Master Thesis

Regretting Vaccine Indecision: Solving Covid-19 Vaccine Hesitancy Through Anticipated Regret-Nudging

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Abstract

Objective: Young adults represent the segment of the population with the lowest willingness to get vaccinated in the Netherlands, hence compromising the achievement of herd immunity for Covid-19. The present research, thus, considers a possible vaccination strategy to stimulate vaccination's intentions among youngsters. In this research, an anticipated regret-nudge prods youngsters to consider the possible consequences of not getting the shot. The thesis evaluates the anticipated regret-nudge with respect to its efficacy and ethical permissibility. It also discusses the importance of institutional and medical trust for the correct development of a vaccine campaign.

Method: An online survey was conducted to assess the effect of the anticipated regret-nudge on vaccine intentions from the 14th of June until the 22nd of June 2021. The final sample counted 171 Dutch participants aged between 18 and 30. For the ethical analysis, a methodology based on conceptual analysis and reflective equilibrium was used to assess the ethical permissibility of regret-nudges.

Results: The results showed no significant difference between the control condition and the regret condition on vaccine intentions. The age and condition of the caretakers did not moderate the willingness to get the vaccine. However, both institutional and medical trust moderated the relationship between the vaccination message and the intention to get vaccinated. The regret message did not significantly impact the trust in the vaccine campaign, and it was found that the acceptability of the message explained the relationship between the message and the trust in the vaccine campaign. The outcome of the ethical analysis is that regret-nudges do not constitute an instance of manipulation nor coerciveness, though they constitute a form of emotional paternalism which can be morally justified since anticipated emotions enable autonomous decisions based on future thinking.

Conclusions: This research shows that an anticipated regret-nudge might not be enough to stimulate vaccine intention in young adults. On the other hand, the research pointed out the importance of different dimensions of government trust in the success of the vaccine campaign. Finally, the research shows the importance of evaluating the moral permissibility of a vaccine strategy also on its capacity not to deteriorate institutional trust.

Keywords: Anticipated regret; vaccine nudging; public health policy; regret theory; vaccine intentions; institutional trust; ethics of nudging; health communication.

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Introduction

The ongoing Covid-19 pandemic is posing tremendous pressure on the health system worldwide. To flatten the curve of contagion and reduce the number of people hospitalized for the novel coronavirus, governments are issuing restrictive policies. However, the adapted sanitary restrictions might not be enough to solve the current pandemic. A vaccine against SARS-CoV-2 represents a central element for terminating the Covid-19 pandemic. Only through an extensive acceptance of the acclaimed Covid-19 vaccines it would be possible to realize the indirect protection for the overall population: herd immunity. The urgency to achieve herd immunity in the case of Covid-19 is evident given the high rate of infected patients with severe acute respiratory problems who become critically ill and require intensive care.

The current wave of vaccine hesitancy, however, might impede the resolution of herd immunity for the overall community. Research carried out in June 2020, just prior to the mass deployment of vaccines, shows that vaccine intentions are at a suboptimal level to counteract COVID-19 (Neumann-Böhme et al., 2020). Although vaccine intentions increased over time (van Heck, 2021), the rate of vaccine hesitancy in June 2021 was still high for some subgroups of the population in the Netherlands, where this research is carried out ("Vaccinatie|RIVM", 2021). In particular, as of June 2021, when the vaccine was not fully deployed to people under 30 years old, young adults had the lowest intention to get vaccinated among the overall population ("Vaccinatie|RIVM", 2021); possibly because they regard the virus as not so problematic, or they feel they are not so likely to get infected.

Vaccine hesitancy is so important that it has even been declared the greatest next challenge in fighting COVID-19 (Dror et al., 2020). In this thesis, a nudge is proposed as a promising vaccination strategy to solve the indecisiveness of young adults in the Netherlands to get the jab. The proposed nudge will hinge upon the anticipated regret that the youngsters might feel in not getting vaccinated and being infected or infecting one of their beloved ones. In particular, the research will look at the effectiveness of the anticipated regret-nudge in stimulating vaccine intentions of those aged between 18 and 30. The relevance of this study pertains not only to the effectiveness of the nudge to stimulate vaccine intentions among young generations but to its potentiality to be used as a fast-to-implement and morally permissible policy to increment vaccine intentions in the overall population. In fact, as of

September 2021, the Dutch government, following the lead of other countries, implemented the use of covid certificates to travel abroad or to attend social events ("Steps for getting a COVID Certificate", 2021). Vaccine certificates, however, are difficult to implement and present many problematic ethical issues (Gostin, Cohen & Shaw, 2021). Regret-nudges might represent a valid alternative under certain conditions. Thus, the nudge will not be assessed solely on its effectiveness but more broadly on its ethical permissibility. In particular, this thesis will provide a new dimension to assess the ethicality of a public health nudge: its impact on institutional trust.

The research questions of the present thesis thus are the following: *Does a regret-nudge significantly increase vaccination intentions in young generations in the Netherlands whilst at the same time not impacting trust in the vaccine campaign? And, is a regret-nudge morally permissible?* To answer these questions, the thesis is structured in the following manner. The first chapter assesses the concept of vaccine hesitancy from a public good standpoint. In this regard, the sub-questions of this chapter are: *How can we define vaccine hesitancy? How does the Covid-19 pandemic bring along vaccine hesitancy? And, what are the strategies that governments can use to tackle vaccine hesitancy?* The second chapter looks at the role that trust has in sustaining vaccination campaigns. In particular, the sub-questions of this chapter will be: *What is the relationship between trust in the government's vaccination policy and campaigns and citizens' intentions to vaccinate? How does trust in institutions affect the perceived safety of the vaccine?* Based on the answers to these two questions, a normative question will be answered at the end of the chapter: *Should trust take a more central role when assessing vaccination policies?* The third chapter analyzes the ethical aspects of regret-nudging under the condition of a pandemic, thus the chapter sub-questions: *Is regret-nudging morally permissible a priori of questions of public acceptance? Is regret-nudging permissible notwithstanding its possible negative impact on the trust in the vaccine campaign?* The fourth chapter outlines the hypotheses and describes the methodological design of the study. The study is a survey experiment with a 2X2 factorial design, control (regret) framing X high (low) risk exposure of the caretakers, with vaccination intentions and trust in vaccine campaign as dependent variables. Following, the results are presented. The fifth and final chapter answers the research questions by discussing the results of the online survey. The chapter provides an analysis of the moral acceptability of the nudge, considering the result of the survey experiment. The main limitations are presented, and some suggestions for future works. Finally, some practical conclusions are drawn from the study.

Chapter 1. Vaccine Hesitancy

On the 14th of February, Ran Balicer, the head of the innovation and research at Clalit, the most important Israeli Health Maintenance Organization, reported that the data collected comparing 600,000 fully vaccinated individuals with 600,000 unprotected individuals "shows unequivocally that Pfizer's coronavirus vaccine is extremely effective in the real world a week after the second dose." (Mitnick & Regalado, 2021). Similarly, in the UK, researchers report that four weeks after receiving the first dose, Pfizer-BioNTech's vaccine resulted in a reduction in hospitalizations of up to 85 percent, while AstraZeneca's up to 94 percent (Vasileiou et al., 2021).

A massive study carried out by Israel's largest health provider indicated that the vaccine's efficacy stands at 94% in preventing symptomatic Covid-19 and 92% in preventing serious pulmonary symptoms (Staff, 2021). Israel, maintaining the current pace of vaccination, could become the first country to suppress the transmission of the virus through the achievement of *herd immunity*. Herd immunity represents a threshold condition achieved when a certain percentage of the population is fully vaccinated and immune to the circulating virus, thus halting the spread of the virus (Andre et al., 2008). The coverage rate required to realize herd immunity depends on the specific disease considered; for Covid-19, estimates are around 70% (Neumann-Böhme et al., 2020; Randolph & Barreiro, 2020). However, some studies point to even 85% of the population being immunized to reach this threshold (Thunstrom et al., 2020; Randolph & Barreiro, 2020). Despite the hopeful words of Ran Balicer and the early evidence of the safety and efficacy of the vaccine, the demand in Israel has dropped dramatically (Mitnick, 2021). Critics remarked that Israel has now approached the most critical point of the vaccination campaign since it now has to convince a significant part of the population comprising younger Israelis, ultra-Orthodox Jews, and Bedouin Arabs who are hesitant of the safety of the vaccine (Kraft, 2021). Furthermore, as of February 2021, only 41% of Israeli parents intend to vaccinate their kids once the shots become available for the under 12, with a striking feature of 30% of the respondents declaring to be unsure (Staff, 2021).

Vaccine hesitancy, however, is not a problem related solely to the Israeli population. Recent research has shown that vaccine hesitancy about the Covid-19 vaccine is high in many countries of Europe, the US, Russia, and Australia (Freeman et al., 2020; Hacquin et al.,

2021; Latkin et al., 2021; Neumann-Böhme et al., 2020; Sallam, 2021); thus, being considered one of the greatest threats in fighting the coronavirus (Dror et al., 2020). The failure of the vaccination program would mean the unfulfillment of herd immunity and the possibility of virus mutations. This, in turn, could signify that governments around the world would need to continue with the current drastic solutions of physical distancing and quarantine measures to flatten the infectious curve and manage health care service demand and provision, which will severely affect the economy in the long run. Recent estimates predict that the current impact of the pandemic on the global economy would lead to a total loss of 9 trillion US dollars (Ozili & Arun, 2020).

It is necessary to begin to understand and address vaccine hesitancy. That is the main aim of the current thesis. In this chapter, the intention is to understand better the emerging trend of vaccine hesitancy and recognize the main factors that drive this behavior. In this regard, the research questions of the following chapter are: *What is vaccine hesitancy? How does the current pandemic affect vaccine hesitancy? What are the strategies that governments can use to tackle vaccine hesitancy?* To answer these questions, I will firstly conceptualize vaccine hesitancy as a public bad. Secondly, by adopting the macro-micro-macro framework explained by De Graaf and Wiertz (2019), I will identify how the current pandemic shapes vaccine intentions and how this could lead to a suboptimal outcome. Finally, I will outline the possible strategies that a government could take to contrast this social problem by reporting them in order of the "least restrictive alternative" principle, which assumes that the least coercive policy should be favored over coercive options (Giubilini, 2019).

1.1. Herd Immunity as a Public Good and Vaccine Hesitancy as a Public Bad

A vaccine against SARS-CoV-2 represents a central element for terminating the Covid-19 pandemic and realizing the indirect protection for the overall population: herd immunity. However, U.S. national polls hint that the level of vaccination intentions is suboptimal for contrasting the Covid-19 pandemic (Callaghan et al., 2020; Neergaard & Fingerhut, 2020). Worrying data concerning vaccine hesitancy also come from Australia, Italy, England, Kuwait, Jordan, Russia, and France (Freeman et al., 2020; Hacquin et al., 2021; Palamenghi et al., 2020; Rhodes et al., 2021; Sallam, 2021). The sole accessibility to the vaccine does not match the acceptance of the vaccine (Fadda, Albanese & Suggs, 2020); a situation that is not new. When in 2009, a vaccine against influenza A H1N1 was available, vaccination rates

were well below an optimal level to reach herd immunity (Mereckiene et al., 2012). Low levels of vaccine acceptance for risky infectious diseases have been termed a "pandemic public health paradox". Vaccine hesitancy is the main contributor to this contradiction (Reintjes et al., 2016).

The WHO defined vaccine hesitancy as the "delay in acceptance or refusal of vaccines despite availability of vaccine services" (WHO, 2020, p.59). Vaccine hesitancy represents a major threat to herd immunity achievement, being listed among the top ten hazards to global health (Friedrich, 2019). Despite the WHO definition of vaccine hesitancy and the enormous number of publications that have tried to tackle the problem in the last years, vaccine hesitancy remains a contrasting expression that has taken many connotations. Giving a formal definition to this issue is made more challenging given the difficulty in individualizing vaccine-hesitant in the population (Dubé et al., 2013).

In their landmark study, Benin and colleagues (2006) have analyzed the attitudes of mothers vaccinating their infants and have divided the sample into four categories: accepters, vaccine-hesitant, late vaccinators, and rejecters. The authors, in this case, defined vaccine hesitancy as the acceptance of the vaccine while holding concerns. However, relating vaccine hesitancy solely to an attitude might not give justice to the complexity of the aspect. In this way, specific behaviors would be neglected, and the notion of attitude might need to be defined concretely to give ground to the concept. Peretti-Watel and colleagues (2015), trying to surpass this ambiguity, argue that it is beneficial to think of vaccine hesitancy as a decision-making process influenced by numerous circumstantial causes. Section 2 will expand on why it might be more analytically precise to see vaccination hesitancy as a decision-making process shaped by the context. Firstly, however, I will specify why vaccine hesitancy can be seen as an act of free-riding and why it constitutes a social problem.

1.2. Vaccination Hesitancy as Free Riding

The goal of a vaccination strategies is to achieve herd immunity so to stop the transmission of the virus. Compromising herd immunity results in the outbreak of transmissible diseases. The recent outbreaks of pertussis, mumps, and measles exemplify the fragility of herd immunity and the danger of undermining it (Flanigan, 2014; Omer et al., 2009). It is important to notice that the control and elimination of diseases can be endangered even by a few

individuals refusing or delaying vaccination in a local community. Unvaccinated individuals tend to cluster, creating small pockets of unvaccinated communities, increasing the probability of an outbreak. For instance, in the Netherlands, recent cases of measles outbreaks derived from several communities of Orthodox Protestants who have rejected vaccination, the so-called "Bible Belt" (Eisenstein, 2014). Herd immunity, thus, can be seen as a *collective good*, a good that can only be produced through the cooperation of a large enough number of individuals (Dawson, 2007). Moreover, herd immunity can also be analyzed from the perspective of a *public good* (Dawson, 2007), a good that is characterized by non-excludability and non-rivalry. Herd immunity is non-excludable since everyone can benefit from its provision even though they may not contribute to the cause. Herd immunity is non-rivalrous since individuals can contemporarily benefit from it.

The provision of public good in general and herd immunity, in particular, requires a collective effort. Individuals need to coordinate their actions to achieve the desired goal. Collective action is difficult to realize since it might encounter coordination problems due to insufficient communication and sharing of information. Moreover, collective action faces an additional complication: the individual is disincentivized to participate because everyone benefits from the good no matter their contribution (De Graaf & Wiertz, 2019). The mismatch between individual interest and collective interest contributes to the free-riding problem: the act of non-participation. Consequently, the free-riding problem gives rise to a collective action problem, the situation where individual rational behaviors determine the under provision of the good, resulting in a *public bad* (De Graaf & Wiertz, 2019). It is important to realize that public bads do not stem necessarily from the individual will of the rational actors, but it is rather an unintended consequence of multiple rational acts that produce negative externalities. In the case of vaccination, if the overall community has achieved the level required for herd immunity, it might be perceived as rational and strategic from the individual point of view not to get vaccinated since the virus cannot spread anyway (Böhm, Betsch & Korn, 2016). Nevertheless, the act of refusing a vaccine or postponing it can result in the overall compromise of herd immunity.

Every vaccine-hesitant can be conceived as a potential vaccine refusal, ultimately constituting a possible barrier to the full accomplishment of herd immunity (Latkin et al., 2021). Thunstrom and colleagues (2020) constructed a model of vaccine uptake and found that current rates of the Covid-19 vaccine program can reduce the number of infections but will likely fail to generate herd immunity. The authors conclude that the current rates of

Covid-19 vaccine avoidance represent a risk for the health system. In this respect, it is important to outline why vaccine hesitancy might represent a problem for the overall society.

1.3. Vaccine Hesitancy as a Societal Problem

Herd immunity safeguards the lives of those who remain biologically susceptible. When herd immunity is achieved, the likelihood that two susceptible individuals infect each other is negligible (Freeman, 1997). Thus, herd immunity represents protection to all those categories that may not be able to take the vaccine or remain vulnerable after the jab. Among these categories, there are infants and young children who have not yet reached the recommended age for initiating the childhood immunization schedule and thus remain exposed up to their first vaccination ("Measles, Mumps, Rubella (MMR) Vaccine", 2021). Secondly, herd immunity protects those who do not develop a strong immune response from the vaccine. Every vaccine does not have a protection rate of 100%, and some individuals might not develop a sufficient immune response ("Measles, Mumps, Rubella (MMR) Vaccine", 2021). Finally, some cannot take the jab in the first place because they might have a compromised immune system or suffer from specific allergic reactions (Pierik, 2018). Consequently, the unsuccessful achievement of herd immunity is particularly risky for the immunosuppressed, given that the consequences of the transmission among this part of the population are more extreme (Flanigan, 2014). In turn, herd immunity represents a safety net for society by protecting the community and lessens the possible expenses associated with public health costs deriving from illnesses. Vaccine hesitancy, on the other hand, hindering this safety net represents a risk for the overall society.

2. Modeling Vaccine Hesitancy

By departing from the controversial definition of vaccine hesitancy of the WHO (WHO, 2020), various scholars have tried to determine the main factors of vaccine hesitancy and model its relations. Amongst the most important efforts to model vaccine hesitancy, there is the work of MacDonald (2015). The author’s work draws upon the “3Cs” model, which was initially conceptualized by the WHO Euro Vaccine Communications Working Group. This model highlights three possible barriers to vaccination: complacency, convenience, and confidence. Complacency refers to the perception of low risk of the infectious disease and thus the evaluation that the vaccine is not strictly necessary. Vaccination convenience refers to all the possible physical and informational barriers that can make vaccination an inconvenient behavior. Vaccine convenience can be affected by the accessibility to the

vaccine, language and health literacy, and the overall quality of the service (Larson et al., 2014). Confidence is related to beliefs that the risks of the vaccine are not properly communicated and thus result in a strong negative attitude towards the vaccine in question. This model has been widely adopted. Critics, however, have pointed out that the particular circumstances of a pandemic might surpass this categorization.

Little research has been done about vaccination hesitancy during a pandemic, which provides a completely different analytical context. Pandemics, indeed, are characterized by a high degree of uncertainties, and fast developments of vaccines that can be accompanied by erroneous facts, and the possible politicization and polarization of the vaccination campaign (Mesch & Schwirian, 2015). The most widely used model to outline the specificity of vaccine hesitancy under pandemic circumstances is the health belief model (Mesch & Schwirian, 2015). The model revolves around the concept of the perceived hazard of the disease. The individual will vaccinate if she feels that the infectious disease in question is dangerous, that she is susceptible to the disease, and that the vaccine is helpful. The model has recently included the affective dimension of fear, worry, and anxiety, which resulted in strong predictors of vaccination intentions. Studies using the model pointed out that the older population, women, and the less educated perceive the risk of infection to be higher (Oliver, 2006).

Schmid and colleagues (2017) expanded the 3Cs model using the health belief model to account for the peculiarity of a pandemic situation. By analyzing 470 articles to evidence the main barriers to vaccine uptake, the authors added the new dimension of *calculation*. The dimension of calculation refers to the attitude of basing the vaccine decision on utility maximization. As we will see in chapter two, evaluating the utility of a vaccine depends on the subjective evaluation of the risk, which contextual factors might shape. Their study, furthermore, compared seasonal influenza's uptake barriers with pandemic influenza's uptake barrier. For their analysis, it stems out that the lack of confidence was the main barrier for both seasonal influenza and pandemic influenza vaccination uptake. Moreover, complacency resulted in being a consistent barrier to vaccine uptake in pandemic circumstances.

These models are based on the common assumption that vaccination intentions and attitudes can be disposed over a continuum going from active request to absolute rejection. While this conceptualization might be convenient, it presents many drawbacks. If a person does not

stand at the extremes of the axes, it does not necessarily mean that she is hesitant towards vaccination in general. An individual might be highly supportive of a specific vaccine but be concerned about the validity of another one. These models, thus, do not sufficiently explain specific contextual factors. Larson and colleagues (2014), drawing on an extensive analysis of 1187 studies, argue that vaccine hesitancy is shaped by a variety of context-specific factors that vary across time, place, and vaccines. Vaccine hesitancy is thus a multilayered problem presenting context-specific elements. For this reason, the next section will delve into the main determinants of vaccine hesitancy in the specific case of Covid-19.

2.1. Identification of Vaccine-hesitant in the Covid-19 Pandemic

Many studies are trying to outline the characteristics of those who are more likely not to pursue the Covid-19 vaccine and their reasons for doing so. Hacquin and colleagues (2020), for instance, investigating a large representative sample, individuated that in France, vaccine-hesitant are more likely to be young adults, women, less educated individuals, those who are most dissatisfied with the government's response to the pandemic, and those who feel less exposed to the virus. It stands out from their study that young adults under the age of 35 are the category with the least willingness to get vaccinated since they believed to be less affected by the risks of the virus. Seemingly, in the UK, Robertson and colleagues (2021) noticed that young people were the least likely to accept the shot, with those aged between 16 and 24 as the most hesitant towards the vaccine. Furthermore, they showed that vaccine hesitancy correlated negatively with the level of education. Also, Murphy and colleagues (2021) showed that in Ireland and the UK, younger adults were the category most associated with vaccine hesitancy and resistance. Furthermore, in their study, trust in the vaccine, medical institutions, and the state is an important determinant for the uptake of the vaccine. The main reason for vaccine hesitancy in their sample related to the unknown effects of the vaccine, whilst the main reason to get the shot related to the possible future regret of getting infected or infecting a family member. Callaghan and colleagues (2020) concluded that in the US, vaccine-hesitant are mostly represented by women, those belonging to minorities, conservatives, highly religious people, those who deem the risk of the virus small, and those who do not trust the efficacy and safety of the vaccine. Lack of trust in the safety and efficacy of the vaccine were the two most common reasons individuals gave not to pursue the vaccine, but still, other reasons stand out, such as the lack of financial resources and the lack of insurance or the belief that they already contracted the virus and thus now they are immune. Latkin and colleagues (2021), analyzing a sample of 522 participants recruited through

Amazon's Mechanical Turk (MTurk) service, evidenced that men had increased vaccine trust compared to women, while those belonging to racial minorities tended to trust the vaccine less than Whites. Moreover, the study showed that republicans had lower levels of vaccine intentions compared to democrats. On the other hand, there was no significant correlation between vaccine trust and age, income, and education level in their study. In their study, the most common reason to decline the vaccine was related to the doubts about the vaccine's safety and its actual efficacy in protecting from the virus. In a very large experiment conducted by Thunstrom and colleagues (2020) in the US presenting 3,133 adults, it appears that vaccine intentions are positively correlated to confidence in the vaccine and inversely related to feelings of personal safety. Those who believe that people around them are vaccinated feel less the need to get the shot. Whilst the confidence in the vaccine was undermined by its novelty and the potential undiscovered side effects. This is consistent with the findings of the other studies and the previously accepted conclusion that people are particularly skeptical of new vaccines (Dube et al., 2013). Further, Covid-19 vaccine intentions highly correlate with the flu shot uptake in the last two years.

In the specific case of the Netherlands, where this study takes place, not many studies have assessed vaccine intentions. However, national data and the studies reported here do not show optimal vaccination rates. It has been reported that the percentage of young adults in the Netherlands willing to get the vaccine lies well below the global average ("Vaccinatie|RIVM", 2021; van Heck, 2021). Vollmann and Salewski (2021), assessing vaccine intentions in young adults aged between 18 and 34 in the Netherlands between the end of March and the beginning of May 2021, found out that 81% of the 584 participants were willing to get the jab against Covid-19. In particular, the authors found out that vaccine intentions were related to the perceived risks of getting infected and stronger emotional responses to Covid-19, confidence in the vaccine in preventing serious symptoms, and weaker beliefs that the coronavirus could be controlled solely by restrictive measures. Wismans and colleagues (2021), when assessing vaccine intentions in students coming from the Netherlands, Belgium, and Portugal, showed that only 40% of them were utterly convinced to take the jab, whilst almost 1 out of 10 detained a negative attitude towards the vaccine. The authors showed that the confidence parameter of the 5C model explained vaccine intentions well among this population. They found that the perceived risk of the vaccine and its efficacy affected the confidence of the vaccine. Furthermore, Wismans and colleagues (2021) showed that trust in health authorities and the government plays a

fundamental role in vaccine uptake (as we will see in chapter 2). Those who reported lower institutional and medical trust had less confidence in the vaccine and thus were less willing to take the vaccine. Finally, the authors showed that the environment of the students mattered. Students who believed that people around them were not at risk of getting infected or developing serious symptoms were less willing to get vaccinated. Using a mixed-iterated methodology, Sanders and colleagues (2021) showed that vaccine intentions were not stable in the Netherlands but increased. In November, vaccine intentions laid close to 50% in the population, whilst at the end of January, almost 75% of the population intended to get vaccinated. However, the results are not so positive, showing that in March, almost 20% of the adults interviewed declared having no intention to get vaccinated. The primary reasons for not getting the jab were the fear of the vaccine's possible side effects, the trust in the system delivering and producing the vaccine, and the weaker belief that the vaccine protects the others. Finally, in a large study assessing vaccine intentions across Europe, Neumann-Böhme and colleagues (2020) showed that vaccination intentions rates in the Netherlands laid around 73%; a suboptimal rate to achieve herd immunity considering the percentage of the people that cannot take the vaccine for medical reasons or because they are too young. In particular, the study found out that vaccine-hesitant were concerned about the vaccine's potential side effects and the experimental nature of the vaccine.

These studies indicate that vaccine-hesitant are more likely to be women, conservatives, belonging to racial minorities, having strong religious beliefs, and young. Regarding the rationale for vaccine hesitancy in the Covid-19 pandemic, the main concerns were related to the vaccine's long-term safety and the perceived threat of the virus. This data seems to agree with the health belief model, which relates the uptake of the vaccine with the advantageousness of the preventive measures and the risk of catching the virus. By translating the data on the 3cs model, the main barriers towards a Covid-19 vaccine are complacency and a lack of confidence. A result that concords with the analysis of Schmid and colleagues (2017). All these results seem to accord with the previous indication that although vaccine hesitancy is context-dependent, perception of vaccine safety contributes the most to the uptake of the vaccine (Eisenstein, 2014). How did the current pandemic shape the perception of vaccine safety and drive such high rates of vaccine hesitancy? To answer this question, the next section will draw upon the macro-micro-macro model.

2.2. The Macro-Micro-Macro Model to Explain Vaccine Hesitancy

As we have seen, vaccine hesitancy represents a social problem. However, apart from establishing why vaccine hesitancy is a social problem and outlining the characteristics and reasons of those likely to reject or postpone vaccination, it is important to understand the processes that bring such public bad and its repercussion at the macro level. In doing so, this section will depart from the theoretical perspective of De Graaf and Wiertz (2019) and subsequently formalize a macro-micro-macro explanatory model of the problem under study.

De Graaf and Wiertz (2019) proposed to look at societal problems by taking a *methodological individualism* stance, analyzing the subtle mechanisms that lead to a certain social problem at the macro level. The authors adopted the macro-micro-macro model, which positions the micro-level behaviors at the center of the explanatory process. This model departs from the macro-level conditions that shape the individual's decisional setting in which the individual acts. The mechanism that links the macro-level context in which individuals act and the influence at the actor's decisional level is called the *situational mechanism* (De Graaf & Wiertz, 2019, p. 36). This mechanism thus explains the individuals' creation of perceptions or beliefs dictated by the environment in which his/her judgments are framed. The formation of these beliefs will lead to specific individual behaviors. The formation of individuals' behavior is attributable to the *action-forming mechanism* (De Graaf & Wiertz, 2019, p. 37). This mechanism connects the individuals' decisional standpoint with the consequent display of certain actions. This mechanism, thus, relates to the micro-to-micro relationship. Finally, the aggregation of micro-level outcomes deriving from both situational and action-forming mechanisms leads to macro-level consequences. The complex interaction of single behaviors that lead to macro-level outcomes is explained through the *transformation mechanism* (De Graaf & Wiertz, 2019, p. 38). This mechanism, which links the micro to the macro conditions, describes how the aggregation of individuals' behaviors can lead to suboptimal or even drastic consequences (the problem of aggregation). The context of the decision, such as the condition of non-excludability in public goods, leads to rational choices -the possibility to free ride- that eventually can lead to undesirable consequences.

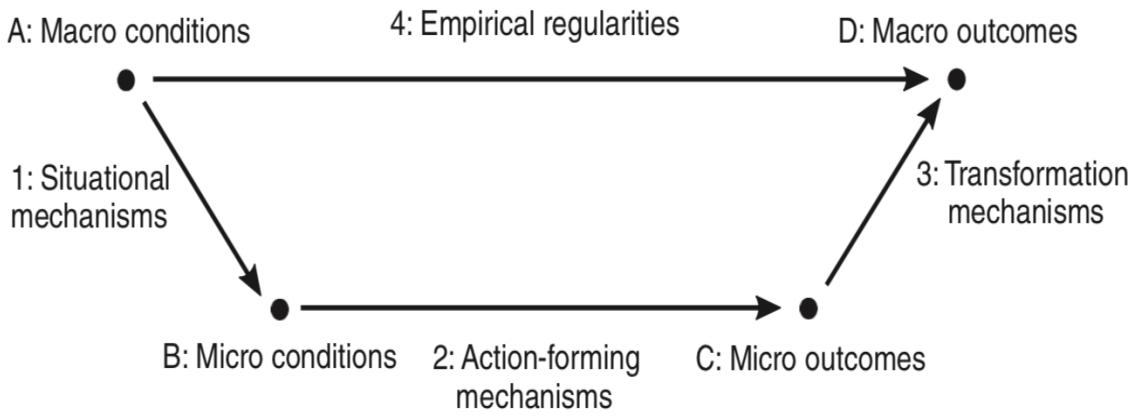

Figure 1. The macro-micro-macro model. Taken from De Graaf, N. D., & Wiertz, D. (2019). *Societal problems as public bads*. Routledge, p. 35.

How does the macro-micro-macro model explain how the Covid-19 pandemic brings vaccine hesitancy and thus the possible non-fulfillment of herd immunity? Covid-19 imposes a change in the macro-level conditions. Firstly, the vaccine has been developed faster than ever. In fact, under normal circumstances, most vaccines are developed in years, if not decades. Thus, the reduced time span of the vaccine development might raise genuine concerns about possible underestimated side effects. The public might believe that experts and the government are not analyzing the possible dangerous effects of the vaccine and are cutting the required time necessary to develop the vaccine (Rosenbaum, 2021; Verger & Dubé, 2020). The expedited approval of the vaccine may convey the message that the vaccine had not undergone the necessary tests. Secondly, most antigen platforms used to develop the SARS-CoV-2 vaccines are relatively understudied and might prosper concerns about their safety and efficacy in the long run (Kyriakidis et al., 2021; Rosenbaum, 2021). Third, different vaccines have been developed and approved. Their relative safety might vary according to specific subgroups' characteristics, such as age or gender, and thus create the impression that some vaccines are better than others (Dubé & MacDonald, 2020). All These dynamics render effective risk communication strategies a key factor to contrast these concerns. These macro-level conditions change the decisional structure at the individual level. In fact, through situational mechanisms, the peculiar conditions of Covid-19 affect the decision structure of the individuals and thus result, through action-forming mechanisms, in the emergence of new behaviors. The newer the vaccines, the likelier it is to encounter more questioning (Dubé et al., 2013). The developed trust of the individuals in the vaccine strictly depends on the overall understanding of the virus and the maturity of the vaccine.

Furthermore, falsities and misinformation propelled by anti-vaccination campaigners may increase the tendency to question the vaccine (Dubé & MacDonald, 2020). This would result in a general questioning of the vaccine and a tendency to delay its uptake, which through transformation mechanisms, might lead to the suboptimal outcome of nonachievement of herd immunity (Fadda et al., 2020). In the case of young adults, the subject of this study, they might feel the opportunity to free-ride if the overall community has achieved herd immunity or if they feel unexposed to severe symptoms to avoid potential risks. Nevertheless, this act of free riding can result in the overall compromise of herd immunity.

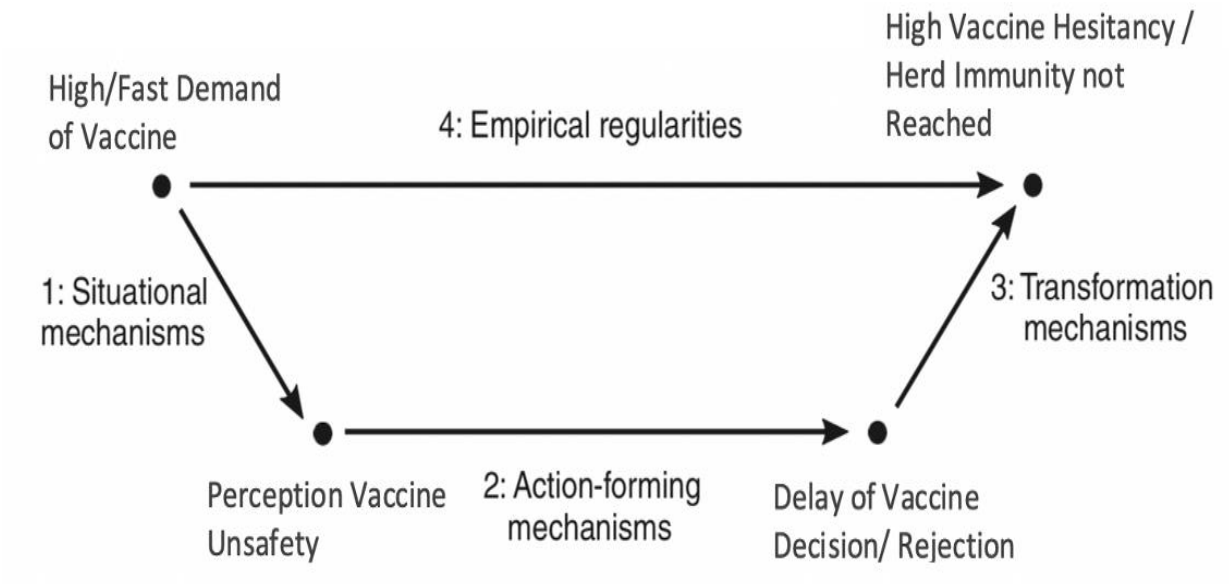

Figure 2. The macro-micro-macro model applied to the Covid-19 vaccine hesitancy problem.

3. Strategies to Solve Vaccine Hesitancy

To prevent the spreading of the Covid-19 virus, vaccine uptake remains a required action. However, as we have seen, the phenomenon of vaccine hesitancy is on the rise, especially among young adults, and could prevent the actual achievement of herd immunity. What can governments do to stimulate vaccine uptake? By following the Nuffield Council on Bioethics and Giubilini (2019), I will outline the possible strategies that a government could take to contrast this social problem by reporting them in order of the "least restrictive alternative" principle, which assumes that the least coercive policy should be favored over coercive options, all things being equal.

3.1. The Principle of Least Restrictive Alternative

In the past decades, the principle of least infringement has taken a central place in the public health ethics discussion (Childress et al., 2002). According to the principle, the least violating available policy should be pursued by public authorities to attain a certain public health outcome. Policies are compared on their infringement of certain accepted rights such as the right not to be harmed, the right of free movement and association, the right of bodily integrity, and personal autonomy (Giubilini, 2019). When concerning the rights of bodily integrity and personal autonomy, the principle refers to the *principle of least restrictive alternative* (PLRA) (Childress et al., 2002). Yashar Saghai (2014) gives a clear definition of the PLRA: "if two interventions can both efficaciously and effectively address a public health or health policy issue and are equal in all other morally relevant respects, the intervention least restrictive of personal liberties ought to be preferred" (p. 350). The Nuffield Council on Bioethics has conceptualized an intervention ladder classifying public health interventions based on the PLRA (Nuffield Council on Bioethics, 2007). The intervention ladder goes from the simple intervention of providing people with the necessary information about the relevant health matter to complete compulsion. It is important to notice that the PLRA is not exempt from criticism and that it might not be worth following in some critical situations. The PLRA might request the actualization of a least restrictive policy but this could pose greater problems related to the effectiveness of the policy chosen or raise critical questions on the final (unfair) distribution of burden and risks that the policy causes. Comparing different vaccination strategies goes well beyond the aim of this thesis and here the PLRA principle is not used as a criterion for justification but as a guideline to outline the main policies to solve vaccine hesitancy.

Giubilini (2019) revised the Nuffield Council intervention ladder on the basis that some interventions that might be more restrictive than others to some categories of individuals but not to others given their socio-economical condition. For instance, the author points out that giving financial incentives to get vaccinated might be more restrictive for people in need of money than those who are financially well-off. In this way, the author adopts a maximin criterion to establish the ranking of his intervention ladder. According to this criterion, the interventions are considered less intrusive, not only if they are less interfering but also if the number of people that are burdened by a policy is less than the number of people burdened by a more restrictive policy. Furthermore, Giubilini's (2019) revision of the Nuffield Council intervention ladder concerned mainly the individualization of specific interventions and their positioning on the scale.

3.2. Vaccination Policies

The first intervention in the revised intervention ladder of Giubilini (2019) is persuasion. Persuasion is the exercise of communication strategies to influence an individual's behavior. A common form of persuasion in the domain of public health is educational campaigns. For instance, a vaccination communication campaign might be used to inform and persuade people to get vaccinated. The characteristic of persuasion is that it is neither coercive nor manipulative (a formal definition of coercion and manipulation will be given in chapter 3). Persuasion works by providing factual information and leaves options open to the individuals. Various governments around the world have provided information to their citizens to persuade them to get vaccinated. However, given the progression in the vaccination rate, persuasion does not seem to be enough to reach herd immunity.

Scaling the intervention ladder, the second option we encounter is nudging. A *nudge* is a choice architecture mechanism that exploits certain behavioral biases to stir certain behaviors (Li & Chapman, 2013, p. 188). Nudges might be considered manipulative but not coercive since they leave open all the possible alternatives to the decision-maker. As explained by Yashar Saghai, there is enough confirmatory indication that "at least when individuals have strong enough preferences, goals, or beliefs, they are likely to become aware of an anomaly" (Saghai, 2013, p. 489) and thus disregard the nudge. A proper ethical analysis of regret-nudging will be given in chapter 3; for now, it is important to understand that nudging might be a preferable solution over persuasion given their effectiveness and preservation of the freedom of choice. Nudges have already been applied in the domain of vaccine campaigns. For instance, some maternity schools have set up vaccines as default options (Giubilini, 2019). In this case, the parents who hold strong beliefs about the vaccine still reserve the right not to vaccinate their kids, but those ambivalent about the vaccine might be more intent to get the kids vaccinated because they do not want to make an effortful decision.

In the third and fourth positions of the intervention ladder, we found incentives and disincentives in this order. Incentives refer to the provision of monetary enticements, such as conditional cash transfers for vaccinating oneself or one's children (Giubilini, 2019). Incentives could be coercive depending on the economic background of the interested person and on the amount of money that it is offered. Large enough incentives could leave no other choice but acceptance of the vaccine. Another problem that could arise from the use of

incentives is that they might crowd out intrinsic motivation (Gneezy, Meier & Rey-Biel, 2011) or induce people to believe that there are secondary reasons why the option is incentivized. For instance, people might believe the government has secondary reasons to incentivize the vaccine for Covid-19 and thus have less trust in the vaccination campaign. On the other hand, disincentives could work in the opposite direction of monetary incentives. For instance, disincentives could take the form of withholding financial benefits to those who do not want to get vaccinated. The withholding of certain benefits might be more manipulative than monetary enticements since it could trigger the feeling of loss aversion of something already endowed. A stricter form of disincentives could involve not only the withholding of financial benefits but of services. For instance, governments could prohibit unvaccinated people from entering certain public buildings or prohibit access to schools to unvaccinated kids. Obviously, some people have the financial capacity to afford homeschooling or get public services through private institutions, but for most of the population, this intervention would leave no other alternative than accepting the vaccine.

Finally, compulsion represents the last step of the intervention ladder. Whilst up to this intervention, the choice not to get vaccinated would remain legally prosecutable, utter compulsion would make vaccination refusal illegal. This intervention, thus, represents the most restrictive option since it leaves no one with the possibility of forgoing the vaccination. Up to now, there have been no cases where this strategy was adopted.

4. Chapter Conclusions

From what we can see from the different studies, it is unlikely that COVID-19 vaccines will be accepted with eagerness by everyone. Strategies to improve vaccine uptake must be adapted to tackle Covid-19 vaccine hesitancy. This chapter has set the stage for implementing an evidence-informed strategy by analyzing the phenomenon of vaccine hesitancy, understanding why vaccine hesitancy is a social problem, outlining how the Covid-19 pandemic could shape vaccine hesitancy, and reporting the possible governmental strategies to contrast this social problem. The studies reviewed demonstrated that vaccination decision is an act of free-riding due to different reasons out of which one of the most important is individuals' trust in the institutions carrying out the vaccine policy. Trust is a factor that must be included in the implementation of an evidence-informed strategy. In the next chapter, thus, the focus will be on government trust and how this shapes the perception of the safety of the vaccine and ultimately drives vaccination behaviors. The next chapter will analyze and

contextualize trust towards higher institutions in the macro-micro-macro model outlined before.

Chapter 2. Vaccine Risk Perception and the Role of Trust

1.1. Are Vaccines Decisions Rational?

The decision to get vaccinated could be seen as a rational act where the risks of not accepting the vaccine and contracting the virus are pondered upon those of getting vaccinated and, in some rare cases, incur adverse events. Since the risks associated with taking the shots are lower than those related to the virus, vaccination is defined as a rational decision (Böhm et al., 2016; Weinstein, 2000). As seen in the previous chapter, different studies suggest that the rapid development of the Covid-19 vaccine is of great concern with rising worries regarding the actual safety of the vaccine and its potential side effects. If people believed vaccination to be a rational choice, emphasizing the low absolute risk of vaccination would be enough. However, not always persuading strategies that deliver factual knowledge of the risks of the vaccine are effective in changing the way people think about the vaccine. Individuals are less rational than predicted (Kahneman, 2011). For instance, in the domain of vaccination, Brown and colleagues (2010) showed that people tend to evaluate the symptoms arising as a consequence of the vaccine more negatively than those deriving from the virus. Omission bias explains this behavior (Böhm et al., 2016). Humans, indeed, tend to estimate the negative events due to action as more drastic than the same events stemming from inaction (Ash et al., 1994; Baron & Ritov, 2004). Furthermore, it has been shown that vaccine uptakes do not increase even soon after outbreaks (Justwan et al., 2019; Oster, 2018). Vaccine hesitancy, thus, could derive from biased information processing in which the actual risks of getting vaccinated are enlarged (Betsch et al., 2011; Taylor, 2019).

When unwanted events are rightly or wrongly connected with vaccination, when the media extensively cover vaccine rumors, when new critical studies emerge, and when there are recalls or temporary suspensions of the vaccine, all these erode confidence in vaccines and the authorities delivering putting public health at risk (WHO, 2017). Vaccine decision-making is shaped by many factors, from confidence in the vaccine to socio-economic backgrounds (as seen in chapter 1), and the correct communication about the vaccine must consider these factors. One factor that shapes vaccine decisions that recently has taken a more central role in many studies is the trust individuals have in the institutions promoting them (Vergara, Sarmiento & Lagman, 2021). Whilst individuals might take a cost-benefit analysis approach to decide upon getting vaccinated or not, this “rational attitude” is most likely

shaped by non-rational factors that enter the vaccination decision's equation. The way individuals acquire and use certain information to base their decision is shaped by the trustworthiness they believe the source of information has, which conversely might be shaped by other (ir)relevant contextual factors. In this chapter, I will discuss the effect that trust in government and vaccination policies has on risk perception, and I will argue that trust must take a more central role in the analysis of vaccination strategies.

2. Risk Perception

2.1. Knowledge and Feelings About Risk

The way people perceive risk affects vaccination decisions (Karlsson et al., 2021). In general, individuals perceive risk based on the probability of a certain dangerous event happening or on the severity of the consequences (Scovell et al., 2021). In this second case, risk is understood as a feeling. Feelings about risks are more decisive in driving human decision-making than mere knowledge about the risks (Slovic & Peters, 2006).

In particular, the centrality of the emotional dimension in the explanation of risk perception characterizes the theoretical models developed in the context of the "risk as emotion" perspective, according to which the responses to a risk depend in part on influences linked to the emotions experienced (Albanesi et al., 2011). According to these theories, risks with a similar danger component are perceived differently if the emotional component is greater in one of the two. The literature has listed a series of risk characteristics that systematically influence risk perception (Savadori & Rumiati, 2005; Slovic, 2010). The most important is the ability to evoke visceral reactions of fear or terror: a terrifying risk is usually an uncommon risk that you are unfamiliar with. A new source of risk, with no direct experience, leads to an overestimation of its danger. For example, Perko (2014) has demonstrated how experts have lower risk perceptions than the general population regarding nuclear waste and an accident at a nuclear installation. Furthermore, risks taken voluntarily, for example, smoking or tanning in the sun, are perceived to be lower than the risks imposed, such as installing a radio antenna (Lupton & Tulloch, 2002). Moreover, if the potential damage is observable, then the risk of an activity increases (Jenkin, 2006).

In this regard, it is important to look at the potential factors that influence vaccines' perceived risk. Vaccine intentions are strictly related to the perceived safety of the vaccine and the risks of getting infected (Karlsson et al., 2021).

2.2. Vaccine Risk Perceptions

Humans create subjective representations of risk by acquiring different information. However, humans do not process information systematically but rather use mental shortcuts to drive their way through uncertain situations. These mental shortcuts are called heuristics (Kahneman, 2003). Whilst heuristics are very useful in many circumstances, in some cases, they lead to biased decision-making. In practice, people, to be able to make quick decisions, use simplified procedures, which do not respect all the steps of logical reasoning. In doing so, however, they more easily run into errors, and they do so systematically. For instance, the availability heuristic is used to evaluate the probability (or frequency) of an event and estimate the risk; it is based on the ease and speed with which examples referring to the category of judgment in question come to mind (Folkes, 1988). It can be influenced by the personal salience of events (people believe that events that have happened to them or their acquaintances are more likely) or by the imaginability of a specific event. For example, people consider more frequent dramatic events such as explosions or terrorist acts versus less dramatic events such as cardiovascular disease (Schwarz et al., 1991).

Regarding risk perceptions, emotions can have a greater influence on behavior than knowledge (Slovic & Peters, 2006). So, whilst the risks associated with contracting the virus are factually greater than those associated with the vaccine, individuals might not accept these conclusions as their way of comparing the risks is driven by the usage of heuristics in gathering and understanding information. In the domain of vaccines, negative messages will attract more attention than positive ones (Featherstone & Zhang, 2020), and they are generally believed to be more sincere (Loomba et al., 2021). This, evolutionary speaking, could be given by the fact that paying attention to negative circumstances could be far more crucial for survival than focusing on positive messages (Siegrist & Cvetkovich, 2001). Furthermore, in uncertain situations like a pandemic, individuals are more loss aversive than risk-seeking (Novemsky & Kahneman, 2005). Thus, for vaccines, they would focus more on avoiding potential harms from the vaccine rather than obtaining further protection from the shot, despite the individual risks of getting infected. In this way, individuals tend to be victims of what has been termed a risk perception gap (Ropeik, 2012). To contrast this gap, an academic branch has specialized in communicating risk effectively: “risk communication”. The aim of risk communication in the domain of vaccines is to deliver positive statements about the vaccine that can counterbalance the negative side of the risk equation, thus convincing people to get the jab.

However, even tailoring the message to a specific audience adopting strategies that consider people's heuristics might not be enough. Social and cultural factors could come into play when people assimilate information. When looking at public health compliance, individuals must be responsive towards the communicator of the message, such as public institutions, experts, and the medical world (McAndrew, 2020). If individuals do not trust the source of information, it will be difficult to make them believe the positive aspects of vaccination. In this regard, trust in the information source represents one of the main factors affecting individuals' risk perceptions. Individuals will comply with the public health recommendations if they believe they can trust the messenger. A specific aspect of trust that is fundamental to vaccine policy is institutional trust. Institutional trust refers to the generalized trust in what constitutes public institutions, such as government officials, politicians, governmental branches, the military, and the police (McAndrew, 2020). Different institutions within the same government might have different levels of trustworthiness depending on their performance (Dolea, 2018). However, institutional trust serves as a useful decision rule for individuals (Hetherington & Husser, 2012). Trust is of utter importance when individuals make decisions involving material or ideological sacrifices (Hetherington, 2005; Rudolph & Popp, 2009). Thus, when people are asked to take the vaccine in a pandemic, they must understand the risks associated with the virus in question and believe in the capacity of the government to solve the situation. It has been shown that trust in governmental bodies is essential for people to adopt protective behaviors (Chon & Park, 2021) and that institutional trust is associated with positive attitudes towards the vaccine (Krishna, 2018).

3. The Role of Trust

Institutional trust is essential to achieve an accurate response to public health crises since it facilitates public health care decision-making responses in catastrophic situations (Meredith et al., 2007; O'Toole, Michael & Inglesby, 2002). Trust is a sine qua non for effective risk communication, given that no kind of communication could be effective if there is a lack of trust. Emerging studies show how trust is a fundamental predictor of public health compliance (Justwan et al., 2019). Thus, the remainder of this chapter will clarify the correlation between institutional trust, risk perception, and the adoption of protective behaviors. Furthermore, the analysis intends to elucidate the determinants of trust, which will then be used for the survey design.

Institutional trust is fundamental in resolving natural disasters, economic crises, or pandemics. Institutional trust leads to cooperative behavior that safeguards the security of the whole community (Blendon et al., 2008). The link between trust in the institutions and the adoption of cooperative behaviors is explained by the Trust and Confidence Model (Siegrist, Earle & Gutscher, 2003). According to the model, trust affects how the public assesses risks and benefits and shapes the way they interpret and respond to public health messages (Vaughan & Tinker, 2009). People with high credibility in the government's performance will support the public health messages and thus adopt cooperative behaviors. During a pandemic, institutional trust might be a too general dimension to shape the perception of risk and public compliance with protective measures. This is way, Bogart and colleagues (2021) have introduced the concept of medical trust. Medical trust refers to the specific level of trust in the health care system, the government as a guardian of public health, and the specific role of health care providers. In the domain of vaccination, medical trust refers to the trust in the overall system that delivers the vaccines. Public trust in vaccines is complex and dynamic, and it entails different determinants (Larson et al., 2011). The trust that individuals have about vaccines and vaccine information is shaped by different factors, such as the credibility and the openness of the messenger, the goodwill of the provider, and the perceived capacity of the institutions (Heath & O'Hair, 2020). In the next section, by departing from research about environmental risk communication and health communication, I will discuss the main dimensions of institutional and medical trust associated with vaccine stimulation strategies. This will serve as a theoretical background for developing the dimensions of trust used in the research study.

3.1. The Determinants of Trust

From a trustee point of view, it was initially thought that two main variables affect the trustworthiness of a communicator: the level of expertise and sincerity (Covello, 1992). A very experienced source can be judged less credible if it is perceived to have manipulative intentions, while if the source seems to act to protect the interests of others, it is judged more credible. Confirmatory evidence of expertise and trustworthiness as the most common determinants of source credibility comes from Pornpitakpan's (2004) meta-analysis. Expertise was also found to have the greatest effect on source trustworthiness by Peters, Covello and McCallum (1997). On the other hand, Kumkale and colleagues (2010) found out that expertise does not affect trust in the source of communication equally among different population groups. Women and group minorities rely more on source expertise when making

decisions than teenagers. Regarding the interaction effect between expertise and sincerity, Yang and Beatty (2016) showed that expertise correlated with sincerity in health information messages online but not offline.

Whilst early research on source credibility mostly focused on expertise and trustworthiness. A third component was introduced in the equation of trust and source credibility. McCroskey and Teven (1999) argued that more attention should be given to the dimension of goodwill in affecting source credibility. A source is believed to be more trustworthy once it shows an understanding of people's positive and negative emotions, identifying with those feelings, and having the capacity to respond to them (McCroskey & Teven, 1999). Often faced with a controversial and complex situation, people adopt the behaviors of those they feel closest to and who reflect their values and beliefs. Covello (2009) argues that the factors affecting trust are different in conditions of low or high citizens' concern about the risk under discussion. Under conditions of low citizen concern, the most important factor in determining trust is the perceived competence of the source. Instead, in conditions of great concern, the ability to listen and to show empathy becomes decisive while competence or expertise becomes less relevant.

In their study, Meredith and colleagues (2007) analyzed the main factors of trust in public health, evidencing the main components. The authors identified perceptions of empathy, competency, expertise, honesty, openness, and commitment as the main determinants of trust in public health authorities. Honesty and consistency of information were important determinants of public health messages credibility. It was also individuated that the public's greatest concerns were related to the actual completeness of the information and its consistency among different sources. People, especially when the sources of information are multiple, tend to trust more those who express values consistent with their own, made salient by the specific situation. When a government is believed to withhold complete information, it is deemed less professional and trustworthy. These results are consistent with the literature considering trust as a multifaceted and intricate notion (Rose et al., 2004).

In general, the degree of institutional and medical increases in a public health crisis when: institutions have clear positions on their aims and on the values that guide them; decisions are shared clearly and transparently; scientific evidence guides the choices taken by the public authorities; citizens have the perception that the authorities share their values; citizens have sufficient information to make calibrated choices; errors are quickly recognized and resolved

by the authorities; actions are consistent with public statements; the legitimacy of suffering and worries is recognized (Albanesi et al., 2011; Heath & O'Hair, 2020). Thus, we have seen that institutional and medical trust can take many forms and that trust is a fundamental factor for compliance. However, it is important to review what empirical research shows about the relationship between institutional and medical trust and the adoption of health and prosocial behaviors crucial for pandemic control, such as vaccine acceptance.

3.2. Institutional Trust and Vaccine Decisions

Establishing research has shown that greater levels of institutional and medical trust were correlated with higher compliance with cooperative and protective behaviors. For instance, higher trust in governmental bodies correlated with the adoption of preventive behaviors to avoid the transmission of the swine flu (Rubin et al., 2009), with respecting the social distance measures imposed during the Ebola outbreak (Blair, Morse & Tsai, 2017), and getting vaccinated against seasonal influenza (Bish & Michie, 2010). In particular to vaccination, Marlow, Waller and Wardle (2007) demonstrated that higher levels of institutional and medical trust correlated with HPV vaccine uptake. Similarly, van der Weerd and colleagues (2011) showed that vaccine intentions in the Netherlands during the H1N1 pandemic were positively correlated with the trust in government bodies. These results receive confirmation also from Quinn and colleagues (2009), who show that during the H1N1 pandemic, the intention to get vaccinated augmented with higher levels of institutional trust in the American government. These results show that trust in the government cannot be neglected when looking at vaccine intentions. Quinn and colleagues (2019) found that trust in the vaccine and the system delivering it is the most important predictor of flu vaccine intention. When analyzing qualitative data, Majid and Ahmad (2020) concluded that trust in the health care system was a major determinant in vaccine uptake. In conclusion, various studies point to the importance of institutional and medical trust in determining vaccine decisions.

Looking at the specific case of the Covid-19 pandemic, Moxham-Hall and Strang (2020) showed that trust in the government predicted individuals' intentions to respect regulations imposed during the lockdown. Similarly, Han and colleagues (2021) demonstrated that institutional trust correlated with higher levels of compliance with the measures imposed by the government to flatten the curve of infection, such as maintaining social distancing, wearing a mask, and self-isolation. Regarding vaccine intentions, Lazarus and colleagues

(2021) reported that institutional trust was one of the dominant determinants of Covid-19 vaccine uptake. In this study, countries with high vaccine acceptance also had the strongest trust in central governments, like China and South Korea. Public trust affects the way people make decisions about vaccines. However, still little is known about how institutional and medical trust shapes individuals' decisions about vaccination. In the next section, I will combine the research about vaccine risks perception and institutional trust to outline the relation between declined institutional trust and the increase in vaccine hesitancy.

3.3. The Relation Between Trust and Perceived Vaccine Risk

The decline in public trust towards vaccination is a global issue (Dubé et al., 2015; Larson et al., 2018) linked to the problematic decrease in public trust in general (Clemence, 2021). The literature has identified several factors that drive public questions and concerns about vaccines (Larson et al., 2011). Firstly, coincidental adverse events impact the way the vaccine is accepted. Negative stories about side effects, which might not be related to the vaccine, attract much attention, especially in the domain of social media (Puri et al., 2020). Furthermore, the diversity of the vaccines drives concerns. The fact that new vaccines with different protection rates and different vaccination schedules are introduced and approved might drive worry among lay people (Black & Rappuoli, 2010). Furthermore, research publications that derive strong conclusions drive vaccination concerns. For instance, both the research of Talwar and colleagues (1994), relating tetanus vaccines to antipregnancy issues, and the publication of Wakefield (1999) linking MMR vaccine to autism have been used as evidence against the importance to get vaccinated. Moreover, the advent of democratizing movements and social media communication have enlarged the dialogue from experts to the public. Indeed, the public has questioned more about the vaccines and the immunization strategies of the government in the last decades (Bean, 2011). The amount of information online has increased exponentially, and antivaccination groups have been able to proliferate and use the available information to attract the attention of vaccine-hesitant online (Cooper, Larson & Katz, 2008). Social media are considered the second most important source of information during a pandemic (Marlow et al., 2007). Finally, in most cases, vaccines are seen as driven by political and financial motives. In the U.S., for instance, pharmaceutical companies are regarded as the least trusted industry (McCarthy, 2019), and medical institutions are seldomly believed to act in the public's best interest (Funk et al., 2020). Trust in policymakers is another feature of trust that affects the perception of the vaccine. The trust

in the vaccine is challenged particularly when public authorities disagree about the different strategies relating to the vaccine campaign (Latkin et al., 2021).

From a macro-micro-macro model perspective, all these factors shape how the vaccine is interpreted as a safe and rational choice at the individual level and determine the possible reluctance to accept the vaccine because of the possible enlargement of the risks associated with side effects, leading to vaccine hesitancy at the macro level. As seen in the previous chapter, many individuals' express concerns about the newness of the vaccine and the potential side effects. In particular, how might the loss of trust in governments' vaccination policy translate into delayed vaccination decisions? It is likely that trust in institutions and in the vaccine campaign overall affects individuals' perceived safety of the vaccine. General distrust in the government will probably translate to distrust in the vaccine and in the system delivering them. Those who distrust government medical officials will perceive more negatively the threat posed by vaccines (Byington, 2014). For this reason, the trust in medical institutions relates so tightly with vaccine uptake since these governmental bodies provide the necessary information relating to vaccine safety and effectiveness. Those holding negative trust in medical institutions will neglect the information provided by the medical experts and rely more on personal stories or other forms of information (Justwan et al., 2019). In particular, Construal Level Theory (CLT), developed by Liberman and Trope (2008), could help clarify the link between institutional and medical trust and vaccine intentions. CLT entails that events with higher construal levels, represented by more abstraction, are related to psychologically more distant events, while lower construal levels, indicating more concreteness, are linked to psychologically close events (Spence, Poortinga & Pidgeon, 2012). Recent research has shown that psychological proximity is well related to risk perception. Individuals react more strongly to risks when they are specific, concrete, and proximate than when they are abstract (Arias et al., 2017). It is possible that people that distrust government and vaccines might interpret the official statistics about vaccine safety as more distant and thus perceive less the actual safety of the vaccines. On the other hand, the same individuals might perceive tangible stories appearing on the news and social media channels as more concrete and closer to them and thus identify vaccination as a risky and irrational decision. In this way, trust can be seen as a moderating factor that affects the way individuals read and feel about the information delivered by the official sources and shapes the uptake of the vaccine. In particular, individuals with higher institutional and medical trust will rely more on the vaccine information shared by the government and follow the advised

behavior. Empirical research seems to accord to this theory, evidencing that coronavirus risk perceptions are higher when people have higher trust in medical professionals and lower when they tend to distrust the government (Dryhurst et al., 2020).

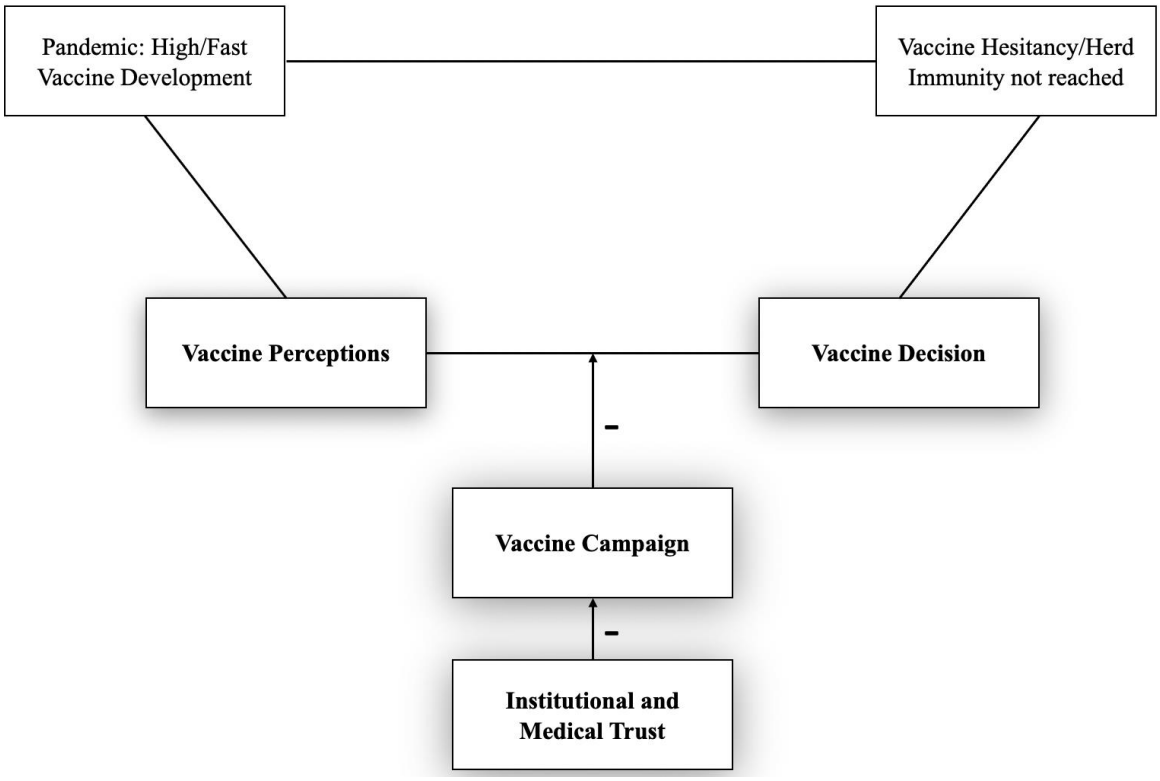

Figure 3. Implementing the dimension of trust in the macro-micro-macro model. The figure highlights the micro dimensions that will be assessed in this study. Lower institutional and medical trust will negatively affect the reception of the vaccine campaign which in turn will lead to lower vaccine intentions.

4. Chapter Conclusions

Cooperative health behaviors are necessary to solve the current pandemic. In this regard, sustaining public trust is essential to achieve better compliance with the protective behavior needed to contrast the Coronavirus. As shown in this chapter, higher levels of institutional and medical trust correlate with higher intentions to adopt health recommendations.

Governments should thus build and maintain trust in the vaccination policies by showing concrete performative results, clearly communicating their intentions, and empathizing with the potential worries of the citizens, to achieve the desired levels of vaccine uptake. Trust is essential for citizens to suppress their short-term intentions and make sacrifices to benefit the

entire community (Murphy, 2004). Vaccine hesitancy, indeed, cannot be accountable solely to skewed information or risk perception gap but rather on the broader distrust in the institutions that deliver them (Yaqub et al., 2014; Goldenberg, 2016). In this light, it is of fundamental importance that a vaccination strategy, as the regret-nudging that will be discussed in the next section, does not hinder trust in the government, as it might be seen as a strategy that does not fully disclose all information to the public, but rather sustains a certain level of trust in science and in the vaccine campaign. Thus, given the outlined importance of trust in the government in shaping an individual's risk perception, I believe it is fundamental that trust takes a more central role when evaluating and comparing different vaccination strategies.

Chapter 3. The Moral Permissibility of Regret-framing Nudging in Vaccine Policy

Adopting the macro-micro-macro model, we have seen that vaccine hesitancy can be considered a free-riding act, possibly derived from the human incapacity to assess the probabilities associated with the risks of not getting vaccinated or the inability to foresee future outcomes (e.g., Betsch et al., 2011; Brewer et al., 2007; Hollmeyer et al., 2009). Given that humans present biases when acquiring and evaluating information (Tversky & Kahneman, 1974), vaccination communication should not only be about conveying information. Vaccine campaigns could levy on emotions and promote trust to deliver the message more directly (Chou & Budenz, 2020). In this chapter, I will first elucidate the role emotions have in shaping vaccine decision-making. Secondly, I will describe the anticipated regret-nudge and the role it could take in tackling vaccine hesitancy among young people. Consequentially, I will review and criticize some of the main arguments against nudging. In particular, I will assess the moral permissibility of regret-nudging on the basis of three common conceptualizations of autonomy and advance some counterarguments in defense of the autonomy preserving condition of the anticipated regret-nudge. Finally, I will make the point that autonomy might not be the biggest concern when evaluating the moral permissibility of a regret-nudge but that more attention should be paid to its impact on institutional trust.

1.1. The Role of Emotions in Vaccine Decisions

Precautionary behaviors, such as wearing masks or maintaining a distance of 1.5 meters, have successfully limited the spread of the Covid-19 (Hemmer et al., 2021; WHO, 2020a). However, the complete eradication of the virus and the return to a normal situation depend on the developed vaccines' acceptance. Communication campaigns that promote the uptake of the vaccine will be crucial in fostering vaccine acceptance and overcoming the enlarging problem of vaccine hesitancy (see chapter 1). Given the importance of the matter and the incapacity of human beings to process large amounts of information, vaccine campaigns could rely on more direct communications strategies that use emotional appeals. It has been shown that emotions affect the intention to adopt protective health behaviors (Morgul et al., 2020; Qiu et al., 2020; Wang et al., 2020). Furthermore, given that emotions are necessarily involved in a pandemic, vaccine campaigns could make use of them to foster vaccine acceptance. Emotions, however, have not been conventionally associated with rational

decision-making. Many scholars have traditionally divided rational thinking on the one hand and emotional feeling on the other hand (Ashkanasy & Humphrey, 2011; Salovey & Mayer, 1990; Simon, 1966). For instance, when assessing human decision-making, Kahneman (2011) discerns between a system 1, intuitive and automatic, and a system 2, deliberative and rational. From this, it derives that human decision-making has long been associated with cognition and emotions were omitted from accounts of rationality.

However, contemporary scholars have started to associate emotions with rational and moral decision-making (Damasio, 1994; Greene et al., 2001). Li, Ashkanasy & Ahlstrom (2014) make the point that emotions do not just interfere with decision-making, but they are an integral part of the process of decision-making. In this respect, Damasio (1994) has been one of the first advocates of the idea that emotions are a primary factor in rational decision-making. Damasio (1994) gave a neurobiological foundation to this thesis by showing that patients with damaged ventromedial prefrontal cortexes could not respond well to trivial tasks, acting irrationally when deciding between risky and non-risky choices. The author concluded that emotions aid the decision process by quickly marking outcomes as positive or negative in the prefrontal cortex, given the anticipated emotional significances. Bechara and colleagues (1997) subsequently showed that patients with prefrontal damages, thus emotionally impaired, did not produce preemptive skin conductance responses (SCRs) in contrast to normal participants when making risky choices, even when realizing the outcomes of their choices were risky. The authors conclude that nonconscious biases drive rational conduct in normal individuals.

Affective forecasting is a way for individuals to imagine future events and ponder their choices (Wilson & Gilbert, 2005). For instance, a gut feeling of guilt might help a person who wants to lose weight stick to her diet. Emotions, thus, have been successfully used to stimulate health behaviors (Perugini & Bagozzi, 2001). For instance, anger and negative sentiments have been used to fight tobacco usage (Murphy-Hoefer et al., 2010), emphasis on social responsibility to stimulate fruit and vegetable intake (Williams-Piehota et al., 2004), and fear to encourage safe driving (Carey & Sarma, 2016). However, researchers must be careful since the relationship between emotions and health behaviors might be less straightforward than initially theorized. For instance, messages aiming to stimulate a certain behavior through the appeal of certain emotions (e.g., Shame) might hinder the intention to adopt protective behaviors or even lead to riskier lifestyle decisions (Duhachek et al., 2012; Eppright et al., 2002). Given that emotions affect more vaccine intentions than simple

statistical reporting (Betsch et al., 2011), vaccine campaigns contrasting the current Covid-19 crisis could leverage emotions to contrast vaccine hesitancy. The contribution of this chapter, thus, lies in expanding the current stream of research on anticipated emotions and decision-making to the domain of vaccine decisions.

1.2. Anticipated Regret

How do anticipated emotions shape decision-making about future and uncertain choices? Decision-makers construe future scenarios and accept the uncertainty of a situation by processing anticipatory feelings and making the decision that makes them feel best (Li et al.,2014). Thus, anticipated emotions allow the thinking of alternatives and the process of the future implications of certain events since they result from the expectation of the possible success or failure derived from a certain choice (Bagozzi & Pieters, 1998; Gleicher et al., 1995). These anticipated thoughts affect feelings, cognition, and behavior (Li et al., 2010; Zhang and Fischbach, 2005). Anticipated emotions, thus, are an essential constituent of rational decision-making in terms of procedural rationality. These Anticipated emotions have been defined by Pfister and Bohm (2008) as the "beliefs about one's future emotional states that might ensue when the outcomes are obtained" (p.6). From this definition, it is clear that anticipated emotions are different from trait emotions and moods, which are more stable and diffuse across time (Delgado et al., 2015). From the different studies looking at anticipated emotions (e.g., Loomes & Sugden, 1986; Mellers et al., 1997), such as disappointment, regret, and frustration, it becomes evident that decision-makers try to make the choice that maximizes emotional utility by avoiding possible negative emotions stemming from future consequences.

Experiencing regret often guides our thoughts and behaviors in a productive manner (Smallman & Roese, 2009) and helps individuals learn from their mistakes (Zeelenberg & Pieters, 2007). *Regret* is a negative emotion stemming from counterfactual thinking defined by "what might have happened" (Gilovich & Medvec, 1995, p. 380). The key differential factor of regret from other negative emotions is the presence of a self-blame component (Frijda et al., 1989; Zeelenberg, 1999). Moreover, research has shown that individuals overestimate the future impact of self-blame, tending to regret decisions more in prospect than in experience, leading to higher prospected self-blame (Gilbert et al., 2004). Thus, people tend to make risk-prone or risk-averse decisions based on the potential experienced regret. The stronger the regret associated with a certain choice, the more risk-averse the

decision-maker will be (Tochkov, 2009). Given that anticipated regret influences decision-making due to the potential self-blame experienced, recently, anticipated regret has been studied in relation to protective health behaviors. The anticipation of regret has been shown to prompt preventive health behaviors more than the perceived severity of the illness or the perceived exposure to the virus (Li et al., 2012). A recent meta-analysis by Sandberg and Conner (2008) has shown that anticipated emotions are strong predictors of intentions. Making salient the way people could feel about the consequences of a certain choice affected intentions and protective behaviors: experiencing regret led to higher intentions to drive more safely (Lawton, Conner & Parker, 2007; Manstead & Parker, 1995), to eat healthier, consume less alcohol and reduced intentions to smoke (Lawton *et al.*, 2007), to greater tooth care behaviors (Lawton *et al.*, 2009), to make use of condoms (Richard, de Vries, & van der Pligt, 1998), to exercise more often (Abraham & Sheeran, 2004; Lawton et al., 2009), and increased vaccine intentions (Chapman & Coups, 2006; Wroe, Turner & Salkovskis, 2004). Regarding vaccination, greater anticipated regret was correlated to higher intentions of vaccine uptake (Chapman & Coups, 2006; Weinstein et al., 2007).

1.3. Anticipated Regret-Nudging

As seen in chapter one, strategies to increase vaccine coverage include persuasion, nudging, (dis)incentives, and compulsion. Nudges are an interesting form to study since these interventions are very effective in encouraging vaccination (Giubilini, 2019). However, not all nudges might be equally effective. In the case of vaccine hesitancy, nudges designed to facilitate or prompt action might not be particularly effective since the decision-maker has significant doubts or concerns about the vaccine (Brewer et al., 2017). On the other hand, for vaccine hesitancy, it is more important to tackle the determinants that drive negative concerns about the vaccine or those that inhibit vaccine decision-making. Findings revealed that HPV and seasonal flu vaccine acceptability is determined by many psychological factors, out of which the most significant is *anticipated regret* (Brewer, DeFrank & Gilkey, 2016; Penţa, Crăciun & Băban, 2020). Anticipated regret is more strongly and stably related to intentions and behaviors than other anticipated negative emotions (Penţa et al., 2020). In particular, *anticipated inaction regret* was the strongest predictor for engaging in protective behaviors (Brewer et al., 2016). Thus, emphasizing the potential feelings of regret due to inaction could drive healthier behaviors. Regarding vaccination, Kim, Kim and Murphy (2020) showed that reading loss-framed messaged that connected to future regretful consequences led to higher HPV vaccine intentions. In a recent study about Covid-19 vaccination intentions, Wolff

(2021) showed that anticipated regret was the major factor in explaining the variance in intentions.

Anticipated regret might not always correlate strongly with intentions. Less severe and more abstract outcomes produced less inaction regret and thus corresponded to weaker intentions (Penţa et al., 2020). As we have seen before, decision-makers tend to maximize regretful decisions based on self-blame. Self-blame, in turn, is reduced when the choice is considered inevitable or justifiable (Zeelenberg & Pieters, 2007). Thus, the justifiability of a certain decision affects the feelings of anticipated regret (Connolly & Zeelenberg, 2002; Reb & Connolly, 2010). In the case of vaccine decision, the decision-maker might feel justified if she has a low perception of the risks associated with the virus or if she feels the vaccine has not been tested enough, which will lead to less self-blame in case of a bad outcome. However, the decision might be more difficult to justify if the vaccine is presented as a safe choice and when the chances of contracting the virus and developing serious symptoms are high. Following this reasoning, it is imaginable that younger generations, affected the least by severe acute respiratory problems from Covid-19, could not feel the necessity to get vaccinated and do not blame themselves if they get infected. Therefore, the strategy to lever in particular on the individualistic drives of anticipated regret might not be so effective for younger generations. In this case, nudging youngsters with the use of altruistic rather than egoistic motives might increase more vaccination intention in this population. Infecting others, especially individuals at risk, might be accompanied by greater self-blame than catching the virus as a healthy young adult.

Betsch and colleagues (2013) have demonstrated that vaccine intentions were higher when the collective benefit of achieving herd immunity was made salient. Similarly, Vietri and colleagues (2012) demonstrated that when the risks of infection were low, participants' intentions to get vaccinated were mainly driven by the number of people that would indirectly benefit from their vaccination. Finally, Attari and colleagues (2014) showed that the two most important reasons for vaccine uptake were personal protection and preventing the spread of the virus. Thus, these studies show that personal concerns are important for vaccine uptake, but altruistic preferences make up an important aspect of vaccine decisions. Suppose the emphasis is on the anticipated regret of consequences of vaccine inaction that focus on the possibility of infecting a beloved one or not achieving herd immunity for the whole community. In that case, this might lead to higher vaccination intention among the younger generations. This research, thus, aims to expand the literature of anticipated regret

framing with the inclusion of both selfish and altruistic motives and to study the effect of anticipated regret on younger generations, given that previous research has shown the low vaccination's intentions rate of this part of the population (Neumann-Böhme et al., 2020; "Vaccinatie|RIVM", 2021; Yoda & Katsuyama, 2021).

To recapitulate, in the case of an anticipated regret-nudging, a negative belief will be induced in the decision-maker. This will trigger a status of potential self-blame that could lead the decision-maker to either reconsider her future outcome and thus make a pondered decision or to neglect the future outcome, since it did not produce any feeling of self-regret, and thus stick with her initial choice. This raises some moral considerations. Is it morally acceptable to induce negative emotions in others? In particular, is there a difference in inducing regret rather than any other negative emotion, such as anger or fear? Is it morally acceptable to interfere with individuals' deliberative capacity by potentially creating a greater state of regret than what individuals would experience? And, does it make a difference who induces such emotions? Thus, the next sections will discuss the following questions to assess the ethical acceptability of regret-nudging. It is important to notice that the ethical analysis will be made keeping in mind the constraints that a pandemic imposes. This chapter will argue that regret-nudging, notwithstanding its problematics, in particular to what will be defined as emotional paternalism, is a morally justifiable measure to tackle vaccine hesitancy in a pandemic situation. Furthermore, in this chapter, I will argue that aspects of autonomy infringement and paternalism do not make up the whole story when assessing public health policies but that institutional trust should take a more central role. To begin with, the analysis will assess regret-nudging based on its autonomy infringement aspects. However, autonomy will not be taken as a generalized concept, but following Vugts and colleagues (2020), regret-nudging will be assessed on three aspects of autonomy: agency, freedom of choice, and self-constitution. These three categorizations of autonomy will correspond to three objections about nudging, respectively: manipulation, coercion, and wrongful paternalism.

2. Regret-nudging and the Concepts of Autonomy

2.1. Manipulation, Coercion and Paternalism

Nudging has been consistently assessed in relation to its autonomy-infringing aspects. Regret-nudging might be subject to the same concerns. Thus, in this section, I will put forward some arguments against regret-nudging based on the three concepts of autonomy that Vugts and colleagues (2020) have individuated in the nudging literature and try to defend regret-nudging from some of these accusations.

An insistent attack on nudging is based on its manipulative character of influencing people's choices (Blumenthal-Barby, 2012; Hausman & Welch, 2010; Vallgårda, 2012). Nudges, the argument goes, steer us in courses and behaviors that we did not support. In this way, nudging is described as an attack on our autonomy. As Furedi (2011) explained, nudging harms our autonomy to make choices that are valuable to ourselves. So, the problem with nudging is that it impacts a certain conceptualization of autonomy, the one related to agency (Vugts et al., 2020). Agency pertains to governing one's life based on personal intentions and the capacity to set own goals. Manipulation represents a critical threat to this conception of autonomy since someone's rationales and decision-making processes are usurped by others. Indeed, nudges that exploit weaknesses in people's reasoning capabilities so that they might lose control could be considered a form of manipulation in that sense. To properly evaluate this argument with regards to regret-nudging, we need to take a closer look at the definition of manipulation. By intuition, manipulation relates to being treated in a way that circumvents our will, and thus the manipulator makes it more difficult for us to choose what we would otherwise have chosen. Gorin (2018), following Noggle (2018), defines manipulation in this way:

"A manipulates B if and only if A deliberately and non-coercively influences B to x and one of the following conditions is met:
(1) A believes that B lacks sufficient reason to x.
(2) A believes B has sufficient reason(s) to x, but A is not motivated by this reason(s).
(3) A's influence of B is motivated by B's sufficient reason to x, but A deliberately leads B to x in light of some other reason.
(4) A exploits means of influence that do not reliably track reasons" (p. 238).

This definition, however, presents distinctive definitional problems (Noggle, 2018). Manipulation can comprehend so many aspects that it is difficult to specify in a formal definition. As specified by Noggle (2018), the definition of manipulation has followed three directions. In the first account, since it mentions the use of influence that does not need to

track reasons, manipulation is considered a form of influence somewhere between the two extremes of rational persuasion and coercion (Noggle, 2018). However, this definition remains unclear since many acts that are not coercive nor rationally persuasive may not be an instance of manipulation. For instance, signaling danger via powerful images may not be considered manipulative. To bypass this dichotomy, some authors defined manipulation as an act of bypassing rational deliberation by introducing non-rational influences in the decision-making process (Blumenthal-Barby, 2012). A second approach identified by Noggle (2018) is to consider manipulation as a form of trickery. Differently from deception that aims to install a faulty belief, manipulation in this sense would aim to trick someone into adopting an incorrect mental state. This approach, however, struggles to define what a faulty mental state is. Finally, Noggle (2018) identifies a third direction to define manipulation. This third approach sees manipulation as a form of pressure that pushes the decision-maker towards a certain choice. Manipulation, thus, could take the form of blackmailing or peer pressure and would impose certain costs to the decision-maker for contrasting the will of the manipulator. These three approaches remain quite vague and difficult to use as a base for an ethical evaluation. More concretely, Wilkinson (2013) defines manipulation in this way: "Manipulation is intentionally and successfully influencing someone using methods that pervert choice" (p. 347). Despite the inclusion of its potentially wrong-making qualities, this definition of manipulation is useful for three reasons. Firstly, it states that there must be an agency condition. Thus, manipulation must be done by agents as opposed to non-agents such as natural forces. It is also widely agreed that manipulation presupposes some intention condition: the agents must intend to influence their targets in some sense. Secondly, manipulation shapes personal preferences by making the manipulator's preference the final choice of the manipulator. Finally, manipulation also has a successful condition: the target must have been manipulated for manipulation to occur. Put another way, A can act manipulatively towards B, and yet B would not be manipulated by A if A's attempt failed.

Is regret-nudging manipulative? As we have seen, manipulation influences decision-making in a way that is not autonomy-preserving. Manipulation, in contrast to rational persuasion, hinders autonomous decision-making (Noggle, 2018). Thus, the main claim is that a nudge is manipulative if it infringes on autonomous decision processes. On the other hand, if the nudge is not successful or is not an intentional form of influence that deters autonomous decision-making, then it cannot be considered a form of manipulation. For instance, framing information can be a way to enhance and reduce understanding, so one cannot say that

framing is essentially manipulative. When it enhances understanding, framing might well be considered an instance of rational persuasion rather than manipulation, since it does not bypass rationality or instill false beliefs. Writers have proposed various general explanations of when a method is manipulative, from non-rationally influencing to shaping people's choice in ways they would not endorse, but these have their problems too (Wilkinson, 2013). Thus, not all nudges can be considered in the same way, and some might enhance autonomy. Some nudges might well facilitate the decision process, e.g., by eliminating unimportant options (Saghai, 2013). Furthermore, nudges, from an outcome point of view, may also strengthen a person's ability to be in control, such as by helping them avoid irrational behavior or steering them away from instinctive choices they would not have made if they had the opportunity to make a deliberate decision. This seems especially the case of regret-nudging since the ultimate use of the regret emotion is to prompt a certain self-blame component that could lead to the re-evaluation of the personal preferences. In this way, regret-nudging does not bypass rational deliberation, but it aids future thinking. As shown by some neurobiological studies, regret activates the same brain regions associated with moral decision-making (Timberlake, Coricelli & Bault, 2019). Moral decision-making involves the capacity to arrive at some optimal outcome given certain limiting and conflicting factors. Thus, even though moral decisions regard the capacity to mediate between conflicting outcomes and decisions, regret interests the possible emotional pain of making a less optimal choice, the human brain seems to handle these mechanisms likewise (Timberlake al., 2019). These processes request the capacity to evaluate and choose among future realities. Thus, the stimulation of regret seems almost an integral component of a rational choice that involves complex future realities. In this sense, stimulating regret could not be considered as an instance of bypassing deliberative thinking, unless the stimulation of regret is not endorsed or considered appropriate by the person who is nudged. But then again, confirmatory evidence points out that when people have strong preferences and do not endorse the nudge, they can easily reject it (Saghai, 2014). Furthermore, the consideration of regret might make the decision-maker consider the whole spectrum of choice, especially in an uncertain situation like the pandemic. In this sense, regret-nudging could make a deliberative process more reason tracking. Since it does not hinder the autonomous decision process, but it helps it, regret-nudging cannot be considered manipulative.

Secondly, regret-nudging could be attacked because they restrict another specific aspect of autonomy, freedom of choice (Vugts et al., 2020). This aspect of autonomy implicates the accessibility of options in the choice environment. It, therefore, refers to external factors that

influence choice. Freedom of choice is most clearly disrupted when the most relevant alternative options are taken away, and persons are coerced to act in specific ways, thereby not having a real choice at all (Vugts et al., 2020). Backing autonomy in this sense infers that nudge should not make options impossible or costly. Yashar Saghai's work on nudging, where he presents the idea of easy resistibility, clearly involves this conception of autonomy (Saghai, 2013). In fact, Saghai's explanation of nudging states that "A nudges B when A makes it more likely that B will ϕ, primarily by triggering B's shallow cognitive processes, while A's influence preserves B's choice-set and is substantially non-controlling (i.e., preserves B's freedom of choice)" (2013, p. 491). Here we see that Saghai's definition explains both the mechanism of action of nudges, though automatic processes, and distinguishes nudges from other types of influences which restrict the set of choices, such as coercion or bans.

Thus, nudging should not be coercive. Similarly to the accusation based on its manipulativeness, we need to assess what does coercion entails. According to Wood (2014), someone is coerced to do something when she did not choose to do it or had no acceptable alternative (p. 21). Seemingly to manipulation, there must be a certain successful condition: someone is being coerced only if the person forced to do the act does it. The second condition regards the acceptable alternatives. Alternatives can be considered acceptable or unacceptable for different reasons. However, intuitively we can agree that unacceptable alternatives might be considered so because they might entail an unacceptable physical or phycological burden, they contrast with moral values, or they are legally not prosecutable (Wood, 2014). Thus, coercion entails something more than just being manipulated. The greatest difference between manipulation and coercion lies in the restriction of acceptable alternative options. Manipulation leaves open more than one acceptable alternative even though the person manipulated is influenced towards one choice. On the other hand, coercion restricts the possible alternative circle to one choice and thus raises issues about freedom of choice.

Thaler and Sunstein (2008) address concerns about nudges violating freedom of choice by emphasizing their liberty preserving character. The fact that nudges secure freedom of choice in their work is defended in two ways. Firstly, the authors argue that nudges are just an architectural way of presenting choices in another way and that our choices are always being influenced without notice (Thaler & Sunstein, 2008). This entails that there is no such a thing as a neutral design of choice, and that one choice will always be automatically preferred by the undecided given the context. The undecided, thus, is never actually free from the

influence of the choice architecture given the presence of heuristics and biases that shape her decision process. Although, there is a difference between intentional manipulation and "natural" choice architecture in terms of respect and recognition of the individual. Therefore, Secondly, Thaler and Sunstein (2008) defend the liberty preserving aspect of nudges also on the basis that nudges should not eliminate options from the choice pool and should not make one option excessively more costly than others. In other words, nudges should be easily resistible, and someone nudged should always be able to reject the nudge and choose otherwise (Thaler & Sunstein, 2008). Thus, a proper nudge should not alter the original set of choice, and neither does regret-nudging. Regret-nudging in the domain of vaccination does not alter the set of choices but leaves the option to refuse the vaccine. It seems unlikely that this nudge could be considered coercive.

A further attack on nudges entails not the outcome, but the process of the choice. Nudges have been criticized for disrespecting human agency and rational capacities (Hausman & Welch, 2010; Tengland, 2012). As claimed by Waldron (2014), Nudges are an attack on human dignity since they do not take the decision-maker's preference seriously. This claim has been developed by many other authors arguing that nudges are just a new way of framing paternalistic intentions (Mitchell, 2004; Rebonato, 2012) and that nudging is a reappearance of behaviorism (Burgess, 2012). Thus, nudges, the argument goes, are an instance of wrongful paternalism. The paternalistic aspect of nudging interferes with what Vugts and colleagues (2020) denominate as autonomy as self-constitution. Agents define themselves based on the decision they make. In other words, a person's identity is forged by her values, which in turn derives from the conception she has of the personal choices she made in interpersonal relations. In this regard, the greatest threat to this concept of autonomy as self-constitution refers to the aspect of indoctrination since the agent will support choices and values that are not her own (Vugts et al., 2020). For instance, if a paternalistic government continuously nudges healthy life, then health choices are not endorsed by the citizens because of their value to them but just because they have come to be automatic. However, nudging in the public health domain may be interpreted either as absolutely wrong given their paternalistic character, or charges of wrongful paternalism could be discounted in the domain of public health policy given the importance of some problems.

To discuss these arguments, we need to first assess the notion of paternalism. Traditionally, paternalism has been thought to involve constraints on or interferences with liberty (Mill, 1989 [1859]). It is widely accepted as a conceptual matter that a paternalistic act or policy

restricts an agent's liberty or interferes substantially with her ability to act as she wishes and that it does so for the benefit of the agent targeted by the act or policy. Thus, one possible counterargument would say that the potential gains outweigh the loss in autonomy, and this argument must defend sacrificing autonomy. Theorists who oppose paternalistic policies, however, hold that interferences with an agent's liberty are not justified by the welfare gains (or purported welfare gains) the interferences make possible when those gains accrue not to third parties but the agent herself, so long as the agent is competent to make her own decisions about how to live her life. By limiting an agent's liberty "for her own good," the paternalist either forcefully imposes the paternalist's judgment about value onto the agent or forcefully imposes the agent's own better judgment onto her when she is unable or unwilling independently to act in accordance with that judgment. Such an imposition, the objection goes, may be an infringement on the victim's autonomy. In this way, Scoccia (2018), following Dworkin (2020), defines paternalism in this way:

"P acts paternalistically toward Q (target) just in case:

1. P limits Q's liberty or interferes with Q's decision-making;
2. against Q's will, without Q's consent, or contrary to Q's preferences; and
3. for Q's own good." (p.11)

As shown by Dworkin (2020), the conditions identified in this definition are difficult to clarify. The first condition is delicate since, as we have seen for the discussion of manipulation, many acts could be considered interfering with one's liberty of choice, from physical harm to deception. However, many borderline cases might be more difficult to define since they might not compromise liberty but enhance it. The second condition is difficult since someone may neither consent nor dissent and be simply unaware of the interference. Furthermore, it is problematic to establish whether the one acting paternalistically knows about the consent or dissent of the paternalized. Finally, the third condition is also arduous to assess since there might be more than one motive, not just the welfare of the one paternalized (Dworkin, 2020). Furthermore, it is challenging to define what is good for Q.

Thus, the point here is that nudges divert the person from their core values into adopting the values of the paternalistic agent. Regret-nudging seems particularly liable to these attacks. Given that regret-nudging seems to influence vaccine-hesitant choices, we should now define

under what categorization of paternalistic means regret-nudges can be put in. Regret-nudges do not seem to influence people's choices via physical means or attaching strong disincentives to prevent the choice of alternatives. However, regret-nudges might be subtly paternalistic without limiting the set of available options. If a paternalizing agent intentionally exaggerates the danger of a certain situation, she does not reduce the pool of choices or makes some choices impossible to choose, but we can still see how this influences the paternalized agent. For instance, a doctor who holds a certain opinion might present a treatment regimen by presenting successful stories rather than percentages, which might well shape the patient's decision. In the same way, regret-nudging by "simply" framing the problem under different lenses may be wrongfully paternalistic despite not being coercive nor manipulative.

In this section, I have argued that regret-nudging is not essentially manipulative or coercive, especially when considering the current context of the pandemic. However, regret-nudging may well be considered paternalistic and interfering with the self-constitution conception of autonomy. In the next section, I will expand on this point and argue that regret-nudging presents a particular instance of paternalism, emotional paternalism.

2.2. Emotional Paternalism

Although manipulation and coercion are the most prominent suggestions about what makes nudging wrong, probably the greatest problem with the particular case of regret-nudging may refer to wrongful paternalism. This is not only a case of knowledge manipulation but rather a case of *emotional paternalism*. Here the question becomes whether it is justifiable to manipulate emotions: Can experts or institutions nudge individuals because they do not hold the "right" kind of emotions? In this case, the differentiation between soft and strong paternalism may help untangle the issue.

Soft paternalism does not interfere with someone's values or ideas but simply with someone's ignorant or mistaken beliefs (Feinberg, 1986). The aim of soft paternalism, thus, is to assist the paternalized in achieving what she wanted, were she competent in achieving it and not acting under false thoughts. On the other hand, hard paternalism also interferes with the values and ideas of someone. Thus, hard paternalism justifies the interference with the liberty of others no matter if the decision of the person was voluntarily chosen (Feinberg, 1986). The moral permissibility of regret-nudging stands on the conception we hold of

emotion paternalism, where emotion paternalism refers to the non-consensual interference of someone's emotional state for the person's own good. If we see emotional paternalism as merely *prima facie* immoral, meaning that at first it might be categorized as an immoral act but that certain circumstances make it justifiable, then an act of strong paternalism may well be justified in some circumstances. In this respect, interference with someone's emotions is not always immoral but depends on the context. On the other hand, if we regard emotional paternalism as an absolute wrong, then it will not be possible to interfere in any way with a person's mental state. This second argument will defend the thesis that interfering with someone's emotional states means thwarting the ultimate agency of the person since the paternalistic agent is making the paternalized behave in the way she wants simply by relying on emotional levers.

Unfortunately, the differentiation between soft and hard paternalism presents its ambiguity as well. Some authors seem to correspond this differentiation with that of manipulation and coercion, where soft paternalism stands for something more similar to manipulation whilst hard paternalism, given that it imposes some costs, reflects coercion (Dworkin, 2020). However, this definition does not correspond with Feinberg's initial conceptualization of hard and soft paternalism (1986). In fact, according to him, there might be situations possible to solve through soft paternalism, but that still imply the usage of material costs. Notwithstanding these differences in definition, hard paternalism presupposes a stronger interference with someone's autonomous decision process. Utterly, the decision to see an act of emotional paternalism as prima facie immoral or as an absolute wrong depends on the conception we have on the role of emotions in shaping autonomy. Feinberg (1986) defines paternalism only in reference to acting against someone's authentic preferences, and he goes on to argue that self-harming choices deriving as a consequence of emotions, drug usage, and ignorance cannot be considered intentional choices. In his argument, we see that emotions do not ameliorate but rather obstacle an individual's decision process.

If we accept that emotions, especially anticipated feelings, are paramount to autonomous and rational decision-making, as we have seen at the beginning of the chapter, then emotional paternalism might still preserve the autonomy of the decision-maker. It is possible to figure instances where emotional paternalism thrives on someone's autonomy. As argued by Diamond (1982), arguments are just one way to approach moral questions and deliberative processes might well be helped by emotional responses. For instance, when a patient is

suggested to take a cooling-off period before taking an important financial or medical decision, this may enhance her autonomy since it has been demonstrated that people cannot predict their preferences across different affective statuses (Loewenstein, 2005). In this case, emotional paternalism may be justified not only because it promotes the welfare of the other person but also because it is an appropriate way of showing affective concern.

3. Are Regret-Nudges Wrongfully Paternalistic?

Regret-nudging is an instance of emotional paternalism since it instills a negative belief in the decision-maker that eventually causes the individual to (re)consider the negative emotions of regret and self-blame that might arise from her actions. In this sense, the nudge could stimulate regret when the individual would have not judged regret as an appropriate emotion, thus interfering with the concept of autonomy as self-constitution. One could question whether the application of regret-nudging in the domain of vaccination is a paternalistic act in the strict sense since the nudge stimulates a behavior that is not only beneficial to the self but to the community as a whole. In the case of this thesis, the vaccination message is framed both as an individualistic act and an altruistic one. Instilling regret to promote vaccination at the individual level is a case of emotional paternalism in the strict sense since it promotes the well-being of the nudged. On the other hand, leaving on altruistic motivations could be considered a case of indirect paternalism since the well-being of the individual nudged is promoted indirectly by not making her infect her beloved ones and thus regret future undesired outcomes. However, the question remains whether regret-nudging is wrongfully paternalistic.

The capacity to make rational and autonomous decisions may not be constant as commonly believed but might well depend on the context of the decision. With its intrinsic uncertainty, the pandemic might render decision-makers less decided to act for their own good and that of the community by having a skewed perspective of the danger of vaccination. In this regard, it is possible that people do not behave rationally since they misstep in some form of reasoning failure. The uncertainty of the pandemic may make it more difficult to assess and calculate risks, and people may not be able to have a clear vision of their future self. It has been shown that under uncertain situations, decision-makers do not behave according to rational standards (Wit & Wilke, 1998). Maintaining that government should consider us rationally capable under every circumstance and assume that we always want to make autonomous choices is unrealistic given a large amount of evidence that shows our predictably irrational behavior

and, secondly, too burdening. The second defense is especially true if we accept that people do not always want to bear the burden of responsibility in situations where they may not feel completely confident. In this regard, defending autonomy at all costs might be undesirable from the citizens' point of view (Quong, 2011). Regret-nudging, however, could promote the autonomy of the decision-maker and be an appropriate way for the government to show concern.

Anticipated regret-nudging in the domain of health promotion could secure people's autonomy in two ways. In the first place, they can help people be healthy, which is considered a precondition to autonomy itself. Health is paramount to the rational decision process. Health is difficult to define concretely. However, health nudges could be said to promote specific aspects of health. Health nudges can, acting on the automatic system, help the decision-maker accomplish deliberated goals that were hampered by certain biases (Skipper, 2012). For example, a smoker might understand the risk of smoking and intentionally decide to stop smoking, but he may fall into the trap of autonomous mechanisms that prevent him from quitting. In this case, a nudge could short-circuit such a prolonged decision and make the smoker finally quit his habit (Barton, 2013). The health nudge would just stimulate the decision-maker in a direction that he had already deliberated on. Furthermore, people do not always want to bear the burden of responsibility for their actions, and they might prefer to be nudged in a direction by someone who has more authority in that field. In uncertain and difficult circumstances, the decision-maker may prefer to follow her heuristics instead of assessing all the possible alternatives (Schwarz, 2004). Making a decision has its costs, whether they be related to its temporal, monetary, or emotional dimension, and thus the decision-maker may prefer to transfer these costs to a person they may believe to be equally or more competent. It is not by chance that vaccine decisions tend to be heavily influenced by the decisions of the social network surrounding the undecided (Rao, Mobius & Rosenblat, 2007). In this sense, vaccine-hesitant might export their decision to people they tend to trust. Thaler and Sunstein (2008) have argued that people prefer to be nudged when they are overwhelmed by information or when they might be uncertain about the future outcome, and there is no potential feedback mechanism. In conclusion, paternalism may not hinder autonomous decision-making when people prefer to be nudged in a situation of uncertainty where people do not want to bear the whole responsibility or given their incapacity to stick to their plans.

A second defense could see health promotion nudges as a form of counter-manipulation. People are generally influenced towards unhealthy behaviors by large corporations (tobacco, alcohol, or junk food) (Holland, 2007; Marmot, 2015). To contrast these influences, it could be valuable to think of counter manipulative strategies to make people behave healthier. As we have seen, manipulation is considered a wrongful act since it impacts our capacity to decisions valuable to ourselves; it impacts the agency component of autonomy. However, counter-manipulation may not be so autonomy-infringing (Wilkinson, 2017). Counter-manipulation may simply expose another side of the story to the already influenced decision-maker; thus, it may not impact their actual agency. As a result of counter-manipulation, the decision-maker may ponder more about her habits and deliberate on her actions. As explained concisely by Holland (2007):

"Health promotion is counter-manipulation, as opposed to manipulation proper; it is one of the myriad forces motivating our health behaviors, but one intended to counteract those forces that motivate unhealthy choices". (Holland, 2007, p. 128)

From this analysis, it results that competition may put people on their guard. It is harder to manipulate the wary. Even if we do not accept that vaccine-hesitant might have been manipulated in the first place, and they might be simply irrational or not very good at estimating probabilities, the concept of counter-manipulation might work as an instrument against their skewed probabilities. Decision-makers tend to underestimate the probability that certain bad things will happen to them and overestimate the probability that things will be all right (optimism bias) (Wolff, 2021) and thus fall prey to reasoning failures. In this sense, they may lack the capacity to assess risks based on probabilities, or they may lack imagination or foresight given that they never experienced such a situation, and they might tend to stick with fake news, which tends to be more concrete in their reporting and emotionally appealing. Regret-nudging, thus, could provoke the imagination and comparison of alternative consequences. Similarly to the argument of Diamond (1982), the point here is that regret-nudging could excite in us appropriate emotions that drive certain attitudes, which persuasive strategies relying on facts might not be able to do. Thus, regret-nudging could invite critical reflection since "thinking well involves thinking charged with appropriate feeling" (Diamond, 1982, p. 31). As we have seen at the beginning of the chapter, regret thinking is associated with contractual thinking, where realities that have not yet happened are assessed and judged upon their potential regretful impact. In this way, the anticipation of regret stimulates the imagination of unencountered realities and induces an emotional learning

process, and drives behavioral changes (Zeelenberg et al., 2008). People prefer to choose outcomes that minimize their potential regret (Coricelli, Dolan & Sirigu, 2007). In this regard, regret may not be simply a negative emotion but an indication that drives the agent to minimize potentially disrupting outcomes.

Up to now, I have argued that not all nudges should be considered equally in terms of inhibiting people's autonomy. More specifically, anticipated regret-nudging used in vaccination campaigns could be seen as a specific nudge that contributes to people's autonomy in the health domain. Regret-nudging does not seem manipulative or coercive and thus does not impact autonomy as agency and freedom of choice. On the other hand, I have posed the question that regret-nudging could hinder autonomy as self-constitution in view of its emotional paternalism character. As a counterargument to this attack, I have argued that anticipated regret-nudging could act either as a short-circuiting health promotion mechanism that alleviates the worries and responsibility of people making the decision to get vaccinated or as a counter-manipulation strategy for health authorities to level the information playing field. Regret-nudging, by evidencing the future regret participants might have from their choice, could represent a counterbalance to their initial thoughts and thus make them consider the full spectrum of choice. In this sense, this nudge could increase an individual's self-constitution through the role of emotions. Autonomy, however, may not be the most important value to preserve, especially when the government is faced with a global pandemic and the necessity to achieve herd immunity to allow the restoration of normal activities. In this case, attacking regret-nudging based on its paternalizing aspects might miss its validity. Even if we accept that regret-based nudges are morally permissible because they avoid harm to oneself or others and bring collective benefits, one may still wonder whether they could undermine trust in institutions. During a pandemic, it might be more important that the government does not lose credibility in such a delicate situation.

4. Comparing Autonomy and Institutional Trust in Pandemic Circumstances

Under crisis circumstances, wrongful paternalism might not be the main problem. The intention to motivate protective behaviors could stem from the need to protect others. Ethical questions about manipulative health promotion are not entirely questions about paternalism. In a pandemic, the necessity to achieve herd immunity could prevail over autonomy concerns for the sake of saving lives and re-establish a "normal" condition that in the first place had restricted the autonomy of the citizens. Bauch and Earn (2004), through a game-theoretical

model, demonstrated that when people believe that herd immunity is going to be reached, they focus more on the risks associated with the vaccine, and thus vaccine intentions decline. The authors conclude on a drastic note claiming that voluntary vaccination may not eradicate infectious diseases. From this, it derives that state intervention may be necessary to enable a return to normal conditions. Societal challenges, such as a pandemic, cannot be solved through an individualistic lens. If analyzed in this way, then we may miss other pertinent considerations. Regulation and policymaking are not just about individual decision-making, and the aim of government is not always about securing the welfare or liberty of the individual citizen. As such, government policies cannot be evaluated legitimately solely from the individual point of view. Attention must be drawn to factors beyond the individualistic lens of nudging and libertarian paternalism to instead think about the legitimacy of the state employing different forms of choice architecture (Yeung, 2016). The advantage of nudging thus may lay in the promotion of well-being by addressing individual reasoning failures, compromising autonomy to a lesser degree than other types of strategies. However, it is not enough to favor such strategies because they are the least restrictive in terms of liberty and autonomy. We also need to take questions of evidence and effectiveness regarding nudge compared to other potential approaches seriously.

Granted, under certain conditions, the legitimacy of nudging interventions as those interventions that are considered least infringing on people's autonomy to achieve a certain outcome, it is now appropriate to ask whether the application of this approach can be considered acceptable. The problem of acceptability is necessarily linked to the political-cultural context in which these measures are applied. The level of institutional trust dictates the acceptability of a policy. As we have seen in chapter two, institutional trust is paramount to the way the community follows a certain policy. When institutional trust is high, then non-restrictive measures, such as recommendations or nudges, may be enough to achieve a certain social outcome; on the other hand, when institutional trust is low, then governments may need more restrictive and coercive policies to get the same results (Einfeld, 2019; Hartley & Jarvis, 2020). Institutional trust, however, is not a constant. It is a factor that should always be kept under control by the government when implementing a certain policy. Governments should make sure that the implemented policy does not affect institutional trust but rather supports it.

In case of a regret-nudge that leverages upon emotional (counter)manipulation to induce people to get vaccinated, individuals could feel deceived and lose trust in health promoters

and institutions in general, impacting, in the short run, the vaccination campaign and, in the long run, the delicate system of social capital. Often when we experience someone's influence upon our decision-making, we do not notice it immediately but become aware of its influence later. Here are a few remarks about the factors that might affect how much trust could be lost that must be considered. First, the trust involved need not be only between the nudgee and target. Third parties may observe the manipulation and trust the health promoters less. Secondly, how much trust would be lost would depend in part on how much trust already exists. A highly trustworthy institution or person should probably be especially careful to avoid the temptation of 'reputation mining' (Akerlof & Shiller, 2015). The highly trustworthy have more to lose ethically and prudentially than the less trustworthy. Thirdly, the extent of a loss of trust may depend on the means used to nudge. One could certainly see how a deliberate lie could both be discovered and cause great damage to a relationship. Feelings of deception could impact much more trust in authorities than the withholding of information. Thus, governments, experts, and the scientific community might lose their trust if they are perceived to provide deceitful information. For instance, in a study about the impact of deception in psychological research Boynton, Portnoy and Johnson (2013) have shown that benign forms of deception, like false feedback or hiding the hypothesis of a study, do not generate much psychological harm, whilst unprofessional behavior from the experiment leads to serious reduction of trust in scientific research. Thus, the degree to which trust is impacted depends on the way people perceive the authority's behavior. This may well translate to health promotion strategies. People may more likely come to accept a counter-manipulative strategy than a deceitful message.

Furthermore, for a paternalistic act to be justified, we should look at the nature of the relationship between the parties (Quigley, 2018). In this regard, roles matter. For instance, it might be more difficult to process manipulation by public institutions than by private ones (White, 2013). This may be due to the advisability character of paternalism (Clarke, 2013). The justification of paternalism can be granted because it aims to promote the interests of the paternalized, but people might believe that their interests are promoted less by an authoritarian government than by a private and accountable company. This, in turn, could lead to beliefs of false paternalism where the paternalistic act does not actually aim to benefit the paternalized. If people distrust the source of paternalism, then they might as well judge the paternalistic act, notwithstanding its genuine character, as a form of false paternalism (Quigley, 2018). Another argument may derive from power indifferences. A government could be less justified to act paternalistically than a private company in view of its power. A

possible reply to this argument would be that government officials are held accountable in democratic forms of power. The same is not true for firms. However, citizens' growing distrust in the res publica might as well transfer into disbelief that public officials and experts are acting for the good of the community (Wall, 2018). Roles are also important in the healthcare domain (Blumenthal-Barby, 2012). Patients might feel more trustworthy towards doctors than pharmaceutical companies, which they may see as profiting from the commercialization of vaccines, for instance.

A pre-analysis of the impact that a regret-nudge might have on institutional trust is inevitably impossible. However, a regret-nudge could hold some conditions to ensure the message's credibility, such as reporting truthful information and being as clear as possible. The ultimate goal of this research is to assess empirically the impact that a regret-nudge has on institutional trust and vaccine campaign trust specifically. At the same time, the goal of this chapter was to demonstrate that autonomy might not be the only factor upon basing an ethical assessment of nudging under crisis circumstances. It might be that the impact the regret-nudge has on institutional trust represents a more important factor for the permissibility of this policy in the long run.

5. Conclusions

In some particular cases, state interventions are almost necessary to enable a return to normal conditions. Amongst the possible interventions a state could adopt to promote the vaccine campaign, there are nudges. Despite being classified as low according to their degree of restrictiveness of individual autonomy in the "intervention ladder" of the Nuffield Council on Bioethics, nudges still present some controversies when it comes to wrongful paternalism. Paternalism threatens one's capacity to judge or to act and disrespects one's decisional authority in a specific domain. In this chapter, I took the particular case of regret-nudges which not only might be scrutinized under the lenses of paternalism but also of emotional paternalism. When applied to vaccine promotion, I conclude that this nudge may well promote rather than infringe autonomy and thus do not present an instance of wrongful paternalism. However, accurate moral analysis of this intervention cannot be based solely on the single aspect of wrongful paternalism. In this chapter, I conclude that the moral permissibility of a nudge regarding vaccine promotion should be based on the government's capacity to detain a certain degree of institutional trust. In the following chapter, I will adopt

this conclusion to the research design and present the way the nudge impacted the trust in government institutions.

Chapter 4. Hypothesis Development, Methods and Results

1.1. Hypothesis Formation

Herd immunity is a public good that must be achieved through collective actions. However, collective actions are difficult to realize, given the free-riding problem that they pose (De Graaf & Wiertz, 2019). *Vaccine hesitancy* represents a free-riding behavior that gives rise to the collective action problem, potentially compromising herd immunity at the macro-level (see chapter 1). Vaccine hesitancy, at the micro-level, may derive from a pondered rational decision or may be due to reasoning mistakes shaped by erroneous information that enlarge the risk associated with vaccines' side effects (see chapter 2). The macro-micro-macro model helped explain how these concerns might arise in the population during a pandemic. In particular, with its fast pace and politicized debates, a pandemic might lead to a loss of institutional trust, increasing the chance of vaccine delay. As we have seen in chapter 2, institutional and medical trust shape individuals' perceived vaccine safety. To contrast this collective action problem, governments could adopt different policies (see chapter 1). In this regard, this thesis aims to discuss an effective and morally permissible strategy to solve vaccine hesitancy during the Covid-19 pandemic that sustains institutional trust. One tool that governments could use to contrast negative discourses about vaccines and thus re-direct the vaccination preferences among the population is regret-nudging (see chapter 3).

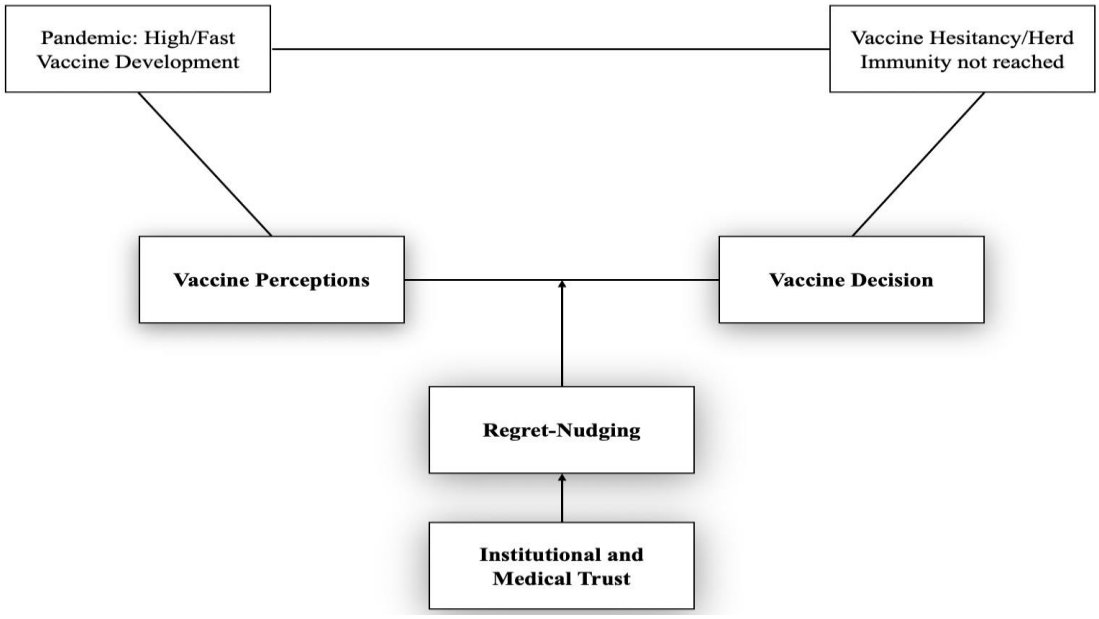

Figure 4. Adding the policy of regret-nudging to the macro-micro-macro model. Highlighted the micro dimensions that will be assessed in this study.

Emphasizing the consequences of inaction may stimulate anticipated regret that will stir certain health behaviors. Golden and colleagues (2014) have successfully used anticipated regret messages to increase HPV vaccine intentions. This thesis intends to expand on this topic by looking at the case of young adults and pandemic circumstances. However, anticipated inaction regret does not always prompt strong health behavior intentions: in fact, inaction regret is weaker for behaviors that are less severe and that have long-term resolutions (Penţa et al., 2020). The avoidance of self-blame remains a central component in the management of this emotion. Justifiable decisions, which might be those that relate to less severe risks or distal outcomes, induced less anticipated regret (Zeelenberg & Pieters, 2007). Following this reasoning, it is imaginable that younger generations, affected the least by severe acute respiratory problems from Covid-19, could not feel the necessity to get vaccinated and do not blame themselves if they do get infected. Thus, a regret-based nudging must touch upon the potential future self-blame youngster might have from not vaccinating.

As seen in the first chapter, vaccine-hesitant tend to lack altruistic motivation; thus, emphasizing the personal loss of avoiding the vaccination against Covid-19 might lead to higher intentions to get vaccinated than stating facts related to achieving herd-immunity. However, the strategy to lever on the individualistic drives of anticipated regret might not be completely effective in the case of younger generations since they still might feel little risk in not getting vaccinated and exposing themselves to the virus. In this case, nudging youngsters with the additional use of other motives might increase more vaccination intentions in this population. Emphasizing the anticipated regret of the consequences of vaccine inaction that focus on the possibility of infecting a beloved one might lead to higher vaccination intention among the younger generations. Furthermore, it is expected that this emphasis on weak altruistic motives will produce the desired effects, particularly on those who have older caretakers or presenting health problems. If a youngster has a caretaker at risk of developing serious symptoms upon Covid-19 infection, the potential self-blame stemming from vaccination inaction might be more difficult to justify. This research, thus, aims to expand the literature of anticipated regret framing with the inclusion of weak altruistic motives and to study the effect of anticipated regret on younger generations, which present high percentages of vaccine hesitancy in the Netherlands (Neumann-Böhme et al., 2020; "Vaccinatie|RIVM", 2021; Vollmann & Salewski, 2021). Thus, the following two hypotheses:

H1. Anticipated regret framing will increase individuals' vaccine intentions compared to neutral framing.

H2. Caretakers' conditions will moderate the relationship between regret framing and vaccine intentions. Anticipated regret framing will lead to higher vaccine intentions among students with caretakers in the risk group than among students with younger and healthier caretakers.

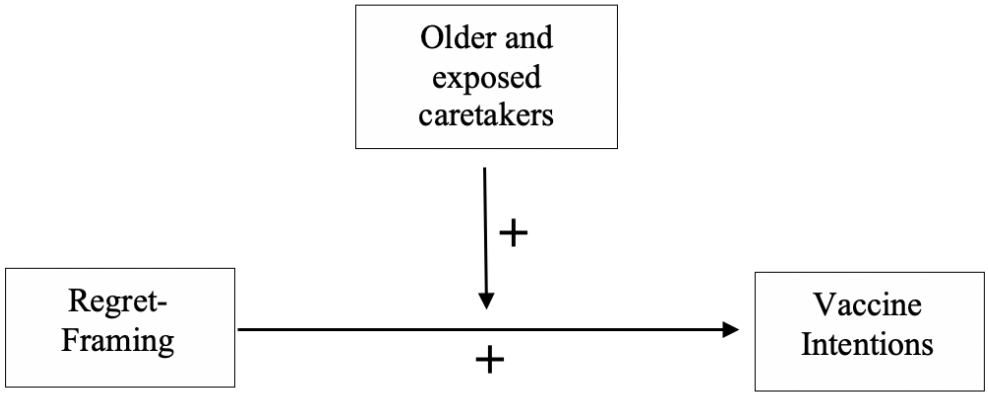

Figure 5. Research model for hypotheses 1 and 2.

Vaccination strategies, however, only work if people trust the source of information. Vaccine information is considered reliable if the messenger of the vaccine campaign is regarded as trustworthy. Thus, vaccine uptake depends heavily on the trust in the system that produces and delivers them. To adhere to health requirements, individuals must be receptive to the message sent by the authorities. As we have seen in chapter 2, the credibility of the vaccine message is shaped by institutional and medical trust. As postulated by the Trust and Confidence Model, trust influences how individuals judge risks and benefits, thus affecting the way people accept a protective measure (Siegrist, Earle & Gutscher, 2003). The higher the level of trust in institutions, the more likely the measures are to be accepted by the public (Verger & Dubé, 2020). Institutional trust represents the overall trust in the government bodies (McAndrew, 2020). Van Bavel and colleagues (2020) showed that higher institutional trust led to higher compliance to recommended measures such as respecting quarantines, distance, and testing in the Covid-19 pandemic. However, this thesis aims to differentiate a specific aspect of institutional trust that might be more relevant for the topic of vaccine hesitancy, medical trust. Medical trust refers to the trust in the medical system, the health care providers, and the government as a guarantor of public health (Bogart et al., 2021). Medical trust is indispensable for individuals to feel that their interests will be protected. As argued by Hetherington (2005), trust is especially important when people are asked to make a

material sacrifice. In this case, young adults might feel that they are taking the vaccine only for the overall community and might consider it a material sacrifice that could put their lives at risk. In this regard, individuals' intention to get vaccinated derives from the trust in medical institutions, which in turn is related to the way the government has been performing (Justwan et al., 2019). Thus, trust in public institutions is likely to moderate the relationship between government vaccination campaigns and individuals' intention to get vaccinated. It will be easier to promote vaccine uptake among individuals who trust in the government's ability to deal with the pandemic outbreak than those lacking such trust.

H3. Institutional and medical trust will moderate the relationship between anticipated regret framing and intention to vaccinate. People with higher medical and institutional trust will have higher considerations in the framing and thus higher intention to get vaccinated.

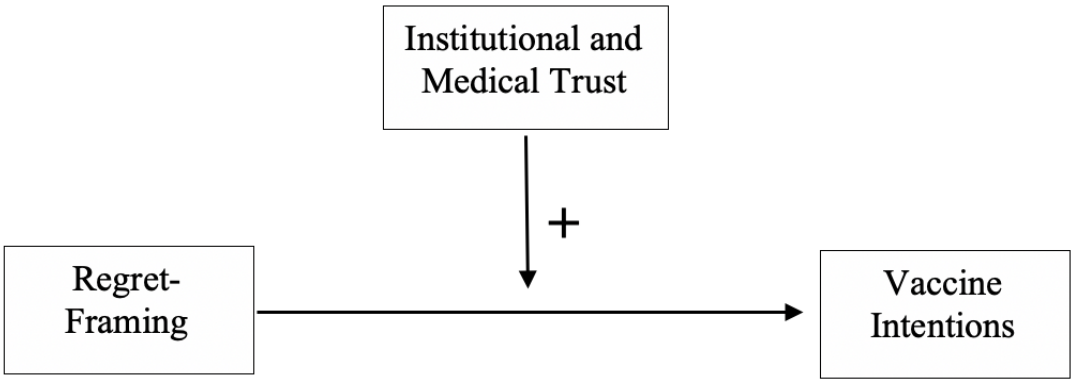

Figure 6. Research model for hypothesis 3.

Research about institutional trust during the coronavirus has taken primarily two directions (Devine et al., 2020). In the first instance, trust is related to the effect it has on a certain intervention; this relates to the previous hypothesis. On the other hand, trust is studied as a dependent variable. In this case, the effect of certain government performance or policies is studied in reference to its impact on public trust. The next hypotheses will look at this second aspect.

The peculiar aspect of trust is that it cannot be coerced and that it must always be maintained (Gilson et al., 2003). Trust requires continuous monitoring and maintenance. It is conceivable that individuals who learn that a certain vaccination campaign is using a nudge to stir them

toward vaccination might feel that the government has not been transparent and tried to manipulate them. These could affect the way citizens trust the government but more concretely it could directly affect the way individuals trust the vaccine campaign. Will individuals' trust in government vaccination campaign decrease in this circumstance? This research will examine how a regret-nudge for increasing vaccination coverage ultimately affects individuals' trust in the government vaccine campaign. It is conceivable that if people consider the nudge morally acceptable and legitimate, they will maintain their level of trust in the vaccine campaign. Legitimacy considerations, in fact, are linked to policy acceptability (Hagman, 2018). In other words, considerations of moral acceptability and legitimacy of the regret-nudge will explain how regret-nudging affects trust in the vaccine campaign. If the nudge is not deemed acceptable it will be likely that individuals lose trust in the vaccine campaign, while if the regret-nudge is considered morally permissible and legitimate participants will retain their initial level of trust in the vaccine campaign. Thus, the following hypotheses:

H4. Anticipated regret framing will not significantly impact trust in the government vaccine campaign.

H5. Acceptance of regret-nudging, considering both moral considerations and legitimacy concerns, explains the effect of regret-nudging on vaccine campaign trust.

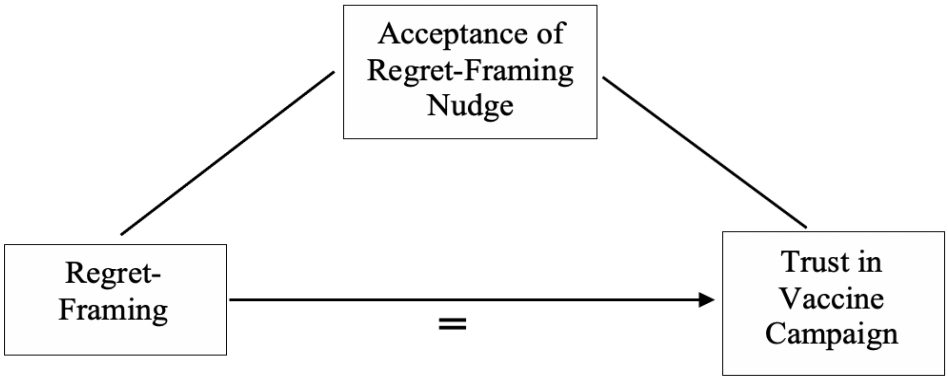

Figure 7. Research model for hypotheses 4 and 5.

2. Methods

2.1. Procedure and Participants

The study aimed to recruit at least 150 participants using the SONA recruitment system, a subject's pool offered by the University of Twente, and availability sampling. The necessary sample size was calculated by using the statistical power software G*Power (Faul et al., 2007). Participants eligible for the study must have residency in the Netherlands, be eligible for getting a Covid-19 in the Netherlands, be aged between 18 and 30, and have not already received the Covid-19 vaccine. The ethics committee of the BMS faculty of the University of Twente approved the study (approval number 210844). The study was conducted from the 14th of June until the 22nd of June 2021; just previous to the opening of the vaccine scheme to the class of 1990. 181 participants responded to the questionnaire. 10 participants mentioned they preferred not to say anything about the age and health conditions of the caretakers. Since this aspect is paramount to the research proposal, their answer was discarded. The final sample size compromised 171 participants (M_{age} = 23.50, SD_{age} = 2.74; 101 females, 1 non-binary). The research was carried out in the form of a survey via the platform Qualtrics.com.

2.2. Design

This study has a 2x2 between-subject design. The dependent variables are (1) the intention to get a Covid-19 shot and (2) the trust in the vaccine campaign; the independent variables are (1) the risk exposure of the caretakers and (2) the regret induction (table 1). The exposure of the caretakers to the risks of Covid-19 was assessed based on age and the presence of health issues. Caretakers older than 60 and presenting comorbidities such as cardiovascular disease, diabetes, respiratory disease, obesity, a history of hematological malignancy or recent other cancer, kidney, liver and neurological diseases, and autoimmune conditions were considered in the high-risk category following previous experimental evidence (Hussain et al., 2020; Williamson et al., 2020).

Table 1

Schematic representation of the research design

	Condition 2 (*Risk Exposure Caretakers*)	
Condition 1 (*Framing*)	High Risk (HR)	Low Risk (LR)
Control (C)	C & HR (N= 41)	C & LR (N= 44)
Regret (R)	R & HR (N= 40)	D & LR (N= 46)

2.3. Measures

Participants were firstly presented with a consent form that informed them about the nature of the study and asserted their willingness to participate. The consent form introduces the study as related to the understanding of vaccine decision-making processes. No mention of regret manipulation is made. After they consented to the form, the actual experiment started. Initially, some demographic and Covid-19-related questions and questions related to the caretakers were asked. Participants were asked whether they had already been tested positive to Covid-19 in the past 6 months. According to the WHO, patients who had been infected with the SARS-CoV-2 developed natural antibodies that last up to 6 months (WHO, 2021).

Independent Variables

Concerning the independent variable, risk exposure of the caretakers, participants were asked if 1) the caretakers are older than 60 years old and if they presented health issues and 2) if they had already received the Covid-19 vaccine (No, not at all, Yes, they are partially vaccinated, Yes, they are fully vaccinated, Prefer not to say). The second independent variable, regret induction, was assessed with two different messages regarding the effectiveness of the Covid-19 in preventing the spread of the virus, depending on the condition being control or regret. Both messages were based on the U.S. Centers for Disease Control and Prevention (CDC) report on the effectiveness of the vaccine (Tenforde et al., 2021). The control condition message exposed the usefulness of the vaccine in a precise way without leaving on emotions. On the other hand, the regret framing exposed the balance of cost and benefits of taking the vaccine, privileging the latter by inducing a state of regret that could be derived from both resulting positive or infecting beloved ones if the vaccine had not been taken.

Control Condition:

Research shows that Covid-19 vaccination is effective in preventing the spread of the coronavirus and that the risk of harm from Covid-19 is much higher than the risk of the side effects from the vaccination. Covid-19 vaccines significantly reduce the risk for Covid-19 associated hospitalizations in older adults and lead to consistent reductions in post-Covid conditions and death.

Regret Condition:

Nobody wants to do something they may regret. Research shows that Covid-19 vaccination is effective in preventing the spread of the coronavirus and that the risk of harm from Covid-19 is much higher than the risk of the side effects from the vaccination. Covid-19 vaccines significantly reduce the risk for Covid-19 associated hospitalizations in older adults and lead to consistent reductions in post-Covid conditions and death. Imagine you yourself got Covid-19 and/or one of your relatives got Covid-19 after meeting you: wouldn't you regret not having been vaccinated?

Manipulation Check

As a manipulation check to verify whether the regret message induced higher feelings of regret than the control framing, participants were asked to state whether they would feel regret in case they did not get vaccinated and one of their family members tested positive for Covid-19, and they tested positive for Covid-19. Both answers were assessed on a 5-point Likert scale ranging from 1) definitely yes to 5) definitely not.

Dependent Variables

After reading the vaccine message, participants were then asked to state whether they intended to take the vaccine when it was their turn. Intention to get vaccinated was assessed with a 100-point bipolar slider item: (1 = definitely not, to 100 = definitely yes).

Questions related to the trust in the vaccine campaign comprised the second dependent variable (Appendix C). As we have seen in chapter 2, trust is a complex and multidimensional concept and here the aim was to assess the specific effect of the regret-nudge on vaccine campaign trust rather than institutional or medical trust overall. In fact, it seems unlikely that a nudge could change the way people perceive the government and its response to the pandemic. The eight questions regarding vaccine campaign trust were

developed departing from Quinn and colleagues (2013) and assessed the trust in the vaccine campaign focusing on honesty, commitment, openness, goodwill, and competence of the government in developing the Covid-19 vaccine campaign. The 8 items were averaged into a single scale referred to as *vaccine campaign acceptability*. Cronbach's alpha for the 8-item vaccine campaign acceptability scale is 0.89.

Moderators: Institutional and Medical Trust

The moderating factors were institutional trust and satisfaction with how the government dealt with the pandemic, i.e., medical trust (Appendix A). Here, these two aspects of public trust were used as moderating factors for the way individuals accepted the nudge and acted upon it. Questions related to Institutional trust were adopted from Oksanen and colleagues (2020) on a 5-point Likert scale with answers ranging from 1) do not trust at all and 5) trust completely. Furthermore, two items were included to account for the trust in the health-system (trust in the health care system and trust in the health care providers), adopted from Bogart and colleagues (2021). The 6 items were averaged into a single scale referred to as *institutional trust.* Cronbach's alpha for the 6-item institutional trust scale is 0.858. Questions relating to trust in the way the government has dealt with the pandemic were adopted from Quinn and colleagues (2009) and Han and colleagues (2021). The 9 questions developed from the literature assessed the complexity of the dimension of trust, focusing on openness, honesty, commitment, caring and concern, and competence of the government in addressing the Covid-19 pandemic. The questions were adopted particularly from Quinn and colleagues (2009), given the high internal consistency (Cronbach's alpha = 0.91). The 9 items were averaged into a single scale referred to as *covid-medical trust*. Cronbach's alpha for the 9-item medical trust scale is 0.90.

Mediators: Family Visits and Message Acceptance

Participants were asked how often they visited the caretakers (I live with my parents/caretakers; I visit my parents/caretakers once a week; I visit my parents/caretakers once a month; I visit my parents/caretakers less than once a month). The answers to this question would serve as a controlling factor in the relation between having parents in the risk group and vaccine intentions. Vaccine intentions might be reduced if the individual does not visit the caretakers often and when the caretakers have already undergone full vaccination. In

this regard, the moderating effect of having caretakers in the risk group will be controlled with regards to how often they are visited and whether they have already received the vaccine.

At the end of the survey, participants were asked to indicate how much they agreed/disagreed with some statements referring to the acceptability of the vaccine message (Appendix B). This question, evaluated on a 5-point Likert scale, assessed whether the participants found the message clear, patronizing, morally acceptable, and legitimate. In particular, the word choice patronizing was preferred to paternalistic since it was deemed more morally neutral and less difficult to understand. The 6 items were averaged into a single scale referred to as *message acceptance*. Cronbach's alpha for the 6-item message acceptability scale is 0.65. Here, the Cronbach's alpha, despite being still high for a 6-item scale, was negatively affected by the question relating to the message being patronizing which had a lower correlation with the other items. Consequently, participants were asked to state by which institution they preferred to receive the control/regret message.

3. Results

3.1. Descriptive Statistics

Firstly, descriptive statistics for each condition were run. The High-Risk X Control condition included 41 participants, 23 females, 17 males and 1 non-binary/third gender (M_{age} = 23.959, SD_{age} = 2.76). The High-Risk X Regret condition presented 40 participants, 23 females, 16 males, and one participant who preferred not to say (M_{age} = 24.25, SD_{age} = 2.50). The Low-Risk X Control condition compromised 44 participants, 18 females and 26 males (M_{age} = 23.79, SD_{age} = 2.99). Finally, the Low Risk X Regret condition presented 46 participants, 29 female participants and 17 males (M_{age} = 22.60, SD_{age} = 2.42). The samples in each condition presented clear similarities.

Furthermore, 98 participants (57,3%) had caretakers partially vaccinated, having taken just one of the two doses of the vaccine, whilst 51 respondents (29,8%) answered that their caretakers were fully vaccinated.

3.2. Manipulation Check

To ensure that the experimental priming was successful, an independent t-test with participant's regret (individual and family) disposure as the dependent variable and priming

condition as the independent variable was conducted. An independent-samples t-test of individual regret of the participants in the control condition M = 2.41, SD = 1.302 did not present a significant difference from the individual regret of participants in the regret condition M = 2.45, SD = 1. 390, $t(171)$ = -1.65, p = 0.09 (Figure 8). Seemingly, an independent-samples t-test of family regret of the participants in the control condition M = 1.95, SD = 1.208 did not present a significant difference from the family regret of participants in the regret condition (M = 2.27, SD = 1.412), $t(171)$ = -0.18, p = 0.85 (Figure 8).

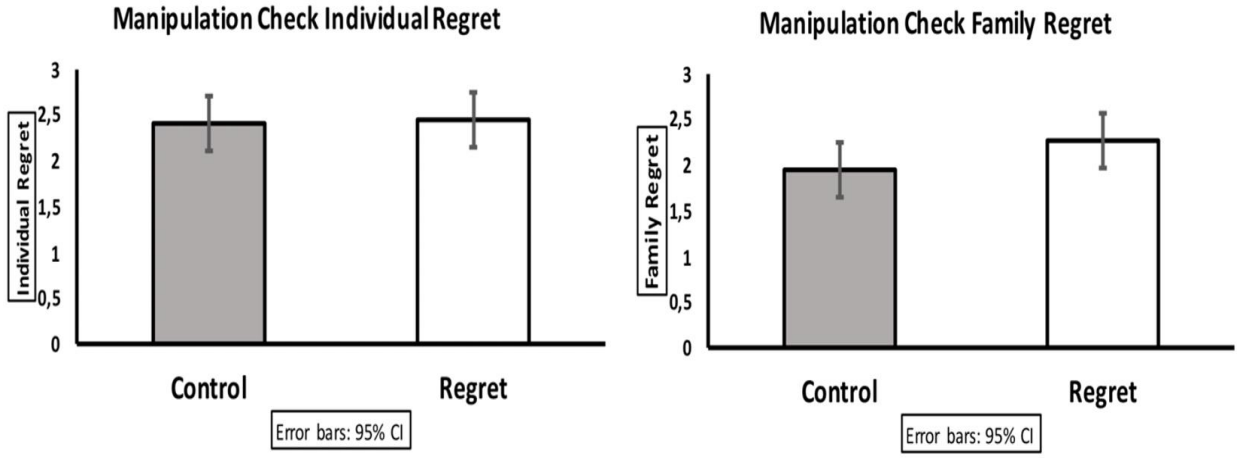

Figure 8. Bar charts of the mean individual regret (left) and of the family regret (right) comparing the control and regret condition. Error bars indicate 95% CI.

3.3. Hypothesis 1: Anticipated Regret Framing

A test of normality was conducted to assess the distribution of the ordinal variables. Institutional trust, medical trust, message acceptability, and vaccine campaign trust are not normally distributed.

Pearson's correlations were conducted for vaccine intentions, age, gender, previous infection, risk category of the caretakers, periodicity of visiting the caretakers, framing condition, institutional trust, medical trust, message acceptability, and vaccine campaign acceptability. Pearson's correlations can be found in Table 2. There were significant correlations between vaccine intentions and the other variables. Caretakers' risk exposure, institutional trust, medical trust, message acceptability, and vaccine campaign trust correlated positively with vaccine intentions.

Table 2

Pearson's Correlations for Vaccine Intentions, Age, Gender, Previous Infection, Caretakers' Risk, Framing Condition, Institutional Trust, Medical Trust, Message Acceptability, and Vaccine Campaign Trust. N=171.

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Vaccine Intentions	-										
2. Age	-.35	-									
3. Gender	-.110	-.150*	-								
4. Previous Infection	0.22	-.14	-.75	-							
5. Caretakers' Risk	.297**	.095	-.032	.157*	-						
6. Visits	-.073	.137	.018	.026	-.132	-					
7. Framing Condition	-.001	.009	-.123	.207**	.218**	.133	-				
8. Institutional Trust	.291*	.107	-.092	-.090	-.093	.139	.207*	-			
9. Medical Trust	.356**	.113	-.109	-.079	.128	.116	.130	.660**	-		
10. Message Acceptability	.324**	-.086	-.243**	.088	-.048	.069	.218**	.238**	.365**	-	
11. Vaccine Campaign Trust	.486**	.039	.230**	.021	.130	-.007	.161**	.500**	.586**	.515**	-

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

A stepwise multiple regression analysis was used to test if the caretaker's vaccine status, institutional trust, medical trust, message acceptability, and vaccine campaign trust predicted participants' vaccine intentions. The results of the regression indicated that vaccine campaign trust and caretakers' vaccine status predictors explained 54.4% of the variance (R^2 =. 29, F

(2,177) = 37.2, $p < .01$). It was found that vaccine campaign trust predicted vaccine intentions ($\beta = .46$, $p < .001$), as did caretakers' vaccine status ($\beta = .24$, $p < .01$).

A preliminary independent-samples t-test was conducted to compare vaccine intentions scores for the control condition and the regret condition. There was no significant difference in scores for control ($M = 80.05$, $SD = 27.79$) and regret condition ($M = 82.65$, $SD = 26.46$; $t(169) = -.63$, $p = .53$, two-tailed). Pointing to the direction that the first hypothesis would not be verified.

A one-way between-groups analysis of covariance was conducted to compare the effectiveness of two different interventions designed to induce vaccine intentions. The independent variable was the type of intervention (control, regret), and the dependent variable consisted of vaccine intentions. Caretakers 'vaccine status and vaccine campaign trust were used as the covariate in this analysis. Assumptions of normality, linearity, and homogeneity of variances were checked. After adjusting for caretakers vaccine status and vaccine campaign trust, there was no significant difference between the two intervention groups on vaccine intentions, (F (1, 167) = .91, $p = .34$, partial eta squared = .005). There was a strong relationship between vaccine intentions and vaccine campaign trust, as indicated by a partial eta squared value of .24, and a discrete relationship between vaccine intentions and caretakers' vaccine status, partial eta squared = .08. In conclusion, the analysis yields no significant difference between the control and the regret condition on vaccine intentions. Thus, the first hypothesis is not verified.

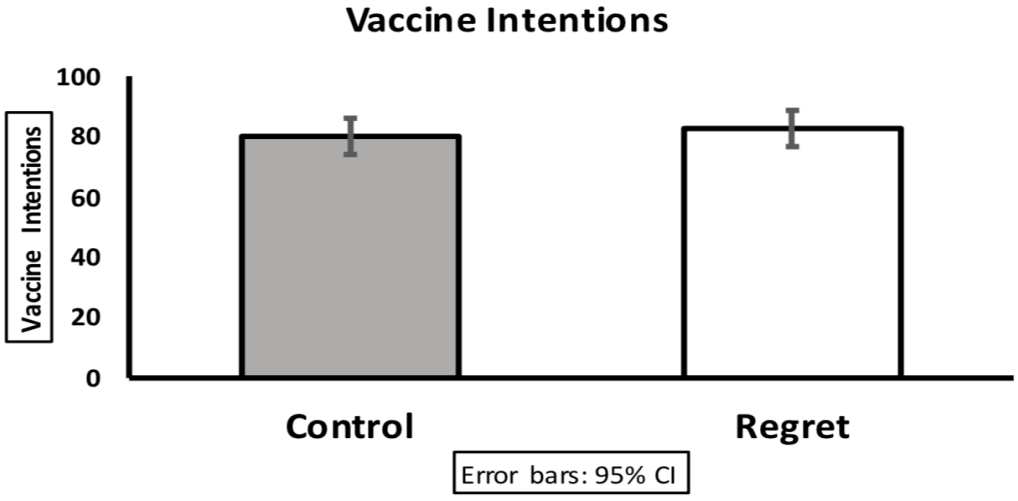

Figure 9. Bar chart of the mean vaccine intentions comparing the control and regret condition. Error bars indicate 95% CI.

3.4. Hypothesis 2: The Moderating Role of Health

A 2 by 2 between-groups analysis of covariance was conducted to assess the moderating effect of caretakers' risk status. The independent variables were the type of framing (control, regret) and the caretakers' age and health condition. The dependent variable was vaccine intentions. Assumptions of normality, linearity, and homogeneity of variances were checked. After adjusting for caretakers' vaccine status and vaccine campaign trust, the interaction effect of framing and caretakers' risk status was not significant, F (1, 164) = 1.62, p = .21, partial eta squared = .010. Neither of the main effects were statistically significant, framing: F (1, 164) = .77, p = .38; caretakers' health status: F (1, 164) = 6.93, p = .009. These results suggest that age and health status of the caretakers' participants does not affect vaccine intentions of youngsters. Thus, hypothesis two is not verified. On the other hand, there seems to be an opposite effect. There is a marginal difference in the regret condition between those having caretakers in the risk group and those having healthy caretakers. Those who have healthier caretakers (M = 86.49, SD = 3.39) seem to want the vaccine more than those who have caretakers in the risk condition (M = 73.08, SD = 3.48). When analyzing the moderating effect of health and age of the caretakers on the vaccine decision of the youngsters, the number of visits of the students was taken as a controlling factor. When looking in depth at this control factor, we see that 91 participants (53,2%) visited their caretakers maximum once a month, whilst 30 participants (17,5%) visited them at least once a week, and 50 (29,2%) lived with them.

3.5. Hypothesis 3: The Moderation of Institutional and Medical Trust

An analysis of covariance was conducted to assess the moderating effect of institutional trust and covid-medical trust on vaccine intentions. The independent variables were the type of framing (control, regret), institutional trust, and covid-medical trust. The dependent variable was vaccine intentions. Assumptions of normality, linearity, and homogeneity of variances were checked. After adjusting for caretakers' vaccine status and vaccine campaign trust, the interaction effect of framing, institutional trust, and covid-medical trust was *marginally* significant, F (1, 25) = 8.18, p = .008, partial eta squared = .24. Neither of the main effects were statistically significant, institutional trust: F (20, 26) = .78, p = .38; covid-medical trust: F (26, 26) = 1.33, p = .24. These results suggest that institutional trust and covid-medical trust together moderate the effect of the framing condition on vaccine

intentions. In this respect, there is a marginally significant effect of the moderation of institutional and medical trust on the relationship between anticipated regret framing and intention to vaccinate. Thus, hypothesis three is confirmed.

3.5. Hypothesis 4: Vaccine Campaign Trust

As shown by Pearson's correlations (Table 2), there were significant correlations between vaccine campaign acceptability and the other variables. Vaccine intentions, institutional trust, medical trust, and message acceptability correlated with vaccine campaign trust, while gender and framing correlated negatively with vaccine campaign trust.

A stepwise multiple regression analysis was used to test how well gender, framing, institutional trust, medical trust and message acceptability predicted participants' vaccine campaign trust. The results of the regression indicated that the predictors explained 71.6% of the variance (R^2 = .52, F(5,164) = 34.51, p <.01). It was found that medical trust predicted vaccine campaign trust (β = .25, p =.002), as did message acceptability (β = .26, p < .001) and vaccine intentions (β = .27, p < .001).

A preliminary independent-samples t-test was conducted to compare vaccine campaign trust scores for the control and regret conditions. There was no significant difference in vaccine campaign trust scores for control (M = 3.27, SD = .55) and regret condition (M = 3.46, SD = .40; t (168) = - 2.58, p = .011, two-tailed). This points to the direction that trust in the vaccine campaign is not impacted by the regret message. To further verify, an ANCOVA analysis is performed.

A one-way between-groups analysis of covariance was conducted to compare the actual difference of the two interventions designed to induce vaccine intentions on vaccine campaign trust when accounting for other factors. The independent variable was the type of intervention (control, regret), and the dependent variable consisted of vaccine campaign trust. Medical trust, message acceptability, and vaccine intentions were used as the covariate in this analysis. Assumptions of normality, linearity, and homogeneity of variances were checked. After adjusting for medical trust, vaccine intentions, and message acceptability, there was no significant difference between the two intervention groups on vaccine campaign trust, F (1, 165) = .88, p = .35, partial eta squared = .005. There was a strong relationship between vaccine campaign trust and medical trust, as indicated by a partial eta squared value of .16,

and a strong relationship between vaccine campaign trust and message acceptability, partial eta squared = .10. The analysis shows that trust in the vaccine campaign was not impacted by the regret-framed message. Thus, the fourth hypothesis is verified.

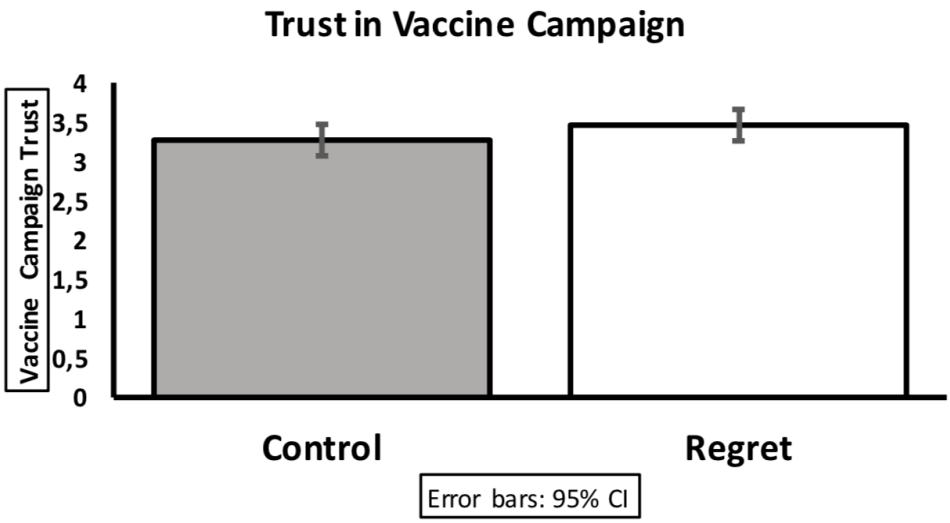

Figure 10. Bar chart of the mean vaccine campaign trust comparing the control and regret condition. Error bars indicate 95% CI.

3.6. Hypothesis 5: The Role of Message Acceptability

To assess the explicative role of message acceptability in the relations between framing condition and vaccine campaign trust, a PROCESS regression analysis by Hayes (2017) was used.

A test of mediation was conducted by applying the above-mentioned approach recommended by Hayes (2017). The test was performed with 1000 bootstrap resamples and a 95% CI; message acceptability was used as the mediator variable and vaccine campaign trust as the criterion. In the first step of the mediation model, the regression of framing condition on vaccine campaign trust was not significant, b = .11, *t(*166) = .11, *p* = .06. The second step was to show that the regression of framing condition on the mediator, message acceptance, was significant, b = .24, *t*(166) =. 24, *p* = .003. The third step of the mediation process was to show that the regression of the mediator (message acceptability), controlling for framing, on vaccine campaign trust was significant, b = .24, *t(*165) = .24, *p* = <.001. Step 4 of the analyses revealed that controlling for the mediator (message acceptability), framing condition was not a significant predictor of vaccine campaign trust, b =. 05, *t*(165) = .05 , *p* =.35. A

Sobel test was conducted and found full mediation in the model ($z = 2.54$, $p = .01$). It was found that message acceptability explained the relationship between framing condition and vaccine campaign trust. When the regret-message was deemed acceptable the trust in the vaccine campaign was not affected, whilst when the message was not considered acceptable participants showed lower trust in the vaccine campaign. Thus, the analysis supported the hypothesis that message acceptability explained the effect of the regret-nudge on the trust in the vaccine campaign, confirming the fifth hypothesis.

In the specific case of the moral acceptability of the message, which relates to the empirical answer of the permissibility of the regret- nudge, 132 participants (77,2%) answered that the message was morally acceptable, 125 participants (73,1%) considered the message legitimate. In comparison, only 67 participants (39,2%) did not consider the message patronizing.

Regarding the messenger by which the participants would have preferred to receive the control/regret message, 85 respondents chose the National Government whilst the second most preferred messenger was the RIVM with 80 responses and WHO being the third preference with 68 responses.

Chapter 5. Discussion and Conclusions

1.1. Discussion

Recent research has shown that a large percentage of Europeans are hesitant about the uptake of the Covid-19 vaccine, thus potentially undermining herd immunity (Lazarus et al., 2021). One tool that governments could use to contrast vaccine skepticism and thus re-direct vaccination preferences among the population is nudging. This research looked at anticipated regret-nudges to stimulate vaccine intentions among young adults aged between 18 and 30 years old. The current research, thus, induced regret through a vaccine message and looked at the effect the message had on vaccine intentions and trust in the vaccine campaign.

The insignificant difference between the control condition and the anticipated regret framing condition on vaccination intentions does not support the first hypothesis. Therefore, there is no confirmatory evidence that a vaccine message that stimulates anticipated regret drives higher vaccine intentions among young adults aged between 18 and 30. There could be two conceivable explanations for the non-significant difference between the control message and the anticipated regret message on vaccine intentions.

Firstly, the insignificant difference could depend on the fact that the message did not arise any anticipated regret in the first place. The manipulation check did not distinguish any significant difference between the control condition and the regret condition, neither in the individual regret nor in the family regret. It could be that the message was too bland and that it did not lead participants to think about their future regretful state in case they would not get vaccinated and get infected and infect their beloved ones, or that young people were confident that they would not get infected and spread the virus to their family. As for the first case, it is difficult to say why the regret message was not strong enough to arise anticipated regret among the participants. A possible explanation for this could be related to the format of the message: the regret message was presented as a question whilst the control condition as a statement. The question format might activate critical reasoning that could counteract the effect of the nudge. Future research needs to analyze whether different regret messages stimulate different reactions. However, it could well be that the message stimulated anticipated regret thinking but that the youngsters were confident enough not to get infected or spread the virus to their families. Vaccine intentions, as shown by Neumann-Böhme and colleagues (2020), are related to the risk perception associated with Covid-19 and the

perception of being infected. On the other hand, it could be that the participants in this research pondered the decision to get vaccinated upon the belief that they would infect their loved ones and deemed this probability low. As seen from the results, more than half of the participants (53,2%) visited their caretakers a maximum of once a month. This consideration might have led them to think that others could infect their beloved ones more than they could. This finding is in line with a recent Bachelor thesis that found no association between young adults' vaccine intentions and living with someone in the risk group (Esen, 2021). This could well be justified by the fact that most youngsters nowadays have caretakers that have already received at least one shot, leading young adults to be less concerned about infecting their beloved ones. This is in line with the free-riding condition outlined in the macro-micro-macro model, where the youngsters seeing that people around them are vaccinated may forego getting vaccinated.

The second explanation that there was a non-significant difference between the control message and the anticipated regret message on vaccine intentions could depend on the fact that the intentions to get vaccinated were already high in both conditions. Over 80% of participants in both the control and regret conditions answered that they were very likely to get vaccinated when it was their turn. This result is in line with corresponding results from the Netherlands that have shown that the percentage of people willing to take the shot has increased from 65% in autumn 2020 to 86% in spring 2021 (Vollmann & Salewski, 2021; van Heck, 2021). Furthermore, the results are striking in line with the Dutch average during June. The National Institute for Public Health and Environment reports that in the second half of June, the percentage of young people aged between 16 and 24 was 78%, and of those aged between 25 and 39, 82% intended to take the shot ("Vaccinatie|RIVM", 2021). These two categories remain the most hesitant in taking the shot, considering that the population average stands at 90%. Furthermore, these results align with a recent Bachelor thesis from the University of Twente that investigated vaccine intentions in young adults at the end of March and beginning of April (Esen, 2021). Esen (2021) indicated that 85.4% of young adults were willing to get vaccinated. Thus, these findings confirm that young adults are the category that should be tackled the most by the vaccine campaign to ensure the achievement of herd immunity. Finally, the results did not indicate a difference in vaccine intentions between men and women, despite recent research indicating that males are more willing to take the shot than females (Hacquin et al., 2020: Robertson et al., 2021; Vollmann & Salewski, 2021).

However, Esen (2021) also did not find a significant difference in vaccine intention between males and females, possibly indicating an increasing trend in women getting vaccinated.

The non-significant moderating effect of age and health of the caretakers on the vaccine intentions of young adults does not provide support to the second hypothesis. The fact that the caretakers presented comorbidities or were older than 60 did not increase the intention to get vaccinated among the participants. In this respect, the exposure of the caretakers to the risk of Covid-19 did not increase the willingness of the youngsters to get vaccinated. This result was in line with the research of Esen (2021) that found no association between the intention of young adults to get vaccinated against Covid-19 and the fact that they lived with someone at risk of developing serious symptoms from coronavirus. This could be due to the fact that, as explained for the first hypothesis, more than half of the participants only visited their caretakers maximum once a month and that 87.1% of them had caretakers with at least one jab of protection. This, in turn, could make the young adults believe that individualistic reasons to get vaccinated are more important than altruistic rationales. On the other hand, when looking at the data more closely, it stands out that those who have healthier caretakers seem to want the vaccine more than those who have caretakers in the risk condition. This could be because those having healthier caretakers might be raised to be more conscious about their health and thus take the protection from the vaccine more seriously.

The significant marginal effect of the moderation of institutional and medical trust on the relationship between anticipated regret framing and intention to vaccinate supports the third hypothesis. The willingness to get vaccinated was positively related to the trust young adults had in governmental institutions and in the capacity of the government to tackle the coronavirus. Thus, the more the youngsters trusted the government and its recent performance in the pandemic, the more they were willing to get the shot. This is because vaccination strategies only work if people trust the source of information. The government's campaigns are not understood in a vacuum, but rather the trust people have in higher institutions shapes the way they receive the message. Thus, the intention to get vaccinated is subject to the trust in the system that delivers the vaccine. Thus, this result is aligned with Quinn and colleagues' (2019) findings that trust is an independent predictor of vaccine uptake.

The non-significant difference between the control condition and the regret condition on vaccine campaign trust supports the fourth hypothesis. The anticipated regret framing message did not affect the trust young adults had in the vaccine campaign more than the control message. In this regard, the regret message did not stimulate any adverse feelings towards the government's operation to solve the pandemic. This result could be due to three reasons. Firstly, it is important to remember that the manipulation check did not find any significant difference in the experience of regret between the control condition and the regret condition. Thus, it could be that the message was not effective in arising any anticipated regret among the youngsters, and this, in turn, did not lead the receptor of the regret message to trust the vaccine campaign less than those receiving the control message. Secondly, when looking more attentively at vaccine campaign trust and medical trust in both conditions, the general level of trust is quite high in both conditions. Thus, it could be that the initial level of trust in the expertise of the government was sufficiently high to shape the way the youngsters received and interpreted the message and that their positive attitude towards the message did not make them change idea over the vaccine campaign of the government. As we have seen from the previous hypothesis, trust shapes the way people receive the vaccine message and thus react to it. Finally, the fact that the anticipated regret message did not impact the trust in the vaccine campaign could be due to the way the participants accepted the message. From the analysis, the message was considered morally permissible and legitimate. This result is particularly important regarding the empirical analysis of the acceptability of the nudge. Whilst most authors tend to criticize or approve specific nudges a priori of the interpretation of those who are actually nudged (Burgess, 2012; Mitchell, 2004; Rebonato, 2012), this research accords to the stream of studies that demonstrate the empirical acceptance of certain nudges (Djupegot & Hansen, 2020; Hagman et al., 2015; Hagman, 2018; Kroese, Marchiori & De Ridder, 2016). The fact that the regret message was considered morally acceptable supports the moral permissibility of the anticipated regret-nudge in a vaccination campaign. However, it is important to notice that no question assessed whether the participants considered the message as manipulative a posteriori and thus it did not assess whether seeing the message as manipulative would reduce trust in the government.

The regret-nudge was considered morally acceptable by a large part of the participants (77,2%). However, only 67 participants (39,2%) declared that the message was not patronizing. So, although the message was seen as patronizing, the regret-nudge was deemed morally acceptable. This result might seem to contrast with the ethical analysis, which posed that paternalism and attacks to self-constitution are the biggest problematics of regret-

nudging. However, it is possible that participants, despite considering the message as paternalistic, did not deem it as a form of false or wrongful paternalism but rather as a trustful act. In this case, it is possible that participants considered the message morally acceptable since they viewed it as a way for the government to show caring. To support this argument, the results show that 73,1% of the participants considered the message legitimate. This is an important result since it could open the discussion on paternalism by disentangling the negative conception attached to the term and considering more the actual context of the act and the relationships between the agents. Furthermore, as argued in the third chapter, roles matter. Participants preferred to receive the message from the National Government, the RIVM, or the WHO rather than other entities.

The final analysis showed that message acceptability explained the relationship between framing condition and vaccine campaign trust, supporting the fifth and last hypothesis. Thus, the way the young adults received the message interceded with how the vaccine campaign was trusted. The fact that the message was accepted allowed the regret framing not to impact the trust in the vaccine campaign. As hypothesized, if people consider the nudge morally acceptable and legitimate, they will preserve their level of trust in the vaccine campaign.

1.2. Limitations and Future Directions

The present study was not able to support the previous findings, which attested that anticipated regret relates to the intention to get vaccinated (Golden et al., 2014). A limitation of this research, which might have led to this result, could relate to how the regret message was formulated. The message, by stimulating regretful thinking related to both individualistic concerns and altruistic motives, might have made the participants deliberate more on the probability of infecting their beloved ones and deem this chance low. In this way, it is conceivable that instead of stimulating anticipated regret, the message created a justification mechanism for the participant. Future research thus should separate the individualistic aspect of the regret massage from the altruistic one.

A second limitation of this study could derive from how the participants' instated regret feeling was measured. The manipulation check used in this research might not have accurately assessed the regretful thinking of the young adults involved in the research. It could be that the question was too general and did not actually tackle the self-blame aspect of not getting vaccinated. Furthermore, it is possible that presenting the manipulation check at the very end of the questionnaire reduced the accuracy of assessing the participants' regretful

status soon after making their decision. Future research could improve the way regretful thinking is methodologically assessed and find a way to present the manipulation check soon after the participants' decision without disclosing the intent of the research.

Assessing the level of trust, institutional, medical, and in vaccine campaign, solely using Likert-scales might be restrictive considering that, as we have seen in the second chapter of this thesis, the concept of trust is complex and dynamic and might not be assessable simply with closed questions. Future studies might assess trust through the use of not only quantitative data but also. Qualitative one, and ideally measure the participant level of trust repeatedly.

Another limitation of this study is related to the procedure of the research. It is a matter of fact that surveys do not always respect real-life circumstances. Assessing the intention of getting vaccinated through a survey might be different from checking the participants' actual behavior. Although the intention to vaccinate correlates well with the actual vaccination decision (Lehmann et al., 2014; Pot et al., 2017; Renner & Reuter, 2012), it might be that, in the present pandemic shaped by a continuous array of circulating fake news, participants decide to change the decision last-minute. Research in psychology has shown how decisions might be shaped by circumstance, and this could well be the case for vaccine hesitant. Thus, future research should not only assess vaccine intention but actual behaviors. Relatedly, this research is done in a controlled way, and reality might present many more uncertainties than the decisional environment presented to the participants. In this way, as argued by Quigley and Stokes (2015), it might be difficult to translate these results to real policy-making, and field experiments should be carried out to verify these results. Furthermore, a possible limitation relates to the period the survey was published. The research took place in the second half of June, when most people over 30 years old were already vaccinated. This might have influenced the way the youngsters perceived the risks of infecting their caretakers. Future research should assess vaccine intentions in younger populations with a repeated research design controlling for caretakers' vaccination status.

Finally, the present research involved solely Dutch university students. This decision might have led to a biased sample with certain specific characteristics. Recent studies have shown that there is a strong correlation between vaccine hesitancy and lower levels of education (Hacquin et al., 2020: Robertson et al., 2021; Vollmann & Salewski, 2021). Thus, future studies should try to recruit participants outside the university context to be able to make new contributions to young adults' vaccine intention.

The ethical analysis of this thesis has its limitations too. The analysis drew only upon three conceptualizations of autonomy identified in the literature by Vugts and colleagues (2020). Despite the importance and accuracy of their research which analyzed a great deal of nudging research to identify these three conceptions of autonomy, these categorizations may be too restrictive to describe an evolutive and complex term as autonomy. Further, the analysis related these three conceptions to common problems associated with nudging, such as manipulation, coercion, and paternalism. However, other important problems might have been neglected, such as questions of epistemic validity or domination. Thus, future research could consider other aspects of autonomy that a nudge could impact and relate them to a more comprehensive array of problematics. Finally, the ethical analysis took vaccine for covid-19 as a unified term rather than distinguishing the different vaccines present. Youngsters might accept a nudge that drives them to accept one kind of vaccine rather than others, considering the problems associated with the particular vaccine. Thus, future research could expand the ethical analysis of nudging in the vaccine domain by considering the specificity of the vaccines in question.

2. Conclusions

The present research wanted to investigate a possible public health policy to ameliorate the crescent problem of vaccine hesitancy. In this regard, a nudge was considered and investigated both on its efficacy to lead to higher vaccine intentions and on its socio and ethical permissibility. The anticipated regret-nudge stemmed from a stream of research that looked at the interlink between anticipated emotions and decision-making. The present research then tried to convert this stream of research into an implementable policy that could contrast the complex and dynamic problem of vaccine hesitancy. The Covid-19 pandemic represented the perfect circumstance to test this nudge. In this way, this research fits into an important stream of studies that tried not only to understand the underlying factor of vaccine hesitancy but propose potential solutions. In this case, the innovativeness of this thesis lay not only on the proposition of a new nudge that was not yet tested in the domain of vaccine hesitancy but also on the new framework presented to assess nudges. In the present thesis, I propose to analyze the moral permissibility of public health nudges not only based on their efficacy or their acceptability but on their impact on institutional and medical trust. Institutional trust must be sustained, and governments cannot allow using deceiving methods that could affect the trust citizens have in the government. The present regret-nudge seems not to affect the trust young people have in the vaccine campaign, but much more research is

needed to confirm these first results. Furthermore, it is valuable to extend this research beyond university students since it might be that those are the most accustomed to recognizing nudges and thus deeming them acceptable, whilst another part of the population might deem them morally impermissible. This research, thus, just opened up a new possible field of research regarding vaccine hesitancy solutions that could proliferate in the future, even though it would be preferable that people start recognizing the importance of getting vaccinated without using subtle strategies.

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Appendix

Appendix A

Q9 I would like to ask you a question about how much trust you have in certain institutions. For each of the following institutions, please tell me if you tend to trust it or tend not to trust it.

	Do not trust at all	Somewhat distrust	Neither distrust nor trust	Somewhat trust	Trust completely
The government (Cabinet)	○	○	○	○	○
The Parliament (Tweede Kamer).	○	○	○	○	○
Public servants.	○	○	○	○	○
Politicians.	○	○	○	○	○
The health care system.	○	○	○	○	○
The health care providers (GGD, RIVM).	○	○	○	○	○

Q10 Please indicate how much you agree/disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I trust the government is transparent with information regarding Covid-19.	○	○	○	○	○
I trust the government is honest with information regarding Covid-19.	○	○	○	○	○
I trust the government to take the right measures to deal with the coronavirus pandemic.	○	○	○	○	○
I trust the government's competence in the management of COVID-19.	○	○	○	○	○
I trust the government medical experts regarding Covid-19.	○	○	○	○	○
I trust the government is committed to protecting me from Covid-19.	○	○	○	○	○
I trust the government decides in the best interest of the community with regards to managing the Covid-19 crisis.	○	○	○	○	○
I trust the government is acting in my best personal interest with regards to managing the Covid-19 crisis.	○	○	○	○	○
I think the government is able to fight the coronavirus.	○	○	○	○	○

Appendix B

Q14 After reading the previous *message*, please indicate how much you agree/disagree with the following statements.

	Definitely not	Probably not	Maybe or maybe not	Probably yes	Definitely yes
Do you think the message was clear?	○	○	○	○	○
Do you think the message was professional?	○	○	○	○	○
Do you think the message was patronising?	○	○	○	○	○
Do you think the message was morally acceptable?	○	○	○	○	○
Do you think the message was legitimate?	○	○	○	○	○
Overall, do you think the message was acceptable?	○	○	○	○	○

Appendix C

Q15 After reading the previous *message*, please indicate how much you agree/disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Regarding vaccines, I am confident that public authorities decide in the best interest of the community.	○	○	○	○	○
The government **cannot** be trusted to tell the truth about COVID-19 vaccine.	○	○	○	○	○
A lot of information about COVID-19 vaccine is being held back by the government.	○	○	○	○	○
I trust the way the government is managing the vaccination scheme.	○	○	○	○	○
I trust the government decisions when it comes to promoting vaccination.	○	○	○	○	○
The government shares my same values when it comes to promoting vaccination.	○	○	○	○	○
The government shares my same goals when it comes to promoting vaccination.	○	○	○	○	○
Overall, I trust the government vaccine campaign.	○	○	○	○	○