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Master Thesis [Behavioural Economics]

"The Ostrich Effect" and Uncertainty: The relationship between Overconfidence and SARS-CoV-2 Medical Information Avoidance

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ABSTRACT

The unique current COVID-19 pandemic environment, quarantine measures and concern surrounding SARS-CoV-2 infection raises the question about individuals' willingness to get tested, especially given that SARS-CoV-2 are heavily distributed towards elderly, and sick, individuals. Younger individuals are significantly less at risk of dying from SARS-CoV-2, which may affect the willingness for this age category to get tested through overconfidence or the comparative optimism effect. This paper investigates the relationship between overconfidence and the 'ostrich effect' in the form of willingness to pay for a SARS-CoV-2 testing kit, and sees if the trends and pattern in this relationship are similar to that of the relationship between overconfidence and the willingness to pay for a HIV/AIDS testing kit. Data was collected through an online survey, through means of personal outreach and also through the use of the survey platform 'Prolific'. Overconfidence is specified as a binary variable where 'the individual is overconfident' takes value equal to 1 and 'the individual is not overconfident' takes value equal to 0. Logistic regressions are run to estimate the effect of overconfidence on the willingness to pay for a testing kit. The correlation between overconfidence and willingness to pay for a testing kit is negative for SARS-CoV-2, and positive for HIV/AIDS, however in both cases the effect is statistically insignificant and as such a causal relationship cannot be established. Robustness checks in the form of OLS regressions and specifying the variable of interest as a continuous variable take place, and the effect of overconfidence is only statistically significant when overconfidence is specified as a continuous variable in the case of willingness to pay for an HIV/AIDS testing kit.

INTRODUCTION

Individuals, as well as deriving utility from outcomes and decision-making, have also been found to derive utility from information and beliefs. Given such observations, it may be the case that individuals have an incentive to control and regulate certain beliefs and consequently control such beliefs through decisions about information acquisition or information avoidance (Karlsson et al., 2009). This psychological processing of information has a hedonic impact on utility in realms such as financial investment, feedback performance, conflicting personal decisions, and, given the recent global pandemic, individuals-at-risk and medical testing. There are many social consequences arising from the *ostrich effect* in medical testing, and problems persist even though receiving information through testing is usually costless and can only grant individuals better decision-making capabilities (Golman et al., 2017). Literature surrounding the ostrich effect has found that individuals are more likely to monitor their financial portfolios (and do so more frequently) in rising markets than in falling or flat markets, as they do not want to receive negative information from the markets or from their portfolio losses (Karlsson et al., 2009). Furthermore, Galai & Sade (2004) found that investors treat risky situations by pretending they do not exist (when choosing between liquid and illiquid assets in periods of uncertainty). More relevantly, extensive evidence exists where individuals with potential health conditions eschew medical tests or enhance positive beliefs of their own health state (Lerman et al. 1996, 1999; Lyter et al. 1987; Oster et al. 2013; Sullivan et al. 2004; Thornton 2008), even in the presence of symptoms regarding sexually-transmitted diseases (STDs) and hereditary diseases, such as Huntington disease (Oster et al., 2013)

Since late 2019, the world has been slowly gravitating towards a state of panic with the outbreak of a pre-existing infectious respiratory disease, the Coronavirus: an infectious and contagious disease caused by severe acute respiratory syndrome coronavirus 2, hereby referred to as SARS-CoV-2. The panic associated with a potential SARS-CoV-2 case in any workplace, building or community begs the question of how individuals take decisions regarding medical testing. Studies regarding information avoidance when screening for disease have been investigated, and in many cases, information avoidance is present regarding degenerative disease such as HD or cancer, that is until the symptoms become highly intense/painful (Oster et al., 2013). Although SARS-CoV-2 symptoms may not be intense – individuals may even be asymptomatic – for many the virus is not long-term and may not affect individuals compared to other 'killer' diseases. As such, individuals may be less willing to get tested for SARS-CoV-2, even in the presence of symptoms, due to factors such as overconfidence, procrastination, anxiety or ignorance which contribute directly to information avoidance (Golman et al., 2017). Information avoidance in a pandemic is extremely dangerous given that world economies have essentially 'collapsed' in response to the virus, and the longer the pandemic is actively spreading, the more individuals are at risk of death, the longer individuals have to be kept in quarantine lockdown, the risk of an economic downturn occurring in the near future increases.

Investigation

Regarding the current health climate to economic literature, no academic studies exist regarding the presence of the *ostrich effect* and the willingness to undergo medical testing in a pandemic situation, alongside individuals' expectations about contracting a virus such as SARS-CoV-2. As aforementioned, there is evidence of overly positive expectations regarding degenerative or incurable diseases, such as cancer and HD. However, given that the COVID-19 has spurred panic on a global scale, it begs the investigation of individuals' risk attitudes and behaviours in the perception of COVID-19, and to what is the extent of health information avoidance in a landscape where COVID-19 cases are still growing exponentially.

I am looking to investigate information avoidance in medical testing for SARS-CoV-2, with a specific motivation to investigate whether overconfidence is the main factor behind the presence of the ostrich effect in this case. The ostrich effect may be present in the willingness to undergo medical testing for SARS-CoV-2 in a pandemic situation, even though obtaining such health information would enter directly into individuals' utility function through private and social benefits. It can further be argued that the decision to avoid information in this case procures significantly more social costs than private costs, compared to HD which is not contagious, and thus the decisions to undergo testing is a time-pressing and important decision that individuals should, theoretically, not avoid. Oster et al. (2013) found that patterns in HD data regarding resistance to medical testing also appeared in viruses such as HIV/AIDS. Similar to SARS-CoV-2 testing, HIV/AIDS testing is socially valuable and it is thus optimal for individuals to test themselves, and it may be the case that the patterns in SARS-CoV-2 data regarding overconfidence and willingness to undergo medical testing are similar to HIV/AIDS. Thus, this thesis research will aim to explore the extent of overconfidence contributing to the cognitive bias of the ostrich effect in the pandemic environment of COVID-19, and similarly the willingness to undergo HIV/AIDS SARS-CoV-2 medical testing.

"The Ostrich Effect: is there a correlation between overconfidence and the willingness to undergo medical testing for HIV/AIDS and SARS-CoV-2 during the COVID-19 pandemic?"

Definitions

Overconfidence is determined by seeing the nominal difference that each participant answered for the two questions in the survey: Q1: "*What, do you believe, is the % probability that an individual with your same demographics and lifestyle dies due to SARS-CoV-2 in the near future? (0% = No chance at all, 100% = Extremely likely)*" and Q2: "*What, do you believe, is the % probability that you die due to SARS-CoV-2 in the near future? (0% = No chance at all, 100% = Extremely likely)*". If a participant answered that an individual of their own demographic and lifestyle (i.e. someone who on average is like themselves) has a higher probability likelihood of dying due to SARS-CoV-2 compared to their own probability likelihood of dying due to SARS-CoV-2, then this would elicit an overconfidence in a 'someone else is more likely to get infected than me' fashion. This is the comparative-optimism effect and this method of elicitation was used in Weinstein's paper, "Unrealistic optimism about future life events" (1980). In reality, there is no feasible reason to believe that an individual similar in demographics and lifestyle to a respondent would be more likely to get infected than the respondent themselves, and this belief is most likely due to a perception bias and overconfidence in their own capabilities to not get infected. As such, respondents are classified as 'overconfident' if their numerical answer to Q1 was larger than their numerical answer to Q2, and respondents are classified as 'not overconfident' if their numerical answer to Q1 was equal to, or smaller than, their numerical answer to Q2.

This same definition of overconfidence applies to HIV/AIDS: Q13: "*What, do you believe, is the % probability that an individual with your same demographics and lifestyle dies due to HIV/AIDS in the near future? (0% = No chance at all, 100% = Extremely likely)*" and Q14: "*What, do you believe, is the % probability that you die due to HIV/AIDS in the near future? (0% = No chance at all, 100% = Extremely likely)*". Respondents are classified as 'overconfident' if their numerical answer to Q13 is larger than their numerical answer to Q14, and respondents are classified as 'not overconfident' if their numerical answer to Q13 was equal to, or smaller than, their numerical answer to Q14.

It must be noted that this research does not specifically investigate the psychological or physiological factors behind overconfidence, other than the extent of the belief that 'someone else is more likely to die in this pandemic than I am'.

Willingness to Pay for a Testing Kit is determined by a predetermined threshold answer to the question regarding COVID-19: Q4: *"Currently, self-testing kits are not available regarding SARS-CoV-2 testing but should be made available in the near future. Assume that you believe you may have been infected with SARS-CoV-2. What is the maximum that you are willing to pay for a SARS-CoV-2 testing kit that is delivered to your residence?*" The pandemic has led to an enormous demand for medical tests worldwide, that even hospitals are not managing to test every possibly infected individual. Given only the recent emergence of SARS-CoV-2 in the Netherlands, take-home testing kits have not yet been mass-produced, and ones that do exist cost up to €300 (for 25 rapid tests) and are not easily available to consumers as they are for medical professionals (Prodiag.nl, 2020). In a pandemic environment, and in countries such as Iceland, governments should urge to mass-test the entire population, in which case testing would be free of charge. This depends entirely on the resources and availability of testing kits in each nation. For the Netherlands, it can be expected that testing kits will be available in the near-future, however for this research, if an individual was not willing to spend any monetary amount for a testing kit, this would signify that an individual would not get tested unless it was free, which represents an unwillingness to test oneself even if SARS-CoV-2 testing kits become available at a small price. The answers to the question were on a scale from 'I would only order a testing kit if it were free' to 'Over €100'. In this case, a respondent that answered, 'I would only order a testing kit if it were free' was considered as the threshold of 'not willing to pay for medical testing'. The unwillingness to pay for a SARS-CoV-2 testing kit is linked to ostrich effect through medical information avoidance, since if an individual is not willing to spend any monetary amount on a SARS-CoV-2 testing kit then they are purposely avoiding important information, even though the (free) acquisition of such information can only be beneficial to themselves and to society.

Similarly, willingness to pay for a HIV/AIDS testing kit is determined by the participants' answer to: Q16: "*Assume that you believe you may have HIV/AIDS. What is the maximum that you will be willing to pay for a*

HIV/AIDS self-testing kit?' The threshold for avoiding medical information was if the participant answered 'up to €50' or any monetary value below. Unlike SARS-CoV-2 tests, HIV/AIDS self-testing kits are prominent and, in the Netherlands, sell for roughly up to €50 based on prices from Soapoli.nl, Viata.nl and Thuistesten.com. To provide a relativity to the definition of COVID-19 medical information avoidance, a threshold answer is used to determine medical information avoidance. Hence, any individual not willing to pay €50 or more for an HIV/AIDS self-testing kit would not get themselves tested for HIV/AIDS infection. The unwillingness to pay for a HIV/AIDS testing kit is linked to medical information avoidance, since if an individual is not willing to spend the required amount for a HIV/AIDS testing kit, then they will not be able to obtain essential information that is useful for their own health, particularly in the case of a life-threatening virus. However, it may be the case that €50 may be too expensive for individuals, given their income or other factors, nonetheless this does represent an unwillingness to pay for the testing kit and to obtain important medical information.

Relevance of Findings

This research thesis aims to collect data about SARS-CoV-2 and HIV/AIDS risk perceptions and behavioural traits towards viruses. Data is collected through an online survey on Dutch residents only, given the non-feasibility of collecting information physically due to quarantine lockdown in the Netherlands. Numerous regressions are run on this data to quantify the relationship between overconfidence and the willingness to pay for a testing kit and investigate whether the effect of the variable of interest on the dependent variable is similar in the case of both viruses. All of the variables that were constructed through data collection in these research is displayed in Appendix III. This research thesis finds that overconfidence does not have a statistically significant effect on an individual's willingness to pay for a SARS-CoV-2 testing kit. In the case of HIV/AIDS, the effect of overconfidence becomes statistically significant on the willingness to pay for a testing kit when overconfidence is specified as a continuous, and not as a binary variable. There is no gender effect on the willingness to pay for a testing kit in the case of both viruses, and the effect of age is statistically significant in the case of the willingness to pay for a HIV/AIDS testing kit. There is not enough evidence of a pattern regarding the relationship between overconfidence and the dependent variable between the viruses, however in the case of both viruses, the effect of 'virus concern' is statistically significant towards the willingness to pay for a testing kit.

The findings of this empirical study will provide relevant information that can contribute to a new line of literature regarding the economics of pandemics and quarantines. This has not been able to be documented in recent decades, and research study will contribute to literature regarding medical information avoidance for a highly contagious virus. It is important to investigate whether the ostrich effect is present in a pandemic environment, as this will show the behaviour and mindset of individuals in a speculatively 'high-anxiety' landscape. However, there are many biases that arise as a result of a pandemic: ignorance, stress, overconfidence, boredom, or self-isolation effects, to name a few. As such, it may be the case that some of these biased effects spill-over when trying to isolate the presence of overconfidence contributing to information avoidance.

The findings of this paper focus specifically at residents in the Netherlands. The findings should be read and interpreted with caution given that presently, the Netherlands has (relatively) relaxed policies in place compared to other countries such as France, Spain or Italy who proceeded to implement a full quarantine lockdown. The Netherlands still allows for individuals to leave their residence freely, whereas many countries only allow one excursion a day for exercise or supermarket purposes. Concluding, the findings of this study can be relevant for policy makers (and from a research standpoint) give a new perspective on the ostrich effect in health-related medical testing domain.

LITERATURE REVIEW

This section will outline the existing literature and evidence relating to the ostrich effect, overconfidence, and subsequently explain the relationship between the two variables. Subsequently, this section will elaborate on the evidence relating specifically to medical information avoidance, and how the measures in this research thesis, using the outlined evidence, are best suited in the investigation of the research question.

The Ostrich Effect

Originally coined by Galai & Sade (2006) in the realm of behavioural finance, the ostrich effect was defined as "the avoidance of apparently risky financial situations by pretending that they do not exist", and essentially burying one's head in the sand. This definition was later adapted by Karlsson, Loewenstein & Seppi (2009) to give a broader definition of the ostrich effect: "avoiding exposing oneself to information that one fears may cause psychological discomfort." The ostrich effect is present in people who eschew medical tests even though they are at-risk individuals, and managers avoiding arguments that conflict with their prior beliefs, even though such information is usually costless, can help individuals make better decisions, and avoid poor or illogical decisions (Golman et al., 2017). Although it seems not socially optimal, information avoidance allows for direct and immediate utility benefits due to self-serving biases, rather than living in uncertainty or anxiety that may occur by obtaining information, such as the medical result of a disease or the realization of losses in one's financial portfolio.

The ostrich effect, put more simply, is a form of information avoidance where individuals selectively pay attention to information. Karlsson et al. (2009) explains that "people derive utility from information and beliefs", which has become conventional from a behavioural economics standpoint. His extension of the idea that "people derive utility from beliefs is, however, that they may have an incentive to control or regulate those beliefs", for example, by acquiring, or not acquiring, information. Information avoidance is thus observed in situations where individuals are emotionally invested in certain information and can neglect it to 'protect' themselves, even though it could improve their decision-making. Golman et al. (2017) also puts forward the idea that people avoid information when there is a strategic rationale for it as well as when beliefs enter an individual's utility function. He defines 'active' information avoidance using two criteria: (i) the individual is aware that the information exists and is available (ii) the individual has free access to the information or would avoid the information even if access were free. Using an example, a person who could (and should) get tested for a transmittable virus, but does not, could harm themselves by not receiving treatment for the condition, and may transmit the virus to others. This example is relevant to both SARS-CoV-2 and HIV/AIDS viruses.

Methods of information avoidance notably include inattention, biased interpretation of information, forgetting and physical avoidance (Golman et al., 2017). For example, getting tested for SARS-CoV-2 and not returning to the clinic to find out the results would be the physical avoidance of information, whereas a 60-year-old individual with heart disease believing that SARS-CoV-2 will not affect him harmfully would be a biased interpretation of information (given that evidence points towards the opposite). Golman et al. (2017) show evidence that information avoidance can also be hedonically or strategically driven. Hedonically driven information avoidance motives refer to psychological mechanisms such as disappointment aversion, regret aversion, optimism maintenance, overconfidence or anxiety. Strategically driven information avoidance occurs when individuals avoid information as a form of commitment, anticipating that it will influence their own future behaviour or the behaviour of those around them. This incorporates motives such as intrapersonal strategic avoidance, avoiding projection biases, abdicating responsibility, or interpersonal strategic avoidance.

Since the initial outbreak of the coronavirus, numerous articles and instances of the ostrich effect have come to light, notably in how the government has outspoken and society's reaction to the outbreak. When the first few cases emerged in China, an ophthalmologist at the Wuhan Central Hospital was the first to warn about a possible SARS-CoV-2 outbreak in December (Krishnan, 2020). The Public Security Bureau accused him of false claims and refused the possibility of an outbreak and forced him to sign a letter of disclosure. The state, by forbidding the freedom of speech and media, jeopardized Wuhan's well-being, but China's well-being and global well-being. Given that there was an outbreak a decade earlier, from 2002-2004, named SARS-CoV-1, it was unreasonable by the government to cover up information relating once again to a coronavirus outbreak. Other classic cases of leaders neglecting, or avoiding the existence of, a coronavirus outbreak has been seen with President Jair Bolsonaro, Brazil. The outbreak was downplayed as 'hysteria', and the president undermined his own health ministry and the imposition of quarantines. On August 1st 2020, Brazil currently has the 2nd most number of cases (2.5 million) and the 2nd most number of deaths (90,000) - justifying the consequences of the ostrich effect and the neglect and health information on society (Schipani et al., 2020). Furthermore, given the lack of testing kits supplied at the beginning of the pandemic, and by encouraging individuals to self-isolate rather than conduct swab tests, jurisdictions have been able to declare themselves as 'coronavirus-free'. This is a false impression of how many cases there are realistically worldwide, and gives false reassurance to individuals and quarantine removals, that can ultimately lead to second outbreaks (Cooler Insights, 2020).

Overconfidence Bias & Information Avoidance

The overconfidence bias refers to an individual whose confidence is subjectively and relatively higher than the objective accuracy of judgements (Pallier et al., 2002). Literature has defined overconfidence in three different ways: (i) the overestimation of one's performance, (ii) the over placement of one's performance relative to others and (iii) over precision in expressed unwarranted certainty in the accuracy of one's beliefs (Moore et al., 2008 & 2017). A main finding from Ludwig & Nafziger (2010) was that overconfident individuals perceived others are under confident or unbiased, and underconfident or unbiased individuals perceived others are overconfident – eliciting a form of 'self-projection bias' (correcting one's own bias). However, subjects unaware of their over- or under confidence remained overconfident on average. Regardless of this heterogeneity, individuals, on average, overestimated their own, and others, abilities. The psychological phenomenon is that individuals project the belief of their own abilities onto others, and that when evaluating oneself, individuals seem to be driven by self-serving motives, resulting in reduced objectivity and unrealistically positive perceptions of oneself (Jefferson et al., 2017).

In accordance with the ostrich effect, overconfidence has been studied by asking individuals about their beliefs, and how confident they are about those specific beliefs, and in the answers provided given those beliefs. Common examples of the overconfidence bias are present in drivers overestimating their driving skills, students overestimating their score performance in tests, and the probability of not getting divorced (Ludwig & Nafziger, 2010). In relation to health situations, overconfidence is present in the form of 'another individual is more likely to be infected by SARS-CoV-2 than me', even though objectively, any two individuals have the same probability of contracting a viral infection unless one individual is immune to the virus. This is described as the comparative-optimism effect (Weinstein, 1980).

Overconfidence can produce many manifestations, for example: egocentrism, unrealistic optimism and comparative optimism. In relation to the COVID-19 outbreak, the most relevant manifestation is the comparative-optimism effect: a bias where individuals believe good things are more likely to happen to them relative to bad events which are more likely to happen to others. In relation to event frequency, individuals believe that common events are more likely to happen to them relative to rare events which are more likely to happen to others. Evidently, a pandemic is hardly a common occurrence, however given the rate of case expansion, it may become 'common' that an individual contracts SARS-CoV-2. Chambers & Windschitl (2004), alongside other studies (Abele & Hermer, 1993; Alloy & Ahrens, 1987; Butler & Mathews, 1987; Salovey & Birnbaum, 1989), found that where positive mood states increase comparative optimism, negative mood states such as anxiety decrease comparative optimism. As such, it is difficult to determine how much overconfidence will be manifested through the comparative-optimism effect, nonetheless it is likely that overconfidence can persist through biases such as the illusion of control or wishful-thinking effects, which can pose health risks to an individual and to society.

The link between overconfidence and the ostrich effect exists through the effect overconfidence has on risk-taking. Broihanne et al. (2014) finds that professionals are overconfident in forecasting future stock prices, and that the risk they are willing to undergo is influenced by overconfidence and optimism - however negatively influenced by risk perception. Armstrong (2002) in "Principles of Forecasting" finds that judgemental overconfidence leads individuals to neglect decision aids, make predictions in opposite fashion of the 'base rate', and to succumb to 'groupthink'. The fact that overconfident individuals are more willing to undergo risks and similarly neglect decision-aid-information suggests a positive relationship between overconfidence and medical information avoidance. Individuals eliciting overconfidence would be more willing to take the 'risk' of being infected, as well as more likely to avoid SARS-CoV-2 testing and neglect the possible information received from decision aids. The relationship, both in the case of SARS-CoV-2 and HIV/AIDS, between overconfidence and the decision to undergo medical testing is important due to the subjective, and somewhat irrational, bias induced by confidence that leads to significantly more social costs than private costs. It is optimal to undergo medical testing when an individual may be at risk of infection, and conjointly irrational to assume that 'I am less likely to be infected than another person' through comparative-optimism and avoid such medical information. Particularly in the case of a pandemic, overconfidence about an individual's SARS-CoV-2 contraction leads to an exponential spread given the highly contagious nature of the virus, and individuals should be more diligent in seeking health information to minimize personal and societal risks of infection and death. Thus, this thesis research will aim to investigate whether individuals elicit overconfidence regarding HIV/AIDS and SARS-CoV-2 decision-making and whether overconfidence is a significant factor in determining an individuals' willingness to pay for medical testing.

A clear example of overconfidence in the face was Donald Trump, stating that he was confident in the warm weather's capabilities in killing the virus, that the risk to the American people remained low and that the spread of the virus was well under control (Newkirk & Dwyer, 2020). To this day, The USA has 25% of all of the world's SARS-CoV-2 cases and deaths, totalling 4.5 million and 152,000 respectively. Similarly, Brazil's president was confident about his capabilities as an athletic individual in that if he did experience symptoms, they would be very weak. Nonetheless, the Brazilian president has contracted the virus twice and is still adamant in the belief of SARS-CoV-2 as hysteria (Schipani et al., 2020). The Stockholm School of Economics underwent a study that shows that "young people in particular feel that the situation isn't a major concern to them, since they tend to be healthy and are less likely to suffer a more serious form of the illness" (Stockholm School of Economics, 2020). Although this is correct based on the foundations of the SARS-CoV-2 virus and general COVID-19 case statistics, this overconfidence can give young individuals a false sense of security which can elongate the length of the pandemic as individuals are 'optimistic' about their chances of survival vis-a-vis the contraction SARS-CoV-2. Conversely, a study from University of Harvard, Bocconi University and the University of Oxford in The Economist (2020) found that young individuals tend to see COVID-19 as a larger threat than older individuals (or elders underestimate the threat of coronavirus), even though the youth have the lowest risk of death (The Economist, 2020). This is visually represented in Figure 1:

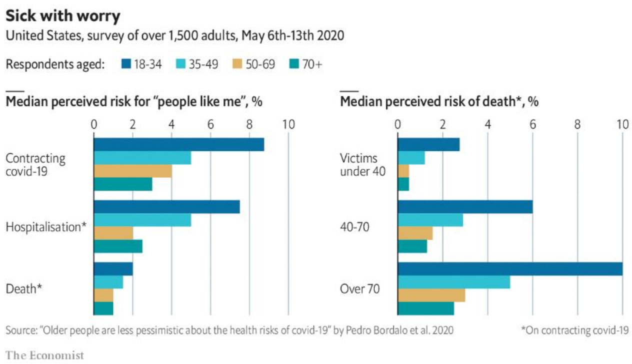

Figure 1: SARS-CoV-2 Perceived Risk of Death (The Economist)

Not only do youthful individuals believe they are most likely to contract the virus, but they also believe, on average, that they will more likely to die from SARS-CoV-2. This perceived probability decreases as age increases, even though the risk of death is highest for older individuals. The physiological reasonings behind this find are not explored, however this study will be used as a reference for the findings in this research thesis.

Information Avoidance & Health Situations

Emily Oster et al. (2013) studied individuals who could be exposed to Huntington disease (HD); a hereditary disease. The disease is a degenerative disease with currently no cure, and individuals who are a carrier of HD are expected to have an average life expectancy of 50. However, they found that individuals were extremely biased in the lower bound about their own perception of the probability towards not having HD. For example, 11% of individuals in the group sample believed there was no chance they carry the HD expansion, even though the objective probability of carrying HD is 52%; no different than the flip of a coin. Furthermore, individuals who were uncertain about having HD behaved almost identically to individuals who were not carriers of the genetic expansion. Some individuals persisted that there is no chance over having the HD expansion, even with significant symptoms. Regarding medical testing, individuals only seem to test when new information comes to light, such as a new symptom pointing towards an increasing chance of having HD, however, in general the primary reason for testing avoidance is wanting to live without the anticipation of future ill health. Unfortunately, evidence from this study and Shoulson and Young (2011) show that testing rates in the sample for individuals who were untested and showed symptoms were only 5%. Testing rates are low, especially for younger individuals, and individuals are clearly overly optimistic and, additionally, update their own beliefs and risk perceptions very minimally with increasing symptoms.

Using Oster et al.'s (2013) framework as a basis for this thesis research, this research study investigates if similar comparative-optimistic and overconfident biases prevail in a pandemic scenario with the spread of the SARS-CoV-2 virus. It is without a doubt that medical testing for a contagious virus is socially optimal, if not privately optimal. Receiving information about being a SARS-CoV-2 carrier or not will allow better decision-making regarding personal health, social distancing/self-isolation, and in revealing which other individuals may also carry the virus. Most importantly, knowledge about being a carrier protects other individuals, especially individuals with a weakened immune system, such as elderly or previously sick individuals (accounting for 80% of COVID-19-related deaths) and should allow an individual to reduce contact with such people. However, Oster et al.'s (2013) study shows clear signs of physical avoidance and overconfidence by individuals who objectively have an equal chance of having, or not having, a degenerative disease or HIV/AIDS. If individuals were aware that they were carriers of the HD expansion at a young age, this information could contribute directly to their utility function and allow them to make better decisions in accordance with their life expectancy. On the other hand, the discovery that one is a carrier of the HD expansion could immediately result in reduced utility due to psychological factors such as anxiety, depression, despair and not wanting to live with the anticipation of future sickness.

Research in the field of psychology has found that people are unwilling to make sacrifices for others when the benefits are uncertain: this could be in the form of sacrificing career opportunities to stay home and self-isolate (Dana et al., 2006). The World Economic Forum conducted a programme and found that "when people have the make decisions that might harm others, they tend to act as if things will work out just fine" – an evident form of over-optimism (WE Forum, 2018). In addition, and relevant to the current outbreak, the World Economic Forum found that in studies where there was a higher likelihood of younger individuals being infected, compared to older individuals, participants were more likely to 'self-sacrifice' and stay home, indicating reduced overconfidence. SARS-CoV-2 is particular in comparison to this study, since even though all individuals have an objectively similar chance of being infected, the elderly are significantly more affected by the virus, and as such it may be the case that individuals remain overconfident in their decision-making.

The ostrich effect may be present regarding SARS-CoV-2 medical testing for several reasons. Firstly, the symptoms of SARS-CoV-2 for the average individual are very similar to the flu, and as such individuals may be overconfident about relating their symptoms to a flu, even though the current environment shows that objectively, there is an increased chance that an individual may be SARS-CoV-2-positive. Secondly, for healthy individuals, it is unlikely that SARS-CoV-2 affects them 'severely', and as such may forego medical testing due to a biased interpretation of their personal health status and continue with daily activities, neglecting or ignoring the possibility that they may be infected. Furthermore, some individuals may be ignorant of the whole pandemic in general, completely ignoring all information about SARS-CoV-2, possibly due to anxiety aversion or over-optimism.

Investigation

This research thesis focuses on the effect of an individual being overconfident on their willingness to pay for a medical testing kit. As well as estimating the effect of overconfidence on the willingness to pay for a SARS-CoV-2 testing kit, these findings will be compared to the effect of overconfidence on the willingness to pay for a HIV/AIDS testing kit. The reason why HIV/AIDS is used as a comparison and not a disease such as cancer, is due to the similarities in the foundations of both HIV/AIDS and SARS-CoV-2 as a virus, which is not the case with disease. In the case of both viruses, medical testing is essential since the viruses can easily be spread through numerous transmission methods, and similarly it can be the case that an individual could have the viruses without being easily aware of it, making the avoidance of medical information and unwillingness to get testing for the viruses life-threatening to an individual and to society. HIV was also considered a pandemic in the 1980s and is still considered one to the present day, with roughly 38 million people infected globally in 2018 (source). Although preventative measures are known and antiviral treatment exists to the point that transmission can be almost completely halted, it still holds that the panic associated with HIV/AIDS is similar to the panic associated with the uprising of SARS-CoV-2 in the current pandemic.

The measures in this research thesis have been taken with the aim of providing the best results for the investigation. The research was conducted during the debut of quarantine as a result of the pandemic, and as such the data collected was most effective through an online survey - reaching out through social media and other forms of communication since physical surveys were no longer feasible. The questions are asked such that the elicitation of an individual's overconfidence is numerically simple, using the definition of Weinstein (1980) and eliciting the willingness to pay for a testing kit is elicited through a simple choice question. The willingness to pay for a testing kit, rather than the willingness to get tested for virus(es) at the hospital, was used as the appropriate definition given that hospitals and STD centres in the Netherlands were not admitting individuals who perceived themselves to be infected (except in severe cases) during the pandemic, and urged instead that individuals self-isolate. As such, the only way to medically test oneself would be to order a testing kit. Using the data from the survey questionnaires, regressions analyses are used to determine the isolated effect of overconfidence on the willingness to pay for testing kits, alongside the effect of other variables that may be significant in determining an individual's decision to get tested for SARS-CoV-2 and/or HIV/AIDS.

Hypotheses

Given the analysis outlined in this literature review, it is difficult to speculate whether individuals will be willing to avoid information and produce an ostrich effect in the global landscape of anxiety and panic caused by a pandemic, since studies regarding epidemics and pandemics have only taken place in hypothetical scenarios. However, literature regarding the general overconfidence of individuals, the presence of the comparative-optimism effect, and the innate characteristics of SARS-CoV-2 as a mild to moderate virus that has major impacts on the elderly and the sick compared to the healthy and young, has led to the following main hypothesis:

Hypothesis 1: "Overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing."

There is a clear demographic in individuals that are considered 'severe' COVID-19 cases; the sick and elderly - accounting for 80% of SARS-CoV-2 deaths worldwide. These groups of individuals should elicit lower overconfidence bias based on such statistics and should be significantly more willing to undergo medical testing since avoiding medical information could be potentially fatal for such individuals. This has led to the development of the following hypothesis look at the relationship between demographics, overconfidence in the investigation of SARS-CoV-2 medical information avoidance:

Hypothesis 2: "Overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing across age and gender."

Oster et al. (2013) found evidence in her study that there are similar patterns in the physiological factors regarding the decision to undergo medical testing for HD, HIV/AIDS and cancer screening. The predominant finding is that individuals believe that their perceived probability of carrying HD is lower than the objectively probability of carrying HD - a form of overconfidence through miscalibration. It begs the questions as to whether individuals are similarly overconfident in contracting SARS-CoV-2 and actively avoid medical testing as a virus such as HIV/AIDS. The difference in this case is that SARS-CoV-2 has spread in the form of a pandemic, and it would be expected that individuals will elicit less overconfidence regarding SARS-CoV-2 and will pursue medical information rather than avoid information (compared to HIV/AIDS) given the panic and anxiety associated with a pandemic. However, for a majority of the world population, SARS-CoV-2 symptoms will be similar to flu symptoms for a majority of the population, given that 87% of global cases are currently considered 'less than severe', which may spur overconfidence. Thus, the mix of existing evidence has led to the following hypothesis:

Hypothesis 3: "The pattern that overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing is similar to HIV/AIDS."

Methodology

This section will explain the main research method used to collect the data in the form of an online survey, which variables the survey aims to collect data for and the descriptive sampling statistics.

Data Collection: Online Survey

It was important for the online survey to be released during the quarantine period within the Netherlands such that individuals would answer the survey while being fully aware of the importance of the COVID-19 pandemic and for respondents to answer in the anxious environment that a pandemic creates. If the survey were released post-quarantine, then individuals may be significantly more overconfident about contracting SARS-CoV-2 and medical testing since individuals would regain their routines and may inherently avoid information regarding COVID-19, or forget the importance, and consequences, of the pandemic. As such, the online survey was initially released on the 4th April 2020, and the survey was closed after 2 weeks on the 18th April 2020; the time period of which was entirely during the quarantine period in the Netherlands, which at the time was until 28th April 2020. To maximize the number of respondents, and to minimize the mental effort required by respondents to finish the survey, the survey consisted of 10 scale-answer questions, 9 multiple choice questions and 4 short, open answer questions, giving an estimation of up to 5 minutes to complete the 23 questions in the survey. The survey was completed using the Qualtrics Experience Management software, licensed by the Erasmus University of Rotterdam.

Primary data for this research thesis was collected in the form of an online survey so to reach out to as many respondents as possible compared to, for example, an interview or a printed survey. Given that the research question predominantly focuses on Dutch residents' risk attitudes and behaviours towards the COVID-19 outbreak, the online survey had a clear instruction in the introduction stating that the survey could only be undertaken by residents living in the Netherlands. There was no constraint on an individual's nationality – respondents did not have to be Dutch – allowing for a larger sample size and the inclusion of international residents and students studying in the Netherlands. The survey was available in two languages: English (Appendix I) and Dutch (Appendix II), as these are the two most spoken languages in the Netherlands.

Furthermore, another restriction was that survey respondents must not have already been medically confirmed to be infected with the SARS-CoV-2 virus. If this were the case, then the inclusion of the respondents' answers could bias the results of the analyses since an individual would have already 'overcome' the virus, making it difficult to elicit overconfidence by belief and not by outcome. Question 7 allows for the segregation of respondents who have been previously infected with SARS-CoV-2, to know who are unsure or who are not infected. It is important to understand individuals' mindsets towards SARS-CoV-2 symptom recognition (and potential information avoidance) alongside attitudes on medical testing before they have medically confirmed to have (not) contracted the disease.

The online survey focused on a quantitative approach and aimed to gather information about respondent overconfidence, attitudes towards the COVID-19 pandemic, SARS-CoV-2 medical testing, HIV/AIDS attitudes and HIV/AIDS medical testing. Survey respondents remained anonymous given some of the personal questions within the survey regarding health concerns, SARS-CoV-2 contraction and HIV/AIDS contraction, allowing respondents to answer honestly without fear of linking answers to any identifying information, other than age, nationality and gender. The survey questionnaire thus focused on collecting data for the following variables:

<u>COVID-19/SARS-CoV-2</u>

1. **Dependent Variable: Willingness to Pay for SARS-CoV-2 Testing Kit**
2. **Variable of Interest: Eliciting COVID-19 Overconfidence**
    a. Probability of oneself dying from SARS-CoV-2
    b. Probability of an individual with similar demographics dying from SARS-CoV-2
3. **COVID-19 Control Variables**
    a. Prior or current SARS-CoV-2 infection
    b. Perceived COVID-19 concern
    c. Contact with friends/family/acquaintances who may be infected
    d. Outlook on when COVID-19 cases in the Netherlands will 'plateau'
4. **Willingness to Pay for SARS-CoV-2 Testing Kit**

<u>HIV/AIDS</u>

5. **Dependent Variable: Willingness to Pay for HIV/AIDS Testing Kit**
6. **Variable of Interest: Eliciting HIV/AIDS Overconfidence**
    a. Probability of oneself dying from HIV/AIDS
    b. Probability of an individual with similar demographics dying from HIV/AIDS
7. **HIV/AIDS Control Variables**
    a. Prior or current HIV/AIDS infection
    b. Perceived HIV/AIDS concern
    c. Contact with friends/family/acquaintances who may be infected

<u>Control Variables</u>

8. **Other Control Variables**
    a. Perceived healthiness
    b. Current symptoms
    c. Prior or current health concerns
9. **Demographics and general information**

Sampling

The online survey was sent out through various social media platforms such as Facebook, LinkedIn, Whatsapp and Reddit, while emphasising the constraint that only students studying in the Netherlands or Dutch residents could participate in taking the online survey. Respondents in this case were contacted through personal means and, as a result, were unpaid. This amounted to 231 survey respondents; however, a large majority of the respondents were students' respondents given the extent of personal outreach. In order to increase the power of the data collected and minimize representation and selection biases, the online survey was also distributed through an online on-demand, self-service data collection platform, called Prolific, which allows participants who use the platform to participate in surveys for a fixed monetary reward. A constraint was implemented in the distribution of the online survey that only Dutch-residential respondents could participate in taking the online survey, allowing for a potential 819 respondents out of the 103,907 platform users to participate. Given the short length of the survey, a small reward was given to each survey respondent, and a total of 359 respondents completed the online survey through the Prolific platform. Overall, through personal distribution and distribution through Prolific, there were a total of 590 respondents to the online survey. Of the 590 respondents, 75 survey participants did not complete the survey and were thus considered invalid and discarded from the data sample. The 75 non-complete survey respondents were only from personal outreach. The reason for this is that in order to obtain the monetary reward on Prolific, survey respondents must first have completed the survey, hence there were no non-completed surveys on the Prolific platform. Of the remaining 515 respondents, 19 stated that they had been previously infected with SARS-CoV-2 and 4 stated that they were currently infected. As such, these respondents were discarded from the SARS-CoV-2 sample as the incorporation of these respondents' answers would lead to respondent bias and distorted overconfidence levels. Thus, there were a total of 493 viable SARS-CoV-2 respondents. For HIV/AIDS, two of the 515 respondents stated that they were currently infected, and as such these respondents were discarded from the HIV/AIDS sample, leading to 513 viable HIV/AIDS respondents. General descriptive statistics regarding the demographics of the sample population are displayed in Appendix IV.

DATA ANALYSIS

This section will analyse the data collected and highlight the key findings as a result of graphical and qualitative analysis. The descriptive statistics of the data will be outlined, followed by regression analyses to investigate the effect of overconfidence and demographics on the willingness to pay for SARS-CoV-2 and HIV/AIDS testing kits. These key findings will be used to determine the (non-) rejection of the three main hypotheses outlined previously in this research thesis.

Descriptive Statistics

Overconfidence

Of the 492 viable respondents for SARS-CoV-2, 482 reported their perceived probabilities of themselves, and a demographically similar individual, dying from SARS-CoV-2. When SARS-CoV-2 overconfidence was constructed as a binary variable, 268 respondents (55.60%) were overconfident with respect to dying from SARS-CoV-2 and 214 (44.40%) were not overconfident. The average perceived probability that an individual believed that they themselves would die from SARS-CoV-2 was 8.80%, and the average perceived probability that an individual believed a demographically similar individual would die from SARS-CoV-2 was 16.18%. With respect to gender, 151 male respondents (57.85%) and 114 female respondents (52.53%) were overconfident with respect to dying from SARS-CoV-2. The average perceived probability that individuals believed that they themselves would die from SARS-CoV-2 was 7.72% for males (n = 261) and 10.06% for females (n = 217). The average perceived probability that individuals believed that demographically similar individuals would die from SARS-CoV-2 was 14.70% for males (n = 261) and 17.60% for females (n = 217). Thus, females believe that they themselves and demographically similar individuals are more likely to die from SARS-CoV-2 compared to males, and female overconfidence levels are slightly higher than male overconfidence levels: 14.70 - 7.72 = 6.98pp for males, and 17.60 - 10.06 = 7.54pp for females. Figure 2 shows the perceived probabilities of dying from SARS-CoV-2 per gender:

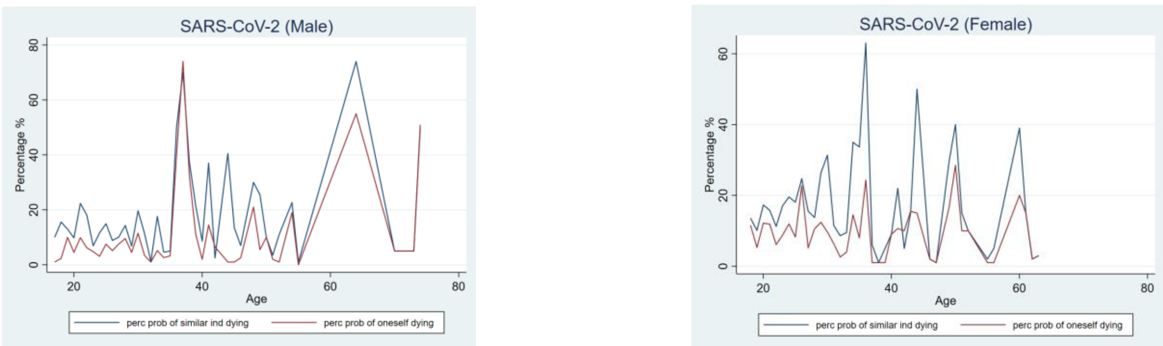

Figure 2: SARS-CoV-2 Overconfidence Levels for Males and Females, by Age

Of the 513 viable respondents for HIV/AIDS, 453 reported their perceived probabilities of themselves, and a demographically similar individual, dying from HIV/AIDS. When HIV/AIDS overconfidence was constructed as a binary variable, 281 respondents (62.03%) were overconfident with respect to dying from HIV/AIDS, and 172 respondents (37.97%) were not overconfident. The average perceived probability that an individual believed that they themselves would die from HIV/AIDS was 4.73%, and the average perceived probability that an individual believed a demographically similar individual would die from HIV/AIDS was 12.44%. With respect to gender, 180 male respondents (64.06%) and 158 female respondents (69.30%) were overconfident with respect to dying from HIV/AIDS. The average perceived probability that individuals believed that they themselves would die from HIV/AIDS was 5.30% for males (n = 252) and 4.00% for females (n = 202). The average perceived probability that individuals believed that demographically similar individuals would die from HIV/AIDS was 12.72% for males (n = 266) and 11.47% for females (n = 214). Thus, although males believe that they themselves and demographically similar individuals are more likely to die from HIV/AIDS compared to females, the overconfidence levels remain largely similar: 12.72 - 5.30 = 7.42pp for males, and 11.47 - 4.00 = 7.47pp for females. Figure 3 shows the perceived probabilities of dying from HIV/AIDS per gender:

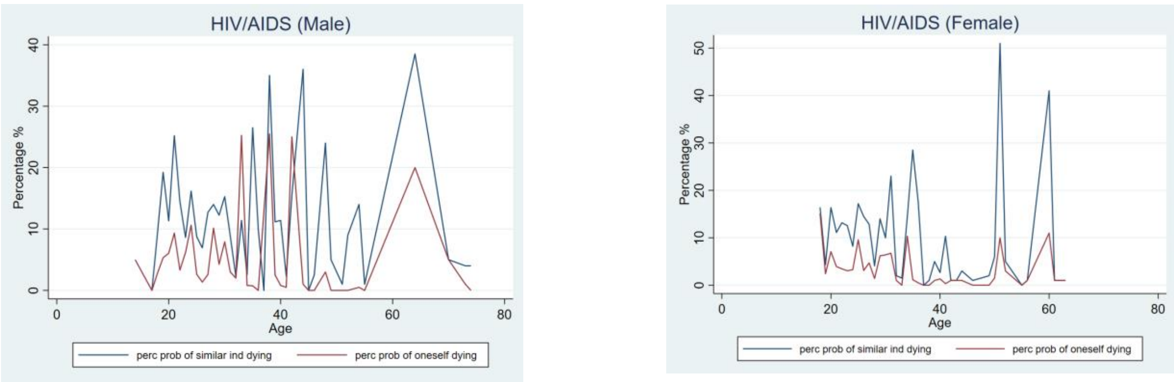

Figure 3: HIV/AIDS Overconfidence Levels for Males and Females, by Age

Willingness to Pay for a Testing Kit

Willingness to pay for a SARS-CoV-2 testing kit is constructed as a binary variable, where individuals who are willing to pay for a testing kit reported a maximum willingness to pay of more than €0, and individuals who are not willing to pay reported a maximum willingness to pay of €0 i.e. they would not be willing to test themselves unless the test was free. All 492 viable respondents for SARS-CoV-2 reported their willingness to pay for a medical testing kit, 70 respondents (14.23%) responded that they would not be willing to pay for a SARS-CoV-2 testing kit, and 422 (85.77%) responded that they would be willing to pay a sum more than €0. With respect to gender, 40 male respondents (14.93%) and 30 female respondents (13.64%) would not be willing to pay for a SARS-CoV-2 testing kit. Figure 4 displays the percentage of individuals that would be willing to pay for a SARS-CoV-2 testing kit across age. Due to the uneven distribution of the ages of individuals, it may have been the case that one individual responded for one specific age - explaining the extreme percentages of individuals willing to pay for testing kits as age increases (100% or 0%).

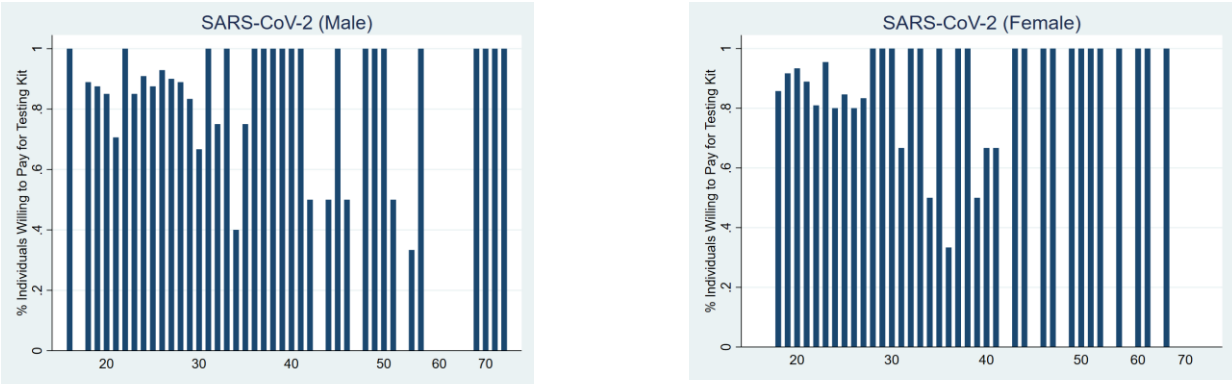

Figure 4: SARS-CoV-2 Willingness to Pay (More than €0) for a Testing Kit for Males and Females, by Age

Willingness to pay for a HIV/AIDS testing kit is constructed as a binary variable, where individuals who are willing to pay for a HIV/AIDS testing kit reported a maximum willingness to pay of more than €50, and individuals who are not willing to pay reported a maximum willingness to pay of less than €50. Of the 513 viable respondents, 505 reported their willingness to pay for a HIV/AIDS medical testing kit. 372 respondents (73.66%) responded that they would not be willing to pay €50 for a testing kit, and 133 (26.34%) responded that they would be willing to pay €50 or more. With respect to gender, 200 male respondents (71.94%) and 169 female respondents (75.45%) would not be willing to pay €50 for a HIV/AIDS testing kit. Figure 5 displays the percentage of individuals per age that would be willing to pay €50 for a HIV/AIDS testing kit across age. Due to the uneven distribution of the ages of individuals, it may have been the case that one individual responded for one specific age - again explaining the extreme percentages of individuals willing to pay for testing kits as age increases.

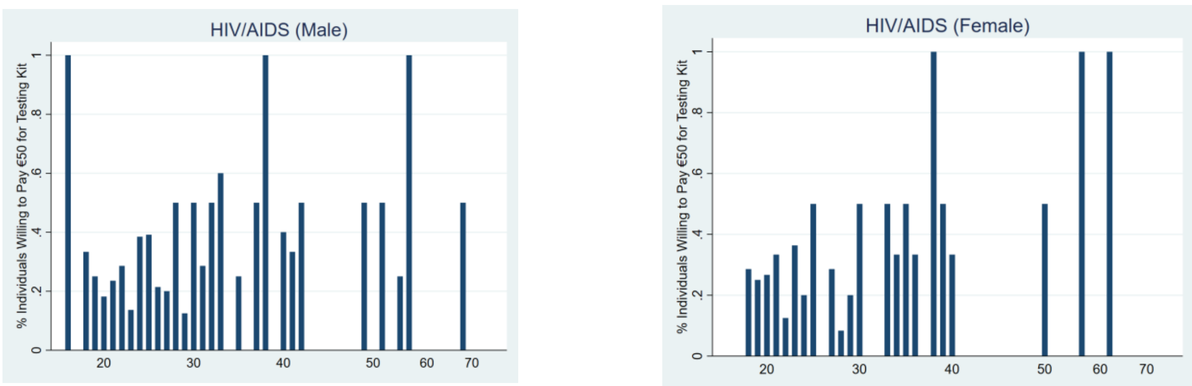

Figure 5: HIV/AIDS Willingness to Pay (€50) for a Testing Kit for Males and Females, by Age

<u>Hypothesis 1:</u> "Overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing."

To determine the quantitative effect of the variable of interest, overconfidence, on the willingness to pay for a testing kit, a logistic regression (Table 1) is estimated using the dummy variable for SARS-CoV-2 willingness to pay as the dependent variable (1 = willing to pay a monetary amount, 0 = not willing to pay any monetary amount). Numerous control variables and demographic variables are included in the estimated regression: predicted month in which SARS-CoV-2 cases will plateau in the Netherlands, self-perceived health, self-perceived SARS-CoV-2 infection, SARS-CoV-2 concern, SARS-CoV-2 contact with acquaintances, friends or family, Number of people known to be infected with SARS-CoV-2, prior health concerns, symptoms, age, gender and nationality. Model 1 includes all of the independent variables aforementioned. Model 2 aims to be more precise with the estimation of the model by excluding certain control variables, notably: predicted month in which SARS-CoV-2 cases will plateau in the Netherlands. The former is excluded since whether an individual believes that SARS-CoV-2 cases will 'plateau' in the near future or far future closely resembles an individual's overconfidence level. An overconfident individual will believe that COVID-19 will be over sooner rather than later, whereas in reality SARS-CoV-2 cases are expected to plateau in the Netherlands in July. As such, this variable is synonymous to overconfidence and if included, may take away from the true overconfidence effect captured in the variable of interest.

Variables	**Willingness To Pay for SARS-CoV-2 Testing Kit**	
	Model 1 (n = 399)	Model 2 (n = 399)
Overconfidence	-0.436 (0.314)	-0.437 (0.313)
Self-perceived health	0.134 (0.119)	0.136 (0.118)
Self-perceived SARS-CoV-2 infection	**-1.095*** (0.328)**	**-1.096*** (0.328)**
COVID-19 concern	**0.216*** (0.072)**	**0.215*** (0.071)**
COVID-19 contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	-0.194 (0.562)	-0.188 (0.560)
- Contact with friends	-0.598 (0.668)	-0.592 (0.667)
- Contact with family	0.362 (0.704)	0.359 (0.704)
Number of people known to be infected with SARS-CoV-2	**0.202* (0.113)**	**0.202* (0.113)**
Prior health concerns	-0.294 (0.380)	-0.297 (0.380)
Symptoms	0.005 (0.325)	0.010 (0.322)
Age	-0.017 (0.015)	-0.017 (0.015)
Gender		
- Female	(omitted)	(omitted)

- Male	-0.025 (0.309)	-0.27 (0.309)
- Other	(empty)	(empty)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.291 (0.652)	0.287 (0.651)
- Outside of EU (international)	-0.225 (0.741)	-0.216 (0.738)
COVID-19 case plateau prediction	-0.044 (0.323)	-
Paid Respondent	0.268 (0.403)	0.270 (0.403)
Constant	0.865 (1.127)	0.818 (1.073)

Table 1: Logistic Estimated Regression: Willingness to Pay for SARS-CoV-2 Testing Kit

It can be seen that in both Model 1 and Model 2, the coefficient of overconfidence on the willingness to pay for a SARS-CoV-2 testing kit is negative, signifying that if an individual is overconfident, then the probability that an individual is more willing to pay for a SARS-CoV-2 testing kit decreases, on average, compared to an individual who is not overconfident, ceteris paribus. The magnitude of the coefficient cannot be easily interpreted given the nature of estimated logistic regressions. However, this estimated coefficient is statistically insignificant ($p = 0.165$). Statistically significant coefficient exists only for the control variables 'self-perceived SARS-CoV-2 infection' (dummy variable), 'SARS-CoV-2 concern' (scale variable) and 'Number people known to be infected with SARS-CoV-2' (continuous variable). The coefficient on 'self-perceived SARS-CoV-2 infection' is negative, signifying that if an individual believes that they may be infected with SARS-CoV-2, then the probability that the individual is willing to pay for a testing kit decreases, on average, compared to an individual who does not believe that they are infected with SARS-CoV-2, ceteris paribus. The coefficient on 'SARS-CoV-2 concern' signifies that the more concerned an individual is about SARS-CoV-2, the more likely they are willing to pay for a testing kit, on average, ceteris paribus. The coefficient on 'number of people known to be infected with SARS-CoV-2' is positive, signifying that the more people an individual knows to be infected with SARS-CoV-2, the more likely they are to be, on average, willing to pay for a SARS-CoV-2, ceteris paribus. The coefficient directions of these variables does not change significantly between Model 1 and 2.

As a robustness check, an OLS regression is estimated using the same variable of interest and control variables as in Table 2, however given the characteristics of OLS estimation, the dependent variable 'SARS-CoV-2 willingness to pay for testing kit' is specified as a continuous variable, not as a binary variable. Robust standard errors are also estimated in the models. The aim of this robustness check is to investigate whether the model provides different conclusions to the effect and statistical significance of the variable of interest, overconfidence, on the dependent variable.

Variables	**Willingness To Pay for SARS-CoV-2 Testing Kit**	
	Model 1 (n = 401)	Model 2 (n = 401)
Overconfidence	-0.045 (0.035)	-0.045 (0.034)
Self-perceived health	0.015 (0.015)	0.015 (0.014)
Self-perceived SARS-CoV-2 infection	**-0.136*** (0.047)**	**-0.136*** (0.046)**
COVID-19 concern	**0.022*** (0.008)**	**0.022*** (0.008)**
COVID-19 contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	-0.020 (0.077)	-0.019 (0.076)
- Contact with friends	-0.066 (0.082)	-0.066 (0.082)
- Contact with family	0.054 (0.064)	0.054 (0.064)
Number of people known to be infected with SARS-CoV-2	**0.018** (0.007)**	**0.018** (0.007)**
Prior health concerns	-0.025 (0.043)	-0.025 (0.043)
Symptoms	0.007 (0.039)	0.007 (0.038)
Age	-0.002 (0.002)	-0.002 (0.002)
Gender		
- Female	(omitted)	(omitted)
- Male	-0.003 (0.035)	-0.003 (0.035)
- Other	0.124 (0.100)	-0.124 (0.099)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.032 (0.061)	0.032 (0.061)
- Outside of EU (international)	-0.022 (0.078)	-0.022 (0.079)
COVID-19 case plateau prediction	-0.0005 (0.0357)	-
Paid Respondent	0.034 (0.049)	0.034 (0.049)
Constant	0.733 (0.138)	0.732 (0.130)

Table 2: OLS Estimated Regression: Willingness to Pay for SARS-CoV-2 Testing Kit

As shown, overconfidence has a negative effect on willingness to pay for a SARS-CoV-2 testing kit and is statistically insignificant in both models, similar to the logit estimation regressions. Self-perceived infection and SARS-CoV-2 concern also once again have a negative and positive effect, respectively, on willingness to pay for a testing kit and are statistically significant to the 5% significance level. Furthermore, the effect of 'number of people known to be infected with SARS-CoV-2' on the willingness to pay for a testing kit becomes statistically significant to the 5% significance level.

Using an OLS estimated regression allows for the possibility to test for multicollinearity using a VIF (variance inflation factor) test, which measures the strength of correlations between the explanatory variables in the model. The results of the VIF test on Model 2 are shown in Appendix V. The VIF test produces a value for each explanatory variable (with a lower bound = 1 and no upper bound), with a value of 1 indicating no correlation between the explanatory variables and other explanatory variables in the model and a value between 1 and 5 indicating a moderate correlation between a given explanatory variable and the other explanatory variables in the model. If the VIF value is 5 or higher, then the coefficient estimates and statistical significance of the explanatory variable is likely to be unreliable in the estimated OLS regression. The VIF value for the variable of interest is 1.03, which is below the threshold of 'potential severe correlation'. All other explanatory variables have VIF values below 5, which indicates that the statistical significance of the coefficient effects in this OLS estimated regression are reliable.

Another robustness check takes place where the variable of interest is specified as a continuous variable – *how* overconfident an individual is – rather than as a binary variable, to investigate if the statistical significance of overconfidence on the willingness to pay for a testing kit becomes statistically significant. The results of this specification change on the logistic and OLS regressions are shown in Appendix VI. Nonetheless, in all estimated regressions the direction of the effect of overconfidence remains negative and statistically insignificant.

<u>Hypothesis 2:</u> "Overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing, and statistically significantly different across age and gender."

The effect of age and gender on the willingness to pay for a SARS-CoV-2 is already displayed in the descriptive statistics in Tables 1 and 2 previously, and in both logistic and OLS estimated regressions the coefficient effect of age is negative. For 'age', this indicates that as an individual gets older, they will be less willing to pay for a SARS-CoV-2 testing kit, on average, ceteris paribus. For 'gender', this indicates that if an individual is male, compared to being female, then they will be less willing to pay for a SARS-CoV-2 testing kit, on average, ceteris paribus. The category 'other' contains only 2 respondents, and thus even though the OLS estimated regression displays a positive effect of being 'other' on willingness to pay for a testing kit, this effect is subject to sampling bias and thus the effect cannot be reliably estimated. Nonetheless, these coefficients are statistically insignificant. To further investigate the effect of age and gender on the willingness to pay for a testing kit, an interactive term is included between age and overconfidence, and gender and overconfidence, since prior descriptive analysis shows that there may be trending relationships between the demographic variables and overconfidence. Model 2 in Table 1 and 2 is run including the interactive terms, and the results of the logistic and OLS estimated regressions are displayed in Table 3:

Variables	**Willingness To Pay for SARS-CoV-2 Testing Kit**	
	Logistic Regression (n = 400)	OLS Regression (n = 402)
Overconfidence	0.113 (0.998)	0.019 (0.111)
Overconfidence*Age	-0.021 (0.031)	-0.003 (0.004)
Overconfidence*Gender		
- Female	(omitted)	(omitted)
- Male	0.107 (0.635)	0.017 (0.070)
- Other	(empty)	0.227 (0.139)
Self-perceived health	0.132 (0.118)	0.015 (0.014)
Self-perceived SARS-CoV-2 infection	**-1.111*** (0.330)**	**-0.138*** (0.046)**
COVID-19 concern	**0.218*** (0.072)**	**0.023*** (0.008)**
COVID-19 contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	-0.219 (0.564)	-0.023 (0.079)
- Contact with friends	-0.572 (0.669)	-0.056 (0.084)
- Contact with family	0.335 (0.705)	0.052 (0.065)
Number of people known to be infected with SARS-CoV-2	**0.204* (0.113)**	**0.018** (0.007)**
Prior health concerns	-0.334 (0.384)	-0.032 (0.045)
Symptoms	0.004 (0.327)	0.007 (0.038)
Age	-0.005 (0.023)	-0.001 (0.002)
Gender		
- Female	(omitted)	(omitted)
- Male	-0.101 (0.490)	-0.013 (0.050)
- Other	(empty)	0.003 (0.103)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.222 (0.655)	0.025 (0.062)
- Outside of EU (international)	-0.209 (0742)	-0.020 (0.077)
Paid Respondent	0.245 (0.405)	0.033 (0.050)
Constant	0.578 (1.168)	0.703 (0.146)

Table 3: Logistic & OLS Estimated Regression Analysis - Willingness to Pay for SARS-CoV-2 Testing Kit

The results of the regression analyses show that the coefficient effect of the interactive term between age and overconfidence is negative, signifying that if an individual is overconfident, then as the individuals get older, they will be less likely to be willing to pay for a SARS-CoV-2 testing kit, on average, ceteris paribus. The coefficient effect of the interactive between between gender and overconfidence is positive, signifying that if an individual is overconfident and male, compared to being female, then they will be more likely to be willing to pay for a SARS-CoV-2 testing kit, on average, ceteris paribus. It is interesting to note that the effect of 'male' by itself on the willingness to pay for a SARS-CoV-2 testing kit is negative, and that the inclusion of the interactive terms in the estimated models changes the direction of the effect of 'overconfidence' on the dependent variable to positive. However, the effects of interaction terms are all statistically insignificant for age and overconfidence, and gender and overconfidence, and similarly insignificant for the individual effects of overconfidence, age and gender on the dependent variable. Thus there is no statistical interaction between age and overconfidence, and gender and overconfidence, and thus no significant conclusions about the effect of demographics on overconfidence and the willingness to pay for SARS-CoV-2 can be drawn.

<u>Hypothesis 3:</u> "The pattern that overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing is similar to HIV/AIDS."

To determine the quantitative effect of the variable of interest, overconfidence, on the willingness to pay for a HIV/AIDS testing kit, a logistic regression is estimated (Table 4) with the dependent variable as a dummy variable (1 = willing to pay €50 for a testing kit, 0 = not willing to pay €50 for a testing kit). Numerous control variables and demographic variables are included in the estimated regression: self-perceived health, self-perceived HIV/AIDS infection, HIV/AIDS concern, HIV/AIDS contact, Number of people known to be infected with HIV/AIDS, prior health concerns, symptoms, age, gender and nationality. An interactive term is included between age and overconfidence since prior analysis shows that there is a downward relationship between the two variables. Model 1 includes all of the independent variables aforementioned. Model 2 aims to be more precise with the estimation of the model by excluding certain control variables, notably: prior health and symptoms. Prior health was excluded since the infection of HIV/AIDS is not dependent on any prior health issues, and in all cases can only be spread through sexual contact or intravenous-blood contact. Whether an individual has prior health issues is not very likely to determine whether an individual gets tested for HIV/AIDS or not. Symptoms are excluded since HIV only physically appears in the first 2-4 weeks of infection in the form of flu-like symptoms. After this period, HIV remains subtly active in the body and in this stage can go unnoticed for 10-15 years without symptoms (HIV.gov, 2020). As such, unless an individual is aware that a sexual partner has HIV or otherwise, symptoms are unlikely to have an effect on an individual getting tested for HIV/AIDS compared to another infection.

Variables	**Willingness To Pay for HIV/AIDS Testing Kit**	
	Model 1 (n = 338)	Model 2 (n = 344)
Overconfidence	0.096 (0.292)	0.110 (0.288)
Self-perceived health	**0.230** (0.117)**	**0.209** (0.108)**
Self-perceived HIV/AIDS infection	0.841 (1.418)	0.881 (1.396)
HIV/AIDS concern	**0.253*** (0.091)**	**0.263*** (0.090)**
HIV/AIDS contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	0.477 (0.715)	0.441 (0.716)
- Contact with friends	-0.227 (0.973)	-0.457 (0.926)
- Contact with family	-0.470 (1.317)	-0.483 (1.319)
Number of people known to be infected with HIV/AIDS	0.018 (0.007)	0.327 (0.237)
Prior health concerns	0.046 (0.350)	-
Symptoms	-0.059 (0.284)	-
Age	**0.026 (0.014)***	**0.027 (0.014)***
Gender		
- Female	(omitted)	(omitted)
- Male	0.063 (0.278)	0.098 (0.277)
- Other	(empty)	(empty)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.665 (0.492)	0.708 (0.487)
- Outside of EU (international)	0.603 (0.641)	0.662 (0.631)
Paid Respondent	-0.086 (0.380)	-0.052 (0.376)
Constant	-4.582 (1.163)	-4.569 (1.071)

Table 4: Logistic Estimated Regression Analysis - Willingness to Pay for HIV/AIDS Testing Kit

It can be seen that in both Model 1 and Model 2, the coefficient of overconfidence on the willingness to pay for a HIV/AIDS testing kit is positive, signifying that if an individual is overconfident, then the individual will be more willing to pay €50 for a HIV/AIDS testing kit, on average, compared to an individual who is not overconfident, ceteris paribus. However, this estimated coefficient is statistically insignificant (p = 0.704). Statistically significant coefficient exists only for the control variables 'self-perceived health', 'HIV/AIDS concern' and 'age'. For 'self-perceived health' and 'HIV/AIDS concern', the estimated coefficients are positive, signifying that an increase in the control variables (individually) will lead to an increase in the likelihood that an individual is willing to pay €50 for a HIV/AIDS testing kit, on average, ceteris paribus. The coefficient direction of these variables does not change between Model 1 and 2. As a robustness check, an OLS regression is estimated using the same variable of interest and control variables as in Table 5, however given the characteristics of OLS estimation, the dependent variable must be specified as a continuous variable, not as a binary variable. Robust standard errors are also estimated in the models. The aim of this robustness check is to investigate whether the model provides different conclusions to the effect and statistical significance of the variable of interest, overconfidence, on the dependent variable.

Variables	**Willingness To Pay for HIV/AIDS Testing Kit**	
	Model 1 (n = 340)	Model 2 (n = 346)
Overconfidence	0.012 (0.046)	0.013 (0.045)
Self-perceived health	**0.035 (0.017)****	**0.031 (0.015)****
Self-perceived HIV/AIDS infection	0.195 (0.359)	0.206 (0.359)
HIV/AIDS concern	**0.045*** (0.017)**	**0.047*** (0.016)**
HIV/AIDS contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	0.075 (0.146)	0.069 (0.146)
- Contact with friends	-0.039 (0.197)	-0.089 (0.175)
- Contact with family	-0.088 (0.252)	-0.089 (0.250)
Number of people known to be infected with HIV/AIDS	**0.067* (0.036)**	**0.069* (0.035)**
Prior health concerns	0.085 (0.059)	-
Symptoms	-0.010 (0.046)	-
Age	**0.005* (0.002)**	**0.005* (0.002)**
Gender		
- Female	(omitted)	(omitted)
- Male	0.012 (0.097)	0.019 (0.046)
- Other	-0.119 (0.128)	-0.084 (0.053)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.132 (0.097)	0.032 (0.061)
- Outside of EU (international)	0.119 (0.128)	-0.022 (0.079)
Paid Respondent	-0.016 (0.066)	0.034 (0.049)
Constant	-0.313 (0.161)	-0.302 (0.143)

Table 5: OLS Estimated Regression: Willingness to Pay for HIV/AIDS Testing Kit

As shown in Table 5, overconfidence has a positive effect on the willingness to pay for an HIV/AIDS and is statistically insignificant in both models, similar to the logit estimation regressions. Self-perceived health and HIV/AIDS concerns also once again have a negative effect on the dependent variable and remain statistically significant to the 5% significance level.

A VIF test is performed on the OLS regression Model 2 in Table 5 to measure the strength of correlations between the explanatory variables in the model. The results of the VIF test are shown in Appendix V. The VIF value for the variable of interest is 1.03, which is below the threshold of 'potential severe correlation'. All other explanatory variables have VIF values below 5, which indicates that the statistical significance of the coefficient effects in this OLS estimated regression are reliable.

Another robustness check takes place where the variable of interest is specified as a continuous variable – *how* overconfident an individual is – rather than as a binary variable to investigate if the statistical significance of overconfident becomes significant. The results of this specification change on the logistic and OLS regressions are shown in Appendix VI. When this is the case, the effect of the level of overconfidence on the willingness to pay for a testing kit becomes statistically significant (at the 10% level). The effect remains positive - similar to all other HIV/AIDS models - which signifies that the more overconfident an individual is, the more they will be willing to pay for a testing kit, on average, ceteris paribus. This result contradicts the theory that if an individual is overconfident, then they will be less willing to pay for a testing kit - this contradiction will be elaborated upon in the discussion section of this research thesis.

The effect of age and gender on the willingness to pay for an HIV/AIDS is already displayed in Tables 4 and 5 previously, and in both logistic and OLS estimated regressions the coefficient effect of age is positive, and the coefficient effect of gender is negative. For 'age', this indicates that as an individual gets older, they will be more willing to pay for a SARS-CoV-2 testing kit, on average, ceteris paribus. For 'gender', this indicates that if an individual is male, compared to being female, then they will be less willing to pay for a HIV/AIDS testing kit, on average, ceteris paribus. Nonetheless, these coefficients are statistically insignificant. To further investigate the effect of age and gender on the willingness to pay for a testing kit, an interactive term is included between age and overconfidence, and gender and overconfidence. Model 2 in Tables 4 and 5 are run including the interactive terms, and the results of the logistic and OLS estimated regressions are displayed in Table 6:

Variables	**Willingness To Pay for HIV/AIDS Testing Kit**	
	Logistic Regression (n = 346)	OLS Regression (n = 348)
Overconfidence	0.438 (0.899)	0.065 (0.158)
Overconfidence*Age	-0.021 (0.027)	-0.003 (0.005)
Overconfidence*Gender		
- Female	(omitted)	(omitted)
- Male	0.540 (0.572)	0.085 (0.093)
- Other	(empty)	-0.034 (0.104)
Self-perceived health	**0.206* (0.108)**	**0.030* (0.015)**
Self-perceived HIV/AIDS infection	0.829 (1.396)	0.200 (0.363)
HIV/AIDS concern	**0.263*** (0.091)**	**0.046*** (0.016)**
HIV/AIDS contact		
- None	(omitted)	(omitted)

- Contact with acquaintances	0.314 (0.730)	0.051 (0.143)
- Contact with friends	-0.498 (0.926)	-0.094 (0.178)
- Contact with family	-0.549 (1.337)	-0.094 (0.244)
Number of people known to be infected with HIV/AIDS	0.342 (0.243)	**0.070** (0.035)**
Age	**0.041* (0.023)**	**0.007* (0.004)**
Gender		
- Female	(omitted)	(omitted)
- Male	-0.249 (0.466)	-0.035 (0.073)
- Other	(empty)	-0.069 (0.093)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.668 (0.490)	0.135 (0.097)
- Outside of EU (international)	0.623 (0.635)	0.126 (0.130)
Paid Respondent	-0.097 (0.382)	-0.015 (0.067)
Constant	-4.715 (1.199)	-0.321 (0.168)

Table 6: Logistic & OLS Estimated Regression Analysis - Willingness to Pay for HIV/AIDS Testing Kit

The results of the regression analyses show that the coefficient effect of the interactive term between age and overconfidence is negative, signifying that if an individual is overconfident, then as the individuals get older, they will be less likely to be willing to pay for a HIV/AIDS testing kit, on average, ceteris paribus. The coefficient effect of the interactive between between gender and overconfidence is positive, signifying that if an individual is overconfident and male, compared to being female, then they will be more likely to be willing to pay for a HIV/AIDS testing kit, on average, ceteris paribus. It is interesting to note that the effect of 'male' by itself on the willingness to pay for a HIV/AIDS testing kit is negative, and that the inclusion of the interactive terms in the estimated models changes the direction of the effect of 'overconfidence' on the dependent variable to positive. However, the effects of interaction terms are all statistically insignificant for age and overconfidence, and gender and overconfidence, and thus there is no statistical interaction between gender/age and overconfidence. The individual effects of gender and overconfidence on the willingness to pay for a testing kit remain insignificant, and the effect of age is once again positive and statistically significant at the 10% significance level.

<u>DISCUSSION</u>

This section will interpret the results found in the 'Data Analysis' section to justify whether the initial hypotheses are rejected or not rejected. Any further relevant findings will be outlined.

<u>Hypothesis 1:</u> "Overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing."

The estimated regression analyses aim to find the effect of overconfidence on the willingness to pay for a SARS-CoV-2 testing kit, and although there is a negative effect of overconfidence on SARS-CoV-2 medical information avoidance across all models, this effect is statistically insignificant and hence it is difficult to infer about the effect of overconfidence of the dependent variable. In these models, overconfidence was used as a binary variable where individuals were classified as either overconfident (1) or not overconfident (0). If overconfidence is used as a continuous variable instead of as a binary variable, the results of this estimation still show that the effect of overconfidence on medical information avoidance is positive, but again statistically insignificant. As a result, the main hypothesis is rejected since a causal relationship between overconfidence and willingness to pay for a SARS-CoV-2 testing kit cannot be inferred.

This is likely to be the case since there are a significant number of factors that are not accounted for regarding overconfidence, such as level of education or income, the effects of which are incorporated in the random error term. Existing literature finds a positive relationship between level of education and overconfidence, and it can be supposed that even though a more educated individual would be more likely to understand the risks of SARS-CoV-2, self-attribution is likely to increase with level of education (Mishra et al., 2015). However, there is limited existing literature between self-attribution and overconfidence, although there is evidence that a component of self-attribution, self-enhancement, leads to overconfidence in non-professional traders (Czaja et al., 2017). As for income, an individual's level of income will most likely have an effect on the monetary amount the individual would be willing to spend on a testing kit. Similarly, studies have found a significant positive correlation between annual income and overconfidence bias, as well negative correlations between income and lower representativeness, availability, loss aversion and mental accounting (Renu et al., 2018). Omitting both of factors of education and income are likely to have led to an endogeneity issue in which the random unobserved factors could be correlated with the variable of interest, overconfidence, which would bias the coefficient effects of overconfidence on medical information avoidance as well as the statistical significance of the effect. Further investigation will have to include level of education and income as control variables in the analysis between overconfidence and likelihood of avoiding medical information.

The variables that were statistically significant in determining the willingness to pay for a SARS-CoV-2 testing kit were 'self-perceived SARS-CoV-2 infection', 'COVID-19 concern' and 'number of people known to be infected with SARS-CoV-2'. The coefficient effects of the two latter variables are positive, indicating that the more concerned an individual is, or the more people an individual knows to be infected with SARS-CoV-2, the more likely that they will be willing to pay for a testing kit, on average, ceteris paribus. However, the effect of the latter is negative, indicating that if an individual believes that they could be infected with SARS-CoV-2, compared to not being infected, then they are less likely to be willing to pay for a SARS-CoV-2 testing kit, on average, ceteris paribus. It may be the case that individuals who believe they are infected with SARS-CoV-2 would prefer not to know whether they have indeed contracted the virus or not, or believe that the symptoms are too similar to flu symptoms to justify being tested for. Especially in the Netherlands, where individuals were encouraged to self-isolate rather than find a way to test themselves for SARS-CoV-2, this may explain the finding that residents in the Netherlands are not actually looking to get tested as a result of government policy.

Hypothesis 2: "Overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing across age and gender."

Based on mean overconfidence levels, it was found that 55.60% of individuals are overconfident with regards to the comparative-optimism effect. 57.85% of males and 52.53% and females are overconfident, however females perceive themselves and 'demographically similar individuals' are more likely to die from SARS-CoV-2 compared to men, however the level of overconfidence was slightly higher for women (7.54pp) than for men (6.98pp). Objectively, men are more likely to die from SARS-CoV-2 compared to women and thus this finding correlates with existing evidence regarding SARS-CoV-2 attitudes and case statistics. Descriptive statistics about individuals' willingness to pay for a SARS-CoV-2 medical test found that 85.75% would be willing to pay for a testing kit (85.07% of males and 86.46% of females). It has been found in existing literature that men are not only more overconfident but are more likely to avoid medical information - this may explain the slight difference in the percentage of individuals willing to get tested for SARS-CoV-2.

Investigating gender in estimated regressions find that, in all cases, males are less likely to be willing to test for SARS-CoV-2, however this effect is statistically insignificant. The inclusion of the interactive term between gender and overconfidence in the regression analyses was used to account for the fact that overconfidence may have an effect on the willingness to pay for a testing kit that may depend on gender. However, the coefficient effect on the interactive term is statistically insignificant. Although SARS-CoV-2 overconfidence exists across age and gender, the relationship between age and overconfidence cannot be speculated upon. It is difficult to comment on the overconfidence across age based on descriptive statistics given that there are overconfidence spikes that occur randomly across and the trend of the relationship seems randomized. Furthermore, the coefficient effect of age on the willingness to buy a SARS-CoV-2 testing kit is positive, but statistically insignificant. The inclusion of the interactive term between age and overconfidence in the regression analyses was used to account for the fact that overconfidence may have an effect on medical information avoidance that may depend on age. However, the coefficient effects of the interaction term was statistically insignificant.

As such, hypothesis 2 is rejected given that the effects of demographics on the willingness to pay for a testing kit are statistically insignificant, and thus a comparative relationship between age and overconfidence, and gender and overconfidence, leading to the willingness to pay for a testing kit cannot be inferred.

<u>Hypothesis 3:</u> "The pattern that overconfidence is a statistically significant variable in determining individuals' willingness to undergo SARS-CoV-2 medical testing is similar to HIV/AIDS."

The estimated regression analyses aim to find the effect of overconfidence on the willingness to pay for a HIV/AIDS testing kit, and although there is a positive effect of overconfidence on HIV/AIDS medical information avoidance across all models, this effect is statistically insignificant and hence it is difficult to infer about the effect of overconfidence of the dependent variable. In these models, overconfidence was used as a binary variable where individuals were classified as either overconfident (1) or not overconfident (0). If overconfidence is used as a continuous variable instead of as a binary variable, then the effect of overconfidence becomes statistically significant. This signifies that the more overconfident an individual is, the more likely they will be willing to pay for a HIV/AIDS testing kit, on average, ceteris paribus. This contradicts general findings about the relationship between overconfidence and the willingness to pay for a testing kit, where it is expected that overconfident individuals would be less likely to pay for a testing kit…

The variables that were statistically significant in determining the willingness to pay for a HIV/AIDS testing kit were 'self-perceived health', 'HIV/AIDS concern' and 'number of people known to be infected with HIV/AIDS' and 'age'. The coefficient effects of all of the mentioned variables are positive, indicating that the more an individual perceives themselves as healthy, or more concerned an individual is about HIV/AIDS, or the more people an individual knows to be infected with HIV/AIDS, or the older an individual is, the more likely that they will be willing to pay for a testing kit, on average, ceteris paribus. It is reasonable to assume that in the case of HIV/AIDS concern and knowing individuals who have HIV/AIDS, that an individual will be more willing to get tested due to physiological factors such as anxiety and uncertainty. It is interesting that the more healthy an individual perceives themselves to be, the more willing they will be to get medically tested. This seemingly contradicts rational behaviour - since an individual who perceives themselves as less healthy should be more willing to test themselves medically. Similarly, the positive effect of age signifies that older individuals would be more willing to get tested, even though objectively, HIV/AIDS is spread more rapidly most through young adults, since the number of sexual partners tends to decrease as an individual gets older.

Descriptive statistics of HIV/AIDS overconfidence levels and the willingness to buy a testing kit show that 62.03% of individuals (64.06% of males and 69.30% of females) are overconfident with regards to the comparative optimism effect. Men perceive themselves and 'demographically similar individuals' to be slightly more likely to die from HIV/AIDS compared to females, however overconfidence levels remain largely similar between males (7.42pp) and females (7.47pp). The overconfidence levels are similar to that of SARS-CoV-2, however individuals, on average, perceive themselves and others as more likely to die from SARS-CoV-2 than HIV/AIDS at the time of the survey. This is likely due to the relevance and the panic associated with SARS-CoV-2 in February, even though objectively there is less than one percent chance that any individual contracts HIV/AIDS or SARS-CoV-2. Similarly, since the survey was structured such that questions about SARS-CoV-2 were ordered first, order effects would make it such that individuals may anchor their perceived probabilities about HIV/AIDS from perceived probabilities on SARS-CoV-2, and may deem themselves less likely to die from HIV/AIDS than SARS-CoV-2 in February. Descriptive statistics about individuals' willingness to pay for a HIV/AIDS medical test (for €50) found that 26.34% would be willing to pay for a testing kit (28.06% of males and 24.55% of females). HIV/AIDS case statistics find that men account for a significant amount of HIV cases worldwide and are equivalently more at-risk individuals to contract HIV compared to women, and these findings may explain why men are more likely to get tested for HIV/AIDS compared to women. These findings differ from SARS-CoV-2, as women are slightly more overconfident regarding SARS-CoV-2 death, but are slightly more likely to get tested, on average. In the case of HIV/AIDS, neither gender is more overconfident regarding HIV/AIDS death, however men are more likely to get tested for HIV/AIDS as they are more at-risk individuals compared to women, on average.

Investigating gender in estimated regressions find that, in all cases, males are more likely to be willing to test for HIV/AIDS, however this effect is statistically insignificant. The inclusion of the interactive term between gender and overconfidence in the regression analyses was used to account for the fact that overconfidence may have an effect on the willingness to pay for a testing kit that may depend on gender. However, the coefficient effect on the interactive term is statistically insignificant. Although SARS-CoV-2 overconfidence exists across age and gender, the relationship between age and overconfidence cannot be speculated upon. It is difficult to comment on the overconfidence across age based on descriptive statistics given that there are overconfidence spikes that occur randomly across and the trend of the relationship seems randomized. Furthermore, the coefficient effect of age on the willingness to buy a SARS-CoV-2 testing kit is positive, but statistically insignificant. The inclusion of the interactive term between age and overconfidence in the regression analyses was used to account for the fact that overconfidence may have an effect on medical information avoidance that may depend on age. However, the coefficient effects of the interaction term was statistically insignificant.

The main difference between the two analyses between HIV/AIDS and SARS-CoV-2 medical avoidance is that the direction of the effect of overconfidence on the willingness to pay for a testing kit is positive for HIV/AIDS and negative for SARS-CoV-2. Given the structure of the survey – asking questions firstly about SARS-CoV-2 and secondly about HIV/AIDS – this is likely to have affected overconfidence levels about HIV/AIDS since respondents are likely to have anchored the perceived probabilities of similar individuals, or themselves, dying from HIV/AIDS from the perceived probabilities of dying from SARS-CoV-2. The fact that the survey was released 1 month after a world declaration of emergency regarding COVID-19, individuals are likely to have overestimated the probabilities of dying from SARS-CoV-2 or under-estimated the probabilities of dying from HIV/AIDS since the topic of the coronavirus spread was significantly more relevant than the topic of HIV/AIDS spread in the Netherlands. Pandemics are significantly more likely to induce states of anxiety and panic in a population, and as such it is unsurprisingly that in all regression estimation models of HIV/AIDS and SARS-CoV-2, that increasing 'HIV/AIDS concern' or 'SARS-CoV-2 concern' is statistically significant in increasing the likelihood of paying for a testing kit. It is logical that fear or anxiety of being infected by any virus will make an individual more likely to test themselves for infection, especially in a national state of pandemic emergency. Similarly, for HIV/AIDS, if an individual is not sexually active, a higher level of overconfidence may reflect this foundation, however if the individual believed that after a sexual encounter that they may be infected, they may be more likely to not avoid medical HIV/AIDS information given the fear and anxiety surrounding STI's and STD's. Therefore, it may be the case that anxiety and fear, rather than overconfidence, play a bigger role in the effect of individuals' willingness to pay for a testing kit. This remains to be investigated by future analysis.

Overall, overconfidence is not statistically significant in determining an individual's willingness to pay for a testing kit, except in the case where overconfidence is used as a continuous variable in HIV/AIDS regressions. There are similarities in the behavioural patterns between the two viruses such as the statistical significance of concern on the dependent variable. However, given the statistically insignificant effect of overconfidence on the willingness to pay for a SARS-CoV-2 testing kit, it cannot be speculated whether the relationship between overconfidence and the willingness to pay for a SARS-CoV-2 testing kit, and overconfidence and the willingness to pay for a HIV/AIDS testing kit, display similar patterns. Thus, hypothesis 3 is rejected as the effect of overconfidence on the dependent variable differs between the two relationships in terms of direction and statistical significance.

Limitations

Sample Representation/Selection Bias: Given the difficulties in reaching out to as many Dutch residents on a nationwide scale, it may be the case that the data sample is not an accurate representation of individuals' mindsets, attitudes and behaviours regarding the COVID-19 pandemic and HIV/AIDS. Examples of selection bias within the dataset are the outreach to students studying at the Erasmus University of Rotterdam compared to any other student body in the Netherlands or having a predominantly young-adult data sample. Within selection bias, there may be response bias due to 60% of respondents coming from the Prolific platform. In this case, it may be that, although the data differs between individuals, the data collected represents only respondents who regularly undertake surveys (Furnham, 1986). As such, it may be that regular survey respondents do not respond passively to a certain stimulus, but combine sources of information (for example, through previous surveys) to develop answers in a given situation (Orne, 1962). As a result, the data sample may not be an accurate representation of the true population of the Netherlands, or the data sample may be considered false and distorted (Heckman, 1979).

Question Order/Order Effects Bias: The online survey was sent out and structured in a non-randomized way: COVID-19-related questions followed by HIV/AIDS-related questions. If questions are ordered in a certain way, respondents may react differently to questions based on the sequential order of the questions in the online survey (Blankenship, 1942). To give a more relevant example, by asking questions about COVID-19 in the first part, and HIV/AIDS in the second part, respondents may anchor their responses to questions such as "What, do you believe, is the % probability that an individual with your same demographics and lifestyle dies due to HIV/AIDS in the near future?" to their own responses to COVID-19 questions, and vice versa. More relevantly, it may be the case that the respondent may only believe their own probability of dying due to SARS-CoV-2 is 5%, then when asked their own probability of dying due to HIV/AIDS, respondents may anchor the probability compared to the probability of dying from SARS-CoV-2. This will be accounted for in the analysis of the data. To minimize this order effects bias, it would have been preferred to randomize the survey distribution such that 50% of respondents would receive COVID-19 questions in part 1 and HIV/AIDS questions in part 2, and the other 50% of respondents would receive the inverse.

Paid Respondents vs. Unpaid Respondents: Respondents that answered the online survey voluntarily without payment were not under the influence of a monetary incentive, unlike the respondents from the Prolific platform who received a small monetary reward for completing the survey. When looking at the response time on average for unpaid respondents versus unpaid respondents, the response time, on average, was significantly less for paid respondents versus unpaid respondents. Regarding paid respondents, it may be the case that these respondents were more focused on finishing the survey as quickly as possible to receive the monetary reward and were thus less focused on the quality of their answers compared to the monetary incentive. This would explain the rapidity of the survey completion. On the other hand, it may be that unpaid respondents were less inclined to put in mental effort towards answering more demanding questions, and as such may also lead to lower quality answers. Analysis will consider the significant differences in answers (if any) between the unpaid and paid respondents, however it would have been more consistent to have a data sample made entirely of paid respondents, or unpaid respondents.

Within-subject Design Limitations: This thesis research focuses on a within-subject approach; the same individual tests all the conditions, whereas in a between-subject design, different individuals would test different conditions i.e. COVID-19 or HIV/AIDS questions. A within-subject design allows for efficient statistical efficiency and good control for independent variables, since all individual respondents are subject to the same survey questions and conditions. However, a disadvantage of exposing subjects to multiple conditions is the carryover effect where, similar to the order effects bias, after individuals are exposed to COVID-19 questions, individuals' answers regarding HIV questions may be impacted by prior-question experience and exposure to multiple conditions. Although the survey had a short completion time, each respondent experiences carryover effects individually and differently. Fatigue/boredom may have also played a role in survey completion, the effect of which would have been minimized by splitting the survey questions with a between-subject design, while conjointly minimizing the carryover effect.

Hypothetical Questioning & Question Misunderstanding: One of the major limitations with the distribution of anonymous surveys is that if a respondent does not understand a question, they cannot receive support otherwise this would be breaking the anonymity behind the survey. As such, respondents were given the possibility to leave questions unanswered if they were not well understood, which may lead to missing observations in the data sample. It may be the case that there are numerous outlier observations due to question misunderstanding given some of the questions' technical phrasings. This will be identified in the data analyses and potentially excluded from analysis if there is a significant outlier effect that will distort the analysis results. Additionally, some of the questions induce hypothetical thinking by asking the respondent to put themselves to an extent to a realistic situation. The issue with this is that respondent answers, although dependent on their own conclusions, also depend on the extent to which a respondent has already been exposed to the hypothetical situation. As a result, the validity of the answers to such relevant hypothetical questions may be questioned, however this will be considered during the data analysis process.

Risk Perception: The judgement about an individual's probabilities of dying from HIV/AIDS or SARS-CoV-2, or self-perceived health, is highly subjective and can become further distorted when asking to numerically judge risk perception. This is due to the individuals perceiving risk probabilities differently, and as such one individual's answer may differ numerically from another, even though they have similar perceptions. The origins of such differences in risk perceptions can be psychological (through heuristics and biases), cultural or through social ramifications such as social media or surrounding environment. The subjective judgemental aspect of risk perceptions is accounted for by averaging such perceptions within age categories so as to gain an overall risk perception using a larger sample. However, over smaller sampling, risk perception has a larger variance and may lead to inconsistent results.

CONCLUSION

This research thesis studies the effect of the overconfidence bias on the ostrich effect in the form of an individual's willingness to pay for HIV/AIDS and SARS-CoV-2. Quantifying the effect of overconfidence on the willingness to pay for a testing kit finds opposite effects for HIV/AIDS and SARS-CoV-2, notably, individuals who are overconfident are less likely to pay for a SARS-CoV-2 testing kit, on average, and individuals who are overconfident are more likely to pay for a HIV/AIDS testing kit. Nonetheless, the quantitative effects are statistically insignificant and thus inconclusive, except in the case that overconfidence is constructed as a continuous variable. A higher concern of a virus is a common and statistically significant factor in both virus cases towards the decision of being more willing to pay for a testing kit. The most natural explanation is that the research was undertaken during a global pandemic, and thus concern about the spread of viruses is likely to have a significant effect on an individual's decision to get tested or not. This pattern is also consistent in HIV/AIDS as well as SARS-CoV-2, probably due to general rise in panic, fear, and health awareness regarding viruses as a result of the global state of emergency, especially at the time that this research was undertaken in March 2020. Although this study does not show any conclusive evidence to the relationship between overconfidence and willingness to pay for a testing kit during a pandemic, the rarity of such a global phenomenon allows that this study to contribute to a new line of literature (pandemic economics) and further investigation should aim to investigate how much of a role overconfidence plays in the ostrich effect during a time where avoiding medical testing can cost significantly more lives than the viruses we generally encounter in the course of our lives.

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APPENDIX

APPENDIX I: Survey (English)

"MASTER THESIS SURVEY (ENGLISH)
TO BE COMPLETED ONLY BY DUTCH INDIVIDUALS OR RESIDENTS LIVING IN THE NETHERLANDS

Thank you for agreeing to complete this important survey! The survey primarily focuses on questions about the current Coronavirus pandemic (COVID-19), alongside other questions.

The survey will only take 3-4 minutes. ALL ANSWERS ARE ANONYMOUS!!! You may now begin the survey. Please click on the arrow on the bottom right of the page. Thank you very much!"

COVID-19

1. **What, do you believe, is the % probability that an individual with your same demographics and lifestyle dies due to SARS-CoV-2 in the near future?**
   (0% = No chance at all, 100% = Extremely likely)
   - Scale answer (0 – 100%)
2. **What, do you believe, is the % probability that you die due to SARS-CoV-2 in the near future?**
   (0% = No chance at all, 100% = Extremely likely)
   - Scale answer (0 – 100%)
3. **Common symptoms of SARS-CoV-2 include shortness of breath, coughing, and fever. If you experienced these symptoms, what, do you believe, is the % probability that you will die due to SARS-CoV-2?**
   (0% = No chance, 100% = Extremely likely)
   - Scale answer
4. **Currently, self-testing kits are not available regarding SARS-CoV-2 testing but should be made available in the near future. Assume that you believe you may have been infected with SARS-CoV-2. What is the maximum that you are willing to pay for a SARS-CoV-2 testing kit that is delivered to your residence?**
   - Up to €10
   - Up to €20
   - Up to €30
   - Up to €40
   - Up to €50
   - Up to €60
   - Up to €70
   - Up to €80
   - Up to €90
   - Up to €100
   - More than €100
   - I would order the testing kit only if it was free (€0)

5. **When, do you believe, the number of COVID-19 cases in the Netherlands will "plateau" i.e. when the highest number of COVID-19 cases will be reached, and will only decrease from thereon?**
    - May 1st – 31th
    - June 1st – 30th
    - July 1st – 31st
    - August 1st – 31st
    - September 1st – 30th
    - October 1st – 31st
    - November 1st – 30th
    - December 1st – 31st
    - 2021
6. **On a scale from 1-10, how healthy would you consider yourself?**
   (1 = Extremely unhealthy, 10 = Extremely healthy)
    - Scale answer
7. **Have you already been infected with, or believe you are infected with, SARS-CoV-2 virus?**
    - Yes, previously infected
    - Yes, currently infected
    - Unsure, I believe I could be infected
    - No
8. **On a scale from 1-10, how concerned are you about contacting SARS-CoV-2?**
   (1 = Not at all concerned, 10 = Extremely concerned)
    - Scale Answer
9. **To the best of your knowledge, have you already been in contact with someone who is likely to, or is confirmed to have been, infected with SARS-CoV-2?**
   Please tick multiple answers, if relevant.
    - Yes, contact through friends
    - Yes, contact through family
    - Yes, contact through acquaintances
    - No
10. **To the best of your knowledge, how many family members and/or friends are suspected to have been, or are confirmed to be/have been, infected with SARS-CoV-2?**
    - Open Answer
11. **Please tick below any symptoms that you currently have:**
    - Fever
    - Nausea
    - Sneezing
    - Blocked Nose
    - Coughing
    - Sore Throat
    - Vomiting
    - Shortness of Breath
    - Fatigue
    - None of these symptoms
12. **Do you have any prior, or current, health concerns?**
    Please tick multiple answers, if relevant.
    - Yes, respiratory concerns
    - Yes, cardiovascular concerns
    - Yes, cancer concerns
    - Yes, other disease concerns
    - No health concerns

HIV/AIDS

13. **What, do you believe, is the % probability that any single individual with your same demographics and lifestyle dies due to HIV/AIDS in the future?**
    (0% = No chance, 100% = Extremely likely)
    - Scale answer
14. **What, do you believe, is the % probability that you die due to HIV/AIDS in the future? (0% = No chance, 100% = Extremely likely)**
    - Scale answer
15. **2-4 weeks after HIV infection, 2/3 of individuals will experience flu-like symptoms, headaches and fever. If you experienced such symptoms, what, do you believe, is the % probability that you will die due to HIV/AIDS? (0% = No chance, 100% = Extremely likely)**
    - Scale answer
16. **Assume that you believe you may have HIV/AIDS. What is the maximum that you be willing to pay for a HIV/AIDS self-testing kit?**
    - Up to €10
    - Up to €20
    - Up to €30
    - Up to €40
    - Up to €50
    - Up to €60
    - Up to €70
    - Up to €80
    - Up to €90
    - Up to €100
    - More than €100
    - I would order the testing kit only if it was free (€0)
17. **Have you already been infected with, or believe you are infected with, HIV/AIDS?**
    - Yes, currently infected
    - Unsure, I believe I could be infected
    - No
18. **On a scale from 1-10, how concerned are you about contracting HIV/AIDS?**
    (1 = Not at all concerned, 10 = Extremely concerned)
    - Scale Answer
19. **To the best of your knowledge, have you already been in (sexual or non-sexual) contact with someone who is likely to be, or is confirmed to be, infected with HIV/AIDS?**
    Please tick multiple answers, if relevant.
    - Yes, contact through friends
    - Yes, contact through family
    - Yes, contact through acquaintances
    - No
20. **To the best of your knowledge, how many family members or friends are suspected to be, or are confirmed to be, infected with HIV/AIDS?**
    - Open answer

DEMOGRAPHICS AND GENERAL INFORMATION

21. **What is your gender?**
    - Male
    - Female
    - Other
22. **What is your age?**
    - Open answer
23. **What is your nationality?**
    - Open answer

APPENDIX II: Survey (Dutch)

ALLEEN IN TE VULLEN DOOR NEDERLANDSE INDIVIDUEN OF INWONERS DIE IN NEDERLAND WONEN

"Bedankt dat je ermee instemt om deze belangrijke enquête in te vullen! Het onderzoek richt zich voornamelijk op vragen over de huidige Coronavirus-pandemie (COVID-19), naast andere vragen.

De enquête duurt slechts 3-4 minuten. ALLE ANTWOORDEN ZIJN ANONIEM!!! U kunt nu aan de enquête beginnen. Klik op de pijl rechts onderaan de pagina. Hartelijk bedankt!"

COVID-19

1. **Wat is volgens u de% kans dat een persoon met dezelfde demografie en levensstijl in de nabije toekomst sterft als gevolg van SARS-CoV-2?**
   (0% = helemaal geen kans, 100% = zeer waarschijnlijk)
   - Schaal antwoord (0 – 100%)
2. **Wat is volgens u de% kans dat u in de nabije toekomst sterft als gevolg van SARS-CoV-2?**
   (0% = helemaal geen kans, 100% = zeer waarschijnlijk)
   - Schaal antwoord (0 – 100%)
3. **Veel voorkomende symptomen van SARS-CoV-2 zijn kortademigheid, hoesten en koorts. Als u deze symptomen heeft ervaren, wat is volgens u dan de% kans dat u sterft als gevolg van SARS-CoV-2?**
   (0% = geen kans, 100% = zeer waarschijnlijk)
   - Schaal antwoord (0 – 100%)
4. **Momenteel zijn er geen zelftestkits beschikbaar met betrekking tot SARS-CoV-2-tests, maar deze moeten in de nabije toekomst beschikbaar worden gesteld. Stel dat u denkt dat u mogelijk besmet bent met SARS-CoV-2. Wat is het maximum dat u bereid bent te betalen voor een SARS-CoV-2-testkit die bij u thuis wordt afgeleverd?**
   - Tot € 10
   - Tot € 20
   - Tot € 30
   - Tot € 40
   - Tot € 50
   - Tot € 60
   - Tot € 70
   - Tot € 80
   - Tot € 90
   - Tot € 100
   - Meer dan € 100
   - Ik zou de testkit alleen bestellen als deze gratis was (€ 0)
5. **Wanneer denkt u dat het aantal COVID-19-gevallen in Nederland zal "platlopen", d.w.z. wanneer het hoogste aantal COVID-19-gevallen zal worden bereikt, en daarna alleen maar zal afnemen?**
   - 1 - 31 mei
   - 1 - 30 juni
   - 1 - 31 juli
   - 1 - 31 augustus
   - 1 - 30 september
   - 1 - 31 oktober
   - 1 - 30 november
   - 1 - 31 december
   - 2021

6. **Hoe gezond zou je jezelf op een schaal van 1-10 vinden?**
   (1 = Extreem ongezond, 10 = Extreem gezond)
   - Schaal antwoord (1 – 10)
7. **Bent u al besmet met of denkt u momenteel besmet te zijn met het SARS-CoV-2-virus?**
   - Ja, eerder besmet
   - Ja, momenteel besmet
   - Weet ik niet zeker, ik denk dat ik besmet kan zijn
   - Nee
8. **Hoe bezorgd bent u over het contacteren van SARS-CoV-2 op een schaal van 1-10?**
   (1 = helemaal niet bezorgd, 10 = zeer bezorgd)
   - Schaal antwoord (1 – 10)
9. **Heeft u, voor zover u weet, al contact gehad met iemand die waarschijnlijk besmet is of zal zijn met SARS-CoV-2?**
   Kruis indien nodig meerdere antwoorden aan.
   - Ja, contact opnemen via vrienden
   - Ja, contact via familie
   - Ja, contact via kennissen
   - Nee
10. **Voor zover u weet, hoeveel familieleden en / of vrienden worden vermoed of zijn / zijn besmet met SARS-CoV-2?**
    - Open antwoord
11. **Vink hieronder de symptomen aan die u momenteel heeft:**
    - Koorts
    - Misselijkheid
    - Niezen
    - Verstopte neus
    - Hoesten
    - Keelpijn
    - Braken
    - Kortademigheid
    - Vermoeidheid
    - Geen van deze symptomen
12. **Heeft u eerdere of huidige gezondheidsproblemen?**
    Kruis indien nodig meerdere antwoorden aan.
    - Ja, ademhalingsproblemen
    - Ja, cardiovasculaire problemen
    - Ja, zorgen over kanker
    - Ja, andere zorgen over de ziekte
    - Geen gezondheidsproblemen

HIV / AIDS

13. **Wat is volgens u de% kans dat een enkel individu met dezelfde demografie en levensstijl in de toekomst sterft als gevolg van hiv / aids?**
    (0% = geen kans, 100% = zeer waarschijnlijk)
    - Schaal antwoord (0 – 100%)
14. **Wat is volgens u de% kans dat u in de toekomst sterft als gevolg van hiv / aids?**
    (0% = geen kans, 100% = zeer waarschijnlijk)
    - Schaal antwoord (0 – 100%)
15. **2-4 weken na HIV-infectie zal 2/3 van de personen griepachtige symptomen, hoofdpijn en koorts ervaren. Als u dergelijke symptomen heeft ervaren, wat is volgens u dan de% kans dat u sterft als gevolg van hiv / aids? (0% = geen kans, 100% = zeer waarschijnlijk)**
    - Schaal antword (0 – 100%)

16. **Neem aan dat u denkt dat u hiv / aids heeft. Wat is het maximum dat u bereid bent te betalen voor een hiv / aids-zelftestkit?**
    - Tot € 10
    - Tot € 20
    - Tot € 30
    - Tot € 40
    - Tot € 50
    - Tot € 60
    - Tot € 70
    - Tot € 80
    - Tot € 90
    - Tot € 100
    - Meer dan € 100
    - Ik zou de testkit alleen bestellen als deze gratis was (€ 0)
17. **Bent u al besmet met of denkt u besmet te zijn met hiv / aids?**
    - Ja, momenteel besmet
    - Weet ik niet zeker, ik denk dat ik besmet kan zijn
    - Nee
18. **Hoe bezorgd bent u op HIV / AIDS op een schaal van 1-10?**
    (1 = helemaal niet bezorgd, 10 = zeer bezorgd)
    - Schaal antwoord (1 – 10)
19. **Heeft u, voor zover u weet, al (seksueel of niet-seksueel) contact gehad met iemand die waarschijnlijk besmet is of zal zijn met HIV / AIDS?**
    Kruis indien nodig meerdere antwoorden aan.
    - Ja, contact opnemen via vrienden
    - Ja, contact via familie
    - Ja, contact via kennissen
    - Nee
20. **Voor zover u weet, hoeveel familieleden of vrienden worden ervan verdacht of bevestigd dat ze besmet zijn met hiv / aids?**
    - Open antwoord

DEMOGRAFIE EN ALGEMENE INFORMATIE

21. **Wat is je geslacht?**
    - Man
    - Vrouw
    - Anders
22. **Wat is uw leeftijd?**
    - Open antwoord
23. **Wat is uw nationaliteit?**
    - Open antwoord

Appendix III: All Variables Used for Statistical Analysis

HIV/AIDS		
Variable	**Variable Type**	**Variable Description**
Willingness to pay for HIV/AIDS testing kit	**Dependent (Dummy)**	(1) Not willing to buy a HIV/AIDS testing kit (€50) (2) Willing to buy a HIV/AIDS testing kit (€50)
HIV/AIDS overconfidence	Dummy	(1) Individual believes that a similar individual is more likely to die from HIV/AIDS vs. themselves (2) Individual believes that a similar individual is equally likely/less likely to die from HIV/AIDS vs. themselves
Perceived probability of similar individual dying from HIV/AIDS	Continuous	Perceived % probability that a similar individual (demographics and lifestyle) dies due to HIV/AIDS
Perceived probability of dying from HIV/AIDS	Continuous	Own perceived % probability of dying due to HIV/AIDS
Perceived probability of dying from HIV/AIDS if symptoms arose	Continuous	Own perceived % probability of dying due to HIV/AIDS if relevant symptoms arose
Self-perceived HIV/AIDS infection	Categorical	(1) No HIV/AIDS infection (2) Possibly infected with HIV/AIDS (3) Currently infected with HIV/AIDS
HIV/AIDS concern	Continuous	Concern about HIV/AIDS (1-10 Scale)
HIV/AIDS contact with individuals	Categorical	(1) No contact with anyone who are infected (2) Contact with acquaintances who are infected (3) Contact with friends who are infected (4) Contact with family who are infected
Number of individuals known to be infected with HIV/AIDS	Continuous	Number of people that respondent has been in contact with that are infected with HIV/AIDS

COVID-19/SARS-CoV-2		
Variable Name	**Variable Type**	**Variable Description**
Willingness to pay for SARS-CoV-2 testing kit	**Dependent (Dummy)**	(1) Not willing to buy a SARS-CoV-2 testing kit (€0) (2) Willing to buy a SARS-CoV-2 testing kit (>0€)
SARS-CoV-2 overconfidence	Dummy	(1) Individual believes that a similar individual is more likely to die from SARS-CoV-2 vs. themselves (2) Individual believes that a similar individual is equally likely/less likely to die from SARS-CoV-2 vs. themselves

Perceived probability of a similar individual dying from SARS-CoV-2	Continuous	Perceived % probability that a similar individual (demographics and lifestyle) dies due to SARS-CoV-2
Perceived probability of dying from SARS-CoV-2	Continuous	Own perceived % probability of dying due to SARS-CoV-2
Perceived probability of dying from SARS-CoV-2 if symptoms arose	Continuous	Own perceived % probability of dying due to SARS-CoV-2 if relevant symptoms arose
Perceived month in which SARS-CoV-2 cases will plateau in the Netherlands	Dummy	Perceived month in which SARS-CoV-2 cases will plateau in NL (1) Before July 1st (2) After July 1st
Self-perceived SARS-CoV-2 infection	Categorical	(1) No SARS-CoV-2 infection (2) Possibly infected with SARS-CoV-2 (3) Currently infected with SARS-CoV-2
SARS-CoV-2 concern	Continuous	Numerical concern about SARS-CoV-2
SARS-CoV-2 contact with individuals	Categorical	(1) No contact with anyone who are infected (2) Contact with acquaintances who are infected (3) Contact with friends who are infected (4) Contact with family who are infected
Number of individuals known to be infected with SARS-CoV-2	Continuous	Number of people that respondent has been in contact with that are infected with SARS-CoV-2

DEMOGRAPHICS & HEALTH-RELATED VARIABLES		
Variable Name	**Variable Type**	**Variable Description**
Paid	Dummy	(1) Unpaid respondent (2) Paid respondent
Symptoms	Dummy	(1) No relevant symptoms to HIV/AIDS or SARS-CoV-2 (2) Relevant symptoms to HIV/AIDS or SARS-CoV-2
Self-perceived self	Continuous	Concern about SARS-CoV-2 (1-10 Scale)
Prior health issues	Dummy	(1) No relevant prior health concerns (2) Relevant prior health concerns
Age	Continuous	Age of respondent
Gender	Dummy	(1) Other (2) Female (3) Male
Nationality	Categorical	(1) Dutch Only (2) EU (3) Rest of World

Table 7: Name, Type and Description of Variables used for Analysis

Appendix IV: Respondent Descriptive Statistics

In total, a sample of 515 viable respondents was used for the final data collection and analysis. The average time taken for the 357 paid respondents to complete the survey questionnaire was 240 seconds (4 minutes), whereas the average time taken for the 158 unpaid respondents to complete the survey questionnaire was 413 seconds (6 minutes 53 seconds). Table 8 shows descriptive statistics of respondents' age. There were three missing age observations. The average age of 512 respondents was ~28 years old; the youngest respondent was 14 years old and the oldest was 74 years old. 80% of the respondents were concentrated at the age of 33 or under, and the mode age of respondents was 22 and 23 years old (45 respondents). This represents a very relatively young adult dataset, as shown by Figure 6 in the form of a histogram of respondents by age.

	Frequency Obs.	Mean	Std. Dev.	Min	Max	Mode	Median
Age	512	27.58	9.57	14	74	22 & 23	24.5

Table 8: Respondent Age Statistics

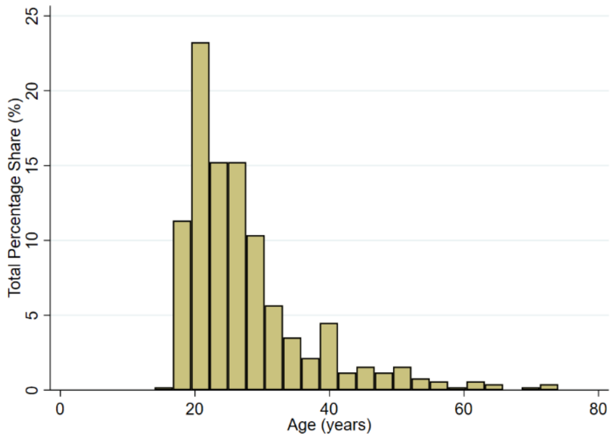

Figure 6: Histogram of Respondents Age

Regarding gender, individuals were categorized into "Other" (0), "Female" (1) and "Male" (2). 228 respondents were female (44.44%) and 283 respondents were male (55.17%), with two respondents declaring their gender as 'other' (0.39%), and two respondents did not declare their gender and are hence missing observations. The distribution per category of gender is shown in Table 9.

Gender	**Frequency**	**Total Share (%)**
Female (0)	228	44.44
Male (1)	283	55.17
Other (2)	2	0.39
Total	**513**	**100.00**

Table 9: Respondent Gender Statistics

Given the large number of Dutch respondents, and EU respondents relative to other continents, nationality was categorized into three categories: "Dutch Only", "EU" and "Rest of the World". The distribution per category is shown in Table 13. If a respondent had dual nationality including Dutch, they were classified into a continent depending on the second nationality i.e. if "Dutch / Turkish" was responded, the respondent would be classified into the EU. Respondents that listed dual nationality from two different continents were placed in the continent corresponding to the nationality that the respondent first recorded i.e. if "British / South African" was responded, the respondent would be classified into the EU. There were nine missing observations as these individuals did not declare their gender.

Continent	**Frequency**	**Total % Share**
Dutch Only (0)	423	83.60
EU (1)	56	11.06
Rest of the World (2)	27	5.34
Total	**506**	**100.00**

Table 10: Respondent Nationality by Continent Statistics

Nationality 1	Frequency	Total % Share	**Nationality 2**	Frequency
American	5	1.04	American	-
Australian	2	0.41	Australian	-
Austrian	2	0.41	Austrian	-
Belgian	1	0.21	Belgian	-
Brazilian	1	0.21	Brazilian	-
British	1	0.21	British	2
Bulgarian	2	0.41	Bulgarian	-
Canadian	2	0.41	Canadian	-
Chinese	1	0.21	Chinese	-
Costa Rican	1	0.21	Costa Rican	-
Cypriot	1	0.21	Cypriot	-
Dutch	411	85.09	Dutch	-
English	1	0.21	English	-
Estonian	1	0.21	Estonian	-
Filipino	-	-	Filipino	1
Finnish	1	0.21	Finnish	-
French	3	0.62	French	-
German	9	1.86	German	-
Greek	1	0.21	Greek	-
Icelandic	2	0.41	Icelandic	-
Indian	6	1.24	Indian	-
Indonesian	1	0.21	Indonesian	-

Irish	2	0.41	Irish	-
Italian	7	1.45	Italian	1
Korean	1	0.21	Korean	-
Latvian	1	0.21	Latvian	-
Luxembourgish	1	0.21	Luxembourgish	-
Macedonian	-	-	Macedonian	1
Polish	1	0.21	Polish	-
Portuguese	1	0.21	Portuguese	-
Romanian	3	0.62	Romanian	1
Russian	1	0.21	Russian	-
Slovak	1	0.21	Slovak	-
Slovenian	1	0.21	Slovenian	-
Spanish	1	0.21	Spanish	1
Swiss	1	0.21	Swiss	-
Turkish	3	0.62	Turkish	1
Vietnamese	2	0.41	Vietnamese	-
Zimbabwean	1	0.21	Zimbabwean	-
Total	**483**	**100.00**	**Total**	**9**

Table 11: Respondent Nationality by Country Statistics

Appendix V: VIF Test Results

i. SARS-CoV-2 VIF Test

Variables	**VIF**
Overconfidence	1.03
Self-perceived health	1.19
Self-perceived SARS-CoV-2 infection	1.17
SARS-CoV-2 concern	1.09
SARS-CoV-2 contact	
- None	(omitted)
- Contact with acquaintances	1.07
- Contact with friends	1.14
- Contact with family	1.12
Number of people known to be infected with SARS-CoV-2	1.20
Symptoms	1.09
Age	1.07
Gender	
- Female	(omitted)
- Male	1.06
- Other	1.05
Nationality	
- Dutch Only	(omitted)
- EU/EEA	1.40
- Outside of EU (international)	1.18
Paid respondent	1.54
Mean VIF	**1.16**

Table 12: VIF Test for Willingness to Pay for SARS-CoV-2 Test

ii. HIV/AIDS VIF Test

Variables	VIF
Overconfidence	1.03
Self-perceived health	1.05
Self-perceived HIV/AIDS infection	1.14
HIV/AIDS concern	1.25
HIV/AIDS contact	
- None	(omitted)
- Contact with acquaintances	1.14
- Contact with friends	1.45
- Contact with family	1.07
Number of people known to be infected with HIV/AIDS	1.55
Age	1.15
Gender	
- Female	(omitted)
- Male	1.06
- Other	1.03
Nationality	
- Dutch Only	(omitted)
- EU/EEA	1.35
- Outside of EU (international)	1.21
Paid respondent	1.51
Mean VIF	**1.21**

Table 13: VIF Test for Willingness to Pay for HIV/AIDS Test

Appendix VI: Robustness Testing: Overconfidence as a Continuous Variable

i. SARS-CoV-2

Variables	**Willingness To Pay for SARS-CoV-2 Testing Kit**	
	Logistic Regression (n = 394)	OLS Regression (n = 396)
Overconfidence Level	-0.010 (0.010)	-0.001 (0.001)
Self-perceived health	0.136 (0.119)	0.015 (0.014)
Self-perceived SARS-CoV-2 infection	**-1.107*** (0.329)**	**-0.136*** (0.046)**
COVID-19 concern	**0.1978*** (0.073)**	**0.020*** (0.008)**
COVID-19 contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	-0.420 (0.571)	-0.047 (0.083)
- Contact with friends	-0.738 (0.666)	-0.072 (0.081)
- Contact with family	0.191 (0.707)	0.043 (0.065)
Number of people known to be infected with SARS-CoV-2	**0.247** (0.124)**	**0.019*** (0.007)**
Prior health concerns	-0.405 (0.384)	-0.357 (0.435)
Symptoms	-0.033 (0.327)	0.004 (0.038)
Age	-0.014 (0.015)	-0.002 (0.002)
Gender		
- Female	(omitted)	(omitted)
- Male	-0.057 (0.316)	-0.006 (0.035)
- Other	(empty)	-0.142 (0.100)
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	-0.057 (0.668)	0.014 (0.061)
- Outside of EU (international)	0.146 (0.861)	0.012 (0.067)
Paid Respondent	0.097 (0.418)	0.014 (0.047)
Constant	0.819 (1.083)	0.739 (0.131)

Table 14: Logistic & OLS Estimated Regression Analysis - Willingness to Pay for SARS-CoV-2 Testing Kit

ii. HIV/AIDS

Variables	**Willingness To Pay for HIV/AIDS Testing Kit**	
	Logistic Regression (n = 336)	OLS Regression (n = 338)
Overconfidence Level	**0.014* (0.007)**	**0.003* (0.002)**
Self-perceived health	**0.182* (0.109)**	**0.027* (0.016)**
Self-perceived HIV/AIDS infection	0.869 (1.450)	0.191 (0.383)
HIV/AIDS concern	**0.264*** (0.092)**	**0.046*** (0.017)**
HIV/AIDS contact		
- None	(omitted)	(omitted)
- Contact with acquaintances	0.469 (0.716)	0.075 (0.149)
- Contact with friends	-0.189 (0.977)	-0.023 (0.188)
- Contact with family	-0.390 (1.312)	-0.067 (0.251)
Number of people known to be infected with HIV/AIDS	0.310 (0.282)	0.064 (0.035)
Age	**0.027 (0.014)****	**0.005 (0.02)****
Gender		
- Female	(omitted)	(omitted)
- Male	0.033 (0.282)	0.008 (0.046)
- **Other**	**(empty)**	**-0.105 (0.062)**
Nationality		
- Dutch only	(omitted)	(omitted)
- EU/EEA	0.680 (0.497)	0.128 (0.010)
- Outside of EU (international)	0.559 (0.647)	0.109 (0.130)
Paid Respondent	-0.074 (0.380)	-0.014 (0.067)
Constant	-4.410 (1.071)	-0.275 (0.148)

Table 15: Logistic & OLS Estimated Regression Analysis - Willingness to Pay for HIV/AIDS Testing Kit