



ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master Thesis

MSc Policy Economics

Heterogeneous Effects of the COVID-19 Pandemic on Mental Health in the Netherlands

Anastasia Korsunsky

Student number: 526381

Supervisor: Dr Gloria Moroni

Second assessor: Dr Kevin Spiritus

8. July 2021

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

In order to contain the spread of the COVID-19 virus, the Dutch government put various social distancing measures and lockdowns in place, which severely affected mental health. This thesis attempts to capture the heterogeneous effects of the COVID-19 pandemic on mental health by socio-economic characteristics in the Netherlands. To analyse this effect an individual fixed-effects model is deployed on 2019 and 2020 panel data from the Dutch Longitudinal Internet Studies for the Social Sciences (LISS). The results suggest that mental health significantly deteriorated during the coronavirus pandemic compared to the previous year. They further indicate that compared to individuals with a low income in 2019, the mental health of the highest-income group deteriorated during the COVID-19 pandemic. This implies that the rich had lower mental health in 2020 than the poor in 2019. Moreover, the results suggest that older age groups tend to have lower mental health scores during the pandemic than 15-24 years old in 2019. In the Netherlands, differences in the impact of the COVID-19 pandemic on mental health could also be observed between living situations, primary occupation types, levels of general health, ethnic background and gender.

Keywords: mental health, COVID-19 pandemic, socio-economic characteristics

Table of Contents

1. Introduction	1
2. Literature Review	4
2.1 The Impact of the COVID-19 Pandemic on Well-Being.....	4
2.2 The Relation between Income, Economic Stability and Mental Health	5
2.3 The Economic and Social Relevance of Mental Health	6
2.4 Socio-economic Characteristics and Mental Health during the COVID-19 Pandemic.....	8
3. Data & Descriptive Analysis	12
3.1 Survey Data	12
3.2 The Dependent Variable: 5-item Mental Health Index	13
3.3 The Explanatory Variables.....	14
3.4 Descriptive Analysis	17
4. Empirical Analysis.....	21
4.1 The Empirical Model	21
4.2 Regression Specifications	22
5. Empirical Results	25
6. Robustness Checks	34
6.1 Random-Effects Model	34
6.2 Sample Restriction to Individuals in Paid Employment	35
7. Limitations	37
8. Conclusion	38
9. References.....	40
10. Appendix.....	46

1. Introduction

The novel coronavirus, COVID-19, rapidly spread across the world reaching the Netherlands in March 2020, where since the start of the pandemic almost 1,7 million infections and around 18.000 corona-related deaths were reported by the beginning of June 2021 (CSSE, 2021). To contain the spread of the coronavirus, the Dutch government adopted various measures leading to rigorous movement restrictions, such as social distancing rules and lockdowns. They temporarily closed borders, schools and businesses. This upended the economic and social life of almost every human being living in the Netherlands (Pan et. al, 2021).

Albeit these measures are generally accepted to have been effective in reducing COVID-19 infections and deaths (Dergiades et al., 2020), they have – together with the financial losses that followed from them – severely affected mental health (Pfefferbaum & North, 2020). The World Health Organisation (WHO) defines mental health as “a state of wellbeing in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community” (WHO, 2013). Statista (2021) observed around 90.000 individuals above the age of 16 and found several significant changes in self-reported mental health due to the coronavirus in the Netherlands. Anxiety and sadness both increased by approximately a third of the Statista survey respondents during the pandemic (measured from April to May 2020). Similarly, stress levels and loneliness increased by close to 30 per cent. Furthermore, Statista (2021) reports that around 20 per cent of survey participants stated that they experienced sleeping disorders. Therefore, it is fair to say that the COVID-19 pandemic poses not only a threat to physical health but increasingly also to mental health (Fancourt et. al, 2021). Home-office and -schooling, fear of and loss of employment, uncertainty in various aspects of life, isolation and a considerable reduction in personal contacts are only some aspects that are likely to cause emotional distress and increase the risk of mental illnesses (Pfefferbaum & North, 2020).

However, not everyone was hit equally hard by the COVID-19 pandemic. As Guintella et. al (2021) and Niedzwiedz et. al. (2021) show, deteriorating mental health as well as resilience to psychological distress varies considerably both across countries and population groups, especially by socio-economic status. According to the OECD (2015) lower socio-economic status, most notably income, closely correlates with an increased risk of mental distress. The findings of Crossley et. al (2020) support this statement, showing that the impact of COVID-19 was highly heterogeneous in the United Kingdom, with low-income groups being hit harder than high-income groups. They find that by May 2020, household earnings in Great Britain had fallen by 13% in the bottom quintile, whereas in the top quintile, the median fall was only 2%. Crossley et. al’s (2020) reasoning goes as follows: As low-income groups face higher losses during the COVID-19 pandemic they are exposed to more factors

that have potentially negative effects on their mental health. Assumably, this leads to a broadening of the gap between rich and poor regarding their mental health. Adams-Prassl et. al (2020) argue that this holds for the US, after having found a positive association between household income and mental health during corona-related lockdowns.

Therefore, this thesis starts from the assumption that mental health in the Netherlands deteriorated during the COVID-19 pandemic compared to the previous year. Further, it is assumed that various socio-economic characteristics influenced this change in mental health. These are - among others - income, age, education levels, the type of primary occupation, the living situation, and the level of perceived general health. The impact of these socio-economic characteristics will be analysed in this thesis. Thus, the main research question reads as follows:

How do various socio-economic characteristics influence the effect of the COVID-19 pandemic on mental health in the Netherlands?

This thesis will also address multiple follow-up questions that are stated below:

- How did the COVID-19 pandemic affect mental health in the Netherlands?
- Does the effect of the COVID-19 pandemic on mental health in the Netherlands vary by the level of income?

As follows, several hypotheses related to the questions above are formulated:

- *Hypothesis 1: The COVID-19 pandemic has a negative impact on mental health.*
- *Hypothesis 2: The effect of the COVID-19 pandemic on mental health varies across several socio-economic characteristics.*
- *Hypothesis 3: The effect of the COVID-19 pandemic on mental health is heterogeneous across income groups.*

This thesis will use data from the Dutch Longitudinal Internet Studies for the Social Sciences (LISS) to empirically test these hypotheses using an individual fixed-effects model.

Answering the above-mentioned research questions is important to further improve targeting treatment measures to those who were hit the hardest by the current crisis. Furthermore, this analysis might contribute to more efficient use of public expenditures on mental health. The Netherlands which is already one of the highest health care spenders among OECD countries (CBS, 2015), spends a fifth of total health and welfare expenditures on mental health care (Bakx et al., 2016). This resulted in 7,1 billion Euros in 2019 (Statista, 2020), making mental disorders the most expensive group of diseases.

Additionally, the deterioration in mental health may have long-lasting economic effects. Mental illnesses result in billions of Euros in welfare costs and lost taxes since their prevalence tends to reduce

both employability and productivity of the workforce (Layard, 2017). Policymakers could give those socio-economic groups additional attention, whose mental health was affected the most by the coronavirus pandemic. By providing them with psychological treatment, their productivity and employability could be increased, and individuals' yearly physical health care costs could be reduced by around 20 per cent (Layard, 2017). Ergo, identifying vulnerable groups as early and as accurately as possible constitutes the basis for efficient use of public expenditures.

Lastly, this thesis contributes to the literature studying the effect of economic downturns on mental disorders and the recent literature on the impact of the COVID-19 pandemic on well-being. It further adds to this strand of literature by documenting how the impact of corona-related social distancing measures on the mental health of the Dutch population varies by income level and other socio-economic characteristics.

Apart from this introduction and a concluding section, the thesis is divided into six sections. The next section is dedicated to the literature review which discusses the impact of the COVID-19 pandemic on well-being, the relation between income, economic stability and mental health, the economic and social relevance of mental health and the relation between socio-economic characteristics and mental health during the COVID-19 pandemic. Section 3 provides detailed information on the data used (dataset and explanatory variables) for the empirical model (individual fixed-effects model) and a brief descriptive analysis, while section 4 presents the empirical model, including the methodological justification and regression specifications. In the fifth section, the empirical results are presented and interpreted. This is followed by a short section on robustness checks and a brief section on the limitations of this thesis. The final section summarizes the main points and concludes.

2. Literature Review

Section 2 contextualises this thesis by discussing the existing literature on the topic of research. First, the impact of the COVID-19 pandemic on well-being is discussed. Next, the relation between income, economic stability and mental health is touched upon. This is followed by a sub-section on the economic and social relevance of mental health. Finally, literature on the relationship between socio-economic characteristics and mental health is presented.

2.1 The Impact of the COVID-19 Pandemic on Well-being

Since the novel coronavirus spread across the globe in the first quarter of 2020, scholars from the fields of health economics, public policy and psychology were interested in the effects of the coronavirus pandemic on mental health and well-being. Thus, a new strand of literature has emerged that studies the impact of the COVID-19 pandemic on well-being. Although it is a widespread assumption that mental health deteriorated during and because of the coronavirus pandemic, there is research that both supports and contradicts this assumption.

Van Tilburg et al. (2020) analysed data from the Dutch LISS Panel COVID-19 questionnaire from May 2020 to study the effect of the coronavirus pandemic on loneliness and mental health. They found that during the coronavirus pandemic, the loneliness of Dutch people aged 65 and above increased, but that surprisingly mental health stayed practically stable compared to 7 months prior. Furthermore, they found that those who experienced personal losses, who worry about the pandemic, and interviewees whose trust in societal institutions has declined were all associated with increased mental health problems and/or emotional loneliness. The result of the mental health outcome is possibly explained by the point in time of the data collection. The authors themselves point out that in May 2020, the Dutch population has only been in their first lockdown, which was not very restrictive. Also, the magnitude of the infection, as well as the death rate, was not yet fully clear. If this questionnaire would have been conducted at a later point in time, the outcomes would have most likely changed.

Similarly to the results of van Tilburg et al. (2020), a longitudinal Chinese study of Wang et al. (2020) observed a statistically but not clinically significant temporal reduction in depression, anxiety, and stress one month after the COVID-19 outbreak, though levels of distress remained high. However, it was reported that young survey respondents aged 12 - 21 suffered a higher psychological impact of COVID-19. The authors assume this to be the case due to prolonged school closures, online education and uncertainty about examinations and matriculation arrangements.

In Sweden, where the coronavirus restrictions were quite loose in the spring of 2020 compared to the rest of Europe and most parts of the world the self-rated well-being of people aged 65 - 71

remained stable or even increased at the end of March/beginning of April 2020 relative to previous years according to Kivi et al. (2021). The authors analysed annual changes for aspects of well-being, namely life satisfaction, financial satisfaction, self-rated health, and loneliness in a sub-sample of 1.071 respondents over 5 years. They found that in relation to COVID-19 44.9% of the 65-71-year-old respondents of the Swedish sub-sample worried about health, 69.5% about societal consequences, 25.1% about financial consequences, 86.4% perceived high societal risk, 42.3% worried about a high risk of infection, and 71.2% reported worrying about high levels of social distancing.

Interestingly, Pan et al. (2020) report that people who already experienced depression, anxiety, or obsessive-compulsive disorders before the pandemic did not have an increase in their symptoms during the pandemic and some even showed a slight decrease in their symptoms. Nevertheless, there was a great increase in the number of people who had none of the above-mentioned mental health issues prior to the COVID-19 pandemic but developed them during the pandemic.

Finally, the findings on the impact of the COVID-19 pandemic on mental health are ambiguous depending on the country, point in time of the data collection and various other factors. In the Netherlands, multiple results point towards a decrease in mental health during the pandemic, but some suggest a stable level of mental health before and during the pandemic.

2.2 The Relation between Income, Economic Stability and Mental Health

The relation between income, economic stability and mental health has been analysed in the fields of economics, psychology, and sociology from various perspectives over a long period of time. Economic downturns, economic crises, income inequality and abrupt changes in income have all shown to affect mental health (e.g., Gresenz et al., 2001; Jenkins et al., 2008; Pieh et al., 2020). The COVID-19 pandemic severely affected the economy (Pak et al., 2020), which in turn influenced mental health. Thus, it is important to investigate the relation between income, economic stability and mental health.

Gresenz et al. (2001) use, similarly to this thesis, a 5-item Mental Health Inventory (MHI-5) to analyse the relationship between mental disorders and income. They find that the probability to develop an anxiety or a depressive disorder increases steadily from the highest to the lowest quintiles of family income. People in the lowest income quintile have on average 10 points less on the MHI-5 than those in the highest income quintile (Gresenz et al., 2001). Their results further suggest that within-quintiles the own level of income is significantly related to mental health in lower-income groups.

In a study on a sample of the British population low-income groups were found more likely to have mental disorders. Accounting for debt and other sociodemographic characteristics, however, this effect was dissolved (Jenkins et al., 2008). According to Jenkins et al. (2008) debt was a good explanatory variable for differences in mental disorders between individuals. Namely, the higher their debt level, the higher their chance to suffer from a mental disorder.

During the COVID-19 pandemic, several papers tried to analyse the association between income levels and mental health. Pieh et al. (2020) for example, show that during the COVID-19 pandemic low income in Austria was associated with lower levels of mental health. In an Indian study by Ahmad et al. (2020) a relation between mental health and income during the coronavirus could be found as well.

Economic stability, including the absence of fluctuations and stable levels of employment and prices, is another important determinant in mental health. Hill and Narayan (2020) study the effect of the pandemic on income inequality across individuals and groups in different countries. They find that while the short-run implications of COVID-19 for income inequality are uncertain and vary across countries and their pre-existing disparities, the longer-term risks the COVID-19 pandemic poses to equity and social mobility are less ambiguous. In the short term, disadvantaged groups of the population (such as those who are poor, vulnerable, those with lower levels of education and assets, and those in insecure employment and lower-skilled occupations) experience a higher impact of the shock of the pandemic. The effect on income distribution could vary, depending on the magnitude of the shock on the economy and the effectiveness of temporary income replacement policies. In the long run, highly uneven differences in the impact of the crisis are likely to widen opportunity gaps between socio-economic groups, leading to lower social mobility and a more unequal distribution of income and wealth.

Another key determinant for mental health is expectations about future income. Fetzer et al. (2020) examine economic anxiety stemming from the COVID-19 pandemic using global data on internet searches and two representative surveys from the U.S. and study perceptions of pandemic risk factors as correlational and causal determinants. They find that there has been a rapid emergence of economic anxiety at the onset of a major pandemic and show that information provision regarding mortality and contagiousness of the virus causally shapes economic anxiety among the population.

2.3 The Economic and Social Relevance of Mental Health

Mental health was given relatively low priority by policymakers across the EU in recent years, despite its substantial social and economic relevance (McCollam et al., 2008). An important consequence of poor mental health is the loss of productivity, which is caused by the increased absence through sickness, low staff retention rates and underperformance (Pinheiro et al., 2017).

Moreover, individuals who are unemployed due to their mental health problems represent a group of people with skills and labour productivity that remain underutilized (Gabriel & Liimatainen, 2000). Sobocki et al. (2006) estimate that the employment consequences and lost productivity due to depression are considerably higher than the health service costs for depression. Treating the mentally ill leads to a significant increase of the overall labour force participation, which in turn augments aggregate income (Layard; 2017).

Additionally, employment issues can be a result of emotional and behavioural disorders in children. The literature often finds that these children are less likely to be employed as adults than their peers (McCollam et al., 2008). Mental health issues in childhood may also cause surging societal costs, in the form of rising expenditures for social welfare or unemployment benefits (Scott et al., 2001). This highlights the importance of targeted mental health policies especially for children and young people, as this might not only benefit their employability but also result in long-term individual, social and economic benefits (McCollam et al., 2008). Layard (2017) indicated that treatment of mental health issues boosts employment and output, with the benefits exceeding the costs of the treatment.

Besides that, mental health issues further show strong financial implications on the health and social care systems. They amount to billions of Euros in welfare payments and lost taxes (Layard, 2017). The OECD (2014) finds that mental disorders in the Netherlands cause 12 million sick days, which cost 2,7 billion Euros per year. Welfare costs of mental health issues are also substantial across the EU, where they result in 25 per cent of all new disability benefits cases (EFILWC, 2003). EFILWC (2003) also notes that in France 25 per cent of illness related social security expenditures and 50-60 per cent of sick leave in Spain result from stress. Treatment of mental health can be very cost-effective. Layard (2017) argues that for each \$1 spent on mental health, approximately \$1 is saved on welfare benefits and \$1 is saved on physical health care.

Mental health also indirectly influences health care costs. This can be explained by the strong association between mental and physical health (WHO, 2003). According to the WHO (2003) there is a strong relationship between poor mental health and higher rates of physical illnesses, for example, heart disease, strokes, diabetes and respiratory disorders, which are related to high health service costs. Improving mental health may strengthen physical health outcomes, such as better overall health, lower risks of strokes and heart diseases and reduce drug abuse, which in turn decreases public health care costs (Friedli and Parsonage, 2007). Moreover, Layard (2017) shows that psychological treatment can lead to a reduction of an individual's physical health care costs by 20 per cent per year.

There is also a significant social impact of mental health. Good mental health and well-being are related to higher levels of participation, civic engagement, and volunteering (McCollam et al., 2008). A

lack thereof can result in higher crime levels, social isolation and tensions between communities (Williams et al., 2020). Other social consequences of low levels of mental health are violence, drug misuse or educational under-achievement, most notably if mental health issues have already been present in childhood (Friedli and Parsonage, 2007).

Thus, tackling mental health issues that originated in or were exacerbated by the coronavirus pandemic efficiently and early on might limit the economic consequences of the coronavirus pandemic.

2.4 Socio-economic Characteristics and Mental Health during the COVID-19 Pandemic

Various socio-economic characteristics exacerbated or alleviated the effect of the COVID-19 pandemic on mental health (Fetzer et al., 2020; Adams-Prassl et al., 2020; Fancourt et al., 2020). This subsection aims to provide a basis for the empirical analysis, by presenting literature on the heterogeneous effects of the COVID-19 pandemic on mental health depending on the variables that were added to the regression analysis. The following explanatory variables were added to the analysis as they are important socio-economic characteristics that are often associated with changes in mental health in scientific literature.

Age

Fetzer et al. (2020) find that young people in the US had to suffer especially hard during the COVID-19 pandemic, as they had substantially higher worries about their economic situation than people in older age groups. This might be explained by a high unemployment risk for young individuals (Gould & Kassa, 2020). In the UK, similar results suggest that mental distress was particularly high for people aged 18-34 (Pierce et al., 2020). Nevertheless, the elderly population also had to endure higher mental distress during the COVID-19 pandemic, since being part of the highest corona risk group meant being bound to isolate even more from family and friends than younger people (RIVM, 2021).

Van Tilburg et al. (2020) show that mental health of the Dutch elderly population remained roughly stable, but they did find an increase in loneliness among the elderly. A Swedish study found similar results which suggested no significant changes in mental health for the elderly (Kivi et al., 2020).

Education

Several scholars show that the level of formal education is an important variable when it comes to the examination of mental health in a society. Mazza et al. (2020), for instance, show that a lower education level is associated with greater depressive symptoms. Adams-Prassl et al. (2020) find similar

results and report that having a university degree is positively associated with mental health. By contrast, other studies conducted by scholars such as González-Sanguino et al. (2020) or Olagoke et al. (2020) suggest that student status is associated with a higher risk factor for developing depressive symptoms compared to other occupational groups. In addition, Wang et al. (2020) found that less-educated individuals and individuals working in the service or enterprise industry have lower levels of depressive symptoms than those with higher education and in professional jobs.

Primary Occupation

The coronavirus pandemic influenced the employment status, livelihood, income and personal debt of many groups in society (Pierce et al. 2020). Many of those who faced financial hardship, which in turn led to poorer mental health, are unemployed, students, people taking care of the housekeeping, etc. Witteveen and Velthorst (2020) point out that the association between financial struggles and indicators of mental health deterioration are significantly dependent on the occupation of people, which might exacerbate already existing inequalities in mental health.

General Health

Several papers point towards significant cross-effects between general health and mental health (Ohrnberger et al., 2017; Canadian Mental Health Association, 2008). The Canadian Mental Health Association (2008) states that people with chronic physical health conditions are twice as likely to be depressed or feel anxiety than the general population. Conversely, people that have serious mental illnesses are at greater risk of having various chronic physical conditions.

During the coronavirus pandemic, the link between general health and mental health might have exacerbated because many people with poorer general health belonged to the COVID-19 risk group. The results of Shigemura et al. (2020) support this assumption, as they find that people from a Japanese sample with poor physical health are also more likely to suffer mentally during the COVID-19 pandemic. This means, that they potentially worried more about contracting the COVID-19 virus and facing stronger symptoms and thus, had to restrict their social contacts even more, which could both lead to more loneliness, fear and consequently to a deterioration of mental health during the coronavirus pandemic.

Moreover, due to the lockdowns, physical activity was at times strongly limited, which might have also caused a deterioration in mental health, as physical activity and mental health are strongly related (Ohrnberger et al., 2017).

Living Situation

The literature provides evidence that the living situation is an important factor that might explain differences in mental health. Pierce et al. (2020) for example, find that mental distress increased highly during the coronavirus pandemic for people living with young children. One possible reason for that might be, that parents living with children often have a lack of emotional support during the pandemic (van der Velden et al., 2020). Moreover, Fancourt et al. (2020) provide evidence on increased domestic abuse, especially in low-income families and among people living with children. Although, Tierolf et al. (2020) did not find an increase in domestic violence in a sample of 246 Dutch families, domestic violence in families with children was still very high and will likely lead to mental health problems in those families. Furthermore, singles show significantly lower mental health scores than those in a relationship, according to Adams-Prassl et al. (2020).

Gender

The effect of economic downturns on mental health can vary significantly by gender. (Adams-Prassl et al., 2020). Moreover, Adams-Prassl et al. (2020) illustrate that the implementation of stay-at-home orders during the coronavirus pandemic led to a significant widening of the gender gap in mental health. The results of Pierce et al. (2020) also show a significant deterioration of mental health for women compared to men in the UK. Additionally, McGinty et al. (2020) report that in April 2020, the increase of psychological distress was the highest for women and young people among adults in the US.

Ethnic Background

Mental health scores are also assumed to vary by ethnic background (Pierce et al., 2020). According to the American Psychiatric Association (2021), minority groups might suffer more from mental health illnesses due to various factors such as inaccessibility of high-quality mental health care services, the cultural stigma surrounding mental health care, discrimination, and overall lack of awareness about mental health.

In Australia, ethnic minority groups showed lower mental health scores than native-born Australians (Lee, 2019). Pierce et al. (2020) expect to find a similar stronger deterioration of mental health due to the coronavirus pandemic for individuals with an ethnically diverse background in the UK. Conversely, their results suggest that people of Asian ethnicity have higher levels of mental health. Significant differences between other ethnic groups could not be observed. Interestingly, Proto and Quintana-Domeque (2021) do find a higher increase in mental distress for Black, Asian, and minority

ethnic (BAME) men than for white British men, even after controlling for demographic and socioeconomic characteristics. Bangladeshi, Indian and Pakistani individuals showed the highest average increase in mental distress compared to white British men. The opposing findings in the literature make a case to further look into the effect the ethnic background has on mental health in the Netherlands.

3. Data & Descriptive Analysis

The following section describes the dataset used for the empirical analysis. It will introduce the dependent variable and its construction, as well as the explanatory variables that were added to the analysis. Finally, the last subsection of this chapter will include a descriptive analysis of the data. It aims to provide a solid framework for the empirical analysis by presenting and evaluating a summary statistics table and multiple frequency tables of the explanatory variables.

3.1 Survey Data

The data used for the empirical analysis is taken from the Dutch Longitudinal Internet Studies for the Social Sciences (LISS) panel which is run by the research institute CentERdata in Tilburg, Netherlands. The LISS panel collects personal data on approximately 7.500 individuals from a random sample which was drawn from the population register, with support of Statistics Netherlands (Centraal Bureau voor de Statistiek, CBS). Thereby, it constitutes a representative sample of the Dutch population, underlining the high quality and representativeness of the data (CentERdata, 2021a). The panel provides information on - among other things - demographic and socio-economic characteristics, subjective perception of (mental) health and income. More precisely, the variables used in this thesis are retained from the Health – LISS Core Study – Wave 12 and Wave 13, which was collected between November and December 2019 (wave 12) and between November and December 2020 (wave 13). The sample of the health panel consists of 5.954 household members in 2019 and 6.832 in 2020, whereas only 5.145 interviewees in 2019 and 5.714 in 2020 provided complete responses. All panel members are aged 16 years and older, with the oldest respondent being 103 years old in 2020 (CentERdata, 2020; CentERdata 2021b). Moreover, the background variables of the LISS Panel from November, as well as December 2019 and 2020 were used to provide additional information on socio-economic characteristics. The above-mentioned health panel datasets and the background variable datasets were matched based on the unique household member's encrypted number (identification code) and the year and month of the fieldwork period and combined into one master dataset containing all relevant variables.

Furthermore, after dropping irrelevant variables for the aim of the research and observations where personal net monthly income was missing, reported as unknown or an outlier, the number of observations was reduced to 4,137 (N = 4,137)¹.

¹ Outliers which indicated an unrealistically high personal net monthly income were dropped. It is assumed that possibly comma mistakes were made by the respondents, or yearly net income was mistakenly reported instead of the monthly net income.

Finally, because an individual fixed effects model is used for the empirical analysis the panel data has to be balanced because to control for individual-specific characteristics in the fixed-effects model these characteristics have to be observed in all time periods (Best & Wolf, 2013). Consequently, all observations which were reported only in 2019 or only in 2020 were dropped. This means that to ensure a balanced panel, only observations that had complete responses for the variables included in the empirical analysis in the health and the background variable questionnaires in both years were kept in the dataset.

3.2 The Dependent Variable: 5-item Mental Health Index

The dependent variable - mental health - is measured using the 5-item Mental Health Index, MHI-5 (Means-Christensen et al., 2005). This index ranges from 0 “bad mental health” to 100 “excellent mental health”. It is a commonly used mental health measure in health economics and psychiatry, such as in Gresenz et al. (2001), Velden et al. (2020), Fone et al. (2007) and ten Have et al. (2015). The MHI-5 is based on self-reporting, which is a widely accepted approach for gathering data in epidemiologic and medical research (Althubaiti, 2016). Although self-reported measurement errors can occur, evidence of its validity as an independent measure of mental health has been found numerous times (Hoeymans et al., 2004; Kelly et al., 2008; Rivera-Riquelme et al., 2019).

Respondents answered the following questions about how they felt over the past month on a 6-point Likert scale (1 = never to 6 = continuously):

1. I felt very anxious.
2. I felt so down that nothing could cheer me up.
3. I felt calm and peaceful.
4. I felt depressed and gloomy.
5. I felt happy.

Similarly to van der Velden et al. (2020), the Likert scale was recoded from 1-6 to 0-5 in this thesis. Thus, the values range from 0 = never to 5 = continuously. Additionally, the negatively formulated items (questions 1., 2. and 4.) were recoded by reversing them. The total mental health scores were computed by adding the outcomes of all answers to the mental health questions together and multiplying the total number by four to receive a score from 0-100. Thereby, the mental health index can be used as the dependent variable to evaluate whether mental health improved or deteriorated during the coronavirus pandemic in comparison to the previous year. A higher mental health score means higher levels of mental health, with a score of 100 on the mental health index indicating that the individual is in excellent mental health. Whereas a lower mental health score means

a worse state of mental health, with a score of 0 points indicating that, the individual is in a very bad state of mental health.

3.3 The Explanatory Variables

All explanatory variables were retained from the LISS Panel – Background Variables, except for the variable *general health* which was retained from the LISS Health Panel. In this subsection, the explanatory variables that were added to the analysis are listed and described.

Pandemic

Pandemic constitutes the main explanatory variable in the regression. As a dummy variable, it describes whether the survey was conducted in the pre-corona year 2019 in November/December or during the coronavirus pandemic in November/December 2020. As the main hypothesis of this thesis states that mental health deteriorated during the pandemic in comparison to the year before, this is a core explanatory variable. The findings of the literature in section 2. strongly suggest that mental health deteriorated in 2020 in comparison to 2019. This finding is also supported by Table 1 in the descriptive analysis.

Personal Net Monthly Income (in Categories)

Personal net monthly income, expressed in Euros, is the second explanatory variable in the regression. This specific income variable is used because it is the monthly disposable income that is left after taxes. Hence, personal net monthly income (I) is the income that can be effectively spent, saved, or borrowed. Moreover, I has a low number of missing values due to the way it was computed. Namely, according to CentERdata (2019) in case the respondents did not provide an answer about their personal net monthly income, the income was asked again in terms of categories and the average of the indicated category was used in their response for I. Furthermore, if respondents answered, “I really don’t know (-13)”, “I prefer not to say (-14)” or “Unknown (missing) (-15)” for personal net monthly income then the observations were dropped. This is necessary, as missing, or insufficient data on personal net monthly income would bias the outcomes.

As an alternative measure of income, this thesis also uses personal net monthly income in categories. Initially, the personal net monthly income was grouped by CentERDdata into 13 different income categories and the categories 13 “I really don’t know” and 14 “I prefer not to say” which were dropped as mentioned above. These income groups were then regrouped into the following five categories to facilitate the interpretation of the regression outcomes:

- no income: EUR 0
- low: EUR 1 to EUR 1500

- middle: EUR 1501 to EUR 2000
- high: EUR 2001 to EUR 3500
- highest: EUR 3501 and above

In order to reassemble the original 13 income groups from the LISS panel into five income groups, the median of personal net monthly income in 2019 and 2020 was calculated. Then, proceeding from the median personal net monthly income, this thesis chose a range for the different income groups, by considering the frequency of certain levels of personal net monthly income.

An in-depth discussion of the association between income and mental health during the pandemic and the importance of personal net monthly income in the regression analysis can be found in the literature review in section 2.2 and will thus, not be repeated in this section.

Age and Age in Categories

The impact of the coronavirus on mental health possibly varies by age and is, therefore, added to the analysis as an additional explanatory variable. The findings from the literature and Table 3 in section 3.4 suggest that the mental health deterioration varied by age group. This highlights the importance of adding *age* to the regression analysis.

Education

The variable education gives insight into the level of education in CBS (Statistics Netherlands) categories, which reads as follows:

- primary school
- vmbo (intermediate secondary education)
- havo/vwo (higher secondary education/preparatory university education)
- mbo (intermediate vocational education)
- hbo (higher vocational education)
- wo (university)

As findings in the literature often see an association between education levels and mental health, the variable *education* was added to the regression analysis.

Primary Occupation

The variable *primary occupation* gives a detailed insight into the main occupation of the respondents. They were able to choose from the following options:

- Paid employment,

- Works or assists in family business,
- Autonomous professional, freelancer, or self-employed,
- Job seeker following job loss,
- First-time job seeker,
- Exempted from job seeking following job loss,
- Attends school or is studying,
- Takes care of the housekeeping,
- Is pensioner ([voluntary] early retirement, old age pension scheme),
- Has (partial) work disability,
- Performs unpaid work while retaining unemployment benefit,
- Performs voluntary work,
- Does something else.

This variable is an important control variable in the regression, as it is strongly associated with other socio-economic characteristics analysed in this thesis. For example, the net income of pensioners stayed fairly stable during the pandemic, which can be seen in Tables A2 and A3 in the appendix, and thus, probably did not lead to a change in their mental health. Therefore, it is important to distinguish between the primary occupation of the respondents.

General Health

In order to capture the perceived general health of the interviewees they answered the question “How would you describe your health, generally speaking?” with one of the following options:

- Poor
- Moderate
- Good
- Very good
- Excellent

This variable is added to the statistical analysis as there are significant cross-effects between general health and mental health (Ohrnberger et al., 2017; Canadian Mental Health Association, 2008).

Living Situation

The literature provides evidence that the living situation is an important variable that might explain differences in mental health. Thus, it is included in the statistical analysis.

The respondents were able to indicate whether they were:

- Single
- (Un)married co-habitation, without child(ren)
- (Un)married co-habitation, with child(ren)
- Single, with child(ren) or
- Other.

Gender

Several papers discussed in section 2.4, find that the effect of economic downturns on mental health can vary by gender. This might exacerbate an already existing gender gap in mental health (Adams-Prassl. et al., 2021). Therefore, gender will be examined as another variable in the regression.

Ethnic Background

The ethnic background of the respondent is time-invariant. Hence, it will be omitted in the fixed-effects model. However, by adding ethnic background as an interaction term with pandemic the effect of the ethnic background during the pandemic can be evaluated.

The respondent was able to choose between the following information on his/her ethnic background:

- Dutch background
- First generation foreign, Western background
- First generation foreign, non-western background
- Second generation foreign, western background
- Second generation foreign, non-western background
- Origin unknown or part of the information unknown (missing values)

Thus, the effect of the coronavirus pandemic on mental health dependent on the ethnic background will be analysed.

3.4 Descriptive Analysis

Subsection 3.4 aims to support the findings of the literature review and the empirical analysis by describing the data of the sample. It should provide additional context to the research at hand and the sample used to conduct the empirical analysis.

Table 1 depicts the summary statistics, including the mean, maximum and minimum of all continuous and discrete variables of the regressions for both the pre-corona year 2019 and the year 2020 with COVID-19 measures in place. These variables are age, mental health on a score from 0 – 100 and the personal net income (I) in EUR of the respondents.

Table 1: Summary Statistics – Continuous and Discrete Regression Variables

VARIABLES	2019				2020			
	mean	sd	min	max	mean	sd	min	max
Mental health	74,80	16,49	0	100	67,65	11,49	0	92
I	1.700	1.116	0	10.000	1.768	1.162	0	17.000
age	54,22	17,80	16	102	55,21	17,80	17	103

First row has *frequencies* and second row has *row percentages*. LISS Panel Data.

The table indicates that mental health strongly deteriorated from 2019 to 2020. In 2019, the mean mental health score was 74,8 whereas in 2020 it declined on average by 7,15 points to 67,65 points. This is also supported by the fact that the maximum mental health score was 100 points in 2019 whereas in 2020 it was only 92 points. Thus, the summary statistics supports the hypothesis that mental health deteriorated during the pandemic in 2020 compared to the pre-corona year of 2019.

The personal monthly net income varies strongly between the respondents of the sample. It ranges from no income to a net personal income of 10.000 EUR per month in 2019 and in 2020 the maximum net personal income per month is even higher with 17.000 EUR. Moreover, the age range of the respondents is also very large, with the youngest being 16 years old (17) and the oldest being 102 (103) years old in 2019 (2020). The mean age is around 54 (55) years, which suggests that the age of sample participants is relatively high. The age composition of my panel does, however, not have an impact on the outcomes, as the statistical analysis controls for age. Moreover, in an individual fixed-effects model, changes are only evaluated within and not between individuals.

While investigating the descriptive statistics, it becomes apparent that the change in mental health varied by age group. This is in line with the findings of the literature in sections 2. and 3.3. Table 2 below shows the number of people in a mental health quartile per age group in 2019 and 2020. 15-24-years-old were the age group with the highest percentage of individuals with a low mental health score (0-25), namely 38,59 % in 2019, which significantly deteriorated to a share of 51,85 % in 2020. In comparison, people aged 65 years old and older initially had much higher mental health scores. In 2019, 48,46 % of 65-year-olds and older had excellent perceived mental health. Although this share declined drastically to 6,28 % in 2020, mental health scores were in total still higher for people aged 65 and older than for younger age groups.

Table 2: Mental Health Level per Age Group in 2019 and 2020

Age in CBS categories	Mental health quartiles - 2019					Mental health quartiles - 2020				
	0-25	26-50	51-75	76-100	Total	0-25	26-50	51-75	76-100	Total
15 - 24 years	120	65	58	58	311	140	57	58	15	270
	38,59	20,90	18,65	21,86	100,00	51,85	21,11	21,48	5,56	100,00

25 - 34 years	134	69	90	132	425	177	124	105	11	417
	31,53	16,24	21,18	31,06	100,00	42,45	29,74	25,18	2,64	100,00
35 - 44 years	150	83	96	135	464	207	121	110	21	459
	32,33	17,89	20,69	29,09	100,00	45,10	26,36	23,97	4,58	100,00
45 - 54 years	182	102	132	245	661	248	189	177	25	639
	27,53	15,43	19,97	37,07	100,00	38,81	29,58	27,70	3,91	100,00
55 - 64 years	192	110	158	386	846	310	219	274	36	839
	22,70	13,00	18,68	45,63	100,00	36,95	26,10	32,66	4,29	100,00
65 years and older	281	181	275	693	1430	439	441	538	95	1513
	19,65	12,66	19,23	48,46	100,00	29,02	29,15	35,56	6,28	100,00
Total	1059	610	809	1659	4137	1521	1151	1262	203	4137
	25,60	14,74	19,56	40,10	100,00	36,77	27,82	30,51	4,91	100,00

First row has *frequencies* and second row has *row percentages*. LISS Panel Data.

To further investigate the changes in monthly net personal income Table 3 was constructed. It shows the total number of respondents in each income category per year.

Table 3: Personal Net Monthly Income in Categories per Year

Personal net monthly income in categories	Year	
	2019	2020
No income (EUR 0)	412	386
	9,96	9,33
Low (EUR 1 to EUR 1500)	1414	1357
	34,18	32,80
Middle (EUR 1501 to EUR 2000)	831	812
	20,09	19,63
High (EUR 2001 to EUR 3500)	1298	1359
	31,38	32,85
Highest (EUR 3501 and above)	182	223
	4,40	5,39
Total	4137	4137
	100,00	100,00

First row has *frequencies* second row has *column percentages*. LISS Panel Data.

The table above suggests that in the sample around 1/3 are high-income earners, around 1/3 are low-income earners and the rest are either below, in or above those income groups. Interestingly, in 2020, there were slightly more respondents in higher income groups than in 2019, despite significant income losses of self-employed individuals and employees in the cultural, retail and hospitality sector due to partial or full closures of these sectors during lockdowns (CBS, 2021). This might partially be explained by the high number of retirees in the sample, which make up approximately 1/3 of the whole sample population (see Table A1 in the appendix). The reason for that is that their net monthly income, which is usually their monthly pension payment, remained fairly stable in the coronavirus year of 2020 (DNB, 2021). Further, in the descriptive analysis, the high proportion of high-income earners and retirees might explain a lack of or a weak effect of income on mental health during the coronavirus pandemic. As for approximately 1/3 of the population in the sample, the net monthly income remained roughly the same during the pandemic.

In order to analyse the effects which led to the deterioration of mental health of these age groups and across income level a regression is run, including various specifications, which will be introduced in section 4.3.

4. Empirical Analysis

The methodology section describes the empirical approach taken in this thesis to answer the research question, which is introduced first together with the underlying hypotheses. Next, the main empirical model, namely an individual fixed-effects model, is introduced and it is argued why this model is the most appropriate one for the analysis. Finally, the regression specifications are presented.

4.1 The Empirical Model

In order to answer the question of whether the change in mental health in the Netherlands during the COVID-19 pandemic varies by income level and other socio-economic factors, this thesis uses an individual fixed-effects model. This model exploits the fact that the same individuals are observed over two time periods. Thus, the panel dataset is convenient to estimate the relationship between the COVID-19 pandemic and mental health for various time-variant socio-economic characteristics. By introducing individual fixed-effects, this model automatically controls for any time-invariant unobserved and observed personal characteristics like gender and ethnic background. Thereby, it controls for variation within individuals rather than between individuals. Adding fixed effects to measure changes in mental health or well-being during the coronavirus pandemic was used in several studies that tackled similar topics, like Pierce et al. (2020), González-Sanguino et al. (2020) and Le & Nguyen (2021).

OLS Regression

A simple ordinal-least-square (OLS) regression is not a fitting approach for the analysis as it likely entails an omitted variable bias. Adding more control variables might reduce this issue, but as many factors are difficult to control for, an OLS regression will most probably have biased and inconsistent estimates. Furthermore, if the constant individual factors a_i are correlated with any of the explanatory variables a heterogeneity bias and a bias caused from omitting a time-constant variable occurs (Wooldridge, 2002). Consequently, the Gauss-Markov assumptions² of homoscedastic errors and no serial correlation of the error terms do not hold and the OLS estimator is most likely not BLUE (best linear unbiased estimator). Hence, another econometric model should be considered for the analysis.

² Gauss-Markov assumptions: The five Gauss-Markov assumptions have to hold in order to for the OLS estimator to be the best linear unbiased estimator. The first assumption is linearity, which means that the population parameters have to be linear. The second is the exogeneity assumption, which states that the estimates are retrieved from a random sample. The third assumption is that there is no perfect collinearity in regressors. The fourth assumption says that the regressors are not correlated with the error term. Lastly, the fifth assumption states that the error terms have to be homoscedastic. For further information, please read Wooldridge (2002).

Due to the panel format of the data, a panel data model for two time periods will be used, which will address the above-mentioned issues.

Fixed-Effects Model

The panel model used for the analysis in this thesis is an individual fixed-effects model, in which the parameters are fixed and non-random. In this case, the fixed effects are specific to the respective individual, meaning that they stay constant over time. They can thereby also be referred to as time-invariant intercepts for each individual. In this model, the fixed effects estimator, also called within-estimator, represents an estimator for the coefficients in the regression. According to Wooldridge (2010), the fixed effects estimator removes any observed or unobserved time-invariant individual characteristics prior to the estimation by using a transformation.

Aside from the fixed effects model, there is another widely used panel model, called random-effects model. The latter is defined by Wooldridge (2010) as “the unobserved effects panel data model where the unobserved effect is assumed to be uncorrelated with the explanatory variables in each time period.” Due to the fact, that the unobserved individual effects are, however, assumed to be correlated with the explanatory variables in this dataset and this thesis is more interested in the differences between individuals, the fixed effects model was deemed to be the better choice for the analysis. To validate the choice between a fixed-effects or random-effects model a Hausman test was conducted in Stata. In economics, the standard Hausman test is a frequently used tool since the 1980s to test whether a fixed or random-effects model should be used (Baltagi et al., 2003).

Due to a small p-value of 0.0006 the null hypothesis of the Hausman test, which states that the random-effects model is appropriate, can be rejected. Conversely, the alternative hypothesis, stating that the random-effects model is not suitable is accepted. Thus, both theoretical and empirical arguments support the use of a fixed-effects model for the analysis in this thesis.

In the following sub-section, the various regression specifications of the analysis are presented and described.

4.2 Regression Specifications

The analysis will consist of multiple regression specifications that will be listed and explained below. In all specifications, the dependent variable is y_{it} , the mental health of individual i at time t . It denotes a value from 0 to 100 on the 5-item mental health index, which is discussed in further detail in section 4.2. The main explanatory variable is *pandemic* in all regression specifications. $Pandemic = 0$ for the period November/December 2019 and $pandemic = 1$ for the coronavirus pandemic in November/December 2020. Several other explanatory variables, which simultaneously serve as

control variables for each other, are added to all regressions as well. The vector X_{it} contains the personal socio-economic characteristics of individual i at time t , which serve as the additional explanatory variables. These variables are the following:

- individual age at time t or individual age category at time t ,
- highest individual educational attainment at time t ,
- the primary occupation of individual i at time t ,
- perceived general health of individual i at time t on a scale from 1 (poor) to 5 (excellent) and
- individual living situation at time t .

The individual living situation is likely to stay relatively stable. Thus, the dependency on time t for individual living situation was removed. More details on the composition and the reason for the inclusion of all explanatory variables can be read in section 3.3. Moreover, the individual fixed effect α_i , which is the fixed intercept for individual i for a given number of N is added to all specifications. Finally, all regression specifications entail the error term ε_{it} .

Thus, the following **baseline regression (1)** of an individual fixed-effects model was constructed:

$$y_{it} = \alpha_i + \beta_1 * pandemic + \beta_2 * I_{it} + \beta_3 * X_{it} + \varepsilon_{it} \quad (1)$$

The baseline regression (1) simple shows the effect of having one additional Euro of personal net monthly income I_{it} and the effect of the coronavirus pandemic on the level of personal mental health of person i at time t , accounting for various personal characteristics with X_{it} . This basic specification does, however, not take into account that an additional Euro of personal net monthly income might potentially have a different effect on mental health in the pre-coronavirus year 2019 than in the coronavirus year 2020. Thus, **the interaction term ($I \times pandemic$) _{i} is added to the regression specification (2)**, which can be seen below:

$$y_{it} = \alpha_i + \beta_1 * pandemic + \beta_2 * I_{it} + \beta_3 * X_{it} + \beta_4 * (I \times pandemic)_i + \varepsilon_{it} \quad (2)$$

This interaction term shows that the relationship between mental health and personal net monthly income changes dependent on the coronavirus pandemic. This will potentially lead to an interaction effect, which is defined by Wooldridge (2002), as “the partial effect of one explanatory variable which depends on the value of a different explanatory variable.”

Regression specification (3) adds interaction terms between pandemic and each explanatory variable in separate regressions. This means that there is one regression specification per additional interaction term. They were added to show that the relationship between mental health and the categorical variables varies during the coronavirus pandemic.

Moreover, regression specification (3) replaces the continuous variables personal net monthly income and age with their categorical variable counterparts. This is done to allow for a different interpretation of the regression results. At first, in the specifications (1) – (2) a change of the impact of the coronavirus pandemic on mental health due to an additional Euro of personal net income was observed. In this specification, a change of the impact of the coronavirus pandemic on mental health of being in a different income group is observed. If one or more coefficients of the four income groups are significant, there is a significant difference in mental health between the income groups *ceteris paribus*.

Additionally, in this specification, the variation of the impact of the coronavirus pandemic on mental health by age groups is measured, rather than by being one year older. Table 4 in section 3.4, which shows how many people per age group are in which mental health quartile in 2019 and 2020, highlights the importance of adding this variable to the regression. It indicates that mental health deteriorated the most for 15-24-year-olds compared to older age groups during the coronavirus pandemic. Moreover, the data suggests that income is very unevenly distributed between different age groups. As seen in Table A2, in the appendix more than 91 % of all 15-24-year-olds in 2019 and in 2020 were in the no or low-income groups, as they are probably still studying, living at home and/or being supported financially by their parents. In comparison, in 2020 59% of 55-64-year-olds fell at least into the middle-income group or higher. These income differences depending on age are widely supported by evidence from the literature, which was discussed in section 3.3. Therefore, an interaction term between age and income *age*I* is added to the regression.

The last **regression specification (4)**, which is described below, is a fixed-effects regression that interacts pandemic with both gender and ethnic background. As gender and ethnic background are time-invariant characteristics, the fixed-effects model omits gender and origin, but by interacting them with pandemic their effect on mental health during the coronavirus pandemic can still be observed.

$$y_{it} = \alpha_i + \beta_1 * pandemic + \beta_2 * I_{it} + \beta_3 * X_{it} + \beta_4 * (gender \times pandemic)_i + \beta_5 * (origin_k \times pandemic)_i + \varepsilon_{it} \quad (4)$$

Interest in these variables originates from the findings of multiple papers that show significant gender differences in the impact of the coronavirus pandemic on mental health as well as the relation between ethnic background and the aforementioned impact. The findings of these papers together with the authors' justification on why to include these variables are elaborated upon in section 3.3.

5. Empirical Results

Section 5 presents the main outcomes of the empirical analysis conducted for this research. The aim is to assess the heterogeneous effects of the COVID-19 pandemic on mental health in the Netherlands by socio-economic characteristics. Tables 4 to 8 depict the main results. They show the results of an individual fixed-effects model that includes interaction terms for each explanatory variable separately.

Table 4: Changes in Mental Health during the COVID-19 Pandemic - Income and Age

VARIABLES	(1)	(2)	(3)
pandemic	-8,170*** (3,101)	-6,631** (3,133)	-6,676** (3,131)
Personal net monthly income (I)	-0,000 (0,001)	0,000 (0,001)	0,001 (0,002)
pandemic*I		-0,001*** (0,000)	-0,001*** (0,000)
age	0,754 (3,105)	0,767 (3,129)	0,810 (3,127)
age*I			-0,000 (0,000)
Constant	17,336 (168,634)	16,239 (169,917)	14,306 (169,779)
Observations	8.256	8.256	8.256
R-squared	0,831	0,832	0,832
Individual FE	YES	YES	YES

Notes: Individual fixed-effects regressions. Robust standard errors in parentheses. LISS Panel Data. Dependent variable: mental health score on the 5-item Mental Health Index. Pandemic is a dummy variable for year 2020, during the COVID-19 pandemic or 2019. Controls include the level of education, general perceived health, domestic situation and primary occupation. Specification (2) includes interaction term I*pandemic. Specification (3) includes interaction terms I*pandemic and age*I. *** p<0,01, ** p<0,05, * p<0,1

Pandemic

Both the literature and the descriptive analysis of the LISS panel data suggest a significant deterioration of mental health during the pandemic in 2020 compared to the previous year across all observed groups. This assumption is supported by the highly significant negative coefficient of the variable *pandemic* in Tables 4 – 8. These tables show that there was a sizable statistically significant decrease in mental health from 2019 to 2020, the year of the coronavirus pandemic. Holding all other variables constant, mental health deteriorated during the pandemic compared to 2019 on average by 6,4 points on the mental health index, which can be seen in the first regression specification of Table 5. Variation in the deterioration of mental health can be seen throughout the Tables, which depends on whether and which interaction terms were added to the regression specifications. In Table 8 regression specification (1) only the interaction term *female*pandemic* was added to the regression, which resulted in a mental health decrease of on average 8,6 points, ceteris paribus. Once the

interaction term age category *pandemic is added to the regression specification (3) in Table 5, the deterioration in mental health is 4,7 points from 2019 to 2020. Despite considerable variation in magnitude, one may conclude that there was a strong decrease in mental health during the coronavirus pandemic compared to the previous year.

Personal Net Monthly Income

This thesis also aims to find the effect of the COVID-19 pandemic on mental health in the Netherlands depending on personal income. Table 4 shows that having one additional Euro of personal net monthly income in 2019 does not have a significant effect on mental health in the Netherlands. However, an additional Euro of personal net monthly income in 2020 has a highly statistically significant, small negative effect of -0,001 mental health points compared to 2019, *ceteris paribus*.

Table 5 below shows differences in the change of mental health during the coronavirus pandemic depending on income levels and age groups. The baseline for income levels is the low-income group with a personal net monthly income of 1 – 1500 Euros per month. Holding all else fixed, in 2019, individuals in the highest-income group have on average a higher mental health score by 4,4 points than individuals in the low-income group. When accounting for a possible confounding effect between age and income this effect becomes statistically insignificant.

However, high-income groups, with a personal monthly net income of 2001 – 3500 Euros, have on average a higher mental health score by 7,6 points in 2019 in comparison to the low-income group when accounting for the combined effect of age and income. These outcomes are in line with the literature and the descriptive statistics.

Individuals in the highest income group saw their mental health deteriorate during the pandemic by on average 4,2 points relative to the low-income group pre-pandemic, while the mental health score decreased by on average 2,2 points for the high-income group relative to the low-income one. Accounting for the combined effect of age and income these results barely change.

Nevertheless, the mental health of individuals in the high- and the highest-income group remained higher in absolute terms relative to the low-income group during the pandemic as, all else equal, the mental health of low-income people deteriorated by on average 6,4 points, looking at the regression specification (1) of Table 5.

Table 5: Changes in Mental Health during the COVID-19 Pandemic - Income and Age Categories

VARIABLES	(1)	(2)	(3)	(4)
pandemic	-6,420*** (0,352)	-6,460*** (0,356)	-4,653*** (0,918)	-4,761*** (0,926)
Personal net monthly income categories				
No income (EUR 0)	1,997 (1,514)	3,101 (2,124)	1,501 (1,470)	2,883 (2,099)
Middle income group (EUR 1501 to EUR 2000)	0,891 (1,124)	2,352 (3,076)	0,425 (1,079)	1,630 (3,032)
High income groups (EUR 2001 to EUR 3500)	1,663 (1,246)	7,621* (4,136)	0,066 (1,210)	5,504 (4,241)
Highest income group (EUR 3501 and above)	4,387** (1,764)	2,884 (2,257)	0,265 (1,658)	-0,785 (2,109)
No income*pandemic	0.032 (0.814)	0.034 (0.817)		
Middle income*pandemic	-0,914 (0,562)	-0,832 (0,567)		
High income*pandemic	-2,170*** (0,476)	-2,139*** (0,479)		
Highest income*pandemic	-4,203*** (0,847)	-4,151*** (0,847)		
Age in CBS (Statistics Netherlands) categories				
25 - 34 years	2,620 (1,700)	3,468 (2,471)	1,298 (1,821)	2,534 (2,517)
35 - 44 years	3,405 (2,362)	7,410** (3,393)	0,603 (2,546)	4,534 (3,552)
45 - 54 years	3,795 (2,799)	9,451*** (3,504)	0,156 (2,985)	5,457 (3,649)
55 - 64 years	5,456* (3,181)	9,173** (3,764)	2,477 (3,327)	5,619 (3,891)
65 years and older	4,389 (3,389)	8,296** (3,860)	2,631 (3,495)	6,254 (3,951)
25 - 34 years *pandemic			-0,944 (1,138)	-1,069 (1,153)
35 - 44 years *pandemic			-1,688 (1,140)	-1,694 (1,145)
45 - 54 years *pandemic			-2,018* (1,040)	-1,734* (1,052)
55 - 64 years*pandemic			-3,765*** (1,021)	-3,644*** (1,030)
65 years and older*pandemic			-3,986*** (0,962)	-3,873*** (0,971)
Constant	53,920*** (4,537)	51,390*** (4,650)	58,313*** (4,612)	55,649*** (4,721)
Observations	8.256	8.256	8.256	8.256
R-squared	0,832	0,833	0,833	0,834
Individual FE	YES	YES	YES	YES

Notes: Individual fixed-effects regressions. Robust standard errors in parentheses. LISS Panel Data. Dependent variable: mental health score on the 5-item Mental Health Index. Pandemic is a dummy variable for year 2020, during the COVID-19 pandemic or 2019, pre-pandemic. Controls include level of education, general health, domestic situation and primary occupation. Specification (1) includes interaction term $I\ category_k * pandemic$. Specification (2) includes interaction terms $I\ category_k * pandemic$ and $age\ category_k * I\ category_k$. Specification (3) includes interaction term $age\ category_k * pandemic$. Specification (4) includes interaction term $age\ category_k * pandemic$ and $age\ category_k * I\ category_k$. *** $p < 0,01$, ** $p < 0,05$, * $p < 0,1$

Age in Categories

In the previous sections, a strong case was made that young people's mental health was affected more by the coronavirus pandemic than older people's mental health. However, the results suggest that during the coronavirus pandemic, older age groups have lower mental health scores than 15-24-year-olds in 2019. For example, 65-year-olds and older have on average a 4 points lower mental health score during the pandemic than 15-24-year-olds pre-pandemic. Similarly, 55-64-year-olds had on average 3,6 mental health points less and 45-54-year-olds on average 1,7 mental health points less than their 15-24-year-old younger counterparts, holding all else equal.

Interestingly, the empirical analysis finds no significant difference in mental health between age groups in 2019, even when accounting for a combined effect between income and age.

Level of Education

Furthermore, the level of education was assumed to affect mental health during the COVID-19 pandemic. The results in Table 6 depict that there are no significant differences in mental health scores between education levels prior to the coronavirus pandemic in 2019. In 2020, during the pandemic, variation in mental health scores can be observed between individuals with only primary education that unexpectedly have on average 3 points more than individuals with lower secondary education (vmbo) in 2019. This positive effect might however be inaccurate, because few people in the sample only have a primary education, as compulsory schooling is until the age of 16 in the Netherlands (Nuffic, 2021). The results in Table 6 show that higher levels of education did not seem to have any significant variations in mental health during the coronavirus pandemic compared to those with secondary education in 2019.

Primary Occupation

The type of primary occupation also plays a role in the level of mental health of an individual. Pre-pandemic people who were working or assisting in a family business had on average a higher mental health score than those who were studying or attending school by 6,9 points, holding all else fixed. Other types of occupation did not show any significant difference in their mental health scores to those studying or attending school in 2019, which is depicted in Table 6.

During the coronavirus pandemic in 2020, greater variations in the level of mental health between primary occupations were observed. Surprisingly, mental health significantly improved for people with a work disability during the coronavirus pandemic compared to students both in school and higher education in the previous year. For all other groups of primary occupation, their mental health either deteriorated or did not significantly change in 2020 compared to those individuals who

were primarily in education in 2019.

Compared to individuals who were studying or attending school in 2019, mental health deteriorated for housekeepers by on average 2,3 points and those in paid employment by on average 2,5 points. The deterioration in mental health in 2020 was on average around 3,4 points for both pensioners and those individuals doing mainly voluntary work, compared to students in 2019. Freelancers, self-employed and autonomous professionals had the highest decrease in mental health in 2020 compared to students in 2019. This decrease amounts to 4,1 points. This indicates that this occupation group suffered the most compared to other primary occupation groups. However, it should be stated that the decline in the mental health of all these groups, was not as strong as for those in education. Their decline amounted to approximately 5,2 points, holding all else fixed, as can be seen in Table 6, specification (2) for the variable *pandemic*.

Table 6: Changes in Mental Health during the COVID-19 Pandemic - Education and Occupation

VARIABLES	(1) Education	(2) Primary occupation
pandemic	-7,435*** (0,424)	-5,126*** (1,030)
Level of education in CBS categories		
primary school	-5,939 (4,324)	-4,671 (4,410)
havo/vwo (higher secondary education/ preparatory university education)	0,228 (4,351)	-0,171 (4,337)
mbo (intermediate vocational education)	1,197 (3,308)	-0,392 (3,315)
hbo (higher vocational education)	5,075 (4,299)	3,693 (4,243)
wo (university)	2,329 (4,866)	-0,104 (4,911)
primary school*pandemic	3,057*** (0,950)	
havo/vwo*pandemic	0,507 (0,728)	
mbo*pandemic	-0,729 (0,579)	
hbo*pandemic	-0,417 (0,549)	
wo*pandemic	-0,257 (0,669)	
Primary occupation		
Paid employment	1,066 (2,338)	2,223 (2,345)
Works or assists in family business	3,876 (2,612)	6,891*** (2,382)
Autonomous professional, freelancer, or self- employed	0,681 (3,001)	2,670 (3,117)
Job seeker following job loss	0,989 (2,782)	-0,631 (2,937)

First-time job seeker	2,834 (4,473)	3,090 (4,470)
Exempted from job seeking following job loss	-5,595 (4,223)	-6,248 (5,008)
Takes care of the housekeeping	1,542 (2,921)	2,288 (2,975)
Is pensioner ([voluntary] early retirement, old age pension scheme)	2,142 (2,502)	3,845 (2,531)
Has (partial) work disability	-1,734 (3,283)	-3,022 (3,266)
Performs unpaid work while retaining unemployment benefit	-1,737 (4,691)	-3,221 (4,021)
Performs voluntary work	2,960 (3,439)	3,928 (3,403)
Does something else	-0,177 (3,794)	-0,356 (3,766)
Paid employment*pandemic		-2,527** (1,070)
Works or assists in family business*pandemic		-3,894 (2,415)
Autonomous professional, freelancer, or self-employed*pandemic		-4,121*** (1,405)
Job seeker following job loss*pandemic		2,519 (2,121)
First-time job seeker*pandemic		-1,635 (4,480)
Exempted from job seeking following job loss*pandemic		-1,510 (4,189)
housekeeper*pandemic		-2,265* (1,224)
pensioner*pandemic		-3,393*** (1,078)
(partial) work disability*pandemic		2,898* (1,551)
unpaid work & unemployment benefits*pandemic		3,288 (3,092)
voluntary work*pandemic		-3,364* (1,893)
Does something else*pandemic		0,575 (2,548)
Constant	53,443*** (4,601)	55,604*** (4,534)
Observations	8.256	8.256
R-squared	0,832	0,834
Individual FE	YES	YES

Notes: Individual fixed-effects regressions. Robust standard errors in parentheses. LISS Panel Data. Dependent variable: mental health score on the 5-item Mental Health Index. Pandemic is a dummy variable for year 2020, during the COVID-19 pandemic or 2019. Controls include level of education, general perceived health, domestic situation and primary occupation. Specification (1) includes interaction term education_k*pandemic. Specification (2) includes interaction term primary occupation_k*pandemic. *** p<0,01, ** p<0,05, * p<0,1

General Health

The results of the empirical analysis in Table 7 suggest that the level of general health and the level of mental health are strongly correlated, as all coefficients of the level of general health are highly significant. According to the results in Table 7, the higher general health is perceived, the higher mental health is perceived. The baseline for general health is people with poor general health in 2019. The biggest difference can be found between people with poor and excellent perceived general health. Individuals who indicate to have excellent general health have on average a 27,2 points higher mental health score than those who indicated to have poor general health in 2019.

Moreover, the results show that the combined effect of the pandemic and mental health increases with the level of general health. Surprisingly, people with good general health during the pandemic have an 8 point lower mental health score than those with poor mental health in 2019, ceteris paribus. Individuals with excellent general health scores showed on average 12,4 lower mental health points in 2020 relative to individuals with poor general health scores in 2019. These findings are contradictory to the findings in the literature and need to be observed more closely.

Living Situation

According to the empirical analysis, no significant differences in mental health scores could be observed for individuals with different living situations pre-pandemic. However, Table 7 shows that during the pandemic individuals living in (un)married co-habitation without children have on average a 1,6 lower mental health score than singles without children pre-pandemic.

Table 7: Changes in Mental Health during the COVID-19 Pandemic - Health and Domestic Situation

VARIABLES	(1) General health	(2) Domestic situation
Pandemic	-0,012 (2,363)	-6,855*** (0,412)
How would you describe your health, generally speaking?		
Moderate health	9,190*** (2,226)	8,488*** (1,975)
Good health	18,416*** (2,297)	15,265*** (2,076)
Very good health	23,309*** (2,358)	19,351*** (2,141)
Excellent health	27,203*** (2,504)	21,869*** (2,273)
Moderate health*pandemic	-2,515 (2,481)	
Good health*pandemic	-8,049*** (2,378)	
Very good health*pandemic	-9,442*** (2,400)	
Excellent health*pandemic	-12,409*** (2,548)	
Living situation		

(Un)married co-habitation, without child(ren)	-0,709 (1,702)	-0,514 (1,786)
(Un)married co-habitation, with child(ren)	-0,903 (1,794)	-1,351 (1,840)
Single, with child(ren)	0,131 (2,423)	-0,267 (2,515)
Other	-1,402 (4,263)	-1,008 (4,526)
(Un)married co-habitation, without child(ren)*pandemic		-1,571*** (0,497)
(Un)married co-habitation, with child(ren)*pandemic		-0,147 (0,561)
Single, with child(ren)*pandemic		0,319 (0,959)
Other*pandemic		1,047 (1,134)
Constant	48,782*** (4,657)	54,367*** (4,602)
Observations	8.256	8.256
R-squared	0,838	0,832
Individual FE	YES	YES

Notes: Individual fixed-effects regressions. Robust standard errors in parentheses. Dependent variable is a mental health score from 0 (bad) and 100 (excellent mental health). Pandemic is a dummy variable for year 2020, during the COVID-19 pandemic or 2019. Controls include level of education, general perceived health, domestic situation and primary occupation. Specification (1) includes interaction term $general\ health_k * pandemic$. Specification (2) includes interaction term $domestic\ situation_k * pandemic$. *** $p < 0,01$, ** $p < 0,05$, * $p < 0,1$

Gender and Ethnic Background

Contradictory to findings of related studies (Adams-Prassl et al., 2020; Pierce et al., 2020; McGinty et al., 2020), Table 8 shows that during the coronavirus pandemic women have on average higher mental health scores than men, holding all else fixed, namely more than 2 points.

Moreover, Table 8 depicts that during the coronavirus pandemic first-generation foreigners and second-generation foreigners with non-Western backgrounds have on average significantly higher mental health scores than individuals with a native-Dutch background, all else equal.

Table 8: Changes in Mental Health during the COVID-19 Pandemic - Gender and Ethnic Background

VARIABLES	(1) Gender	(2) Ethnic Background
pandemic	-8,575*** (0,267)	-7,907*** (0,215)
Ethnic background		
First generation foreign, Western background*pandemic		1,914 (1,168)
First generation foreign, non-western background*pandemic		2,655** (1,105)
Second generation foreign, Western background*pandemic		0,276 (0,797)
Second generation foreign, non-western background*pandemic		3,249** (1,469)
Female*pandemic	2,057*** (0,376)	
Constant	54,667*** (4,554)	55,566*** (4,889)
Observations	8,256	8,030
R-squared	0,832	0,832
Individual FE	YES	YES

Notes: Individual fixed-effects regressions. Robust standard errors in parentheses. LISS Panel Data. Dependent variable: mental health score on the 5-item Mental Health Index. Pandemic is a dummy variable indicating the year 2020, during the COVID-19 pandemic or 2019, pre-coronavirus time. Controls include level of education, general perceived health, domestic situation and primary occupation. Specification (1) includes interaction term female*pandemic. Specification (1) includes interaction term ethnic background_k *pandemic. *** p<0,01, ** p<0,05, * p<0,1

6. Robustness Checks

In this section, the robustness of the empirical results is examined. First, random-effects are added to the model instead of individual fixed-effects. Next, the sample is restricted to individuals in paid employment only. The results of these robustness checks are discussed below.

6.1 Random-Effects Model

In section 4.1., which introduced the empirical model, it is argued that an individual fixed-effects model is better suited for the analysis in this thesis than a random-effects model (RE model). The conducted Hausman test supports this assumption. To check whether the assumption that an individual fixed-effects model is more appropriate holds in practice, a random-effects model was run as a robustness check.

The results of the RE model, which are depicted in Table 9, only show minor differences to the individual fixed-effects model. Individuals in the middle-income group show a significantly lower mental health score by – 1,2 points in 2020 than those with a low income in 2019. Additionally, individuals aged 35-44 in 2020 show a significant deterioration in mental health compared to 15-24-year-olds in 2019. These negative effects were statistically insignificant in the individual fixed-effects model. Otherwise only slight negligible changes of the mental health scores could be observed in the RE model compared to the individual fixed-effects model.

Thus, the effect of running a random-effects model instead of an individual fixed-effects model on the results is minor and barely has an impact on the outcomes. Therefore, contesting the assumption that an individual fixed-effects model is a superior model, does not seem to change the results significantly.

Table 9: Changes in Mental Health during the COVID-19 Pandemic – Random-Effects Model

VARIABLES	(1) Income	(2) Age	(3) Education
pandemic	-6,525*** (0,346)	-4,682*** (0,820)	-7,605*** (0,422)
25 - 34 years *pandemic		-1,304 (1,056)	
35 - 44 years *pandemic		-2,161** (1,041)	
45 - 54 years *pandemic		-2,386** (0,945)	
55 - 64 years*pandemic		-4,030*** (0,929)	
65 years and older*pandemic		-3,879*** (0,871)	
No income*pandemic	0,034		

	(0,770)		
Middle income*pandemic	-1,202**		
	(0,552)		
High income*pandemic	-2,079***		
	(0,471)		
Highest income*pandemic	-4,288***		
	(0,858)		
primary school*pandemic			3,242***
			(0,924)
havo/vwo*pandemic			0,586
			(0,723)
mbo*pandemic			-0,773
			(0,581)
hbo*pandemic			-0,422
			(0,551)
wo*pandemic			-0,135
			(0,669)
Constant	44,914***	44,396***	45,373***
	(2,054)	(2,099)	(2,093)
Observations	8.256	8.256	8.256
Number of ID	4.129	4.129	4.129
GROUP RE	YES	YES	YES

Notes: Random-effects regressions. Robust standard errors in parentheses. LISS Panel Data. Dependent variable is a mental health score on the 5-item Mental Health Index. Pandemic is a dummy variable indicating the year 2020, during the COVID-19 pandemic or 2019, pre-pandemic. Controls include the level of education, general perceived health, living situation and primary occupation. Specification (1) includes the interaction term income category*pandemic and age category*income category. Specification (2) includes the interaction term age category*pandemic and age category* income category. *** p<0,01, ** p<0,05, * p<0,1

6.2 Sample Restriction to Individuals in Paid Employment

The aggregated data might show a different story than the data on specific sub-samples. The large sample observed in this thesis consists of more than 4.000 individuals, with diverse socio-economic characteristics. Some hidden confounding factors which are related to specific sub-groups might not have been controlled for in the whole sample. In order to assess the robustness of the empirical results with respect to sample characteristics, the sample was restricted to individuals in paid employment only. Hence, all individuals in other primary occupation groups such as job seekers, students, housekeepers, and pensioners were removed from the sample.

Restricting the sample to individuals in paid employment stems from the assumption that the mental health of these individuals was affected by different factors during the coronavirus pandemic compared to the mental health of job seekers, students, retirees, and people in other primary occupations. For example, those in paid employment had higher levels of economic stability, including job security than job seekers or self-employed (OECD, 2020). Even in the case of a reduction in working hours during the pandemic, paid employees often-times had access to job retention programmes, that allowed them to keep their pay and their jobs (OECD, 2020). Therefore, limiting the sample to paid

employees might give more accurate results on the mental health of this sub-group compared to just controlling for various explanatory variables in the whole sample.

Numerous differences in the results could be observed between the whole sample and the sample that only considers those in paid employment. The findings of the regressions using the restricted sample can be found in Table A4 of the appendix.

Paid employees with no income have significantly lower mental health scores than those with a low income in 2019. The results considering the whole sample, show no significant difference between those income groups. Moreover, in 2019 paid employees with a high income have on average 8,8 mental health points more than those with a low income. This effect disappears in the whole sample. The difference between the highest income group and low-income groups becomes insignificant in the restricted sample. During the pandemic, no significant differences can be found between various income levels compared to the low-income group in 2019. In the full sample, the high- and highest-income groups show significantly lower mental health scores in 2020 than the low-income group in 2019, which would suggest that the rich had worse mental health in 2020 than the poor in 2019.

The variation of mental health between age groups in the restricted sample is very different to those of the whole sample. Whereas in the whole sample in 2019 there are no differences in mental health levels between age groups, there are significant differences between age groups for people in paid employment. For the restricted sample in 2019, starting from people aged 35 and above, the older the age groups is relative to the 15-24-year-olds the higher the average mental health score. During the pandemic, only 65-year-olds and older show a significantly lower mental health score compared to 15-24-year-olds in 2019.

In 2019, paid employees with any other education level (than lower secondary education) showed significantly higher mental health scores than those with lower secondary education. For the whole sample, no significant differences in mental health levels between education groups could be observed.

During the pandemic, paid employees did not show any significant differences in mental health by the level of perceived general health, whereas in the whole sample, those with higher general health show lower mental health scores than those with poor mental health pre-pandemic.

The differences in the results between the whole sample and the restricted sample of paid employees suggest that various sub-samples might be subject to additional factors which cannot be controlled for by the regression model. Drawing conclusions about variation in mental health for the whole population is difficult and further research is advised.

7. Limitations

This section briefly discusses the limitations of this master thesis and provides recommendations for improvement and further research.

Although the large survey dataset used in this thesis contributes to the representativeness of the sample and provides a strong basis for the descriptive and empirical analysis, the LISS Panel data poses a few limitations for the thesis. Firstly, the 5-item Mental Health Index, which was constructed to analyse changes in mental health, is based on perceived mental health. This may cause inaccurate estimations of people's mental health and thus, bias the main outcome variable. Additionally, other mental health indices, such as the WHO-5 Well-Being Index (Topp et al., 2015) or the General Health Questionnaire 12 (Hoeymans et al., 2004) could have been used for the empirical analysis. For further research, it might be interesting to use another mental health index to a similar research design thereby verifying once more the robustness of the results. Moreover, the general limitation of survey data applies, namely that the daily condition and other circumstances of respondents might have influenced the outcomes of individuals.

The thesis was centred around mental health before and during the coronavirus pandemic in the Netherlands, by using a purely Dutch sample. The outcomes of this master thesis might have limited external validity for other countries, as social-distancing measures and corona restrictions varied between countries and thereby had a different effect on mental health of their citizens. Further research on the effect of the coronavirus pandemic on mental health in other countries, as well as on a regional level is advised.

Moreover, the empirical analysis might suffer from omitted variable bias, as it is very likely that not all factors which influenced mental health were added as control variables to the empirical analysis. Such mental health determinants can include whether a family member or friend was lost due to a coronavirus infection, the square meter of the living space, worries about the coronavirus pandemic, etc. These variables might consequently be in the error term. If there is a correlation between the level of mental health and a variable in the error term, the empirical analysis might suffer from endogeneity.

Another possible limitation is reversed causality between the level of mental health and general health. The perception of feeling generally healthy affects the level of mental health. However, the level of mental health also affects how well a person generally feels. Thus, the relation between those variables goes in both directions. Similarly, there might be reversed causality between mental health and type of primary occupation, as well as mental health and personal net monthly income.

8. Conclusion

The COVID-19 pandemic significantly changed the lives of Dutch people and the rest of the world. Measures to contain the spread of the virus, such as social distancing measures and lockdowns have been successful in reducing COVID-19 infections and deaths, but at the same time have severely affected mental health. Anxiety, stress levels, loneliness and sadness increased by approximately a third during the pandemic in April 2020 compared to April 2019 (Statista, 2021). Thus, the COVID-19 pandemic is not only a threat to physical, but also to mental health. However, not everyone was equally affected by the pandemic. Resilience and psychological distress vary considerably across income levels and other socio-economic characteristics (Guintella et al., 2021).

Thus, this thesis aims to analyse the variation in the impact of the COVID-19 pandemic on mental health by socio-economic characteristics of the Dutch population. The observed socio-economic characteristics in this thesis include net income, age, primary occupation, level of education, living situation, general health, ethnic background and gender. To answer this research question, an individual fixed-effects model is deployed on panel data from the Dutch Longitudinal Internet Studies for the Social Sciences (LISS) from 2019 and 2020. Mental health is measured on a 5-item Mental Health Index from 0 (bad mental health) to 100 (excellent mental health).

The descriptive and empirical analysis, along with findings of similar studies discussed in the literature review suggest a significant deterioration in mental health during the coronavirus pandemic in 2020 compared to the previous year for all societal groups. The hypothesis, which states that the COVID-19 pandemic has a negative impact on mental health can be accepted, as the results of the empirical analysis show that mental health deteriorated on average by 6,4 points in 2020 compared to 2019, holding all else fixed.

Additionally, the hypothesis, which states that the effect of the COVID-19 pandemic on mental health is heterogeneous across income groups is accepted as well. Compared to the mental health of individuals in the low-income group in 2019, the mental health of the highest-income group deteriorated by on average 4,4 points and the mental health of the high-income group deteriorated by 2,2 points during the pandemic. This indicates that the rich had lower mental health in 2020 than the poor in 2019.

Furthermore, the findings suggest that the hypothesis, which states that the effect of the COVID-19 pandemic varies across socio-economic characteristics can be accepted. The results show that older age groups tend to have lower mental health scores during the pandemic than 15-24 years old in 2019, which is contradictory to the findings in the literature and thus, calls for more research on the effect of age on mental health during the pandemic. Unexpectedly, individuals with higher levels of education

did not seem to have any significant variations in their mental health during the coronavirus pandemic relative to those with only secondary education in 2019.

Moreover, relative to individuals with poor general health in 2019, those with good general health during the pandemic have an 8 point lower mental health score and those with excellent general health have a 12,4 point lower mental health score, all else equal. These findings are also contradictory to the findings in the literature and need to be observed more closely.

Mental health also varies between primary occupation types during the pandemic. Additionally, as opposed to findings of related studies women showed higher mental health scores during the pandemic than men. Moreover, during the COVID-19 pandemic, first-generation foreigners and second-generation foreigners with non-Western backgrounds have on average higher mental health scores than individuals with a native-Dutch background, all else equal.

Various findings of this thesis are unexpected. These findings which show the impact of socio-economic characteristics on the change in mental health during the COVID-19 pandemic might be subject to additional factors which were not observed in the empirical analysis. Therefore, more research on this subject matter is needed.

Furthermore, these results call for more targeted mental health treatments for individuals in socio-economic groups that experienced a strong deterioration in mental health during the COVID-19 pandemic. With effective treatments, their productivity and employability might rise in the future and their yearly physical health care costs could be reduced. However, due to an overall decrease in mental health, policymakers are advised to address mental health issues across all societal groups. Due to mental disorders being one of the most expensive groups of diseases in the Netherlands, providing comprehensive psychological treatments will likely reduce total health and welfare expenditures.

In conclusion, the impact of the COVID-19 pandemic on mental health varies significantly by socio-economic characteristics. The results suggest that the rich had lower levels of mental health in 2020 than the poor in 2019 and older age groups tend to have lower mental health scores during the pandemic than 15-24-year-olds in 2019. Differences in the impact of the COVID-19 pandemic on mental health could also be observed between primary occupation types, living situations, levels of general health, ethnic background and gender. Nevertheless, mental health deteriorated across all societal groups during the COVID-19 pandemic in 2020 compared to 2019 in the Netherlands. Thus, comprehensive policies which tackle mental health issues should be addressed by policymakers.

9. References

- Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2021). Lockdowns widen the gender gap in mental health. Accessed June 9, 2021 <https://voxeu.org/article/lockdowns-widen-gender-gap-mental-health>
- Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2020). The impact of the coronavirus lockdown on mental health: evidence from the US. Accessed February 23, 2021
- Ahmad, A., Rahman, I., & Agarwal, M. (2020). Factors influencing mental health during COVID-19 outbreak: an exploratory survey among indian population. MedRxiv.
- Althubaiti, A. (2016). Information bias in health research: definition, pitfalls, and adjustment methods. *Journal of multidisciplinary healthcare*, 9, 211. Accessed February 28, 2021 <https://www.ncbi.nlm.nih.gov/pubmed/27033254>
- American Psychiatric Association (2021). Mental Health Disparities: Diverse Populations. Accessed July 3, 2021 <https://www.psychiatry.org/psychiatrists/cultural-competency/education/mental-health-facts>
- Bakx, P., O'Donnell, O., & Van Doorslaer, E. (2016). Spending on health care in the Netherlands: not going so Dutch. *Fiscal Studies*, 37(3-4), 593-625. Accessed February 11, 2021 <https://onlinelibrary-wiley-com.eur.idm.oclc.org/doi/full/10.1111/j.1475-5890.2016.12114>
- Baltagi, B. H., Bresson, G., & Piroette, A. (2003). Fixed effects, random effects or Hausman-Taylor?: A pretest estimator. *Economics letters*, 79(3), 361-369.
- Best, H., & Wolf, C. (Eds.). (2013). *The SAGE handbook of regression analysis and causal inference*. Sage.
- Canadian Mental Health Association. (2008). The relationship between mental health, mental illness and chronic physical conditions. *Ottawa: Canadian Mental Health Association*. Access May, 2021 <https://ontario.cmha.ca/documents/the-relationship-between-mental-health-mental-illness-and-chronic-physical-conditions/>
- CBS (2015). Relatively high budget for mental health care services. Accessed February 11, 2021 <https://www.cbs.nl/en-gb/news/2015/49/relatively-high-budget-for-mental-health-care-services>
- CBS (2021). Labour market dashboard. Accessed February 23, 2021 <https://www.cbs.nl/en-gb/visualisaties/labour-market-dashboard>
- COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). Accessed June 6, 2021 <https://coronavirus.jhu.edu/region/netherlands>
- Crossley, T. F., Fisher, P., & Low, H. (2020). The heterogeneous and regressive consequences of COVID-19: Evidence from high quality panel data. *Journal of public economics*, 193, 104334. Accessed February 10, 2021 <https://www.sciencedirect-com.eur.idm.oclc.org/science/article/pii/S0047272720301985>

Deaton, Angus and Paxson, Christina. "4. Mortality, Education, Income, and Inequality among American Cohorts". *Themes in the Economics of Aging*, edited by David A. Wise, Chicago: University of Chicago Press, 2007, pp. 129-170. <https://doi-org.eur.idm.oclc.org/10.7208/9780226903330-007>

De Nederlandsche Bank (2021). Financial position of Dutch pension funds improved in fourth quarter of 2020. Accessed May 2, 2021 <https://www.dnb.nl/en/actueel/statistical-newsreleases/statistical-newsreleases-2021/financial-position-of-dutch-pension-funds-improved-in-fourth-quarter-of-2020/>

Dergiades, T., Milas, C., Mossialos, E., Panagiotidis, T., Thompson, L., & Wharton, G. (2020). Who got it right? New LSE research on the effectiveness of lockdowns. *LSE COVID-19 Blog*. Accessed February 9, 2021 <http://eprints.lse.ac.uk/106804/>

European Foundation for the Improvement of Living and Working Conditions (EFILWC) (2003). A New Organisation of Time Over Working Life, accessed June 13, 2021 <https://www.eurofound.europa.eu/publications/report/2003/working-conditions/a-new-organisation-of-time-over-working-life>

Fancourt, D., Andrew St., and Feifei B. (2021). 'Trajectories of Anxiety and Depressive Symptoms During Enforced Isolation Due to COVID-19 in England. A Longitudinal Observational Study.' *Lancet Psychiatry* 8(2): 141–149. doi: 10.1016/S2215-0366(20)30482-X.

Fone, D., Dunstan, F., Williams, G., Lloyd, K., & Palmer, S. (2007). Places, people and mental health: a multilevel analysis of economic inactivity. *Social science & medicine*, 64(3), 633-645.

Friedli, L. and Parsonage, M. (2007). Building an economic case for mental health promotion: part I. *Journal of Public Mental Health*, Vol. 6 No. 3, pp. 14-23. <https://doi-org.eur.idm.oclc.org/10.1108/17465729200700017>

Gabriel, P., & Liimatainen, M. R. (2000). Mental health in the workplace: introduction, executive summaries. Accessed June 13, 2021 <https://ecommons.cornell.edu/handle/1813/76480>

Giuntella, O., Kelly H., Saccardo S., and Sadoff S. (2021). 'Lifestyle and Mental Health Disruptions During COVID-19.' Proceedings of the National Academy of Sciences 118(9): e2016632118. doi: 10.1073/pnas.2016632118

González-Sanguino, C., Ausín, B., Castellanos, M. Á., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences of the Coronavirus 2020 Pandemic (COVID-19) in Spain. A longitudinal study. *Frontiers in Psychiatry*, 11, 1256.

Gould, E., & Kassa, M. (2020). Young workers hit hard by the COVID-19 economy: Workers ages 16–24 face high unemployment and an uncertain future. *Economic Policy Institute*. Accessed June 17, 2021 <https://www.epi.org/publication/young-workers-covid-recession>.

Gresenz, C. R., Sturm, R., & Tang, L. (2001). Income and mental health: Unraveling community and individual level relationships. *Journal of Mental Health Policy and Economics*, 4(4), 197-204.

Hill, R. and Narayan, A. (2020). Covid-19 and inequality: a review of the evidence on likely impact and policy options. Working paper, Centre for Disaster Protection, London. Accessed June 6, 2021 https://static1.squarespace.com/static/5c9d3c35ab1a62515124d7e9/t/5fe218df9507416a29d49d32/1608653024173/WP_3_22Dec.pdf

Hoeymans, N., Garssen, A. A., Westert, G. P., & Verhaak, P. F. (2004). Measuring mental health of the Dutch population: a comparison of the GHQ-12 and the MHI-5. *Health and quality of life outcomes*, 2(1), 1-6.

Jenkins, R., Bhugra, D., Bebbington, P., Brugha, T., Farrell, M., Coid, J., . . . Meltzer, H. (2008). Debt, income and mental disorder in the general population. *Psychological Medicine*, 38(10), 1485-1493. doi:10.1017/S0033291707002516

Kelly, M. J., Dunstan, F. D., Lloyd, K., & Fone, D. L. (2008). Evaluating cutpoints for the MHI-5 and MCS using the GHQ-12: a comparison of five different methods. *BMC psychiatry*, 8(1), 1-9.

Kivi, M., Hansson, I., & Bjälkebring, P. (2021). Up and about: Older adults' well-being during the COVID-19 pandemic in a Swedish Longitudinal Study. *The Journals of Gerontology: Series B*, 76(2), e4-e9.

Layard, R. (2017). The economics of mental health. IZA World of Labor 2017: 321 doi: 10.15185/izawol.321

Le, K., & Nguyen, M. (2021). The psychological burden of the COVID-19 pandemic severity. *Economics & Human Biology*, 41, 100979.

Lee, R. (2019). Does the healthy immigrant effect apply to mental health? Examining the effects of immigrant generation and racial and ethnic background among Australian adults. *SSM-population health*, 7, 100311.

McCollam, A., O'Sullivan, C., Mukkala, M., Stengård, E., & Rowe, P. (2008). Mental Health in the EU Key Facts, Figures, and Activities, A Background Paper provided by the SUPPORT-project. European communities: Directorate general for health and consumers.

Mazza, C., Ricci, E., Biondi, S., Colasanti, M., Ferracuti, S., Napoli, C., Roma, P., 2020. A nationwide survey of psychological distress among Italian people during the COVID-19 pandemic: immediate psychological responses and associated factors. *Int. J. Environ. Res. Public Health* 17, 3165. <https://doi.org/10.3390/ijerph17093165>.

Means-Christensen AJ, Arnau RC, Tonidandel AM, Bramson R, Meagher MW. An efficient method of identifying major depression and panic disorder in primary care. *J Behav Med*. 2005 Dec;28(6):565-72. doi: 10.1007/s10865-005-9023-6. Epub 2005 Oct 25. PMID: 16249822.

Niedzwiedz, C., Green J., Benzeval M., Campbell, D., Craig, P., Demou, E., Leyland, A., Pearce, A., Thomson, R., Whitley, E., Katikireddi, S., (2021) 'Mental Health and Health Behaviors Before and During

the Initial Phase of the COVID-19 Lockdown. Longitudinal Analyses of the UK Household Longitudinal Study.' *Journal of Epidemiology and Community Health* doi: 10.1136/jech-2020-215060

Nuffic – The Dutch Organisation for Internationalisation in Education (2021). Education in the Netherlands. Accessed July 3, 2021 <https://www.nuffic.nl/en/subjects/study-holland/education-netherlands>

Ohrnberger, J., Fichera, E., & Sutton, M. (2017). The relationship between physical and mental health: A mediation analysis. *Social Science & Medicine*, 195, 42-49. Accessed May 21, 2021 <https://www-sciencedirect-com.eur.idm.oclc.org/science/article/pii/S0277953617306639>

Olagoke, A.A., Olagoke, O.O., Hughes, A.M., 2020. Exposure to coronavirus news on mainstream media: the role of risk perceptions and depression. *Br. J. Health Psychol.* <https://doi.org/10.1111/bjhp.12427>.

Organisation for Economic Co-operation and Development (2015). *Fit Mind, Fit Job: From Evidence to Practice in Mental Health and Work*, Mental Health and Work, OECD Publishing, Paris, <https://dx.doi.org/10.1787/9789264228283-en>

Organisation for Economic Co-operation and Development (2020). *Employment Outlook 2020 – Facing the jobs crisis*. Accessed July 3, 2021 <https://www.oecd.org/employment-outlook/2020/>

Pak, A., Adegboye, O. A., Adekunle, A. I., Rahman, K. M., McBryde, E. S., & Eisen, D. P. (2020). Economic consequences of the COVID-19 outbreak: the need for epidemic preparedness. *Frontiers in public health*, 8, 241.

Pan, K. Y., Kok, A. A., Eikelenboom, M., Horsfall, M., Jörg, F., Luteijn, R. A., ... & Penninx, B. W. (2020). The mental health impact of the COVID-19 pandemic on people with and without depressive, anxiety, or obsessive-compulsive disorders: a longitudinal study of three Dutch case-control cohorts. *The Lancet Psychiatry*.

Pfefferbaum B., North CS (2020). Mental health and the Covid-19 pandemic. *The New England Journal of Medicine*; 383(6):510–2. Accessed February 9, 2021 <https://doi.org/10.1056/NEJMp2008017>

Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., ... & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *The Lancet Psychiatry*, 7(10), 883-892.

Pinheiro, Marcelo & Ivandic, Ivana & Razzouk, Denise. (2017). The Economic Impact of Mental Disorders and Mental Health Problems in the Workplace. 10.1007/978-3-319-55266-8_28.

Proto, E., & Quintana-Domeque, C. (2021). COVID-19 and mental health deterioration by ethnicity and gender in the UK. *PloS one*, 16(1), e0244419.

Rivera-Riquelme, M., Piqueras, J. A., & Cuijpers, P. (2019). The Revised Mental Health Inventory-5 (MHI-5) as an ultra-brief screening measure of bidimensional mental health in children and adolescents. *Psychiatry research*, 274, 247-253.

RIVM (2021). Risk groups and COVID-19. Accessed May 23, 2021 <https://www.rivm.nl/en/coronavirus-covid-19/risk-groups>

Scott, S., Knapp, M., Henderson, J., & Maughan, B. (2001). Financial cost of social exclusion: follow up study of antisocial children into adulthood. *Bmj*, 323(7306), 191.

Shigemura, J., Ursano, R. J., Morganstein, J. C., Kurosawa, M., & Benedek, D. M. (2020). Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations. *Psychiatry and clinical neurosciences*, 74(4), 281.

Statista (2020). Total expenditure on providers of mental health care in the Netherlands from 2007 to 2019. Accessed February 11, 2021 <https://www.statista.com/statistics/544547/total-expenditure-on-providers-of-mental-health-care-in-the-netherlands/>

Statista (2021). Changes in mental health due to the coronavirus in the Netherlands in 2020, by category. Accessed February 10, 2021 <https://www.statista.com/statistics/1115803/dutch-mental-health-coronavirus/>

Ten Have, M., Van Dorselaer, S., & de Graaf, R. (2015). The association between type and number of adverse working conditions and mental health during a time of economic crisis (2010–2012). *Social psychiatry and psychiatric epidemiology*, 50(6), 899-907.

Tierolf B, Geurts E, Steketee M. Living violence in families in the Netherlands during the coronavirus crisis: A mixed method study. *Child Abuse Negl.* 2020 Nov 17:104800. doi: 10.1016/j.chiabu.2020.104800. Epub ahead of print. PMID: 33218711.

Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 Well-Being Index: a systematic review of the literature. *Psychotherapy and psychosomatics*, 84(3), 167-176.

van der Velden, P. G., Contino, C., Das, M., van Loon, P., & Bosmans, M. W. (2020). Anxiety and depression symptoms, and lack of emotional support among the general population before and during the COVID-19 pandemic. A prospective national study on prevalence and risk factors. *Journal of affective disorders*, 277, 540-548. Accessed February 19, 2021 [https://www.sciencedirect-com.eur.idm.oclc.org/science/article/pii/S0165032720326227](https://www.sciencedirect.com.eur.idm.oclc.org/science/article/pii/S0165032720326227)

Van Tilburg, T. G., Steinmetz, S., Stolte, E., van der Roest, H., & de Vries, D. H. (2020). Loneliness and mental health during the COVID-19 pandemic: A study among Dutch older adults. *The Journals of Gerontology: Series B*. Accessed March 7, 2021 <https://doi-org.eur.idm.oclc.org/10.1093/geronb/gbaa111>

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., McIntyre, R. S., ... & Ho, C. (2020). A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain, behavior,*

and immunity, 87, 40-48 Accessed March 7, 2021 [https://www.sciencedirect-com.eur.idm.oclc.org/science/article/pii/S0889159120305110?casa_token=3uYnfE8Hfk8AAAAA:WmOg68sAV1lBbffl9EucCHvq2PW1dPVlo6nlzbyM79RBWHxmckBRas88Z8EeeSQ2AjY6CbWOIm7n](https://www.sciencedirect.com.eur.idm.oclc.org/science/article/pii/S0889159120305110?casa_token=3uYnfE8Hfk8AAAAA:WmOg68sAV1lBbffl9EucCHvq2PW1dPVlo6nlzbyM79RBWHxmckBRas88Z8EeeSQ2AjY6CbWOIm7n)

Williams, A.J., Maguire, K., Morrissey, K. *et al.* (2020). Social cohesion, mental wellbeing and health-related quality of life among a cohort of social housing residents in Cornwall: a cross sectional study. *BMC Public Health* 20, 985. <https://doi.org/10.1186/s12889-020-09078-6>

Witteveen, D., & Velthorst, E. (2020). Economic hardship and mental health complaints during COVID-19. *Proceedings of the National Academy of Sciences*, 117(44), 27277-27284. Accessed on May 22, 2021 https://www.pnas.org/content/117/44/27277.short?casa_token=-VlvBagpcEUAAAAA:P2YXyt_QpN3sjJsBoki7U0zvy8a7bwASVqk7_6u3xkfl76MHjzJWMD-ldEVLxW8SQY0OulRjDLahWum

Wooldridge, J. M. (2002). *Introductory Econometrics: A Modern Approach*, 2nd Edition. South-Western College Pub.

World Health Organization (2013). *Investing in mental health: evidence for action*. Accessed March 6, 2021 https://apps.who.int/iris/bitstream/handle/10665/87232/9789241564618_eng.pdf

10. Appendix

Table A1: Primary Occupation in 2019 and 2020

Primary occupation	2019	2020
Paid employment	1748	1687
	42,25	40,78
Works or assists in family business	22	22
	0,53	0,53
Autonomous professional, freelancer, or self-employed	188	194
	4,54	4,69
Job seeker following job loss	78	83
	1,89	2,01
First-time job seeker	9	12
	0,22	0,29
Exempted from job seeking following job loss	15	18
	0,36	0,44
Attends school or is studying	271	238
	6,55	5,75
Takes care of the housekeeping	341	345
	8,24	8,34
Is pensioner ([voluntary] early retirement, old age pension scheme)	1154	1252
	27,89	30,26
Has (partial) work disability	184	176
	4,45	4,25
Performs unpaid work while retaining unemployment benefit	9	9
	0,22	0,22
Performs voluntary work	86	74
	2,08	1,79
Does something else	32	27
	0,77	0,65
Total	4137	4137
	100,00	100,00

First row has *frequencies* and second row has *column percentages*. LISS Panel Data.

Table A2: Age and Personal Net Monthly Income in Categories in 2019

Age in CBS categories	Personal net monthly income in categories					
	No income	low	middle	high	highest	Total
15 - 24 years	165	120	19	7	0	311
	53,05	38,59	6,11	2,25	0,00	100,00
25 - 34 years	40	102	97	181	5	425
	9,41	24,00	22,82	42,59	1,18	100,00
35 - 44 years	27	133	92	181	31	464
	5,82	28,66	19,83	39,01	6,68	100,00
45 - 54 years	42	188	147	245	39	661
	6,35	28,44	22,24	37,07	5,90	100,00
55 - 64 years	94	270	169	263	50	846
	11,11	31,91	19,98	31,09	5,91	100,00
65 years and older	44	601	307	421	57	1430
	3,08	42,03	21,47	29,44	3,99	100,00
Total	412	1414	831	1298	182	4137
	9,96	34,18	20,09	31,38	4,40	100,00

First row has *frequencies* and second row has *row percentages*. LISS Panel Data.

Table A3: Age and Personal Net Monthly Income in Categories in 2020

Age in CBS categories	Personal net monthly income in categories					
	No income	low	middle	high	highest	Total
15 – 24 years	150	101	13	6	0	270
	55,56	37,41	4,81	2,22	0,00	100,00
25 - 34 years	42	77	100	187	11	417
	10,07	18,47	23,98	44,84	2,64	100,00
35 - 44 years	25	113	92	192	37	459
	5,45	24,62	20,04	41,83	8,06	100,00
45 - 54 years	42	184	121	243	49	639
	6,57	28,79	18,94	38,03	7,67	100,00
55 - 64 years	94	250	150	291	54	839
	11,20	29,80	17,88	34,68	6,44	100,00
65 years and older	33	632	336	440	72	1513
	2,18	41,77	22,21	29,08	4,76	100,00
Total	386	1357	812	1359	223	4137
	9,33	32,80	19,63	32,85	5,39	100,00

First row has *frequencies* and second row has *row percentages*. LISS Panel Data.

Table A4: Changes in Mental Health during the COVID-19 Pandemic – People in Paid Employment

VARIABLES	(1) Income	(2) Age	(3) Education	(4) General health
Pandemic	-8,106*** (0,776)	-8,353*** (2,131)	-8,905*** (0,926)	-1,367 (6,816)
Personal net monthly income in categories				
No income	-8,106*** (0,776)	-8,353*** (2,131)	-6,023*** (2,216)	-6,557*** (1,771)
middle	2,260 (4,451)	2,556 (4,497)	-0,438 (2,249)	-0,277 (2,308)
high	8,787* (5,259)	9,174* (5,514)	0,538 (2,355)	0,976 (2,430)
highest	-4,433 (6,489)	-6,451 (5,958)	0,741 (2,963)	1,374 (3,082)
No income*pandemic	-0,582 (3,454)			
Middle income*pandemic	1,214 (0,999)			
High income*pandemic	0,057 (0,892)			
Highest income*pandemic	-1,390 (1,368)			
Age in CBS (Statistics Netherlands) categories				
25 - 34 years	3,642 (3,600)	3,420 (3,667)	2,684 (2,328)	3,504 (2,351)
35 - 44 years	10,782* (5,527)	10,056* (5,666)	3,169 (3,029)	4,733 (3,112)
45 - 54 years	14,549*** (5,441)	13,058** (5,528)	3,057 (3,593)	3,703 (3,699)
55 - 64 years	13,144** (5,749)	12,339** (5,732)	5,128 (4,067)	5,460 (4,152)
65 years and older	14,234** (6,552)	19,894*** (6,579)	4,344 (4,593)	4,285 (4,600)
25 - 34 years *pandemic		1,234 (2,251)		
35 - 44 years *pandemic		0,688 (2,252)		
45 - 54 years *pandemic		1,135 (2,211)		
55 - 64 years*pandemic		-0,513 (2,207)		
65 years and older*pandemic		-6,070** (2,782)		
Level of education in CBS categories				
primary school	23,037 (14,262)	25,074* (13,508)	26,377* (13,999)	27,066* (14,188)
havo/vwo (higher secondary education/preparatory university education	34,444*** (13,116)	36,870*** (12,796)	35,997*** (13,068)	37,625*** (13,296)
mbo (intermediate vocational education, US: junior college)	6,893*** (0,644)	8,353*** (2,131)	8,952*** (0,583)	8,919*** (0,574)

hbo (higher vocational education, US: college)	27,754**	30,125**	29,790**	30,864**
	(12,131)	(11,749)	(12,029)	(12,108)
wo (university)	23,737*	26,973**	29,881**	29,051**
	(12,403)	(11,990)	(12,092)	(12,339)
primary school*pandemic			4,165*	
			(2,238)	
havo/vwo*pandemic			2,218	
			(1,352)	
mbo*pandemic			-0,047	
			(1,081)	
hbo*pandemic			1,583	
			(1,052)	
wo*pandemic			1,637	
			(1,170)	
How would you describe your health, generally speaking?				
moderate	8,866**	8,441*	6,674	8,941
	(4,411)	(4,381)	(4,955)	(7,963)
good	16,597***	16,027***	14,459***	18,611**
	(4,391)	(4,363)	(4,978)	(7,969)
very good	20,517***	19,885***	18,267***	23,021***
	(4,467)	(4,439)	(5,033)	(8,008)
excellent	21,951***	21,514***	19,979***	26,899***
	(4,601)	(4,575)	(5,147)	(8,107)
Moderate health*pandemic				-1,181
				(7,033)
Good health*pandemic				-6,438
				(6,839)
Very good health*pandemic				-7,551
				(6,851)
Excellent health*pandemic				-11,182
				(6,951)
Constant	30,059***	29,224***	35,335***	29,493**
	(9,467)	(9,504)	(9,440)	(11,472)
Observations	3.428	3.428	3.428	3.428
R-squared	0,835	0,835	0,833	0,836
Individual FE	YES	YES	YES	YES

Notes: Individual fixed-effects regressions. Robust standard errors in parentheses. LISS Panel Data. Dependent variable: mental health score on the 5-item Mental Health Index. Pandemic is a dummy variable indicating the year 2020, during the COVID-19 pandemic or 2019, pre-pandemic. Controls include the level of education, general perceived health, living situation and primary occupation. Specification (1) includes the interaction term income category*pandemic and age category*income category. Specification (2) includes the interaction term age category*pandemic and age category* income category. *** p<0,01, ** p<0,05, * p<0,1