The study found that while vaccinated and unvaccinated persons differed in their information behavior, the information sources they considered to be impactful were not typically significant predictors of Covid-19 vaccination likelihood when paired with other variables. In light of the results, the study joins other existing literature in arguing for continued deployment of communication strategies depending on the target group, and recommends continued efforts to examine vaccine outcomes dependent on information sources.

## **Keywords**

Crisis Communication, Health Communication, Vaccine Acceptance, Vaccine Rejection, Vaccine Outcomes, Information Seeking Behavior, Generalized Trust, Risk Assessment

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# Introduction

It would be impossible to overstate the shift humanity has experienced since the Covid-19 (SARS-CoV-2) pandemic started in early 2020. Not only has it had deadly consequences for many people across the globe – as of March 7<sup>th</sup>, 2022, there have been 440,807,756 confirmed cases globally, and 5,978,096 deaths as a result of Covid-19 infection (World Health Organization, 2022) – but the social and economic consequences as a result of the pandemic will likely be felt for a long time even if humanity manages to overcome the disease. Indeed, while vaccines are now readily available and governments across the globe are easing or removing restrictions, there are still significant uncertainties regarding the extent to which humanity will have to deal with the Covid-19 disease in its current deadly form. In fact, even though the vaccines have been proven to be effective in decreasing the seriousness of Covid-19 infection (Zheng et al., 2022), significant portions of the population appear hesitant to take them.

While vaccine hesitancy is by no means a new phenomenon (Dubé et al., 2021), it appears as if the Covid-19 pandemic has coincided with one of the most factually uncertain time periods of human history, causing vaccine hesitancy and refusal to perhaps be more contentious issues than expected. As a result of a growing distrust of institutions and official organizations as well as their loss of legitimacy (Bennett & Livingston, 2018) and an ever-increasing politicized reality (Freelon & Wells, 2020), the line of what constitutes fact or fiction is now blurrier than ever. In fact, propaganda, mis- and disinformation are perceived to be so common that many feel that they no longer know who to trust (ibid.), and factual or accurate information communicated by certain organizations quickly gets ignored in favor of

communicators that exist outside of the mainstream or official media (Bennett & Livingston, 2018; Elías & Catalan-Matamoros, 2020).

Naturally, this has been a nightmare for health and crisis communicators in what has been the most defining event of the 21<sup>st</sup> century so far. Indeed, advocating for health restrictions and vaccination is obviously tricky when competing interests, or simply a lack of understanding regarding how vaccines work, are both factors actively working against an end to the pandemic. Thus, while crisis communication practitioners have good foundations to stand on regarding how to effectively transmit information in a crisis – i.e., by communicating transparently and ethically (Nihlén Fahlquist, 2018), using cohesive and singular messaging (Coombs, 2020; Tetteh, 2020; Tagliacozzo et al., 2021), understanding the target audience (Frandsen & Johansen, 2017) and crafting unique messages depending on the target audience (Coombs, 2020; MacDonald & Dubé, 2020) – there is still a lack of understanding how these strategies are perceived depending on the source from which a person receives the information. Using many different channels in order to increase reach of a health message is beneficial (Coombs, 2020); however, it has not been widely examined how these channels differ in the reception of the health information. Moreover, while social media has previously been identified as a problematic area for the spread of mis- and disinformation (Benkler et al., 2018; Germani & Biller-Andorno, 2021; Kapantai et al., 2021; Nguyen & Catalan-Matamoros, 2020), the correlation between social media use and Covid-19 vaccine hesitancy and refusal is not necessarily straightforward as a result of the wide range of applications available on the web 2.0.

Clearly, there is a pressing need to understand the factors that impact vaccination acceptance and vaccination outcomes, and especially how these factors are related to different information sources. Thus, the present thesis examines this exact relationship in Sweden – a country that has had access to mRNA vaccines for all adults over 18 at least since the middle of 2021. The purpose of the study is to use a binary logistic regression model and descriptive statistics to see how vaccination outcome on the individual level is related to several important factors that have been identified by literature in the past. To this end, firstly, the thesis outlines the research aims of the study, and presents the two research questions. Secondly, the thesis then examines important prior research done in the area and highlights several key variables that are related to vaccination outcomes, acceptance, and hesitancy in the past. Thirdly, the research methods are discussed, including a review of the data, and how different variables were categorized, defined, and collected. Fourthly, important and significant results are highlighted before moving on to the discussion, where several key aspects of the results are brought forward and connected to previous research in order to make some broader suggestions from the data especially as they relate to crisis communication. Finally, the thesis is rounded out by a short discussion of the limitations of the study as well as a conclusion where major findings are repeated in light of the research questions posed by the thesis.

## Research Aim

The purpose of the present thesis is to investigate whether vaccinated and unvaccinated persons differ significantly in their assessment of the importance of different information sources when it came to their Covid-19 vaccination status. To achieve this, firstly, it is important to analyze how vaccinated and unvaccinated persons interact with different information sources and information in general. Secondly, these differences need to be measured against other potentially important variables, to see whether the relationship between vaccination status and information source is significantly correlated. Specifically, the study aims to address the following research questions:

### *Research Questions*

1. Do vaccinated and unvaccinated persons residing in Sweden differ significantly in their information behavior?
2. Are any information sources significant predictors of vaccination likelihood within the sample when other variables (i.e., risk, trust, sociodemographic factors) have been accounted for?

The findings will highlight the extent of how information sources and how Swedish people interact with them can impact their decision to get vaccinated or not. Indeed, while social media is often discussed as a major spreader of mis- and disinformation, the present study sets out to determine to what extent this is true or whether other information sources are



perceived by persons to be more correlated with vaccine rejection within the Swedish context.

The study will make use of descriptive statistics and a binary logistic regression model.

To achieve the above, data was collected through a survey sent to voluntary respondents in Sweden during the spring of 2022, in order to achieve a cross-sectional design. The descriptive statistics served to gauge which information source – i.e., from official sources, social media, local doctor, TV news etc. – was most related to negative or positive vaccination outcomes in the sample. Following, the binary logistic regression model was used to uncover the effect of the independent variables – trust levels, sociodemographic factors, risk perception and vaccination information source – on the binary dependent variable of the participants' current vaccination statuses.

This information was collected and analyzed with the purpose of assessing how persons residing in Sweden assess the impact of different media channels on their own health outcomes. The analysis demonstrates how vaccinated and unvaccinated persons differ in their information processing behavior, to what degree different crisis communication strategies need to be considered, and what variables impacted the likelihood to be vaccinated the most, in a high trust country with a sizeable minority population. The findings have the potential to help the Swedish public health agents by contributing to the greater knowledge of crisis communication and how vaccinated and unvaccinated persons differ in their behavior and how they are similar.

## Literature Review

The scientific and medical consensus clearly indicates that getting vaccinated has major benefits for society as a whole (Dubé et al., 2021; Nihlén Fahlquist, 2018). However, despite vaccines getting better and better with time, there is a growing lack of confidence in vaccines (Larson et al., 2011). With this in mind, it is important to make the distinction between vaccine hesitancy and vaccine refusal. Indeed, as Dubé et al. (2021) explains, while terminology such as vaccine hesitancy and “anti-vaccine” are often used interchangeably, they are not the same. In fact, it is entirely possible for a vaccine hesitant person to get vaccinated, even though they are hesitant. Equally, it is entirely possible for a vaccine accepting person to not get vaccinated if the vaccine is simply unavailable to them. Moreover, there are a wide range of cultural, religious, or social reasons for avoiding vaccines despite believing personally that they are effective tools in combatting the spread of viruses (Dubé et al., 2021). Thus, while there is a tendency to correlate vaccine hesitant persons with irrational behavior (Dubé et al., 2021; Goldenberg, 2016; Nihlén Fahlquist, 2018), the actual relationship between deciding not to get vaccinated or getting vaccinated is decidedly more complex (Larson et al., 2011).

Consequently, it is important to distinguish between several categories of persons. Firstly, *vaccine hesitant* persons are those who are unsure whether they are going to take a vaccine or are unsure whether they will continue to take a vaccine if they have taken a dose or several in the past (Dubé et al., 2021). Secondly, *vaccine refusing* persons are those that are completely rejecting vaccines in favor of staying unvaccinated (ibid.). Thirdly, *vaccine accepting* persons are those that are willing to take vaccines or have already taken vaccines (ibid.). Finally, then, when speaking of vaccine accepting persons, or a correlation with vaccine

acceptance, this means that the person either plans to get vaccinated or is vaccinated. This difference might seem minor but is nevertheless an important aspect to distinguish as planned and past behavior carry with them decidedly different implications.

Thus, as the present literature review will demonstrate, a wide range of factors have been discovered to be correlated with vaccine hesitancy, refusal, acceptance, or outcome. Subsequently, the literature review firstly examines literature surrounding sociodemographic factors – such as education, age, gender, health, ethnicity, and socio-economic background – and their impact on how people think and act when it comes to vaccines. Secondly, generalized trust is defined and how it can potentially be a deciding factor when it comes to vaccine acceptance or hesitancy. Thirdly, literature that has examined persons' risk assessment of the pandemic and the Covid-19 vaccine is discussed in order to highlight common traits in vaccine rejecting and hesitant individuals. Fourthly, the thesis investigates studies that have examined the impact of different information sources and the current understanding of potentially problematic sources. Finally, the thesis situates the research within crisis communication and highlights the research gap that the present thesis fills in order to illustrate the necessity of studies such as this one.

## **Sociodemographic Background and Vaccination Outcomes**

There are a significant number of social and cultural factors that are correlated with vaccine hesitancy and refusal. Notably, education, age, gender, health, ethnicity, and socio-economic background are all potential determinants of vaccination uptake. The reasons for this discrepancy between groups are multifold. Indeed, when considering why these factors

matter for vaccination outcomes, one needs to consider the social and historical context. Often vaccine hesitancy can be traced back to previous mistakes or crimes committed by official organizations or governments towards a particular group (Breslow, 2020; Goldenberg, 2016; Scharff et al., 2010). Other times, it is a question of being unable to overcome cultural, social, or linguistic barriers (Dubé et al., 2021). Thus, vaccine refusal is related to everything from alternative lifestyles and reinforcing social identities to expressing discontent with the current status quo (ibid.). Regardless, it is clear that any study attempting to examine vaccine outcomes needs to account for potentially important demographic variables.

### ***Education***

Several studies have shown the correlation between education levels and vaccine refusal. When considered at a country-level, countries with higher-than-average levels of education typically report more negative sentiments towards vaccination (Larson et al., 2016). On the other hand, at the individual level, higher levels of education are typically associated with a higher vaccine acceptance (Bertoncello et al., 2020; Fabry et al., 2011). Notably, however, it appears as if this relationship does not have a direct correlation. In fact, as several studies have pointed out, education could instead be associated with a variable that is more significant for vaccine refusal or hesitancy rather than being in direct correlation itself (Bocquier et al., 2017; Galarce et al., 2011; Larson et al., 2016). Moreover, in the case of the Covid-19 vaccine, the correlation between vaccination uptake and higher levels of education has been identified in this situation as well (Akiful Haque et al., 2021). However, the relationship seems highly context-dependent and reliant on other factors (Al-Qerem & Jarab, 2021; Biasio et al., 2021). Indeed, Lazarus et al. (2020) in their analysis of 19 countries noticed that while education was highly correlated with Covid-19 vaccine acceptance, whether the

correlation was positive or negative depended greatly on the country. Importantly, they determined that in Sweden, education was positively correlated with vaccine acceptance (ibid.).

### ***Age and Gender***

Age and gender are difficult to clearly associate with vaccination acceptance. While some studies have shown that age and gender do impact vaccination uptake (Galarce et al., 2011), others claim that age and gender are typically less relevant when it comes to vaccine hesitancy and refusal compared to other variables (Bertoncello et al., 2020; Danis et al., 2010). Moreover, Schmid et al. (2017) in their systematic review suggest that age and gender are likely “carrier variables of explanatory factors rather than explanatory factors of hesitancy themselves” (p. 17). Thus, they are likely to be highly correlated with variables that actually have an impact on vaccination outcomes, but only have a minor impact on vaccination acceptance on their own. This is likely the case with the Covid-19 pandemic as well, as studies have shown that Covid-19 vaccination acceptance does vary by age (Akiful Haque et al., 2021) and gender (Kerr et al., 2021), but that the correlation is likely confounded by country (Lazarus et al., 2020) and culture (Dubé et al., 2021) as well.

### ***Health***

Health status has also been speculated to be a predictor of getting the Covid-19 vaccine. Indeed, being in a risk group increases the likelihood of choosing to get vaccinated (Viswanath et al., 2021; Williams et al., 2021). This is reasonable as, belonging to a risk-group that can suffer severe health consequences if not vaccinated, both the incentive to get vaccinated, and easier access to vaccines might make a person much more likely to make the decision.

Similarly, if someone in one's vicinity is a part of a risk-group, or the person in question has personal or second-hand experience with the disease, the decision to get vaccinated might also be easier. However, when it comes to personal experience with the disease, Viswanath et al. (2021) noted that, in their study, if a person had personal experience with Covid-19, they were no more likely to get vaccinated than someone who hadn't had personal experience with the virus. Nevertheless, it is reasonable to assume that factors relating to health status and perceived health consequences of contracting the virus should be a driving factor towards vaccine acceptance.

### ***Ethnicity***

Unsurprisingly, ethnicity is also a factor when it comes to vaccination acceptance, especially as it relates to different ethnicities within a country. As health and access to healthcare in general can vary wildly depending on whether a person is in a minority or majority (Schneider et al., 2001), it is to be expected that this experience can also be extended to targeted health messaging (Alsan et al., 2021; Torres et al., 2021) and vaccination access (Lu et al., 2015) as well. Moreover, during the Covid-19 crisis, minority ethnicities in different countries have been overrepresented in terms of health consequences of the pandemic (Garg et al., 2020; Malik et al., 2020; Price-Haywood et al., 2020). Notably, Bergman et al. (2021) confirmed that living in Sweden but having been born outside of Sweden included a higher risk of Covid-19 diagnosis and hospitalization than for those having been born in Sweden. Furthermore, although, to-date, no study has examined the relationship between ethnicity and the likelihood to get the Covid-19 vaccine in Sweden, it is reasonable to assume that because of a difference in access, culture, and linguistic background, vaccination outcome should vary

depending on ethnicity within the country, as studies have established in other countries (Kim, 2021; Malik et al., 2020; Robertson et al., 2021; Viswanath et al., 2021).

### ***Socio-economic Status (SES)***

Just as with ethnicity, those with a lower Socio-economic status (SES) have been disproportionately affected by the Covid-19 pandemic in Sweden (Bergman et al., 2021) and abroad (Elgar et al., 2020; Krieger et al., 2020). Moreover, studies have confirmed that those with a lower SES are much less likely to get vaccinated than those with a higher SES, be it because of a lack of access or just a vaccine hesitant stance (Arat et al., 2019; Bertoncello et al., 2020; Bocquier et al., 2017; Danis et al., 2010; Peretti-Watel et al., 2019). Similar findings have been discovered when measuring Covid-19 vaccine acceptance as well, indicating that SES has had a high impact on the likelihood to get vaccinated against Covid-19 (Akiful Haque et al., 2021; Kim, 2021; Malik et al., 2020). Thus, while no study has measured the impact of SES on Covid-19 vaccination uptake in Sweden, it stands to reason that, to get a full picture of vaccine acceptance, both ethnicity and SES need to be accounted for.

### **Generalized Trust and Vaccination Outcomes**

Generalized trust – or individuals' propensity to trust other people in general (Rotter, 1967) – has long been associated with positive health outcomes (Hamamura et al., 2017; Xu, 2019). Indeed, generalized trust is also closely related to intercultural and interpersonal collaboration (Chua et al., 2012; Lewicki, 1998; Saunders et al., 2010), which no doubt helps groups and individuals combat the Covid-19 pandemic more effectively while also cooperating within and outside of national borders. However, the inherent difficulty in measuring trust should not be

overlooked. In fact, the current understanding of the concept indicates that how trust is enacted and perceived is likely to vary greatly depending on cultural factors (Saunders et al., 2010). This makes measuring for it complicated. Consequently, few assumptions of symmetry should be taken for granted when measuring differences in trust (Zaheer & Zaheer, 2006). Moreover, the way that researchers define trust varies greatly from research paper to research paper (Liu & Mehta, 2021), further complicating any attempts of understanding a direct correlation between trust and health outcomes.

Regardless, during the Covid-19 pandemic, correlations between high generalized trust levels and positive health outcomes have persisted (Amdaoud et al., 2021; Song & Yoo, 2020). This is unsurprising as Covid-19 health measures are largely related to actions that work only if others within your community are committing to them as well – for example social distancing, mask wearing, or getting vaccinated. However, it should also be noted that it appears as if the relationship is highly context-dependent and might differ greatly depending on what is considered culturally trust-inducing behavior in any given community. Indeed, as noted by Woelfert & Kunst (2020) in their study on trust and likelihood of following government guidelines, while social distancing and mask wearing are typically associated with high trust contexts, if these actions are instead perceived as negative or cultivating untrustworthy behavior, the correlation between following guidelines and generalized trust is actually negative.

Moreover, several studies have identified trust in the government, trust in health organizations, trust in the academic community and trust in the vaccine (Szilagyi et al., 2021; Tam et al., 2022; Viswanath et al., 2021) to be clear indicators of whether a person is likely to get vaccinated or not. As per Kerr et al. (2021), trust appears to be a global factor when it



comes to vaccine acceptance. As for the Swedish context, while no studies on trust and Covid-19 vaccine uptake or acceptance have been completed to date. However, previous research suggests that trust in official health communication channels is typically associated with increased likelihood of adhering to vaccine guidelines (Byström et al., 2020). As such, one can assume that generalized trust is correlated with risk perceptions just as health can be theorized to be. Indeed, with lower trust in scientific institutions and governmental agencies, higher perceptions of risk involved with getting vaccinated should be expected. Consequently, should doubts regarding the safety emerge about a recommended vaccine it “necessarily implies that authoritative bodies who are in charge of safeguarding the safety of a specific vaccine are not doing their job correctly” (Dubé et al., 2021, p. 180), implying a connection between health, risk, and trust in official bodies.

## **Risk Assessment and Vaccination Outcomes**

Risk assessment of the Covid-19 pandemic and its consequences should also be considered when measuring for Covid-19 vaccine outcomes. Although, as mentioned earlier, there likely is some relationship between risk assessment, health, and trust – i.e., risk perceptions of consequences of taking the vaccine vary depending on trust in the government, and poor personal health putting one at risk – risk assessment of the pandemic is likely to vary depending on many factors. As such, regardless of trust levels and health, the decision to get vaccinated might be deemed unnecessary if one considers the risk of serious consequences from getting infected to be small, or the consequences of getting vaccinated to be bigger than getting the virus. Furthermore, these worries can be connected to perceptions regarding the

efficacy and safety of the vaccine. Indeed, with the frequent mutations of the Covid-19 virus (SARS-CoV-2 virus), and the constant development of new and more efficient vaccines to combat its spread, it is likely that vaccine acceptance could be correlated with doubts regarding the effectiveness of the current vaccines regardless of interference from factors such as generalized trust and health status.

Thus, questions regarding the effectiveness and safety of vaccines have long been a source of worry for many (Dubé et al., 2021). This has not changed during the course of the Covid-19 pandemic, and perceptions of Covid-19 vaccine effectiveness and safety have been identified as major reasons for vaccine hesitancy and vaccine refusal (Szilyagi et al., 2021; Viswanath et al., 2021; Williams et al., 2021). While these worries appear mostly unfounded (Baden et al., 2021; Buchan et al., 2022; Tregoning, et al., 2021), the combination of the nature of the SARS-CoV-2 virus and its ability to mutate rapidly, a general lack of understanding of how vaccines function, as well as poor communication during previous vaccine rollouts (Dubé et al., 2021), individuals can still choose to reject the Covid-19 vaccine because of these perceptions of a lack of safety or efficacy. Thus, while these concerns seem to have little basis in science they still result in very real consequences leading to high vaccination hesitancy.

Regardless of the reasoning for associating high risk with taking the vaccine, many prior studies have identified a relationship between vaccine acceptance and risk assessment. Indeed, Covid-19 health outcomes are significantly associated with risk assessment in many countries, where persons that consider the disease and its effects to be overblown are much less likely to choose to get vaccinated (Akiful Haque et al., 2021; Al-Qerem & Jarab, 2021; Malik et al., 2020). Moreover, the connection between risk perception of the Covid-19 virus

and politics should not be understated. Accordingly, with Covid-19 becoming an increasingly politicized issue, many studies have shown that typically those that ascribe to right-wing politics are much more likely to be vaccine hesitant or refuse the vaccine (Szilagyi et al., 2021; Viswanath et al., 2021). However, the rate of politicization of the Covid-19 vaccine globally is still debated, as it seems to be salient only in a few select countries (Kerr et al., 2021) and Sweden does not appear to be one of these.

## **Information Sources and Vaccination Outcomes**

The amount of health information available to the information seeking public during the Covid-19 pandemic is immeasurable. Moreover, only some of the information can be considered accurate or reliable, as there are equal parts mis- and disinformation available as well. This crisis of excess information has been fittingly dubbed the 'infodemic' (Hao & Basu, 2020) and is a cause of major concern for health communicators globally. Indeed, inaccurate information often seems to be at the core of vaccine hesitancy and distrust of official health information (Dubé et al., 2021). It is apparent that the world is currently experiencing an increasingly politicized reality (Freelon & Wells, 2020), and that the political division is driven in large part by new media (Fuchs, 2013). Health communicators face a difficult task in trying to improve vaccine acceptance, since they have to address simultaneously the need for tailor-made messages depending on the target population (Coombs, 2020; MacDonald & Dubé, 2020), as well as the need for consistent, ethical, and repeated messages (Nihlén Fahlquist, 2018; Tagliacozzo et al., 2021; Tetteh, 2020).

Prior studies show that vaccine hesitancy is related to media choice (Qiao et al., 2020; Viswanath et al., 2021). Thus, vaccination outcomes will likely differ depending on what information a person finds trustworthy and where this information is found. Social media usage in particular has been found to be highly correlated with vaccine hesitancy and mis- or disinformation (Barry et al., 2021; Nguyen & Catalan-Matamoros, 2020; Qiao et al., 2020). Indeed, regardless of whether the information being spread is false intentionally – i.e., disinformation – or unintentionally – i.e., misinformation – (Kapantai et al., 2021), the result is that persons that are distrustful of official or educational institutions look for information elsewhere (Nguyen & Catalan-Matamoros, 2020). Thus, media choice is of large importance when measuring vaccine acceptance and is very likely to impact how a person engages with health information in general.

However, information sources outside of media choice are, unfortunately, fairly unexplored territory despite being theoretically relevant. While many studies include some level of measurement for what information a person might consider trustworthy when it comes to media choice, very rarely do studies measure for whether family, friends, or local doctors and nurses have had an impact on a person's vaccination status. Prior studies have discovered that not all healthcare workers are necessarily advocates for vaccines (Barry et al., 2021; Xu et al., 2021), but are nevertheless important information sources when people consider getting vaccinated or having someone under their care vaccinated (Byström et al., 2020). Thus, one-on-one health advice from a medical professional is likely an important factor when it comes to getting vaccinated for Covid-19. In addition, it is reasonable to assume that vaccination outcomes will vary depending on cultural factors, as well. Yet, it is problematic

that neither of these two factors are included in most studies that measure vaccine hesitancy, acceptance, or uptake.

Finally, it is crucial for health communicators to know where vaccine hesitant persons get their information from and who they trust when it comes to their health, since targeted messaging and tailored communication strategies have been identified as key components of combating vaccine hesitancy in the past (Coombs, 2020). Therefore, it stands to reason that different strategies need to be employed depending on national and cultural contexts.

### **Crisis Communication and the Current Research Gap**

Research regarding crisis communication – i.e., "the collection, processing, and dissemination of information required to address a crisis situation" (Coombs, 2010) – has long had a focus on private enterprises over the public sector (Einwiller & Laufer, 2020). However, the wide-reaching effects of the Covid-19 pandemic make this an opportune time to investigate how health agencies and governments need to communicate more effectively during a crisis. Indeed, there is a large research gap regarding the understanding of which factors are the most relevant to address in order to combat health crises like the Covid-19 pandemic. While research regarding the Covid-19 pandemic and vaccination acceptance is a developing area of interest, as of now, little quantitative research has specifically examined which information sources contribute the most to vaccine rejection and how potentially problematic sources can be dealt with in terms of crisis communication.

It is vital for public organizations to seize this moment as an opportunity for their crisis communication practices and emerge stronger (Ulmer et al., 2018). Indeed, crisis management should not be seen as a reactive process based on isolated events, but rather as a way to build resilience through on-going dynamic crisis cycles (Frandsen & Johansen, 2017). That is, it is more productive for health agencies to operate as if dealing with developing crises, rather than neatly dealing with one crisis only for another to arise. Thus, crises should be considered complex events that carry with them certain levels of uncertainty and unpredictability; anticipating them might be useful, but it is even better to build an organization that can use lessons learned to improvise regardless of the difficulties of the crisis at hand (ibid.).

Thus, with the Covid-19 pandemic and the Swedish context in mind, there are many lessons to be learned. While the Swedish Public Health Agency has examined demographic factors and opinions surrounding the Covid-19 vaccine in 2021, these do not focus on crisis communication, nor do they examine information behavior to the extent necessary in order to determine where vaccine hesitant stances come from (Folkhälsomyndigheten, 2022). According to Wallace, in a pandemic “communication assumes a critical role in protecting people’s health around the world. In outbreaks and epidemics, successful communication of risk and the mitigating actions that can be taken is often the most crucial element of effective outbreak management” (2008, pp. 500-501), and it is therefore crucial to examine information sources within the communication context to better tackle the next health crisis the world will be faced with.

As a result, the present study's goal is to examine to what extent vaccinated and unvaccinated persons differ in where they get their information, and whether one information source – be it social media, as identified in previous studies (Benkler et al., 2018; Germani & Biller-Andorno, 2021; Kapantai et al., 2021; Nguyen & Catalan-Matamoros, 2020), or family, friends, or a local health expert – significantly affects the likelihood of being unvaccinated. The findings from the present thesis are of great importance as they further clarify where health and crisis communicators need to place more emphasis in order to increase vaccination rates in Sweden. Indeed, without clear data highlighting these differences within the Swedish context, there is a possibility that wrong communication strategies will be employed and potentially cause higher levels of vaccine rejection rather than acceptance.

# Methodology

## Information Sources and Vaccination Outcomes

The quantitative data for this study was gathered through a survey using a convenience sampling approach in Sweden. The questionnaire reflected important variables found in the literature review and was developed firstly in English, and then translated into Swedish. The survey was then distributed digitally through Google Forms. The questionnaire allowed for participants to choose their favored language between English and Swedish, and consisted of 4 parts measuring demographic information; ethnic origin; risk and trust assessment; and information sources impacting vaccination status.

The survey was circulated primarily via social media (WhatsApp, Facebook, Instagram, and Reddit) as well as by asking respondents to further contribute to the study by sending it to friends and family. In order to be eligible for the study, participants had to have been residing in Sweden for at least 6 out of the last 12 months and be over 18. The residence requirement was intended to discern the respondents' ties with Swedish context and health messages. Whereas the age requirement addressed ethical considerations.

In total, 289 responses were gathered, out of which only 274 were valid. The sample size was not set a priori, but rather, the questionnaire was distributed with the hope of receiving as many respondents as possible considering the timeframe and funding limitations. Thus, with a sample size of 274 respondents ([table 1](#)), the study's margin of error is  $\pm 3.218\%$  with a 95% confidence level. Moreover, in order to estimate the reliability of the Likert-scales used in the survey McDonald's Omega (McDonald, 1999) was used. Since the Likert-scales



present in the survey were not monotonic, the tau assumption was not met, and thus, McDonald's Omega was seen as preferable over Cronbach's Alpha since it is not as restrictive (McNeish, 2018). Thus, the study had an  $\omega = 0.6208$ , which is typically considered below the generally accepted level (Nunnally & Bernstein, 1994). Therefore, for the scales to be used in future research it is recommended new tests are run again in order to properly estimate the reliability.

Sample Characteristics		
Characteristic	n (274)	%
Gender		
Male	111	40.51%
Female	160	58.39%
Other	3	1.09%
Age		
19-25	49	17.88%
26-34	119	43.43%
35-44	28	10.22%
45-54	23	8.39%
55-64	23	8.39%
65+	32	11.68%
Education		
Primary School or No education	10	3.65%
Highschool	69	25.18%
Trade School	39	14.23%
Bachelor's Degree	115	41.97%
Master's Degree or Higher	41	14.96%
Ethnic Origin		
Swedish Origin	211	77.01%
Other Origin	63	22.99%
Income (Net)		
Less than 15 000 SEK	81	29.56%
15 000 to 30 000 SEK	75	27.37%
30 001 to 50 000 SEK	105	38.32%
More than 50 000 SEK	13	4.74%
Health		
Good Health	252	91.97%
Poor Health	22	8.03%
Personal Covid-19 Experience		
Personally have been sick	139	50.73%
Have not been sick	135	49.27%

**Table 1 – Sample Characteristics**

## Survey Administration

The survey was administered in English and Swedish between the 22<sup>nd</sup> of February and the 24<sup>th</sup> of March 2022. The survey was pretested by 10 participants, and was then distributed on

personal channels through, for example, Facebook, Instagram, and Reddit. Reminders were sent out intermittently during the month that the survey was active. Others took it upon themselves to share the survey through their social media channels as well. No incentives were given to participants; they all completed the questionnaire willingly and on their own. Moreover, all participants were made aware of potential risks involved with the survey, including mental distress and privacy issues.

## **Measurements**

### ***Dependent Variable***

The present thesis measured one dependent variable: The number of doses taken at the time of the survey. As explained in the literature review, there is a distinct difference between vaccine acceptance and vaccination outcome. Since the study measured specifically doses taken, it measures vaccination outcome more so than vaccine acceptance. However, it should also be noted that Covid-19 vaccines have been available for all age groups in Sweden since mid-2021, thereby suggesting that access should not have been a determining factor in terms of vaccination status. Thus, doses taken could be deemed as simultaneously measuring vaccine acceptance as well as vaccine outcome. Moreover, since the answer was recoded into vaccinated (i.e., having taken one or more doses of the vaccine) and unvaccinated (i.e., having taken no doses), it was assumed that even though there has been conflicting health information regarding when to get vaccinated after having contracted Covid-19, there should have been enough time during the period between vaccines being available and the

questionnaire administration, for people to have had the chance to get at least one shot of the Covid-19 vaccine if they intended to do so.

The question itself was posed as “How many doses of the Covid-19 vaccine, if any, have you taken?” and allowed respondents to choose between 0, 1, 2 and 3 doses. The present study chose to not include the ability to answer for more than 3 doses as at the time of writing this thesis more than 3 doses had not been recommended by any health authority as far as the author is aware. These responses were then dichotomized as “Unvaccinated”, if the respondent chose 0 doses, and “Vaccinated”, if the respondent chose anything but 0 doses.

### ***Independent Variables***

Several independent variables were accounted for in the study. These included: demographic characteristics (age, gender, SES, health, Covid-19 experience, education and ethnicity), risk perception of Covid-19, and trust and impact of information sources on vaccination status.

Each characteristic was measured for independently, typically through single-choice questions, except for Covid-19 experience which was measured for using multiple-choice. Starting with *demographic data*: age was gathered into ordinal groups (18 or younger, 19-25, 26-34, 35-44, 45-54, 55-64 and 65 or older). Gender allowed for three choices (Male, Female, Other). Education had 7 groupings (No official education, Primary school, High School, Trade School, Bachelor’s Degree, Master’s Degree, and PhD Degree). However, during the course of the analysis, it became apparent that as a result of few responses in the “no official education”, “primary school”, and “PhD Degree” groups, these three were merged into groupings of similar categories. Thus, “No official education” and “Primary School” merged, and “PhD Degree” merged with “Master’s Degree”. SES was measured through the question

“What is your current net monthly income?” and had 4 categories (Less than 15 000 SEK, 15 001 – 30 000 SEK, 30 001 – 50 000 SEK, More than 50 000 SEK). Health was measured with the question “How would you, currently, describe your overall health?” and allowed for three responses (In full health (no underlying diseases or illnesses), Short-term sickness (Currently suffering from an illness that is expected to get better), and Long-term sickness (Currently suffering from long term illness that is unlikely to get better)). These groups were then dichotomized into “Healthy” as long as the respondent chose anything but “Long term sickness”, and “Long term illness” if the respondent answered: “Long term sickness”. The last demographic question concerned the respondents’ personal experience with Covid-19 and was measured through four options (Yes, I am/have been sick with Covid-19, Yes, a friend or acquaintance is/has been sick with Covid-19, Yes, a family member is/has been sick with Covid-19 and No, no one I know is/has been sick with Covid-19).

Finally, *Ethnic origin* was measured as is commonly done in Sweden through the definition given by the European Commission (2017). As per this definition, a person of a different ethnic origin than Swedish is someone that was not born in Sweden or has two parents that were both born outside of Sweden. To measure this, two questions were posed asking whether the respondent had been born in Sweden, and if both their parents had been born in Sweden. If the respondent answered in a way that suggested that either they or both their parents had been born outside of Sweden, they were then asked to provide the relevant countries.

Following, respondents were asked about their *propensity to trust* and perceptions of the Covid-19 as a disease as well as the Covid-19 vaccine. Starting with trust, three results

were derived from a 4-point Likert-scale (1- indicating low trust and 4- indicating high trust) were used in the study. The questions posed concerned the respondents' propensity to trust generally, trust in the Swedish government, and trust in the Swedish academia. Most were taken from the World Values Survey (Haerpfer et al., 2020) with slight adjustments in order to achieve some form of consistency with other studies.

*Risk assessment of the pandemic*, the Covid-19 virus and the Covid-19 vaccine were addressed through two questions. First, the respondents were asked to indicate to what degree they felt that Covid-19 would impact their health long term on a 4-point Likert-scale (1- Not very likely and 4- Very likely). Then, on the same scale they were asked to what degree they felt that the Covid-19 vaccine would impact their health.

The last section of the questionnaire dealt with *information sources* and to what degree the respondents felt that different sources of information had impacted their vaccination status. Six different sources of information were measured on a Likert-scale (1- No impact at all, and 4- Very impactful). These six were social media (Facebook, reddit, Instagram etc.), television broadcasts (such as local news, national news, and talk shows), family (close and extended), friends and colleagues, local health experts (personal doctors, acquaintances with medical expertise etc.), and finally, Folkhälsomyndigheten and the Swedish Government (the Swedish Public Health Agency, their conferences, and flyers etc.). These were then used independently both in the binary logistic regression model, and reported in a table showing percentages of each response.

## Statistical Analysis

First, sample data was cleaned of invalid responses. It resulted that 14 out of the 289 total respondents had not lived in Sweden for at least 6 out of the last 12 months and one respondent was under 18 and these were therefore dropped from the analysis. After which, frequency tables of the independent demographic variables for the 274 valid responses were analyzed in order to gain an understanding of the sample ([Table 1](#)) and how each demographic factor related to the dependent variable ([Table 2](#)). Several additional tables were then constructed, including tabulations of education, ethnic origin and vaccination outcome ([Table 9](#)), age and vaccination outcome ([Table 7](#)), health and vaccination outcome ([Table 8](#)), and information sources and vaccination outcome ([Table 3](#)).

With the results of the above analysis in mind, as well as for the fact that the dependent variable was categorized through binary values of 0 (unvaccinated) and 1 (vaccinated), binary logistic regression was chosen as the analytical method. Through this method, one can estimate the impact of each independent variable on the likelihood to be vaccinated within the sample (Fritz & Berger, 2015). Several models were then constructed in order to investigate the relationship between each independent variable and the dependent variable in order to design the final model. Two models were then chosen, one which used age as an independent variable ([Table 5](#)), and another that did not ([Table 4](#)). This was because one age group (55-64) had no respondents that had admitted to being unvaccinated, which resulted in a lower number of observations in the model that used age as a variable. Thus, as a higher number of observations was deemed more important than the inclusion of age as an inaccurate continuous variable – especially as age was typically shown to be fairly statistically

insignificant in all the models and tests – the final regression model chosen did not include the variable<sup>1</sup>. These models were reported using both coefficients as well as Odds ratio and used a confidence interval of 95%. All analysis was conducted using STATA 17E (15 February 2022) over two weeks in late March and early April, as well as over a week in early June.

## **Strengths and Weaknesses of the Research Design**

Binary logistic regression is useful in situations where the dependent variable has Boolean values – i.e., true or false. It uses the numerical values of 0 and 1 in order to represent conditions numerically and has the ability to predict the likelihood of the “true” condition in any given sample (Fritz & Berger, 2015). Thus, the point of binary logistic regression is to understand the relationship between the dependent variable and one or several independent variables. Consequently, since the present study uses Boolean values for its dependent variable – vaccinated = true, and unvaccinated = false – it makes sense to apply this type of model to the data. Indeed, by applying binary logistic regression one can estimate the likelihood of a person being vaccinated based on the independent variables accounted for in the model.

Moreover, as a binary logistic regression model can only make predictions based on the data it is given, having a sample that is representative of the larger population allows the model to accurately predict the reality of the situation. However, because of time and budget constraints, the present study had to resort to convenience sampling rather than true random

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<sup>1</sup> The other model is nevertheless reported in [Appendix 2](#)



sampling. This is a weakness of the research design that limits the accuracy of the predictions generated by the regression model. Consequently, the findings should be understood as indicative of the potential relationships between these variables in the Swedish population, more so than definite determinants.

## **Ethical Considerations**

Several ethical considerations had to be accounted for during the study. Firstly, as the study dealt with confidential information such as health status, income, and vaccination status, keeping the data confidential and impossible to attribute responses to a person was of great importance. To that end, data was collected in a deidentified manner and stored on a file saved on the author's own password protected desktop (with the copy no longer existing on the cloud). Moreover, all data was handled solely by the author; no one else had access to the raw data. Finally, in order to ensure that data would not be accessed by anyone outside of the author of the thesis, all of the data was deleted after the analysis was completed.

Secondly, since the questionnaire asked sensitive questions during a period of great distress (i.e., the Covid-19 pandemic), the survey made clear the risks of participating in the study in the consent form ([Appendix 1](#)). Thus, by choosing to continue with the survey, all respondents agreed and accepted the risks involved, and participated by their own free will knowing the potential psychological consequences for those that might suffer from anxiety or depression as a result of the pandemic.

# Results

## Demographic Analysis

Out of the 274 valid responses, as shown in [Table 1](#), a majority of the respondents identified as female (58.39%), 40.51% identified as male, and only 3 people reported as belonging to a different gender than male or female. In terms of the age, the younger age groupings comprised approximately 60% of the entire sample, with those 19-25 accounting for 17.88% of respondents, and those 26-34 accounting for 43.43%. Other age groupings contributed fairly evenly to the remaining 40% of the sample (35-44 = 10.22%, 45-54= 8.39%, 55-64 = 8.39%, 65+ = 11.68%). In terms of education, 41.97% of respondents reported that they had a bachelor's degree, whereas the other education groupings were less common (Master's Degree or higher = 14.96%, Trade school = 14.23%, High School = 25.18%, Primary School or No education = 3.65%). The income group with the highest number of respondents was the 30 001 to 50 000 SEK group at 38.32%; 29.56% of the respondents indicated that they earned less than 15 000 SEK; 27.37% indicated they earned between 15 000 to 30 000 SEK; and the group with the least amount of respondents was those with an income of more than 50 000 SEK with 4.74%. Finally, 22.99% of the sample had a different ethnic origin than Swedish as per the European Commission's definition (2017). Most reported to be in good health (91.97%), and approximately half of the sample had personal experience with Covid-19.

Sample Vaccination Division				
Characteristic	Vaccinated		Unvaccinated	
	n (252)	% (91.97)	n (22)	% (8.03)
Gender				
Male	103	92.79%	8	7.21%
Female	147	91.87%	13	8.13%
Other	2	66.67%	1	33.33%
Age				
19-25	48	97.96%	1	2.04%
26-34	110	92.44%	9	7.56%
35-44	24	85.71%	4	14.29%
45-54	19	82.61%	4	17.39%
55-64	23	100%	0	0%
65+	28	87.5%	4	12.5%
Education				
Primary School or No education	8	80%	2	20%
Highschool	61	88.41%	8	11.59%
Trade School	35	89.74%	4	10.26%
Bachelor's Degree	108	93.91%	7	6.09%
Master's Degree or Higher	40	97.56%	1	2.44%
Ethnic Origin				
Swedish Origin	193	91.47%	18	8.53%
Other Origin	59	93.65%	4	6.35%
Income				
Less than 15 000 SEK	77	95.06%	4	4.94%
15 000 to 30 000 SEK	68	90.67%	7	9.33%
30 001 to 50 000 SEK	96	91.43%	9	8.57%
More than 50 000 SEK	11	84.62%	2	15.38%
Health				
Good Health	232	92.06%	20	7.94%
Poor Health	20	90.91%	2	9.09%
Personal Covid-19 Experience				
Have not been sick	127	94.07%	8	5.93%
Been sick	125	89.93%	14	10.07%

**Table 2 – Vaccination Distribution Across Sample Characteristics**

[Table 2](#), by comparison, reports on the same descriptive statistics cross-tabulating them according to vaccination outcomes. As can be seen, only 22 out of the 274 respondents (8.03%) admitted to being unvaccinated (i.e., having taken no vaccine doses at all). This

number is lower than the percentage of unvaccinated persons in Sweden reported by the Swedish Public Health Agency (Folkhälsomyndigheten, 2022), estimated at 15%. This discrepancy is likely a result of the sampling technique and its limitations into representing the Swedish population as a whole. Particularly, no respondent in the 55-64 age group claimed to be unvaccinated, but it is highly unlikely for there to be such a strong causal connection between the age group 55-64 and being vaccinated. Thus, it is clear that the lack of unvaccinated respondents in this particular group has more to do with sampling issues.

## **Descriptive Analysis**

[Table 3](#) shows the distribution of how unvaccinated and vaccinated persons perceived different information sources and their impact on their vaccination statuses. Indeed, as the question was posed on a Likert-scale, where 1 indicated that the information source was perceived to have had no impact on the respondent's vaccination status, and where 4 indicated that the information source was perceived to have had a big impact on the respondent's vaccination status, one can see through the distribution which sources were considered impactful for each group by displaying the percentage of each response.

From this data ([Table 3](#)), one can see that 39.68% of the vaccinated and 28.27% of the unvaccinated respondents considered information from health expert acquaintances to be impactful<sup>2</sup> – even though vaccinated persons were much more likely to indicate that it had a big impact on their vaccination status (18.65% compared to the unvaccinated response rate

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<sup>2</sup> Sum of frequencies of respondents selecting 3 and 4 on the Likert-Scale

of 4.55%). Interestingly, information from health expert acquaintances was also one of the categories which most unvaccinated persons considered to have had no impact on their vaccination status (59.09%), making it one of the categories that was simultaneously most and least relevant for unvaccinated respondents.

Table showing distribution of Likert-scale responses				
Information sources				
	No Impact			Very impactful
Social media				
Vaccinated	63,89%	24,60%	8,73%	2,78%
Unvaccinated	50%	40,91%	4,55%	4,55%
Television				
Vaccinated	44,44%	19,84%	25,79%	9,92%
Unvaccinated	54,55%	27,27%	9,09%	9,09%
Family				
Vaccinated	46,03%	26,19%	19,05%	8,73%
Unvaccinated	45,45%	40,91%	9,09%	4,55%
Friends				
Vaccinated	46,03%	26,19%	19,05%	8,73%
Unvaccinated	45,45%	40,91%	9,09%	4,55%
Health Expert				
Vaccinated	47,62%	12,70%	21,03%	18,65%
Unvaccinated	59,09%	13,64%	22,73%	4,55%
Swedish Gov or FHM				
Vaccinated	21,83%	17,86%	25,79%	34,52%
Unvaccinated	59,09%	18,18%	13,64%	9,09%
Swedish Gov: Swedish Government				
FHM: Folkhälsomyndigheten (The Swedish Public Health Agency)				

**Table 3 – Distribution of Vaccination Status Depending on Assessment of Information Impact**

The other category that was similarly divisive for unvaccinated respondents was the Swedish Public Health Agency and Government. Indeed, this category had 59.09% of unvaccinated respondents reporting it to have had no impact, but simultaneously 22.73% of unvaccinated respondents reporting it had been an impactful source<sup>3</sup>. Moreover, it was the most impactful sources for 60.32% of vaccinated respondents. Importantly, however, comparatively information from the Swedish Public Health Agency and Government was far more impactful for vaccinated individuals, with 34.52% of vaccinated respondents considering it very impactful (4 on the Likert-Scale), as opposed to only 9.09% of the unvaccinated respondents.

In the end, overall, most respondents (regardless of whether vaccinated or unvaccinated) were more inclined towards answering that the information sources had little or no impact. Moreover, in the no impact end of the scale, the percentage difference between vaccinated and unvaccinated respondents does not seem noteworthy for most categories. However, typically a larger percentage of unvaccinated respondents reported most sources had little impact (2 on the scale) for each item. In contrast, the opposite was true for the impactful end of the spectrum for vaccinated persons, where vaccinated persons were proportionally much more likely to say that a source had been impactful (3 on the scale). This was the case across all categories but one, "Health expert acquaintances".

As for the other information categories (TV, friends, social media, and family) these were not considered very impactful sources for most of the respondents. This was especially the case for social media, where 88.49% vaccinated respondents and 90.90% unvaccinated respondents answered that information from this source had either no or little impact on their

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<sup>3</sup> Sum of frequencies of respondents selecting 3 and 4 on the Likert-Scale

vaccination status<sup>4</sup>. For the other categories, vaccinated persons were more inclined to admit they had an impact compared to unvaccinated persons, indicating that more information sources were relevant for vaccinated persons compared to unvaccinated persons.

## **Inferential Analysis**

The logistic regression model is shown in [Table 4](#). Several variables that had theoretical significance did not prove to be statistically significant in the final model. In fact, most variables proved to be poor predictors of vaccination outcomes. This was especially true for most information sources, where the only significant one was information from the Swedish Government and Swedish Public Health Agency – the likelihood to be vaccinated increased several times if the respondent indicated that this was an impactful source of information for them ([Table 4](#)). Social media, TV, family, friends, and health expert acquaintances were all statistically insignificant predictors of vaccination likelihood.

Additionally, several other variables were also shown to not be good indicators as to whether the respondent was vaccinated or not. These were variables regarding health – both whether the respondent is suffering from illness and whether the respondent has had Covid-19 prior – having an ethnic origin other than Swedish, trust in general, and trust in academia. Furthermore, both having a high school education and a bachelor's degree also proved to be insignificant. On the other hand, the results for having a trade school degree or a master's degree were both significantly different compared to the reference point of no official or only

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<sup>4</sup> Sum of frequencies of respondents selecting 1 and 2 on the Likert-Scale

primary schooling. Finally, the results for having an income between 15 000 to 30 000 SEK was not significantly different compared to having an income of less than 15 000 SEK.



Unweighted Logistic Regression Table with Doses as dependent variable (age not included)							
	B	R S.E.	P	df	OR	95% CI for OR	
						Lower	Upper
Gender							
Male	Reference						
Female	-1,81	0,15	0,05*	1	0,16	0,03	0,97
Other	-4,75	0,01	0,00**	1	0,01	0,00	0,21
Education							
Primary Schooling or less	Reference						
High School	1,38	3,91	0,16	1	3,99	0,58	27,26
Trade School	2,87	22,30	0,02*	1	17,64	1,48	210,26
Bachelor's Degree	2,01	9,52	0,12	1	7,43	0,60	91,52
Master's Degree or higher	5,06	330,51	0,02*	1	157,63	2,59	9602,24
Income							
Less than 15 000 SEK	Reference						
15 000 - 30 000 SEK	-1,12	0,23	0,11	1	0,33	0,08	1,29
30 001 - 50 000 SEK	-1,59	0,14	0,02*	1	0,20	0,05	0,78
More than 50 000 SEK	-4,77	0,02	0,01**	1	0,01	0,00	0,29
High Risk Association with Covid-19	1,98	4,63	0,00**	3	7,26	2,08	25,36
High Risk Association with Vaccine	-1,53	0,07	0,00**	3	0,22	0,11	0,41
Trust in general	0,33	0,66	0,49	3	1,39	0,55	3,51
Trust in government	1,58	3,54	0,03*	3	4,87	1,17	20,26
Trust in Academia	0,22	0,46	0,55	3	1,24	0,60	2,56
Other Ethnic Origin	-1,68	0,19	0,09	3	0,19	0,03	1,33
Social Media influence	-0,36	0,30	0,40	3	0,70	0,30	1,61
TV influence	-0,47	0,28	0,28	3	0,62	0,26	1,48
Health Expert influence	0,17	0,50	0,70	3	1,18	0,51	2,72
Swedish Government or Swedish Public Health Agency influence	0,71	0,57	0,01**	3	2,03	1,17	3,52
Family influence	0,11	0,49	0,80	3	1,12	0,47	2,66
Friends influence	0,56	0,78	0,21	3	1,74	0,73	4,18
Poor Health	-0,89	0,45	0,42	1	0,41	0,05	3,48
Prior or current Covid-19 illness	0,49	1,50	0,60	1	1,63	0,27	9,93

B = Coefficient, R S.E. = Robust standard error, P = p-value, \* indicates  $p < 0.05$ , \*\*  $p < 0.01$ , OR = Odds Ratio, CI = Confidence Interval. Pseudo R<sup>2</sup>: 0.5103

**Table 4 – Binary Logistic Regression Table with Vaccination Status as Dependent Variable**

Regardless, a number of variables were significant. In addition to those mentioned above (having a higher education and listening to information from the Swedish government or the Swedish Public Health Agency), others included, gender, income levels above 30 000 SEK, high

risk associations of the Covid-19 disease or the Covid-19 vaccine, and trust in the Swedish government ([Table 4](#)).

Firstly, the results from the model regarding education indicate that, while higher education attainment does not necessarily lead to a higher likelihood of being vaccinated, having a trade school degree or a master's degree increases the likelihood to be vaccinated compared to having little or no schooling. Secondly, [Table 4](#) clearly shows that an increased income means a higher likelihood to be unvaccinated compared to those with lower income. Thirdly, when it came to gender, persons that identified as female were 0,16 times less likely to be vaccinated compared to those who identified as male; those who identified as other were a hundred times less likely to be vaccinated compared to those who identified as male. Fourthly, while trust in the academia and general trust were not significant predictors of vaccination likelihood, trust in the Swedish government was. Indeed, respondents that thought that the Swedish government was at least a little bit trustworthy were between 4.87 to 14.61 times more likely to be vaccinated than those that did not find the Swedish government trustworthy at all.

Finally, the model shows that the variables regarding risk assessment of the Covid-19 disease and the Covid-19 vaccine were some of the most significant predictors of likelihood of being vaccinated and unvaccinated. Indeed, persons that indicated that they thought that the Covid-19 disease was at least somewhat detrimental to their long-term health were between 7.26 and 21.78 times more likely to be vaccinated compared to those who did not believe the Covid-19 disease was very dangerous. In contrast, persons that indicated that they thought that the Covid-19 vaccine was at least somewhat harmful to their health were much less likely

to be vaccinated than those who thought the vaccine had no negative consequences on their health whatsoever. Thus, a person was most likely to be vaccinated if they thought the virus was more dangerous than the vaccine and vice-versa.

# Discussion

## The Results and RQ1/2

The present study measured the impact of different information sources on Covid-19 vaccination outcomes in Sweden. It did this through both descriptive and inferential methods. Indeed, firstly, it examined information source separately divided by vaccination status. Secondly, a binary logistic regression model was introduced in order to measure to what extent the different information sources were statistically significant predictors of Covid-19 vaccination likelihood when combined with several other independent variables that have been proven to be significant in the past.

Thus, with the thesis' two research questions in mind:

1. Do vaccinated and unvaccinated persons in Sweden differ significantly in their information behavior?
2. Are any information sources significant predictors of vaccination likelihood within the sample when other variables (i.e., risk, trust, sociodemographic factors) have been accounted for?

In response to the first question, the results did indicate that vaccinated and unvaccinated persons did differ in their behavior. In fact, the descriptive analysis suggested that health expert acquaintances and the Swedish government/the Swedish Public Health Agency were assessed to be important information sources for the respondents' regardless of if they were

vaccinated or not. However, importantly, a majority of vaccinated persons considered information from the Swedish government/the Swedish Public Health Agency to be impactful for their vaccination status (60.32%), whereas while this number was still comparatively high compared to the other measured information sources for unvaccinated persons, it was noticeably lower with only 22.73% reporting it had an impact ([Table 3](#)). Moreover, both information from health expert acquaintances and the Swedish government/Public Health Agency were divisive information sources for unvaccinated respondents. Indeed, while both of these scored as the most impactful sources for unvaccinated persons (22.73% for Swedish Government/Public Health Agency and 27.28% for health expert acquaintances), they were both also the information sources most unvaccinated persons assessed to be the least impactful sources with 59.09% of respondents claiming it had no impact on their vaccination status ([table 3](#)). These results suggest that unvaccinated persons have large in-group differences when it comes to which information sources they assess to be important.

Furthermore, it appears as if vaccinated respondents were more inclined to admit that any of the six information sources (TV, social media, friends, family, local health expert, and Swedish Government/Swedish Public Health Agency) had impacted their decision regarding their vaccination status compared to the unvaccinated respondents ([table 3](#)). Thus, the answer to RQ1 seems to be that there is a clear difference in how vaccinated and unvaccinated persons assess which information sources are important in the Swedish context, and this difference is primarily signified by the fact that vaccinated respondents are more willing to confirm that they are influenced by different information sources.

In response to RQ2, however, information sources were overall poor predictors for vaccination likelihood ([Table 4](#)). Indeed, only information from the Swedish Government and Health Agency was significantly correlated with vaccination likelihood within the model, whereas none of the other information sources were. This is an interesting, if not entirely unsurprising result. Indeed, persons that admitted that information from the Swedish Government or the Swedish Health Agency had at least some impact were between 2.03 to 6.09 times more likely to be vaccinated than those who did not.

Thus, the answer to RQ2 still appears somewhat inconclusive; although findings from RQ1 seem to suggest that there is a difference in information behavior ([Table 3](#)), these findings did not appear significant in the model ([Table 4](#)). Moreover, as many respondents did not associate any of the information sources as particularly relevant, more emphasis is needed on different aspects of information sources to accurately assess to what extent this is true. As the present study examined information sources generally and did not make a clear-cut distinction between content and medium, more research is needed to determine to what extent information sources can be significant predictors of vaccination outcomes.

## **Discussion of Results**

With the answers to RQ1 and RQ2 in mind, it seems as if in the Swedish context, while misinformation and disinformation likely are still factors for persons choosing to stay unvaccinated, the present study indicates that there is a reluctance to factor in external information sources in general for unvaccinated respondents in the Swedish context. Indeed, the fact that many respondents assessed that the information sources were not particularly

relevant for their vaccination status suggests that the issue was not that they believed information was being manipulated along the way, but rather that information, particularly from sources other than the Swedish Government/Public Health Agency, was simply not relevant to their personal decision-making process. Nevertheless, there were clear indications that the Swedish Government and Public Health Agency have been successful in their attempts to persuade Swedish residents to get vaccinated with the Covid-19 vaccine judging from the data in [Table 3](#).

Although, it should also be mentioned that some unvaccinated respondents also indicated that information from the Swedish Government/Public Health Agency had impacted their decision to stay unvaccinated ([Table 3](#)). This suggests that the Public Health Agency's crisis communication did not have the intended effect on some of the unvaccinated persons in the sample. Consequently, this can be seen as a failure in communicating credibly, conveying the proper context, and/or with insufficient compassion (Tetteh, 2020). Indeed, crisis communication scholars have determined that without framing the conversation in actual risk or not properly conveying what the plan is, poor communication can have harmful consequences in terms of constituents not following the suggested guidelines (Coombs, 2020; Tetteh, 2020). While more research is needed to determine to what extent this is true within Sweden, given the results of the present study it is worth investigating further the failures or successes of Swedish institutions in conveying crisis information.

As for the impact of local health expert on the respondents' vaccination statuses, it was not statistically significant in the model ([Table 4](#)) but did appear as a frequent source of information in the descriptive analysis ([Table 3](#)). Thus, more research is needed to examine

the relationship between local health experts' advice and choosing to stay unvaccinated in the Swedish context. However, prior research suggests that it is not surprising that some healthcare workers or other medical professionals would not advocate for vaccines (Barry et al., 2021; Byström et al., 2020; Xu et al., 2021). Thus, crisis communicators addressing the Swedish public need to be aware of the potential of mis- or disinformation stemming from this source, which has the potential to lead to people choosing to stay unvaccinated. Indeed, despite health expert advice not being a significant predictor in the regression model, it is still wise to address healthcare workers' concerns (Karafillakis et al., 2016). As Wang et al. (2020) explains, health communication in a crisis such as the Covid-19 pandemic comes from many different sources, not just governments and official organizations. As such, it is necessary to create a holistic communication environment where parties such as healthcare workers contribute accurate information to end to the crisis (ibid.).

Finally, one information source that appeared not to be very relevant in the descriptive analysis or the regression model was social media impact. This is rather surprising given that many studies that have indicated that social media is problematic in terms of causing or being correlated to vaccine hesitancy (Barry et al., 2021; Nguyen & Catalan-Matamoros, 2020; Qiao et al., 2020). In fact, neither vaccinated nor unvaccinated respondents of this study were very likely to say that social media had influenced their vaccination status. Specifically, only 2.78% of vaccinated and 4.55% of unvaccinated respondents indicated that social media had a big impact on their vaccination status ([Table 3](#)). There are several potential reasons for this. Firstly, and most simply, the Swedish population might differ in how they use social media and how they interact with vaccine information online compared to populations in other countries. After all, much of the vaccine mis- and disinformation online is not in Swedish, but



rather English. Secondly, as prior studies have identified (Cossard et al., 2020), social media per se is not necessarily the driving cause of mis- or disinformation, but rather it is possible that specific contexts within social media create the space for disinformation and the present study only measured social media influence on vaccination outcome in a general sense. Finally, it is also possible that the respondents had a very different understanding as to what constituted information from social media, with for example, news articles posted on social media pages and leading third-party sites with disinformation not registering as social media posts influencing their vaccination statuses.

Regardless, it is clear that while information source did differ somewhat between vaccinated and unvaccinated respondents, they were not the most significant predictors of vaccination status. Instead, firstly, demographic variables, such as education were mostly significant ([Table 4](#)) in accordance with prior studies (Akiful Haque et al., 2021; Lazarus et al., 2020). Secondly, trust in the Swedish government was significantly associated with being vaccinated where persons that trusted the government more were at least 4.87 times more likely to be vaccinated than those that didn't trust the government at all ([Table 4](#)). This too is in line with what prior studies have identified about unvaccinated individuals (Szilagyi et al., 2021; Viswanath et al., 2021). Thus, as has been theorized previously, indicating that the vaccine is unsafe, also carries with it implications of authoritative bodies as they are the ones in charge of making sure the vaccine is safe (Dubé et al., 2021). Thirdly, risk assessment of the Covid-19 disease and the Covid-19 vaccine were both excellent predictors of vaccination likelihood. In fact, respondents that reported that they thought the Covid-19 disease was dangerous were much more likely to be vaccinated than those that reported that the Covid-19 vaccine was dangerous ([Table 4](#)). While this might seem obvious – i.e., persons who are

not vaccinated do not think the vaccine is safe or efficient – these results indicate that a poor understanding of the dangers of the Covid-19 disease, and the relative safety of the Covid-19 vaccine are indeed definitively some of the most important issues to address when communicating health information in a crisis such as the Covid-19 pandemic.

## **Implications for Crisis Communication in Sweden**

This study highlights several implications for improving crisis communication as it relates to the Covid-19 pandemic in Sweden. Firstly, and most importantly, as several researchers in the crisis communication field have argued, crises create the opportunity for organizations to build institutional resilience (Frandsen & Johansen, 2017; Ulmer et al., 2018). Indeed, the Covid-19 pandemic is a chance for health and crisis communicators to grow and learn in order to better deal with the next crisis that will inevitably occur. Thus, the present thesis demonstrates that there is a significant section of residents in Sweden who do not absorb the information given by Swedish health authorities, meaning that there is room for improvement in how, for example, important components like risk, context, and compassion (Tetteh, 2020) are communicated to the Swedish public.

Secondly, as prior research has continuously asserted, targeted communication is still key and different information strategies need to be employed depending on the target group (Coombs, 2020; Tagliacozzo et al., 2021). Indeed, in the sample analyzed for this study it became apparent that vaccinated and unvaccinated persons differed in how they assessed the relevance of the various information sources for their vaccination statuses. The Swedish Government and Public Health Agency were an important source of information that a

majority of vaccinated individuals found to be impactful ([Table 3](#)), and which significantly increased the likelihood to be vaccinated in the regression model ([Table 4](#)). However, the same information source and messaging appeared to have had the opposite effect on unvaccinated respondents, making them less likely to get vaccinated. Moreover, a similar trend was observed for information coming from sources the respondents considered to be health experts.

Swedish crisis communication strategies need to account for this in the future. While health crises are unique in the sense that there is a need to reach everyone within a population, and not just a few targeted segments, there is still room to use specific messages depending on the group which is in most need of receiving the information. Consequently, one direct recommendation for the Swedish Public Health Agency is to adjust its current communication strategy by re-orienting and tailoring messages targeting different groups. Specific communication efforts should target medical and healthcare workers as the present results indicate that it is possible that information spreading from this source might lead to vaccine hesitancy or rejection. Furthermore, a different communication approach should be employed to target persons that listen to Swedish health authorities but still choose to not get vaccinated. Any adjustments in the communication strategy should present information that is transparent (Nihlén Fahlquist, 2018) and not in opposition with previous messaging (Tetteh, 2020). As Coombs (2020) argues, there is no one-size-fits-all solution, and as such, different crisis communication strategies need to be continuously deployed in order to ease the fears of those that choose to stay unvaccinated.

## Limitations of the Study

It is important to note that the study had some limitations; as such, the results from the present study need to be regarded with adequate caution. Firstly, the survey's sampling technique might not have allowed for a selection of a representative sample. Consequently, the results of this analysis provide useful insights into thinking about crisis communication as it relates to the Covid-19 pandemic in Sweden, but the quantitative results found here should be confirmed by other studies before being used in decision making. In fact, with a sample of 274 respondents, several demographic groups suffered. For example, persons identifying as something other than male and female only had three respondents making it hard to extrapolate any broader conclusions for that group alone. Moreover, the age group 55-64 had zero unvaccinated respondents which led to the age group variable being excluded from the regression model in favor of a more accurate analysis of the other variables.

Secondly, moving on to Income and SES, as the results indicated that an increased income decreased the likelihood to be vaccinated, there is an argument to be made that the present thesis failed to measure SES accurately. Indeed, most literature suggests the relationship should be the other way around (Dubé et al., 2021). Thus, there is a chance that income in this case was a poor substitute for measuring SES.

Thirdly, with an  $\omega = 0.6208$  the Likert-scale questions did not meet the desired reliability requirements indicating that the scale used in the questionnaire could have been improved. Indeed, 0.6208 is below the adequate level as indicated by Nunnally & Bernstein (1994) – although admittedly they specifically discussed Cronbach's Alpha. As a result, for the

scale to be used in the future, reliability tests should be conducted again in order to see whether the reliability is good enough for empirical study.

Finally, there were also some issues with the information sources. Based on the literature review, it was expected that information sources (TV, social media, family, friends, local health expert, and Swedish government/Swedish Public Health Agency) would have been particularly relevant for their decision surrounding respondents' vaccination status. Yet, results did not indicate this relationship. It is possible that the study could have benefitted from more distinct categories with little to no overlap and a clear distinction between content and medium in order to fully estimate how vaccinated and unvaccinated persons. This is an area for exploration in future studies.

## Conclusion

The present thesis set out to determine the effects of information sources on Covid-19 vaccination outcomes. The results indicated that while information habits did differ between vaccinated and unvaccinated respondents, most information sources were not statistically significant when paired with other variables. Instead, demographic variables like income and education, as well as variables concerning risk assessment of the pandemic impacted the likelihood to be vaccinated much more than any other variables.

Regardless, the study indicates that Swedish health authorities still have work to do on easing the fears surrounding the vaccine, as well as communicating the risks of the Covid-19 disease more accurately. While Sweden performs better than other countries on vaccination rates (World Health Organization, 2022), the high chances of other, potentially more dangerous health crises in the future make it vital to learn from the Covid-19 pandemic in order to increase preparedness and mitigate potential damages of the next adverse event.

A particularly interesting finding of the present analysis is that information coming from the Swedish Government and Swedish Health Agency proved to be very divisive for respondents – among unvaccinated respondents, it had the highest frequency as simultaneously the most and least impactful source of information. This suggests that the communication strategies of Swedish authorities should be adjusted to respond to this counterintuitive result. In addition, authorities should take a different approach to communicating with health experts in order to improve the likelihood the experts will promote vaccine safety and improve vaccine uptake in their communities.

Further research on the impact of communication approaches on vaccination acceptance and uptake is still necessary to improve crisis communication strategies. In order to establish whether information sources are good predictors of vaccination outcomes, future studies should disaggregate information sources, and make clear distinctions based on the messaging content and the medium of delivery. Furthermore, quantitative studies like the present one should be complemented with qualitative studies in order to investigate the reasons behind the different behaviours and information absorption patterns, and how these translate into vaccination decisions.

**Word count:** 11,768

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# Appendix 1 – Questionnaire & Consent Form

## Consent form

*Scroll down to see English*

## Samtyckesform

Hej,

Mitt namn är Timmy Klamvik, och jag studerar på Göteborgs Universitet. Som en del av mina studier håller jag nu på med en undersökning av Covid-19 vaccinations resultat i Sverige. Om du för tillfället bor i Sverige är du välkommen att ta del i denna undersökning. Resultaten kan ge många insikter i hur våra beteenden påverkar vår hälsa och kan hjälpa forskare och hälsomyndigheter vara mer effektiva och transparenta i framtiden. Din medverkan hjälper, och skulle uppskattas mycket.

Denna enkät tar endast **5 till 10 minuter** att slutföra. Du kan frivilligt välja att delta eller att inte delta i denna undersökning. Även om du väljer att delta, kan du närsomhelst välja att avsluta din deltagning utan att din enkät sparas. Om du väljer att delta, är det viktigt att du svarar fullständigt och samvetsgrant för att undersökningen ska lyckas.

Lite till ingen risk till din person förväntas om du väljer att ta del av undersökningen. All data som samlas är anonym och kan inte tillskrivas till din person. All konfidentiell information kommer endast behandlas av mig och tas bort efter att undersökningen är färdig (Juni 2022). Om du för tillfället upplever bedrövelse i och med den nuvarande Covid-19 pandemin, kan vissa frågor få dig att känna dig obekvämt. Vet du med dig att du lätt blir ängslig runt frågor angående covid-19 pandemin, samt frågor relaterade till pandemin, vänlig var medveten om att denna undersökning kan medföra ytterligare bedrövelse och att om du bestämmer dig för att delta i denna undersökning godkänner du de potentiella riskerna som kan tillkomma. Vänligen kom ihåg att det finns resurser och hjälp tillgängligt om du lider av depression eller ängslighet som ett resultat av covid-19 pandemin.

Tack för din hjälp!

## Consent form

Dear Participant,

My name is Timmy Klamvik, and I am a student at the University of Gothenburg. As a part of my studies, I am conducting a survey on Covid-19 vaccination outcomes in Sweden. I am asking you to participate in this survey if you are currently residing in Sweden. The results can give many insights into how our behaviors impact our health and can also help researchers and health agencies be more efficient and transparent in the future. Your participation helps and is greatly appreciated.

This survey will only take **5 to 10 minutes** to complete. You can freely choose to take part or to not take part in this survey. Even if you agree to participate, you can stop at any time without your response being gathered. If you choose to participate, it is important that you fill in the questionnaire completely and conscientiously for the success of the study.

Little risk is expected on the part of the participant if you choose to participate. All data is collected anonymously and cannot be attributed to your person. All confidential information will only be managed by me and will be deleted after the study is completed (June 2022). If you are currently suffering from distress as a result of the ongoing pandemic, please remember that some questions might be uncomfortable. If you know that you are sensitive to triggers regarding covid-19 (SARS-CoV-2) and the current pandemic, I kindly ask you to consider that the questionnaire might cause severe discomfort and that by taking the survey you agree that you understand the associated risks involved. Please remember that there is help available if you are in emotional distress as a result of the Covid-19 pandemic.

Thank you for your help.

Preferred Language / Föredraget Språk

- English
- Svenska

**General Information:** This section contains questions about your age, gender, education level, monthly income, vaccination status and health.

Have you spent at least 6 months in Sweden during the last 12 months?

Har du spenderat åtminstone 6 månader i Sverige under de sista 12 månaderna?

- Yes/Ja
- No/Nej

How old are you?

Hur gammal är du?

- 18 and under/18 eller yngre
- 19-25

- 26-34
- 35-44
- 45-54
- 55-64
- 65 and over/65 eller äldre

What is your gender?

Vad är ditt kön?

- Male/Man
- Female/Kvinna
- Other/Annat

What is your highest completed degree?

Vad är din högst avklarade examen?

- No Official Education/Ingen officiell utbildning
- Primary School/Grundskola
- High School/Gymnasienivå
- Trade School/Yrkesutbildning
- Bachelor's Degree/Kandidatexamen
- Master's Degree/Masterexamen
- PhD Degree/Doktorsexamen

What is your current net monthly income?

Vad är din nuvarande månadsinkomst innan skatt?

- Less than 15 000 SEK/Mindre än 15 000 SEK
- 15 001 – 30 000 SEK/15 001 – 30 000 SEK
- 30 001 – 50 000 SEK/ 30 001 – 50 000 SEK
- More than 50 000 SEK/Mer än 50 000 SEK

How would you, currently, describe your overall health?

Hur skulle du, nuvarande, beskriva din fullständiga hälsa?

- In full health(No underlying diseases or illnesses)/Vid full hälsa (Inga underliggande sjukdomar eller besvär)
- Short term sickness (Currently suffering from an illness that is expected to get better)/Kortvarig sjukdom (Lider av en sjukdom som förväntas bli bättre inom kort)

- Long term sickness (Currently suffering from long term illness that is unlikely to get better)/Långvarig sjukdom (Lider av en sjukdom som inte förväntas bli bättre inom snar framtid)

Do you know anyone that has been sick with Covid-19 (SARS-CoV-2)?

Känner du någon som varit sjuk i Covid-19 (SARS-CoV-2)?

- Yes, I am/have been sick with Covid-19 / Ja, Jag har/har varit sjuk i Covid-19
- Yes, a friend or acquaintance is/has been sick with Covid-19 / Ja, en vän eller bekant är/har varit sjuk i Covid-19
- Yes, a family member is/has been sick with Covid-19 / Ja, en familjemedlem är/har varit sjuk i Covid-19
- No, no one I know is/has been sick with Covid-19 / Nej, ingen känner är/har varit sjuk i Covid-19

How many doses of the Covid-19 Vaccine, if any, have you taken?

- No dose / Inga doser
- 1 Dose / 1 Dos
- 2 Doses / 2 Doser
- 3 Doses /3 Doser

**Ethnic Origin – Part 1:** These questions relate to your ethnic origin

**Etniskt ursprung – Del 1:** Denna del har frågor angående ditt etniska ursprung

Were you born in Sweden?

Är du född i Sverige

- Yes/Ja
- No/Nej
- Rather not say/Vill helst inte säga

(In case the respondent answered that they were not born in Sweden, they were presented with the following question)

Where were you born? (If unsure, or country not in list please choose “Not sure”)

I vilket land är du född? (Om du är osäker, välj "unsure" i botten av listan)

- List of 197 countries and unsure

**Ethnic Origin – Part 2:** The following question asks whether both your parents were born abroad. If only one of your parents were born abroad, please answer “No”. If you are uncertain, please answer “No”.

**Etniskt Ursprung – Del 2:** Följande sektion frågar om båda dina föräldrar är födda utanför Sverige. Om bara en förälder är född utanför Sverige, svara ”Nej”. Om du är osäker, svara ”Nej”.

Were both your parents born outside of Sweden?

Är båda dina föräldrar födda utanför Sverige?

- Yes/Ja
- No/Nej
- Rather not say/Vill helst inte säga

(In case the respondent answered that both their parents were not born in Sweden, they were presented with the following question)

Since you stated that both your parents were born outside of Sweden, please indicate where they were born. The numbers do not indicate anything in particular, and may represent either parent. If you only have one parent, choose "unsure" for parent number 2. / Eftersom du svarade att båda dina föräldrar är födda utanför Sverige, vänligen välj i vilka länder dina föräldrar är födda i. Det spelar ingen roll vilken förälder som är nummer ett eller två. Om du endast har en förälder, välj "unsure" i listan för förälder nummer 2.

Where was parent number 1 born? (If unsure, or country not in list please choose “Not sure”)

Var föddes förälder nummer 1? (Om du är osäker, välj "unsure" i botten av listan)

- List of 197 countries and unsure

Where was parent number 2 born? (If unsure, or country not in list please choose “Not sure”)

Var föddes förälder nummer 2? (Om du är osäker, välj "unsure" i botten av listan)

- List of 197 countries and unsure

**Trust and risk assessment:** This section measures to what extent you trust those around you and the Swedish government, and how dangerous you believe the Covid-19 pandemic and the Covid-19 vaccine to be

On a scale of one to four, how trustworthy are people?

På en skala mellan ett och fyra, hur pålitliga är människor?



- 1: Most people cannot be trusted/De flesta människor är inte pålitliga
- 2
- 3
- 4: Most people can be trusted/De flesta människor är pålitliga

On a scale of one to four, to what degree do you trust people that you know personally?

På en skala mellan ett och fyra, hur mycket litar du på människor du känner personligen?

- 1: Most people I know cannot be trusted/De flesta människor jag känner är inte pålitliga
- 2
- 3
- 4: Most people I know can be trusted/De flesta människor jag känner är pålitliga

On a scale of one to four, to what degree do you trust people that you just met?

På en skala mellan ett och fyra, hur mycket litar du på människor du precis träffat?

- 1: Most people I have just met can be trusted/De flesta människor jag precis träffat är inte pålitliga
- 2
- 3
- 4: Most people I have just met cannot be trusted/ De flesta människor jag precis träffat är pålitliga

On a scale of one to four, to what degree is the Swedish government trustworthy?

På en skala mellan ett och fyra, hur pålitlig är den svenska regeringen?

- 1: Not trustworthy at all/ Inte pålitlig alls
- 2
- 3
- 4: Very trustworthy/ Våldigt pålitlig

On a scale of one to four, how trustworthy are Swedish researchers and the Swedish academia?

På en skala mellan ett och fyra, hur pålitliga är svenska forskare och den svenska akademien?

- 1: Not trustworthy at all/ Inte pålitlig alls
- 2
- 3
- 4: Very trustworthy/ Våldigt pålitlig

Risk Assessment: Next are questions regarding your perceptions of covid-19 and the covid-19 vaccine

On a scale of one to four, if you were to get sick with Covid-19, how likely is it that the sickness will impact your long-term health negatively?

På en skala mellan ett och fyra, om du skulle bli sjuk i Covid-19, hur sannolikt är det att sjukdomen skulle påverka din långvariga hälsa?

- Not very likely/Inte särskilt sannolikt
- Very likely/Väldigt sannolikt

On a scale of one to four, how likely is getting the Covid-19 vaccine to impact your health negatively?

På en skala mellan ett och fyra, hur sannolikt är det att Covid-19 vaccinet kommer påverka din hälsa negativt?

- Not very likely/Inte särskilt sannolikt
- Very likely/Väldigt sannolikt

On a scale of one to four, how effective do you believe the Covid-19 vaccine is against the current strain of the Covid-19 virus?

På en skala mellan ett och fyra, hur effektivt tror du covid-19 vaccinet är emot det nuvarande Covid-19 viruset?

- Not very effective/Inte särskilt effektivt
- Very effective/Väldigt effektivt

**Information Sources:** This section asks questions related to where you got information regarding the Covid-19 vaccine and your decision to get or not get vaccinated.

On a scale of one to four to what degree did information from social media (Twitter, Facebook, reddit, etc.) impact your vaccination status?

På en skala mellan ett och fyra, till vilken grad har information från sociala medier (Twitter, Facebook, reddit etc.) påverkat din vaccineringsstatus?

- 1: Information from social media did not influence my decision at all / Information från sociala medier har inte påverkat mitt beslut alls
- 2
- 3
- 4: Information from social media influenced my decision a lot / Information från sociala medier har påverkat mitt beslut mycket

On a scale of one to four to what degree did information from TV broadcasts (Local news, national news, talk shows, etc.) impact your vaccination status?

På en skala mellan ett och fyra, till vilken grad har information från TV (Lokala nyheter, nationella nyheter, talkshows) påverkat din vaccineringsstatus?

- 1: Information from TV broadcasts did not influence my decision at all / Information från TV har inte påverkat mitt beslut alls
- 2
- 3
- 4: Information from TV broadcasts influenced my decision a lot / Information från TV har påverkat mitt beslut mycket

On a scale of one to four to what degree did information from your family (Mother, father, siblings etc.) impact your vaccination status?

På en skala mellan ett och fyra, till vilken grad har information från din familj (Mamma, Pappa, syskon, etc.) påverkat din vaccineringsstatus?

- 1: Information from my family did not influence my decision at all / Information från min familj har inte påverkat mitt beslut alls
- 2
- 3
- 4: Information from my family influenced my decision a lot / Information från min familj har påverkat mitt beslut mycket

On a scale of one to four to what degree did information from your friends and acquaintances (Colleagues, friends, etc.) impact your vaccination status?

På en skala mellan ett och fyra, till vilken grad har information från dina vänner och bekanta (Kollegor, vänner, etc.) påverkat din vaccineringsstatus?

- 1: Information from my friends and acquaintances did not influence my decision at all / Information från mina vänner och bekanta har inte påverkat mitt beslut alls
- 2
- 3
- 4: Information from my friends and acquaintances influenced my decision a lot / Information från mina vänner och bekanta har påverkat mitt beslut mycket

On a scale of one to four to what degree did information from local health experts (Personal doctor, family doctor, health expert friend etc.) impact your vaccination status?

På en skala mellan ett och fyra, till vilken grad har information från lokala hälsoexperter (Personlig läkare, familjens läkare, vän med hälsoerfarenhet) påverkat din vaccineringsstatus?

- 1: Information from local health experts did not influence my decision at all / Information från lokala hälsoexperter har inte påverkat mitt beslut alls
- 2
- 3
- 4: Information from local health experts influenced my decision a lot / Information från lokala hälsoexperter har påverkat mitt beslut mycket

On a scale of one to four to what degree did information from the government or Folkhälsomyndigheten (Digital Advertisements, TV advertisements, flyers, physical advertisements, press conferences) impact your vaccination status?

På en skala mellan ett och fyra, till vilken grad har information från regeringen eller folkhälsomyndigheten (Digital reklam, reklam på TVn, flajers, fysisk reklam, press konferenser) påverkat din vaccineringsstatus?

- Information from the Swedish government or Folkhälsomyndigheten did not influence my decision at all / Information från den svenska regeringen eller folkhälsomyndigheten har inte påverkat mitt beslut alls
- Information from the Swedish government or Folkhälsomyndigheten influenced my decision a lot / Information från den svenska regeringen eller folkhälsomyndigheten har påverkat mitt beslut mycket

## Appendix 2 – Statistical tables and figures

Logistic regression

Number of obs = 251

Wald chi2(25) = 59.53

Prob > chi2 = 0.0001

Log pseudolikelihood = -40.484562

Pseudo R2 = 0.4570

dose_rec	Odds ratio	Robust std. err.	z	P> z	[95% conf. interval]	
gender_rec						
Female	.6443132	.4698099	-0.60	0.547	.1543233	2.690063
Other	.0602755	.1067045	-1.59	0.113	.0018762	1.936448
edu_rec						
Highschool Degree	1.244357	1.793095	0.15	0.879	.073855	20.96573
Trade School Degree	3.602087	4.897246	0.94	0.346	.2507821	51.73827
Bachelor's Degree	2.578723	3.821896	0.64	0.523	.1412047	47.09345
Master's Degree or higher	25.50794	49.11015	1.68	0.093	.5859586	1110.412
income_rec						
Income: 15k to 30k SEK	.181603	.2010232	-1.54	0.123	.0207442	1.589828
Income: 30k to 50k SEK	.0978543	.1006036	-2.26	0.024	.0130455	.7340018
Income: more than 50k SEK	.0161243	.021365	-3.11	0.002	.0012012	.216442
age_rec						
26-34 years old	.8342148	1.153564	-0.13	0.896	.0554912	12.54099
35-44 years old	.7056481	1.037224	-0.24	0.813	.0395747	12.58227
45-54 years old	.0470153	.0631419	-2.28	0.023	.0033812	.6537469
55-64 years old	1 (empty)					
Over 65 years old	.4174565	.6881612	-0.53	0.596	.0164982	10.56294
cov19_risk_rec	9.326257	10.71546	1.94	0.052	.9811015	88.65451
vax_risk_recoded	4.720383	1.463577	5.01	0.000	2.57074	8.667548
trust_score_rec	5.695055	4.711185	2.10	0.035	1.125509	28.81688
ethnic_origin	.7576153	.6005017	-0.35	0.726	.1602391	3.582027
social_media_rec	1.914038	1.905439	0.65	0.514	.2720025	13.46877
tv_rec	1.624924	1.821012	0.43	0.665	.1806809	14.61348
health_experts_rec	.9140141	.6367481	-0.13	0.897	.233326	3.580491
health_agency_rec	8.989283	9.489797	2.08	0.038	1.135349	71.17388
family_rec	2.411669	1.891186	1.12	0.262	.518587	11.21538
friends_rec	12.55463	15.09109	2.10	0.035	1.190231	132.427
health_rec	.5220686	.5478784	-0.62	0.536	.066749	4.083292
covidexp_rec	.4706844	.383225	-0.93	0.355	.0954317	2.32149
_cons	.0746622	.1669198	-1.16	0.246	.0009335	5.971778

Note: \_cons estimates baseline odds.

Table 5 – regression table showing age and OR

Logistic regression

Number of obs = 251

Wald chi2(25) = 59.53

Prob > chi2 = 0.0001

Log pseudolikelihood = -40.484562

Pseudo R2 = 0.4570

dose_rec	Coefficient	Robust std. err.	z	P> z	[95% conf. interval]	
gender_rec						
Female	-.4395703	.7291639	-0.60	0.547	-1.868705	.9895647
Other	-2.80883	1.77028	-1.59	0.113	-6.278515	.6608551
edu_rec						
Highschool Degree	.218619	1.440981	0.15	0.879	-2.605651	3.042889
Trade School Degree	1.281514	1.359558	0.94	0.346	-1.383171	3.946198
Bachelor's Degree	.9472945	1.482088	0.64	0.523	-1.957545	3.852134
Master's Degree or higher	3.23899	1.925288	1.68	0.093	-.5345061	7.012486
income_rec						
Income: 15k to 30k SEK	-1.705932	1.106938	-1.54	0.123	-3.875491	.4636257
Income: 30k to 50k SEK	-2.324276	1.028097	-2.26	0.024	-4.339308	-.3092438
Income: more than 50k SEK	-4.127429	1.325023	-3.11	0.002	-6.724425	-1.530432
age_rec						
26-34 years old	-.1812644	1.382814	-0.13	0.896	-2.891531	2.529002
35-44 years old	-.3486386	1.469888	-0.24	0.813	-3.229566	2.532289
45-54 years old	-3.057282	1.343008	-2.28	0.023	-5.689529	-.425035
55-64 years old	0 (empty)					
Over 65 years old	-.8735749	1.648462	-0.53	0.596	-4.104501	2.357351
cov19_risk_rec	2.232834	1.148956	1.94	0.052	-.0190794	4.484747
vax_risk_recoded	1.55189	.3100547	5.01	0.000	.9441938	2.159586
trust_score_rec	1.739598	.8272412	2.10	0.035	.1182353	3.360961
ethnic_origin	-.2775795	.7926209	-0.35	0.726	-1.831088	1.275929
social_media_rec	.649215	.9955075	0.65	0.514	-1.301944	2.600374
tv_rec	.4854608	1.120675	0.43	0.665	-1.711023	2.681944
health_experts_rec	-.0899093	.6966502	-0.13	0.897	-1.455319	1.2755
health_agency_rec	2.196033	1.055679	2.08	0.038	.1269403	4.265126
family_rec	.8803192	.7841811	1.12	0.262	-.6566475	2.417286
friends_rec	2.53009	1.202033	2.10	0.035	.1741475	4.886032
health_rec	-.6499563	1.049438	-0.62	0.536	-2.706816	1.406904
covidexp_rec	-.7535675	.8141868	-0.93	0.355	-2.349344	.8422094
_cons	-2.594782	2.235667	-1.16	0.246	-6.976608	1.787045

Table 6 – regression table showing and coefficient

Distribution of Age depending on Vaccination Status						
Vaccination Status	19-25	26-34	35-44	45-54	55-64	Over 65
Unvaccinated	1 2,04%	9 7,56%	4 14.29%	4 17,39%	0 0%	4 12,50%
Vaccinated	48 97,96%	110 92,44%	24 85,71%	19 82,61%	23 100,00%	28 87,50%
Total	49	119	28	23	23	32

**Table 7 – Distribution of Age depending on Vaccination Status**

Health depending on vaccination status		
Vaccination Status	Healthy	Long-term illness
Unvaccinated	20 7,94%	2 9,09%
Vaccinated	232 92,06%	20 90,91%
Total	252	22

**Table 8 – Distribution of Health Status depending on Vaccination Status**

Ethnic Origin depending on Education Level			
Education Level	Ethnic Origin		
	Swedish	Other	Total
Primary School or No education	10 (100%)	0 (0%)	10 (100%)
Highschool	63 (91.30%)	6 (8.70%)	69 (100%)
Trade School	35 (89.74%)	4 (10.26%)	39 (100%)
Bachelor's Degree	78 (67.83%)	37 (32.17%)	115 (100%)
Master's Degree or Higher	25 (60.98%)	16 (39.02%)	41 (100%)
Total	211 (77.01%)	63 (22.99%)	274 (100%)

**Table 9 – Distribution of Ethnic Origin Across Education Level**