Taking a COVID-19 Vaccine or Not? Do Trust in Government and Trust in Experts Help Us to Understand Vaccination Intention?

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Abstract
Governments worldwide are relying on the COVID-19 vaccines as the solution for ending the coronavirus pandemic and the resulting crisis. Although scientific progress in the development of a vaccine has been astonishing, policymakers are facing an extra hurdle as increasingly more people appear to be hesitant in their intention to take such a vaccine. Based on a large Corona survey in Belgium, this study aims to explain the vaccination intention by linking it to trust in government and experts, while accounting for individuals' risk perceptions and prosocialness.

Keywords
trust in government, trust in experts, vaccine hesitancy, vaccination intention, COVID-19, crisis management in experts, vaccine hesitancy, vaccination intention, COVID-19, crisis management

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Introduction

During the coronavirus pandemic, governments need to take highly restrictive and increasingly controversial measures to protect public health, prevent health care from having to “triage” (select) patients and mitigate the economic and social impact. The long-term solution and the only true exit strategy from the coronavirus pandemic are the widespread vaccination of citizens. In the history of medicine, no vaccine has been as eagerly anticipated as that to protect against COVID-19 (Bingham, 2021, p. 1). However, the pressures on governments and experts in the race to a COVID-19 vaccine may also have resulted in citizens being extra wary and doubtful about the quality and reliability of the developed vaccines, which in turn is likely to influence their intention to get vaccinated. Hence, the coronavirus pandemic provides a special context in which people’s concerns about vaccination may be even more pronounced than in normal times. Indeed, a development that pre-dates the coronavirus pandemic is the increasing number of people who are hesitant toward getting vaccinated (Larson et al., 2014).

Nevertheless, for governments, it is crucial to maximize vaccine uptake. Stopping the spread of the coronavirus and allowing societies to return to a normal situation will only be possible if the population is sufficiently immunized and when herd immunity is attained. As a result, vaccination has become an inherent part of the crisis management approach of governments. It is therefore key to understand what factors influence an individual’s vaccination decision. From the pre-coronavirus literature (i.e., non-pandemic context), we learn that trust is an important factor in reducing vaccine hesitancy. Trust may refer to trust in health care workers (Simone et al., 2012) or the health system (Casiday et al., 2006), trust in the vaccine itself (Ozawa & Stack, 2013) and the procedures to safeguard the effectiveness of the vaccine and the absence of negative side effects (Hardt et al., 2013), and trust in the policymakers who decide on vaccination strategies (World Health Organisation [WHO], 2014). All point to a similar finding of higher trust reducing vaccine hesitancy.

In this study, we approach vaccination as part of the crisis strategy that governments employ, as advised by experts, to combat the spread of the coronavirus. Given this approach, we look into the role of trust in government and experts in people’s vaccination intention. In the first phase of the crisis, many governments enjoyed a “rally-round-the-flag effect” with trust in government rising to high levels (van der Meer et al., 2020). But as the pandemic persists and the economic and social consequences are hitting citizens and businesses harder, political pressure on governments increases and the rally-round-the-flag effect seems to subside (GOVTRUST Centre of Excellence, 2020). A similar trend can be observed when it comes to experts. While experts initially enjoyed even higher trust than the government, this has also gradually
declined (although trust in government took a much harder hit) (GOVTRUST Centre of Excellence, 2020). As trust provides legitimacy to governments and experts, it can be expected to also play a pivotal role in a population’s vaccination decision. In fact, the literature on trust in crisis shows that trust in government and those experts that advise governments increases compliance with crisis management measures (Blair et al., 2017; Mesch & Schwirian, 2015). Moreover, previous research on vaccination as a strategy to overcome large health crisis situations showed that trust in government and experts in terms of how they handle the crisis is an important predictor of the vaccination decision (Mesch & Schwirian, 2015).

This study examines the effect of trust in government and trust in experts on people’s intention to get vaccinated against COVID-19, while also taking into account the role of other relevant factors such as people’s risk perceptions and prosocial attitudes. In this study, the link between trust in government and experts and the intention to get vaccinated is examined using a large Corona survey conducted in Belgium, in August 2020, before any COVID-19 vaccines were approved. We start with a review of the literature on vaccination, vaccine hesitancy, and trust in times of crisis before presenting the empirical study and discussing the results.

This study contributes to the literature in at least three ways. First, the study helps to understand vaccine hesitancy and the intent to get vaccinated in the ongoing and special case of the coronavirus crisis and the role of trust in government and experts therein. Secondly, the analysis of the study allows for comparing the relative relevance of trust in government versus trust in experts in people’s vaccination intention. A third contribution is to the literature of crisis management, where we discuss an important role of trust in government and experts in understanding compliance with government measures in times of crisis, including compliance with government’s recommendation to get vaccinated.

**Literature Review**

**Vaccination and Vaccine Hesitancy**

Vaccination is considered to be one of the greatest achievements of public health. During the 20th century, mass vaccination programs have resulted in dramatic declines in the incidence, morbidity, and mortality of various infectious diseases, with diseases such as smallpox and poliomyelitis being (nearly) eradicated (Dubé et al., 2013; Rémy et al., 2015). When a critical proportion of a population is immunized, the circulation of the pathogen decreases, and unvaccinated persons incur a lower risk of infection, a phenomenon known as herd immunity. For vaccination programs to be successful, however, a high
uptake level is often crucial (Anderson & May, 1985). In many countries, vaccination coverage rates are still below the World Health Organization (WHO) targets and efforts to increase vaccination uptake are being undermined by a growing anti-vaccination movement (Badur et al., 2020). Public concerns about vaccination are as old as vaccines themselves, but the once isolated, local cases of vaccine resistance have now become well-organized antivaccination groups with global reach and influence, empowered by the internet and social media (Larson et al., 2011; Larson, Clarke et al., 2018). Consequently, vaccines are increasingly perceived as unsafe, illegitimate, and unnecessary, resulting in growing doubts and concerns among increasing proportions of the population, which undermines immunization campaigns worldwide (MacDonald, 2015).

Over the past decade, the public health literature has coined the term “vaccine hesitancy” to describe contemporary forms of social resistance and reluctance concerning vaccines (Bocquier et al., 2018; Peretti-Watel et al., 2019). Vaccine hesitancy is defined by the WHO Vaccine Hesitancy Working Group (WHO, 2014, p. 7) as “delay in acceptance or refusal of vaccines despite availability of vaccine services”. Vaccine hesitancy literature recognizes a continuum from full support, and sometimes even active demand, for vaccination (vaccine acceptance) to strong opposition to any vaccine (vaccine refusal). Also, behavioral outcomes can vary from one vaccine to another, as the vaccination decision is based on vaccine-specific features. Hesitant individuals may potentially refuse some vaccines, but agree to others, delay vaccines, or unsurely accept vaccines (Dubé et al., 2013; Larson et al., 2014; Peretti-Watel et al., 2019).

Nowadays, the increasing hesitancy in the population about participating in vaccination programs is believed to be responsible for decreasing vaccine coverage rates and has led to the re-emergence and outbreaks of vaccine-preventable diseases (Larson, De Figueiredo et al., 2018; Mesch & Schwirian, 2015). According to the Vaccine Confidence Project, Europe is the region with the highest level of vaccine hesitancy (Larson, De Figueiredo et al., 2018), which is well illustrated by recent measles outbreaks in the EU (European Centre for Disease Prevention and Control, 2020). Not surprisingly, vaccine hesitancy has become a major public health issue, with the WHO recognizing it as one of the top 10 threats to global health (WHO, 2019).

Trust and Vaccination Intention

Vaccine hesitancy, as suggested by Peretti-Watel et al. (2019), can be seen as a decision-making process (how/why do people come to accept/refuse/delay vaccination) that may lead to a variety of behavioral outcomes. Based on such an approach, understanding factors that predict acceptance, refusal, or
delay of vaccination is key in addressing vaccine hesitancy. The individual decision-making regarding vaccination is, however, complex and involves an extensive and diverse range of variables. The vaccination decision is first and foremost driven by individual-level aspects such as emotional, cultural, social, religious, and political factors. It is further grounded in the particular historical, political, and socio-cultural context in which vaccination occurs. In addition, there is an important influence of communication and media, peer group influence, scientific and economic evidence, the health system and institutional factors, not to forget issues directly related to the characteristics of the vaccine or the vaccination development process (Justwan et al., 2019).

In this study, we focus on the role of trust in government and trust in experts as key factors that shape people’s intention to get vaccinated. Scholars have repeatedly stressed that an individual’s trust in the immunization community, including scientists, policymakers, pharmaceutical companies, and health professionals, is essential for shaping vaccination intent (Badur et al., 2020). Also in the WHO (2014) conceptualization of vaccine hesitancy, confidence plays a central role. Confidence represents “trust in (1) the effectiveness and safety of vaccines, (2) the system that delivers them, including the reliability and competence of the health services and professionals, and (3) the motivations of policymakers who decide on the needed vaccine,” (WHO, 2014, p. 11). But before elaborating further on the role of trust in the intention to vaccinate, we will briefly touch upon our conceptualization of trust.

**Trust.** Trust has been conceptualized in many different academic disciplines resulting in a variety of definitions. Dietz (2011) provides a useful overview of trust as a process that distinguishes between (1) the assessment of trustworthiness, (2) the actual decision to trust, and (3) trust-informed actions; with a feedback loop into trustworthiness assessments. The widely accepted definition by Rousseau et al. (1998, p. 395) focuses only on the first two steps of the trust process where trust is seen as “a psychological state comprising the intention to accept vulnerability based upon the positive expectations of the intentions or behaviour of another.” Alternatively, Möllering’s (2006, p. 111) definition focuses on the decision to trust, the subsequent risk-taking behavior and the reciprocal process that follows: trust is “an ongoing process of building on reason, routine and reflexivity, suspending irreducible social vulnerability and uncertainty as if they were favourably resolved, and maintaining thereby a state of favourable expectation towards the actions and intentions of more or less specific others.”

Trust, thus, implies uncertainty and vulnerability. In a medical context, vulnerability related to illness and disease risks is thought to intensify trust relationships (Hall et al., 2001). Nevertheless, the willingness to be vulnerable is
not unlimited. When the trustor has overall positive expectations, they are willing to take “the leap of faith” (Möllering, 2006). When, by contrast, negative expectations dominate, the leap of faith will not be taken and the involved individual will not come to trust-informed actions. It is also important to be precise as to who trusts whom with respect to what: A trusts B to do X (Nooteboom, 2002). In the context of vaccination and this study, citizens accept a vulnerable position in relation to the information source due to a high level of information asymmetry (Larson, Clarke et al., 2018). The individual citizen needs to be able to trust the government and the experts to give them the reliable and truthful information needed for a proper vaccination decision (Mesch & Schwirian, 2015). This trust-based relation assumes the trustee (government and experts) first has the expertise and competence expected of them (ability), second has the trustor’s (citizens) best interests at heart (benevolence), and third adheres to a set of principles that the trustor finds acceptable (integrity) (Larson, Clarke et al., 2018).

Vaccination intention and people’s trust in government and experts. Vaccination uptake strategies often rely on a knowledge-deficit approach, attempting to persuade the public by providing understandable, dependable, and timely vaccine information (Mesch & Schwirian, 2015). The vast amount and complexity of (mis)information on vaccines, however, complicates people’s decision and leaves most individuals to make assessments based on trust in the information source rather than on specific content (Casiday, 2005). Because vaccination decisions occur within the context of trust held in the actors who interpret and make decisions based on the available evidence (Larson, Clarke et al., 2018), building trust in those who provide the information is crucial (Larson, 2016).

Two key information sources regarding vaccination are the government and scientific experts. Both play a central role in defining vaccination strategies. Not surprisingly, lack of trust in governmental and scientific institutions is a recurring reason why people refuse vaccination (e.g., Larson, 2016; Mesch & Schwirian, 2015). Studies on trust in government generally find a significant positive association between trust and (intended) vaccine uptake (Larson, Clarke et al., 2018; van der Weerd et al., 2011).

In a context of low trust in the government, however, citizens tend to turn their trust to experts. The importance of experts lies in them being perceived as information sources who are independent of the government (Marlow et al., 2007). Furthermore, when dissenting opinions exist regarding scientific facts on vaccination, people will turn to experts. Overall, it is assumed that individuals with greater trust in experts are more likely to express intent to be vaccinated (Baumgaertner et al., 2018). At the same time, the legitimacy of science, expertise and medical authority are ever more questioned and rising
distrust of expert culture, in general, is observed (Dubé et al., 2013). This structural crisis of disenchantment with science and trust in experts may shape (negative) attitudes toward vaccination (Bocquier et al., 2018).

Trust and Vaccination Intention in Times of Crisis

The coronavirus SARS-CoV-2 (COVID-19) was declared a pandemic by the WHO on March 11, 2020. When the world is threatened by the emergence and spread of a new and deadly virus, such as this one, governments across the globe are called to forge a crisis strategy aimed at controlling the new disease, identifying its features, evaluation, infectivity, as well as developing a suitable therapy and a vaccine. Motivating the public to actually comply with such crisis measures, including vaccination, has proven to be rather difficult (van der Weerd et al., 2011). As such, the ability of governments to tackle a major health crisis oftentimes depends on human behavior. In times of crisis, trust is of paramount importance.

Research on the determinants of behavioral responses to other infectious pandemics (e.g., the severe acute respiratory syndrome [SARS], H7N7 influenza, Ebola), shows that trust is an especially important determinant of the public’s acceptance of the government’s health crisis strategy, including vaccination. Studies on the 2009/2010 H1N1 pandemic found that trust in government had a significant impact on citizens’ acceptance of protective measures (van der Weerd et al., 2011), including their intention to accept a new influenza vaccine (van der Weerd et al., 2011). Similarly, research on the 2014/2015 Ebola outbreak in West Africa showed that citizens refused to comply with vaccination policies not because they were susceptible to scientifically unfounded beliefs as previous research suggested (Salmon et al., 2005) but rather because they did not trust government’s capacity and integrity to control the spread of the disease (Blair et al., 2017, pp. 93–94).

Studies on the intent to accept a COVID-19 vaccine show that significant portions of populations and sub-groups around the world are reluctant to take one (Graffigna et al., 2020). Vaccine hesitancy (including refusal) is present in different countries: for example 4.9% refusal in Australia (Dodd et al., 2020); 15% refusal and 26% hesitancy in Italy (Graffigna et al., 2020); 9% refusal and 22% hesitancy in the United States (Reiter et al., 2020); 8.7% refusal in China (Wang et al., 2020). A multi-country European study (Denmark, France, Germany, Italy, Portugal, The Netherlands, and the United Kingdom) confirms these findings with 7.2% of respondents not wanting to get vaccinated and a further 18.9% stating to be unsure (Neumann-Böhme et al., 2020). These findings highlight the importance of understanding the factors that affect people’s intention to get vaccinated against COVID-19.
Building on the theoretical and empirical insights on trust and crisis management, we argue that citizens’ intent to take a COVID-19 vaccine is driven by their trust in government’s capacity and integrity to control the spread of the virus as well as by their trust in experts who advise the government on what are the best measures to control the crisis.

**Other Factors Impacting Vaccination Intention**

**Risk perceptions.** In times of a health crisis, the vaccination intention is further driven by one’s perceived risk in a pandemic. Risk perceptions entail three dimensions: risk proximity, risk severity, and vulnerability (Brewer et al., 2007). Risk proximity refers to the perceived risk that oneself or people close to them are likely to contract the virus (Tang & Wong, 2004). Risk severity refers to the belief that the disease is likely to have serious consequences (Tang & Wong, 2004) or that it will be difficult to treat (Lau et al., 2007). Vulnerability refers to susceptibility and individual resistance or constitutional vulnerability should one contract the disease (Brewer et al., 2007). In all three cases, health behavior theorists argue, people will be more motivated to implement protective behavior (Rosenstock, 1974) and comply with protective measures (Bruine de Bruin & Carman, 2018), including vaccination (Mesch & Schwirian, 2015). There may, however, be variations in the importance of the different risk dimensions in people’s vaccination decision, with perceived severity of the disease often yielding the highest gains in vaccine demand (Verelst et al., 2018).

Risk perception is also an important driver of trust. Studies have consistently shown that, in times of crisis, that is during natural disasters (Akbar & Aldrich, 2017), swine flu outbreak (Mesch & Schwirian, 2015), and the current COVID-19 crisis (Bian et al., 2021; Brück et al., 2020; Oude Groeniger et al., 2021), risk perception is a significant predictor of trust in government. This suggests the existence of an indirect effect of risk perception on vaccine hesitancy via trust. We address this issue in our results section and discussion.

**Prosocialness.** Studies on crisis management have further emphasized the role of prosocialness: the behavior that benefits other members of society even if it does not bring any personal gains to the person who engages in such behavior. Prosocialness has been described as being based on other-regarding (as opposed to self-regarding) preferences and on prosocial (as opposed to individualist) social values (Declerck & Boone, 2016).

Research conducted by Oosterhoff et al. (2020) on the protective behavior among the US youth during the coronavirus crisis, for example, reported that adolescents who were motivated by autonomous or prosocial reasons were
more likely to engage in social distancing. Greater social responsibility has further been found associated with more disinfecting and news monitoring and less hoarding (Oosterhoff & Palmer, 2020). Similar results were reported by studies on adults. Research on compliance during the coronavirus pandemic also shows that empathy (Pfattheicher et al., 2020) and altruism (Brooks et al., 2020) for the vulnerable ones are the main drivers of social distancing and wearing face masks in the public (see also Zettler et al., 2022).

Moreover, for vaccination, studies reported that one’s intention to vaccinate is driven by a decision that vaccination affects not only own health but also the health of the family and the community (Ozawa & Stack, 2013) as well as by one’s sense of social responsibility or concern for others (Larson et al., 2014).

Socio-demographic characteristics. Finally, it is important to discuss several individual socio-demographic characteristics, which may play a role in one’s intention to accept the COVID-19 vaccine as part of the government’s crisis strategy. Variables that are most commonly discussed in the literature on crisis management include, among others, age, gender, education, and family situation/composition.

Several studies showed that older citizens have slightly more negative views about vaccination than younger ones (Baumgaertner et al., 2018; Larson, De Figueiredo et al., 2018). This does, however, not seem to hold for one’s compliance and intention to vaccinate in times of pandemics where older generations are marked as a high-risk group. As recorded during the SARS and H1N1 pandemics, older people were found to be more likely to engage in preventive behavior (van der Weerd et al., 2011) and more likely to get vaccinated (van der Weerd et al., 2011), a finding that has been confirmed by the early COVID-19 studies (e.g., Zettler et al., 2022).

Other socio-economic factors did not yield such consistent results. While some studies show that women, people who live with a family, and people with a higher level of education are more likely to change their behavior and comply with government measures, including to accept vaccination (Zettler et al., 2022), other studies reached the opposite conclusion (Bocquier et al., 2018; Wong et al., 2020).

Hypotheses

The purpose of the study is to investigate the role of trust in government and experts in the public’s vaccination intention during the current COVID-19 pandemic. In developing our hypotheses, we draw on two strands of literature previously discussed: the literature on vaccination, vaccine hesitancy and trust, and the literature on trust and vaccination in times of crisis.
Trust in Government and Experts and the Intention to Get Vaccinated

Based on the literature, we expect that individuals who exhibit higher trust in government to deal with the coronavirus crisis and who exhibit higher trust in the scientific experts who advise the government will be more likely to comply with government recommendations to get vaccinated. We derive the following hypotheses:

H1: Individuals who have high trust in government to deal with the coronavirus outbreak are more likely to express intention to get vaccinated than those lacking such trust or having low trust.
H2: Individuals who have high trust in experts to advise the government on what are the best measures to control the crisis are more likely to express intention to get vaccinated than those lacking such trust or having low trust.

Other Factors and the Intention to Get Vaccinated

Based on the empirical evidence on risk perception, we expect that individuals who feel more at risk by the coronavirus and who believe that they are likely to contract the virus will be more likely to comply with government recommendation to get vaccinated. We hypothesize that:

H3: Individuals perceiving a high risk in face of the coronavirus (risk proximity, risk severity, and vulnerability) are more likely to express intention to get vaccinated than those who perceive a low risk.

Prosocialness, that is, the willingness to take the interests of others and the collective into account, even if it presents a disadvantage for oneself, is an important factor eliciting compliance and could motivate people to take the new COVID-19 vaccine as part of the government’s crisis strategy. We posit that:

H4: Individuals who exhibit higher levels of prosocialness are more likely to express intention to vaccinate than those who exhibit low levels of prosocialness.

Data

Our analyses make use of data from a weekly (from June 2, the survey shifted to a bi-weekly frequency), web-based survey which is called the “Grote Corona studie,” which is specifically designed to estimate the impact of the
Measuring Intention to Get Vaccinated as Dependent Variable

The dependent variable, “the intention to get vaccinated,” is measured using the following question; “Suppose there is a safe and effective vaccine against COVID-19. Suppose the vaccine is recommended for your age group and is offered and administered to you completely free of charge in your place of residence. Would you get vaccinated?” Respondents could answer using the following categories: Certainly, Probably yes, Maybe, Probably not, and Certainly not. A similar approach to ours has been employed in previous studies on vaccine hesitancy in normal times (Salmon et al., 2005) and times of crisis (Mesch & Schwirian, 2015; Quinn et al., 2019; Wang et al., 2020). An overview of these answers, and how these have been recoded into three categories, is provided in Table 1. Based on Table 1, it is clear that most people are certain to get vaccinated (54.76%), 42.39% still has doubts (Probably yes, Maybe, Probably not), and 2.85% or 614 individuals are certain that they will not get vaccinated.

Measuring Trust in Government and Trust in Experts as Independent Variables

To measure trust in government and experts, respondents were asked to what degree they trust; (A) that the scientific experts who advise
the government know what the best measures are to take against the COVID-19 crisis? (B) your city or municipal government to deal with the COVID-19 crisis in a good way? (C) your regional government (Flemish government, Walloon government . . ) to deal with the COVID-19 crisis in a good way? (D) the federal government to deal with the COVID-19 crisis in a good way.

They were asked to answer each item using a 7-point Likert scale ranging from 1 (no trust at all) to 7 (complete trust). The answers on (a) regarding trust in experts are included separately in the subsequent regression analyses. The other items, being (b), (c), and (d), offer a general indication of one’s trust in government to deal with the coronavirus crisis in a good way. This claim is supported as these items load on the same factor (the factor loading for trust in local government equaled 0.702; for trust in regional government 0.8597 and for trust in federal government 0.7698; the eigenvalue equaled 1.832). For ease of interpretation, the regression includes the average score on these items.1

Measuring Risk Perceptions and Prosocialness as Independent Variables

The respondents’ perception of risk in face of the coronavirus falls apart in three dimensions, being risk proximity, risk severity, and vulnerability. In the survey, we ask for the respondents’ perception on the severity of the COVID-19 disease (to what degree do you think being sick with the coronavirus can be serious?) and the proximity of the risk (to what degree do you think that there is a great risk that you yourself, family, or friends will become infected with the coronavirus?). Both items are measured on a 7-point scale and draw on measures used in previous studies on vaccine hesitancy (see Lau et al., 2007; Tang & Wong, 2004). The dimension of “vulnerability” is measured by asking respondents whether they have specific underlying medical conditions, which

| Dependent | Answer categories intention to get vaccinated | Frequency | % |
|-----------|-----------------------------------------------|-----------|---|
| 0         | Certainly not                                | 614       | 2.85 |
| 1         | Maybe                                        | 9,138     | 42.39 |
|           | Probably not                                 | 1,000     | 4.64 |
|           | Maybe                                        | 2,575     | 11.95 |
|           | Probably yes                                 | 5,563     | 25.81 |
| 2         | Certainly                                    | 11,803    | 54.76 |

Table 1. Construction Dependent Variable “Intent to Get Vaccinated.”
increases the chances of being seriously ill when they get infected with the coronavirus. Similar to the study of Brewer et al. (2007), the following question from the survey was used to construct this variable: “Do you have one or more of the following underlying medical conditions which cause extra risks in case of an infection with the coronavirus? 1: Heart disease; 2: Lung disease; 3: Kidney disease; 4: Diabetes; 5: High blood pressure; 6: Suppression of immune system; 7: Recent cancer diagnosis; 8: None of these conditions.” This variable is a dummy with value 1 being assigned when a respondent indicated to have one or more of the listed medical conditions, and value 0 when they indicated to have none of the listed medical conditions.

In line with the literature (e.g., Bogaert et al., 2008), the concept of prosocialness is measured through the following question, using a scale from 1 (not important at all) to 7 (very important): “To what extent do you think it is important . . . to do things for the benefit of others and for society, even if that has disadvantages for you?”.

Control Variables

We also include some socio-demographic variables, which were relevant as control variables in earlier research on vaccination decisions, such as age, gender, education, and respondents’ current living situation (living apart or together). Table 2 shows descriptive statistics as well as a (Pearson) correlation analysis. We also test for multicollinearity using the variance inflation factor. The mean VIF equals 1.21 and indicates that no collinearity exists between the variables.

Method

Since the dependent variable is measured on an ordinal scale, a first approach consists of adopting a standard ordered logit model. There is, however, a hidden assumption in this kind of model: when an independent variable \( x \) increases, the cumulative distribution function shifts to the right or left, but there is no shift in the slope of the distribution. This causes the \( \beta \)’s to be the same for each category (parallel assumption). Since this is not always realistic, a Brant test was used to test the parallel assumption. The parallel regression assumption appeared to be violated (\( \chi^2(10) = 400.87^{***} \)). As a second approach, we, therefore, model a generalized ordered logit model, using the gologit2 command in Stata (Williams, 2006). The standard formula for the predicted probability can be written as:

\[
P(y_i = j \mid x_i) = F\left(\mu_{j+1} - x_i\beta_{j+1}\right) - F\left(\mu_j - x_i\beta_{j+1}\right)
\]
| Variables                          | Mean  | SD    | (1)   | (2)   | (3)   | (4)   | (5)   | (6)   | (7)   | (8)   | (9)   | (10)  | (11)  |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Intention to get vaccinated       | 1.519 | 0.554 | (1)   |       |       |       |       |       |       |       |       |       |       |
| Individual characteristics        |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Age                               | 51.479| 14.258|       | .1335*|       |       |       |       |       |       |       |       |       |
| Gender                            | 1.705 | 0.456 | (3)   | −.1411*| −.1631*|       |       |       |       |       |       |       |       |
| Education                         | 4.832 | 1.350 | (4)   | .0462*| −.2698*| −.0144|       |       |       |       |       |       |       |
| Living situation                  | 1.819 | 0.385 | (5)   | .0103 | −.1280*| −.008 | .0527* |       |       |       |       |       |       |
| Pro-socialness                    |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Pro-socialness                    | 4.835 | 1.481 | (6)   | .1029*| .022   | .0205 | .0864*| −.0024|       |       |       |       |       |
| Risk perceptions                  |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Vulnerability                     | 0.272 | 0.445 | (7)   | .0936*| .2978*| −.1063*| −.1420*| −.0653*| −.0276*|       |       |       |       |
| Perception of severity            | 6.398 | 1.127 | (8)   | .2223*| .2245*| .0388*| −.0601*| −.0341*| .1054*| .1136*|       |       |       |
| Perception of risk proximity      | 4.198 | 1.557 | (9)   | .0917*| .0712*| .0447*| −.0899*| −.0075| .0395*| .0883*| .2618*|       |       |
| Trust                             |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Trust in experts                  | 5.510 | 1.537 | (10)  | .3451*| .1495*| .0242 | .0032 | −.0152| .1856*| .0671*| .3989*| .2180*|       |
| Trust in government               | 3.971 | 1.418 | (11)  | .2133*| .1326*| .0705*| −.0068| −.0207| .1842*| .0121 | .2268*| .1421*| .4961*|

*Shows significance at the .01 level.
Marginal effects are calculated as follows:

\[
MPE_{jm}(x_m) = \frac{\partial \Pr(Y = j)}{\partial x_m} = f\left(\mu_j - X'\beta_j \right)\beta_{jm} - f\left(\mu_{j+1} - X'\beta_{j+1}\right)\beta_{j+1,m}
\]

where \(\beta_{j+1}\) is the vector of coefficients for outcome \(j\) and \(\beta_{j+1,m}\) is its \(m\)th element. The statements on constant effects no longer hold. The model thus offers greater flexibility. In Table 3, the marginal effects are presented. Column 1 refers to the likelihood of being certain not to get vaccinated, column 2 refers to the likelihood of being in doubt of being vaccinated, and column 3 refers to the likelihood of being certain to get vaccinated.

**Results**

Before focusing on the role of the independent variables for the intention to get vaccinated, we shortly discuss the model statistics. First of all, we notice that adding extra variables significantly improves the model: adding prosocialness of an individual leads to a significant, but rather small improvement. Especially the adding of risk perceptions (perceptions of severity, perceptions of risk proximity, and vulnerability) clearly and significantly enhances the base model (i.e., the model with purely individual sociodemographic variables; gender, age education, current living situation). Also and more importantly, when adding trust in experts, the explanatory power of the model is further enhanced to a considerable extent. Finally, also the adding of trust in government leads to a significant, albeit smaller improvement.

When examining the \(\beta\)’s of the socio-demographic characteristics we included as control variables, we notice that age, education, and especially gender affect the intent to get vaccinated. Women have a significantly lower likelihood to be certain to get vaccinated compared to men. They are significantly more likely to be doubtful when it comes to the intention to get vaccinated. Although this difference remains significant for the first category (certainly not) the size of the \(\beta\) becomes extremely small, making the difference between genders for that category negligible. A similar trend can be observed for the other socio-demographic characteristics. Older people are more likely to be certain to get vaccinated. Younger people on the other hand are more likely to be in doubt. But no difference exists for the intention to not get vaccinated. People with higher education are also significantly more likely to be certain to get vaccinated. People without higher education are more likely to have doubts. Again the difference becomes extremely small when looking at the first category “certainly not.”

When it comes to the independent variables we have included in the analysis, the results show first that respondents which are more prosocial are significantly
Table 3. Results Generalized Ordered Logit Model for the Intention to Get Vaccinated.

| Variables                        | (1)                      | (2)                      | (3)                      |
|----------------------------------|--------------------------|--------------------------|--------------------------|
|                                  | Certainly not dy/dx      | Maybe dy/dx              | Certainly dy/dx          |
| Individual characteristics (a)   |                          |                          |                          |
| Age                              | -0.000 (-0.02)           | -0.003*** (-8.98)        | 0.003*** (8.93)           |
| Gender                           | 0.005*** (5.93)          | 0.181*** (21.69)         | -0.186*** (-22.17)       |
| Education                        | -0.001* (-2.44)          | -0.029*** (-10.41)       | 0.030*** (10.59)          |
| Living situation                 | -0.002* (-2.08)          | -0.029** (-3.09)         | 0.031** (3.27)            |
| Pro-socialness (b)               | -0.000 (-0.23)           | -0.012*** (-4.90)        | 0.012*** (4.89)           |
| Risk perceptions (c)             |                          |                          |                          |
| Perception of severity           | -0.002*** (-6.32)        | -0.031*** (-8.36)        | 0.033*** (8.64)           |
| Perception of risk proximity     | -0.001* (-2.46)          | 0.001 (0.39)             | -0.000 (-0.15)            |
| Vulnerability                    | -0.003*** (-3.96)        | -0.054*** (-6.33)        | 0.057*** (6.68)           |
| Trust in experts (d)             | -0.004*** (-12.20)       | -0.076*** (-25.33)       | 0.080*** (26.74)          |
| Trust in government (e)          | -0.004*** (-8.97)        | -0.012*** (-4.11)        | 0.016*** (5.26)           |
| N                                |                          |                          | 21,555                   |
| $R^2$ individual characteristics (a) only | 0.0278                   |                          |                          |
| Model improvement adding (b) to (a) | $\chi^2(2) = 220.65^{***}$ |                          |                          |
| Model improvement adding (c) to (a) and (b) | $\chi^2(6) = 1056.54^{***}$ |                          |                          |
| Model improvement adding (d) to (c), (a) and (b) | $\chi^2(2) = 1667.67^{***}$ |                          |                          |
| Model improvement adding (e) to (d), (c), (a) and (b) | $\chi^2(2) = 110.38^{***}$ |                          |                          |
| Pseudo $R^2$ full model (a, b, c, d, and e) | 0.1169                   |                          |                          |

Note. Standard errors in parentheses. *10%, **5%, ***1%.
more likely to be certain to get vaccinated. Individuals who are relatively less prosocial are more likely to have doubts. Once more, the difference becomes extremely small when looking at the first category “certainly not.”

When examining the β’s of the risk perceptions, it appears that especially the perception of the severity of the risk is an important predictor. Individuals who believe that the coronavirus poses serious health risks are equally more likely to be certain to get vaccinated. Also, the vulnerability of respondents in terms of having one or more underlying medical conditions which cause extra risks in case of an infection with the coronavirus has a significant effect: individuals with such medical conditions are much more likely to be certain to get vaccinated and less likely to have doubts about vaccination. These are findings which intuitively make sense. Surprisingly though, the perceived risk proximity does not really matter when explaining the intention to comply. We turn back to the discussion about the indirect effect of risk perception via trust, which we introduced in our literature section. While we do acknowledge the possible indirect effect of risk perception on vaccine hesitancy via trust (Akbar & Aldrich, 2017; Bian et al., 2021; Brück et al., 2020; Mesch & Schwirian, 2015; Oude Groeniger et al., 2021), our paper aims to explore individual effects of variables posited by the literature and introduced in our theoretical framework. As we show above, including risk perception significantly enhances our model, which suggests the existence of a strong direct effect. In addition, by including risk perception in our model, the variable’s indirect effect has been partially accounted for. We performed a correlation test, which shows that the correlation between trust and risk perception is low to moderate (0.18, 0.06, 0.39, 0.18). Thus, including both variables in our model is methodologically justified.

When examining the results for the trust variables, we notice that an increase of trust in experts significantly increases the likelihood of being certain to get vaccinated. Similarly, it decreases the likelihood of having doubts or being certain not to get vaccinated. A comparable trend can be observed for trust in government, albeit that the β’s, and thus the effect, is much smaller compared to those of trust in experts. These findings are also visualized in Figure 1. When trust increases, we see a nearly linear increase in the probability to be certain to get vaccinated. Note that the increase is much larger for trust in experts compared to the increase for trust in government. An opposite trend can be observed for the likelihood of being in doubt to get vaccinated. Both an increase in trust in experts as well as an increase in trust in government diminishes the likelihood of being doubtful on whether or not to get vaccinated. Finally, trust in both experts and the government reduces the likelihood of being certain not to get vaccinated. However, it is important to stress that the negative effect of trust in government on being certain not to
get vaccinated is extremely small. The negative effect of trust in experts on being certain not to get vaccinated is larger. Interestingly, this latter effect does not appear to be linear. When trust in experts is high (above 4 on a scale of 7, see also the descriptive statistics), the likelihood of being certain not to get vaccinated is extremely small so that even small decreases in trust seem to have a trivial effect. However, when the level of trust becomes low (movements below 4), we see that the likelihood of being certain not to take the vaccine increases considerably. Having a low trust in experts will hence significantly affect the likelihood of being certain not to get vaccinated.

**Discussion and Conclusion**

This study aims to make three contributions to the literature. First, the study seeks to improve our understanding of vaccine hesitancy and the intent to get vaccinated in the case of the coronavirus crisis, and the role of trust in government and experts therein. The analysis and results of the study show that trust in government as well as trust in experts matter for explaining vaccination intention. Hypothesis 1 “Individuals who trust the government to deal
with the coronavirus outbreak are more likely to be willing to be vaccinated than those lacking such trust” is supported by our data, although the effect of trust in government is rather small. Also, Hypothesis 2 “Individuals who trust experts to advise the government on what are the best measures to control the crisis more likely to be willing to be vaccinated than those lacking such trust” finds support. Hence, at least in Flanders, citizens’ trust in the capacity of government and experts to handle the coronavirus crisis in a good way has a positive effect on the vaccination intention of citizens: high trust leads to citizens being more certain in their intention to get vaccinated, but when trust is relatively low, it is more likely that citizens will be doubtful about getting vaccinated. Also, the likelihood increases that these citizens refuse to get vaccinated, although the effect of low trust on the intention to refuse the vaccine is relatively small.

These findings echo with the vaccination literature, with the review of Larson, Clarke et al. (2018) pointing at the positive role of trust. Trust in relation to vaccination can be understood in three ways. First, in much of the vaccination literature trust is linked to specific vaccination-related elements and actors, like the safety and effectiveness of vaccines, the capacity of health professionals and the health system, the trustworthiness of information, and the motivation of policymakers (WHO, 2014). Secondly, much of the vaccination literature pictures trust in government and experts as institutions, with higher trust in government and experts as institutions leading to higher willingness to get vaccinated (e.g., Baumgaertner et al., 2018). Third, some of the literature focuses on trust in relation to vaccinations as strategies in health crises and epidemics, and within that literature, authors look at trust in government and experts in their capacity to handle the related crisis in a good way (Mesch & Schwirian, 2015; van der Weerd et al., 2011). Our research clearly adds to this latter part of the literature, underscoring the finding of Mesch & Schwirian (2015) in the context of the 2009/2010 H1N1 influenza pandemic that trust in the government’s skills to deal with the outbreak predicts public compliance with vaccination programs in a health crisis (for a very similar finding see Blair et al., 2017).

A second contribution is that our analysis allows assessing the relative relevance of trust in government versus trust in experts in combatting vaccine hesitancy. Our study shows that trust in experts has a stronger positive effect on the intention to get vaccinated, compared to trust in government. Expertise is indeed a trust-enhancing factor (Weaver et al., 2017), and the positive role of scientific experts as trustworthy information sources or providers of legitimacy to vaccination programs has been highlighted in the literature (Baumgaertner et al., 2018). Apparently, trust in scientific expertise as an institution is more important than trust in government, at
least in the context of vaccination initiatives as a crisis management measure, as our study shows.

A third contribution builds further upon that latter observation: a COVID-19 vaccine is considered by governments (and experts) to be the cornerstone, the ultimate weapon to control the spreading of SARS-CoV-2 virus and to end the COVID-19 crisis. In that perspective, taking the vaccine or not becomes a question of compliance with crisis management measures as taken by the government and as advised by experts. Hence, this study also contributes to the broader literature on regulatory governance, and more precisely to the emerging literature on the role of trust in regulatory governance (e.g., Kroeger, 2015). It speaks to the literature on how trust in government enhances compliance with government policies and measures (e.g., Yapp & Fairman, 2006) in normal times, but also with crisis management measures during health crises (e.g., for Swine flu Rubin et al., 2009; for SARS Tang & Wong, 2004; for COVID-19 Bargain & Ulugbek, 2020).

In relation to that latter literature, it is also interesting to note that trust in government and experts have a positive effect on compliance with vaccination measures, independent from two other factors which are central in crisis compliance literature and which prove in our study to have a positive effect on vaccination intention: risk perception (risk severity, risk proximity, and vulnerability) as well as the prosocial attitude of respondents. The positive effect of these two factors is in line with other scholars working on COVID-19 (e.g., related to prosocialness and other altruistic values: Brooks et al., 2020; Oosterhoff et al., 2020; related to risk perception and fear-related factors: Wise et al., 2020). Other studies might, however, want to explore indirect effects of risk perception on vaccine hesitancy via trust.

However, a remarkable finding of our analyses is that the effects of trust in government, trust in experts and the other independents on vaccination refusal (the category “certainly not”) is much smaller, compared to the effect on the intention to get vaccinated (the category “certainly”), or being doubtful (the category “maybe”). This finding indicates that, at least for this category, other explanations seem to be important. For instance, confidence in the vaccine itself (Larson, Clarke et al., 2018), sociocultural context, including religious and moral convictions (Dubé et al., 2013; Salim, 2012), as well as the type of media one relies on to gather information (Klein & Robison, 2020) are likely to have an effect on the intention not to get vaccinated and the impact of trust. This is also a strong limitation of the current study. Our variables do succeed in explaining a significant amount of the variation of the intention to get vaccinated, yet future research should test for alternative explanations and their
interactions. Moreover, but related to this, the use of panel data would offer a solution. Variables such as religion are fixed in time; panel data would allow taking such issues into account while also correcting for the broader issue of endogeneity. A second limitation of the study is self-selection. As discussed earlier, the data are part of a broader survey that is held on a bi-weekly basis. It is likely that these data suffer from sample selection bias. For instance, individuals with a higher trust in government and experts can also be expected to be more likely to fill out a survey. The results, therefore, have to be interpreted with caution. A further limitation of the study is that the data are collected in Belgium, which raises the question of generalizability. However, from the discussion above, it is clear that the results, in this case resonate with recent literature on other regions or countries. Nonetheless, future research should aim for a wider knowledge base, across different countries, which would in turn allow making more general predictions.

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Monika Glavina is now affiliated to Erasmus University Rotterdam, the Netherlands.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The paper has also benefited from the funding of the Research Foundation Flanders (FWO) (Grant G0G1920N, 2020 and FN7010, 2019) and the BOF/COVID project on ‘Trust, legitimacy and intended compliance with COVID-19 exit strategy measures’ (project number FFB200181-42817). The ‘Grote Corona-studie’ is supported by the Research Foundation Flanders (FWO). This article has benefited from the interaction within the GOVTRUST Centre of Excellence (University of Antwerp, Belgium). See https://www.uantwerpen.be/nl/projecten/coronastudie/.

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Note
1. The use of the factor score led to similar results.
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