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One Hundred Yen of Solitude

A study of the associations between loneliness and socioeconomic factors from an economic point of view

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Abstract

This thesis investigates the increasing condition and problem of loneliness from an economic point of view, adding to the limited research made on the topic. This is done by reviewing the literature on costs connected to loneliness both for the individual and for society. After that, a Mann Whitney U-test and a Logistic regression model is used on the ALLBUS 2018 dataset to examine the relationship between loneliness and different socioeconomic factors. The results show that there are substantial costs connected to loneliness. To varying extents, loneliness was in turn found to be negatively associated with income and subjective financial situation and positively associated with unemployment. Adding to the small but growing body of research, these findings have possible future applications for reducing the costs associated with loneliness by addressing socioeconomic factors, as well as contributing with theoretical value which could help inspire more in depth research on the topic.

Keywords: *Loneliness, Socioeconomics, Costs of Loneliness, Logistic Regression, ALLBUS*

Contents

1. Introduction

The Covid-19 pandemic is not unlikely to come to mind in response to the word *loneliness*. To be unable to meet your family, go to school or to do something as simple as visiting the supermarket are big changes that ought to decrease one's social interactions. Indeed, a study has shown that some groups' risk of being lonely increased during the pandemic. With that said, the same study also found these groups to have a higher risk of being lonely under normal circumstances, indicating that loneliness is present and affects individuals even in a non-pandemic state (Bu et al., 2020).

Undeniably, the rise is not just connected to the pandemic. When combining results from 345 studies, it has been shown that loneliness levels have been linearly increasing every year from 1976 to 2019 (Buecker et al., 2021). This trend has not gone unnoticed, both Japan and England have appointed a loneliness minister, and research on the subject has increased.

This research often approaches loneliness from a psychological or health perspective. Even though outcomes from these fields often have an impact on the economy, and that economic factors potentially could explain loneliness, studies from an economic point of view are seldomly performed.

In light of the above, this thesis aims to present and contribute to the literature on loneliness through an economic lens. Firstly, a short background will introduce the term loneliness and review the health effects associated with it. Building on these findings, loneliness will then be looked at from an economic point of view. This will be done in two ways: a short literary review of costs associated with loneliness will be presented followed by how loneliness relates to a few socioeconomic factors. Because of trouble generalizing that literature, empirical statistical analysis will be conducted to explore the relationship between an individual's perceived loneliness and their economic situation and education. With support from the reviewed literature on socioeconomics, the hypothesis will be that there is a positive relationship between loneliness and unemployment, and a negative relationship between loneliness and income, financial situation and higher education. When this has been done, the findings from both the literary review and the empirical research will be used to draw a conclusion about loneliness from an economic point of view.

2. Background

2:1 Loneliness trends

Loneliness has lately become an often discussed and not seldom controversial topic. Some take it as far as calling the situation "epidemical" (Ninivaggi, 2019; Relationsships Australia, 2018). Meanwhile, there are researchers arguing for a rising loneliness trend, while stating that calling it epidemical seems exaggerated. (Buecker et.al., 2021).

No matter the label, different studies indicate that the levels of loneliness are rising. In the US, it has been shown that the number of people one can turn to when important matters need to be discussed has declined, and that this counts both for kin and outside the family (McPherson, Brashears & Smith_Lovin, 2006, p.371). Even partners living together seem to have become more distanced from each other. For example, studies have shown that the sexual frequency between partners has declined (Twenge, Sherman & Wells, 2017). These findings are backed up by Cacioppo & Cacioppo (2018), publishing in the highly regarded medical journal *The Lancet*, who found that the ratio of people affected by loneliness is increasing.

By concretising these findings into numbers, studies show that only 53 per cent in the US report to have meaningful daily interactions (Cigna, 2018, p.8). Furthermore, the people in the UK often or always feeling lonely has been measured to be 14 and 4 per cent respectively (YouGov, 2019, p.1).

As for who is lonely, the often thought of factors gender and age have varying findings in the literature. However, the influence of the individual's living situation and surroundings on loneliness are more clear. Baretto et al. (2020) found by analysing a dataset of 46 000 participants living in 237 different countries that cultures with higher individualism seem to have higher rates of loneliness. Furthermore, to have a partner, be satisfied with the living situation and to be satisfied with the health situation seem to decrease loneliness (Theeke, 2009; Nguyen et al., 2020), as well as finding life meaningful and having meaningful social interactions (Maciá et al., 2021; MacDonald et al., 2020).

These findings about loneliness might seem ominous, however it is important to keep in mind that these types of findings and statistics vary between different surveys and measures. It is also important to have in mind that loneliness is a broad term with different meanings. How loneliness will be approached in this thesis will be presented in the next section.

2:2 Defining loneliness

With an economic approach, it could be tempting to try to simplify loneliness into something concrete and easy to measure, for example number of social interactions. This would not be the correct way to do it. As a matter of fact, the correlation between perceived loneliness and social isolation has been shown to not be convincing (Steptoe et al., 2013, p.5799). These findings imply that some people can be surrounded by people and still feel lonely, while others live in solitude without the feeling of loneliness.

Instead, loneliness is something subjective, described as a detachment from peers and society (Bower, Conroy & Perz, 2017, p.246). It is less about the frequency of meeting and having friends and more about the nature of these interactions (Peplau & Perlman, 1982, p.4). Thus, when it comes to what factors affect perceived loneliness, quality exceeds quantity.

With this cleared out, it is important to note that since loneliness is subjective, it also becomes something relative. Indeed, loneliness is affected by social and cultural norms (Langenkamp, 2021, p.3). Thus, what is experienced as loneliness in a certain culture at one point in time, is not necessarily perceived in the same way under different circumstances.

2:3 Health effects of loneliness

As for negative health effects caused by absence of companionship and togetherness, one of the most well-known examples is the Roseto effect. The effect was coined in the 60's, referring to how a close-knit Italian-American community in Roseto seemed to experience lower rates of myocardial infarction (heart attack) compared to nearby towns who did not share their sense of community. The reason for this would be the strong family ties and the cohesion experienced in this specific borough of Northampton County, Pennsylvania.

At first, this might sound as an exaggerated myth. However, as a matter of fact, studies conducted on the case has provided evidence supporting the effect. One study compared Roseto with the close by borough Bangor between the years of 1935 to 1985. The results showed that the inhabitants of Roseto had a lower death rate due to myocardial infarction during the first 30 years, but that it then rose to the Bangor level. The rise of deaths occurred after a period where the level of cohesive family and community relationships had sunken (in other words, the Roseto people had become "Americanized"), implying that the fellowship in the community was the reason for the low rates of myocardial infarction (Egolf et al., 1992).

By looking at the meta-analytic review conducted by Holdt-Lunstad, Smith & Bradley Layton (2010) reviewing 148 studies on social relationships and mortality risk, more concretized results can be found. To start with, the influence of social relationships on death rate was found to be comparable to activities such as smoking and consumption of alcohol. Furthermore, social relationships were shown to have an even bigger impact on the risk of death than both physical inactivity and obesity.

Thus, the relationship between loneliness and health is truly a serious and severe one. To concretize even further, studies have shown that loneliness is associated with: coronary heart disease, stroke, clinical depression, early deaths among elderly, and dementia (Steptoe et al., 2013; Valtorta NK et al., 2016; Holwerda TJ et al, 2016; Kuiper JS et al., 2015).

In light of these findings, one might question why the feeling of loneliness should exist since all it seems to do is to hurt the individual. From an evolutionary perspective, the reason for that has to do with the fact that humans originally are social species. By feeling lonely, the human gets motivated to hold on to, or to create social relationships that brings security and resources vital to survival (Baumeister & Leary, 1995).

3. Literary review of the economics of loneliness

In this chapter, loneliness will be approached from an economic point of view. In the first section, this will be done by reviewing the literature on costs associated with loneliness. In the second section, the literature on socioeconomics as an explanatory variable of loneliness will be reviewed.

3:1 Costs of loneliness

The negative health effects associated with loneliness presented will have a negative effect on the individual's quality of life. Likely, this will also affect the economy and society through different costs.

The first and most obvious cost of loneliness is health care costs. The relationship between loneliness and healthcare usage has been examined by Kung, Kunz & Shields (2021), who found that healthcare usage and loneliness has a positive relationship regardless of age. In the same article it is stated that the health care costs due to loneliness are substantial. However, no numbers or calculations are being made, probably because loneliness is complex and could be correlated with other factors that affect the health care costs.

The most prominent study that puts a number on these costs is one made by the London School of Economics. Here, long-term benefits associated with lower levels of loneliness (in other words avoidable costs) are presented with the help of a constructed analytical model, analysing many of the risk factors mentioned under the *2:3* section such as depression, coronary heart disease and dementia. The model suggests that if effective general actions to avoid loneliness were put in place, costs of 1700 pounds per person over a ten-year period could be avoided. If able to target those who are lonely, costs of 6000 pounds per person over a 10-year period could be avoided. The main reasons for these savings are avoidance of unplanned hospital admissions and the avoidance of consultation from a general practitioner (McDaid, Park & Fernandez, 2016).

Another common cost associated with loneliness is sick leave. Zachary Morris (2020) finds that loneliness is significantly predictive of work disability, and suggests that depression mediates the relationship. Indeed, individuals with symptoms of depression are at increased risk of losing their job (Porru et al., 2018). Converting these findings into numbers seems, just like with the health care costs, not the easiest thing to do. However, the independent

think tank New Economics Foundation have estimated the total cost to employers in the United Kingdom associated with loneliness to be 2.5 billion pounds per year. These numbers were calculated with a conservative estimate, which might explain the contextually rather low number. An interesting finding made was that out of these 2.5 billion, only 10 percent of the costs were related to health, meanwhile 90 percent were related to well-being (Michaelson, Jeffrey & Abdallah, 2017).

Moving on, loneliness has also been shown to inversely be associated with empathy (Beadle et.al., 2012). In turn, weak empathy has shown to be associated with higher criminal and antisocial behaviour (Trivedi-Bateman & Crook, 2021). Once again, it is not completely intuitive how to translate these findings into actual costs. With that said, a survey performed in Hong Kong showed that the monetary cost of crime for the public was 7466-11,786 dollar per case (Cheung & Chui, 2021).

Lastly, there are more indirect costs connected to loneliness to be presented. As described in section *2:3*, the feeling of loneliness works as a motivation for humans to sustain relationships. If the motivation fails with its purpose and the individual feel lonely for a long time, self-defeating behaviour can occur. This can cause the individual to develop a chronic sense of loneliness. When at this state, the loneliness tends to make the individual overly sensitive to potential threats in their surroundings, and can make the individual emotionally disconnected (Langenkamp, p.1241-1242, 2021). Thus, people could become less unified and more detached from each other due to loneliness.

This can be linked to the results that Langenkamp found in his study where perceived loneliness linked to voting behaviour was examined. The results showed that lonely individuals were significantly less likely to vote compared to not lonely individuals, partly due to a reduced sense of duty to vote amongst the lonely individuals (Langenkamp, 2021).

3:2 Socioeconomics and loneliness

Just as loneliness has been shown to be associated with individualism, partnership, health and quality of social interaction, there is also a socioeconomic relationship. Hansen & Slagsvold (2015) found that satisfaction with one's financial situation and being educated had a negative relationship with loneliness. The respondents in their dataset were between 60-80 years old, and loneliness was measured indirectly by six questions with three different response alternatives.

Additionally, Möwisch, Brose & Schmiedek (2020) found that people with higher education feel better in their lives. This study was based on the variable "subjective well being", consisting of many variables like happiness, anger, satisfaction, but also of loneliness. The respondents, where the lowest aged one was 28, had to rate themselves on these questions on a scale of 1-7. The data was from 2012-2013.

Furthermore, Macdonald, Nixon & Deacon (2018) found a significant negative relationship between income and loneliness. Here, the response format of the survey for the data was binary and direct, meaning that the respondents were asked straightforward if they were lonely, with the alternative yes and no as response.

Kung et.al. (2021) state that they are unaware of any causal evidence in the literature regarding the relationship between loneliness and socioeconomics. Although, they did find variables negatively associated with loneliness, such as income and financial situation, and positive associations between unemployment and loneliness.

4. Methodology

4:1 Approach

To my best of knowledge, the findings under the *3:2* section are representative of the previous research on the topic of loneliness and socioeconomics. The datasets used in these studies have flaws regarding validity and may not be representative of the populations they aim to capture. A major issue is that the results of these studies are drawn from different types of surveys with different types of measures. To address these problems, complementary empirical research will be performed by using a big and representative dataset, allowing to a greater extent for the results to be compared and generalized.

The literary findings on socioeconomics are used to form the hypothesis. Based on these associations, the hypothesis will be that there for an individual is a negative association between loneliness and: income, financial situation, and level of education, and a positive association between loneliness and unemployment. Variables for gender and age will be included as control variables.

4:2 Data

The data used to conduct the research is taken from the ALLBUS (German General Social Survey) 2018 dataset, which is representative for the German population regarding age, gender and background. The data is cross-sectional and collected through high quality surveys conducted in person, on the subject of social structure in Germany. It is published by GESIS Data Archive, who are funded by the state. The version used for this research is cross-sectional (GESIS, 2019). All the participants are Germans, aged between 18 and 92 years.

One of the most established ways to quantify loneliness is the UCLA loneliness scale. To measure loneliness in the survey, a short version of the scale was used. The respondents got to answer three indirect questions about loneliness, meaning that they do not have the explicit word "loneliness" in them. Because the participants were German, the UCLA loneliness scale questions were translated from English to German. The word isolated in one of the three questions was translated into the German word "einsam", which in German could be interpreted as lonely. If so, the UCLA loneliness scale goes from measuring loneliness indirectly to measuring it directly. The combined score reflects if the individual perceives themselves to be lonely or not. The shortened version has been tested and found to be reliable (Hughes & Waite, 2004).

4:3 Operationalization

Loneliness: The respondents were asked how often during the past four weeks they had felt: a lack of companionship, left out, and isolated from others. To answer this, the respondents had to pick one alternative on a five-answer scale ranging from never to very often. In this report, these three answers are added together and divided by three, thus merging into one loneliness variable, with a Cronbach's alfa of 0.817. A mean score of five indicated that the individual always perceived themselves as lonely, whereas a mean score of one indicated the individual never perceived themselves as lonely. Since the questions are subjective, they measure the quality of interactions, in line with the definition on loneliness made above in the *2:2* section.

Income: The respondents got to answer an open question about their net monthly income. Many of those who did not give an exact answer had answered in a closed format, indicating which income bracket corresponded with their earnings. These respondents were included by taking the mean of the income class they put themselves in. Further on, the individuals were put into groups where the first group represented the bottom 10 percent earners, the second group represented the next 10 percent up, resulting in 10 groups with fairly similar size. This made the relationship between loneliness and income linear which made the model a better fit.

Financial situation: Here the respondents got to self-report their subjective financial situation on a five-answer scale ranging from very bad to very good.

Unemployment: The respondents got to answer if they were currently employed or not. Those who were not got to answer why they were not, where one of the answers was unemployed and the others referred to other reasons for not working such as retirement or being financially independent. Those who picked the unemployed answer were coded as 1's in the unemployment variable, and the rest were coded as 0's, thus the unemployment variable is an indicator variable.

Higher education: The respondents got to answer what their highest achieved education was. For the education to be seen as higher, it had to be a bachelor's degree or above. Like unemployment, this variable is an indicator variable, where bachelor's degree or above is coded as 1's and everything below bachelor's degree as 0's.

Age: The age of the respondents in years.

Female: The gender of the respondents. The females were coded as 1's and the males as 0's.

For every independent variable there were some errors or individuals that did not answer. When these groups were of a size greater than 100 individuals, a t-test was performed to check if the loneliness score was different between those who had answered and those who had not. It was not, thus these respondents could be dropped from the dataset.

In table 1, the descriptive statistics of all the variables is as follows:

Table 1: Descriptive statistics

Variable	Observations	Mean	Std. Deviation	Min	Max
Loneliness	1518	1.5	0.71	1	5
Income	1518	5.56	2.88	0	10
Financial situation	1518	3.74	0.77	1	5
Unemployed	1518	0.02	0.14	0	1
Higher education	1518	0.27	0.45	0	1
Age	1518	51.46	17.32	18	92
Female	1518	0.48	0.5	0	1

5. Econometric considerations

The distribution of the dependent variable looks as follows:

Graph 1: Frequency of Loneliness variable
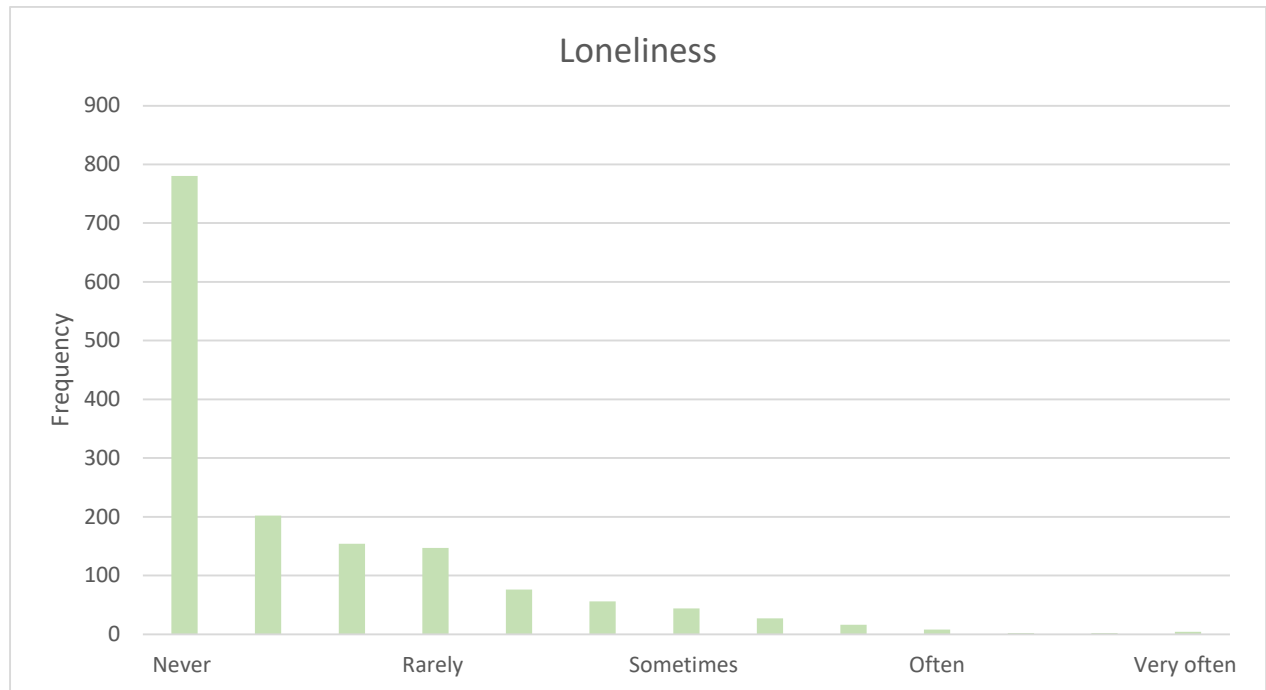
Because of the characteristics of the distribution, the Gauss-Markov assumptions of linearity in parameters and homoscedasticity are violated (Hayashi, 2000, p4-13). Thus, the commonly used Ordinary Least Squares model was not performed.

Instead, a Mann Whitney U-test and a Logistic regression was performed. The Mann Whitney U-test is of non-parametric nature, making no assumptions regarding the distribution and few assumptions overall. The Logistic regression is of parametric nature and has more assumptions. The trade-off for using a test with fewer assumptions is less power to the test, meaning that there is increased risk of making a type II error (Siegel, 1957).

Below follows a description of how the test and the regression was performed:

Mann Whitney U-test: This tests if there is any difference in *Loneliness* for the independent variables by splitting them in to two groups, ranking the observations between the groups and comparing the central tendency. To perform this, the independent variables were transformed into binary ones. *Income* was split in half in the intercept between the fifth- and sixth-income class, creating a distinction between high and low earners. *Financial situation* was divided so

that the score of 1-3 (very bad to part good; part bad) was in one section, and 4-5 (good to very good) was in the other. *Unemployed* and *Higher education* were already binary and therefore did not need to be split. The sample was random, ordinal and there was only one observation per participant, thus the assumptions for the test were fulfilled (Nachar, 2008).

Logistic Regression: Here, the dependent variable was transformed to be binary, and the independent variables remained in their original form. The *Loneliness* variable was divided into two categories where one category consisted of individuals who answered "never" on all the three loneliness questions and another category where at least one of the three answers was "rarely", or above. In other words, one category where the individual the past four weeks experienced minimum some type of loneliness, and another category where the individual for the last four weeks experienced none.

The Logistic regression model measured the likelihood of feeling lonely with respect to the independent variables by predicting the dependent through analysing its relationship to the independent variables. The assumptions of independence of errors, linearity in the model, absence of multicollinearity and lack of strong outliers were all fullfilled (Stoltzfus, 2011).

The coefficients in the Logistic regression are presented in the form of logged odds ratios which makes the magnitude of them hard to interpret. By taking the number e and raise it to the power of the cofficient ($e^{coefficient}$), the coficients would transform into odds ratios letting us interpret the magnitude. Since the odds ratios represent the probability of experiencing loneliness divided by the probability of not experiencing loneliness when the independent variable increases with one, they are still not comepletely intuitive to interpret. Because of this, the odds ratios will not be interpreted, but instead the marginal effects.

The marginal effects should be interpreted in the same way as the odds ratios except for the fact that they measure the probabilities and not the odds. Since the Logistic regression model is non-linear, the marginal effect will differ depending on at what value of the independenent variable the increase occurs. Because of this, the average marginal effect was used. The average marginal effect calculates the marginal effect for each individual and average it out to one number that represents the whole population. By doing this, the average change in probability of experiencing some form of loneliness by increasing the independent variables was estimated.

6. Results

6.1 Correlation matrix
The correlation matrix below shows the correlation between the variables. As can be seen it is rather low, thus nothing that will interfere the models.

Table 2: Correlation Matrix

	Income	Finacial situation	Unemployed	Higher education	Age	Female
Income	1					
Financial situation	0.31	1				
Unemployed	-0.16	-0.22	1			
Higher education	0.33	0.23	-0.09	1		
Age	0.06	0.05	-0.09	-0.05	1	
Female	-0.38	-0.03	0.03	-0.07	0	1

6.2 Mann Whitney U-test
Down below, the results from the Mann Whitney U-test will be presented:

Table 3: Mann Whitney U-test

Income	Mean Loneliness	Financial situation	Mean Loneliness
Lower	1.60	Lower	1.72
Higher	1.40	Higher	1.41
Prob > |z| = 0.000***		Prob > |z| = 0.000***	

Unemployed	Mean Loneliness	Higher education	Mean Loneliness
No	1.49	No	1.52
Yes	1.96	Yes	1.44
Prob > |z| = 0.001***		Prob > |z| = 0.104	

*Note: *** = P ≤ 0.001, ** = P ≤ 0.01, * = P ≤ 0.05*

We can see that the mean of loneliness is significantly higher for individuals in the low income group than those in the high income group. The mean score of loneliness is also significantly higher for those with lower financial situation compared to those with higher. Furthermore, the mean of loneliness was signficantly higher for those who had reported unemployment compared to those who had not. As for the case of those with higher education, there was no significant difference in their mean score of loneliness comapred to those without a bachelor's degree.

6:3 Logistic regression

Results from the Logistic regression are presented below. Column 1-4 present *loneliness* logsitcially regressed with respect to each one of the four independedent variables and the control variables at a time. The fifth column presents *loneliness* logistically regressed with respect to all the four independent variables and the control variables at the same time. Because of the trouble interpreting the coefficients, the marginal effects for each variable are displayed.

Table 4: Average Marginal effects Logistic regression

Variable	1	2	3	4	5
Constant	0.97***	2.11***	0.69***	0.78***	2.06***
	0.21	0.31	0.17	0.18	0.33
Income	-0.009*				-0.001
	0.02				0.02
Financial situation		-0.09***			-0.086***
		0.07			0.08
Unemployed			0.187		0.084
			0.4		0.41
Higher education				-0.031	0.008
				0.12	0.13
Age	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	0	0	0	0	0
Female	-0.029	0.046	0.047	0.047	0.043
	0.11	0.11	0.12	0.10	0.11
Pseudo R-squared	0.0191	0.0312	0.0191	0.0178	0.0317
Number of observations	1518	1518	1518	1518	1518

Note: *** = $P \leq 0.001$, ** = $P \leq 0.01$, * = $P \leq 0.05$. The smaller number below the marginal effect represents the std.error.

To start with, the presented Pseudo R-squared numbers are of a small magnitude. As with the Mann Whitney U-test, significance is found for *income* and *financial situation*, but not for the *unemployed* variable. *Higher education* remains unsignificant. When all the independent variables are regressed together, only *financial situation* stays significant.

When Logistically regressed one by one, entering a higher income group decreases the probability of the individual feeling lonely by 0.9 percentage points. When a higher financial situation group is entered, the probability of the individual feeling lonely decreases with 9 percentage points. When all the variables are Logistically regressed together, the probability of the individual feeling lonely decreases with 8.6 percentage points when entering a higher financial situation group.

Furthermore, the Logistic regression model only correctly predicts 59.29% of the observed values. This should be seen as fairly low since the dependent varibale is binary, thus it should by randomization be able to correctly predict 50% of the observed values of loneliness.

7. Discussion of results

To begin with, some comments will be made about the fit of the Logistic regression model. As already stated, the Pseudo R-squared and the correctly predicted values are low (rule of thumb for Pseudo R-square is that the model has a great fit in the interval of 0.2 – 0.4). Both results indicate that the model may not be able to sufficiently explain the self-rated loneliness of the respondents. This result was expected – mainly because of omitted variable bias. In other words, there are factors influencing loneliness that have been left out of the model. Loneliness is a complex phenomenon and stating that the socioeconomic variables and the control variables would be able to explain it to a large extent is not in line with reality. To include a health variable could have, as showed in the *2:1* section, given the model a better fit. Because of risk of endogeneity, this was not done.

Furthermore, by looking at graph 1, interpretations can be made about the distribution of the loneliness variable. It becomes clear that the perceived loneliness is quite low for most of the individuals included in the survey. As a matter of fact, 84.5% of the respondents received a loneliness score of 2 or less. This rather dense distribution can explain the relatively small difference in loneliness score between the different independent variable groups in the Mann Whitney U-test.

Moving on to interpret the Mann Whitney U-test, the results suggest that high earners significantly perceive less loneliness compared to low earners. The same counts for those with higher and those with lower financial situation. Furthermore, the results suggest that those unemployed significantly perceives more loneliness than those employed. These results are in line with the hypothesis. The only non-significant difference regarding perceived loneliness was the one between those with higher and those with lower education, which means this part of the hypothesis has to be rejected.

When performing the Logistic regression by making the loneliness variable binary, *income* and *financial situation* stays significant meanwhile *unemployed* becomes unsignificant. Thus, when measuring the likelihood of being lonely and introducing the control variables *female* and *age*, unemployed do not explain enough of loneliness to remain significant.

That unemployment does not seem to have a more significant effect on loneliness and that the correlation between unemployment and income is rather small (-0.16) might seem surprising. One explanation for this could be the low frequency of unemployed people, as can be seen by

the mean in table 1. As a matter of fact, only 31 out of 1518 people were to be defined as unemployed. Since they are so few, attributes on an individual level could affect the test and model, complicating the analysis and potentially making the results misleading. It would also be interesting to know the duration of unemployment for these 31 people, since studies have shown that the longer the unemployment lasts, the more well-being decreases (McKee-Ryan et al., 2005).

Through the average marginal effects, the magnitude of the change for the significant variables can be interpreted. Here, it's important to remember that the two variables have different scales. An increase in *financial situation* with the scale of five is a bigger change in the variable compared to an increase of *income* with the scale of ten.

If the relationship between the independent variables and perceived loneliness turned out to be causal, the marginal effects could be interpreted as follows according to the model: By entering a higher group of income, for example reaching top 40% income earners instead of 50%, the probability that the individual would experience some type of loneliness decreases with 0.9 percentage points. When achieving a higher financial situation, the probability that the individual would feel lonely decreases with 9 percentage points. If an individual with the most strained financial situation would win the lottery and exceed to the highest, the probability that the individual would feel at least a bit lonely would decrease with 45 percentage points.

When including all the independent variables in the same Logistic regression model, an interesting result shows. Here, only *financial situation* remains significant, still highly so (P ≤ 0.001). Thus, income who regressed alone was significant is not anymore. This finding imply that the effect of *income* that explains loneliness when Logistically regressed alone, is included in the *financial situation* variable. When the variables are all Logistically regressed together, the *income* variable becomes redundant and thus insignificant. These findings do not, however, mean that the *income* variable is not important. It has an indirect effect on *loneliness* with *financial situation* as mediator, meaning that if the individual's income would decrease, loneliness may still increase.

These results can be explained intuitively. Income affects financial situation. Because of that, income is explained by financial situation to such an extent that it does not matter when the *financial situation* variable is included in the model. It also seems likely that the relationship follows the described direction. A low income can partly explain a low financial situation, but

a low financial situation can not in the same way explain a low income. With that said, the correlation between financial situation and income of 0.31 tells us that there are more factors that explain financial situation than income alone.

As for the marginal effects when all the variables were regressed together, the value of a better financial situation (the only significant one) went from 9 percentage points decrease in likelihood of feeling lonely to 8.6 percentage points decrease in likelihood of feeling lonely. Lastly, we can see that the control variable *age* has a significant negative relationship with loneliness.

8. Conclusion

To summarize, the literary review showed that there are substantial costs associated with loneliness and that they could be decreased if loneliness was to be addressed. In the statistical research conducted, the hypothesis of association between *loneliness* and *income*, *financial situation*, *unemployment* and *higher education* was tested. Here, the conclusion was that the hypotheses could be accepted for all the variables except for higher education, where no significance was to be found. However, unemployment was only significantly associated with loneliness in the Mann Whitney U-test which has less power than the Logistic regression. These findings imply that the current situation of increasing loneliness could partly be explained by socioeconomic factors. Considering this, it becomes interesting to combine the findings of the literary review of loneliness and economics, and the results of the statistical research.

Conclusions like "If a lonely individual were to increase its financial situation, there would be an 8.6 percentage point probability of saving health care costs of 6000 pounds over a ten-year period" could now have been hastily drawn. Because of limitations both in the literary review and the empirical results, this will not be done.

More concretely, the literature on costs associated with loneliness suffers from a similar problem as the one highlighted in the review on the relationship between socioeconomics and loneliness. To measure the costs of loneliness, different ways of measuring loneliness has been used, making the results hard to generalize. The same goes for in what way costs have been measured and which models have been used, as different levels of conservativeness will affect the outcome. This problem could be reduced if more well-defined and standardized definitions of loneliness and methods of how to account for its costs were to be introduced. A more conventional measurement would make the results easier to generalize.

As for the empirical results, the reliability could have been higher for various reasons. To start with, if the data had been longitudinal instead of cross-sectional, it would have controlled for time and been able to display trend developments. Furthermore, it is described under the *2:2* section that loneliness depends on culture and situation, and studies show that loneliness differs depending on where you live (Hansen et.al., 2015). Because of this, a survey conducted in same way as ALLBUS 2018 but in another country than Germany would have been preferred as a control for the results. As also mentioned under the discussion of the

results, the unemployed group were small in size, which could affect the reliability of the test and the model.

If assumed that the results were reliable there could still be concerns about the validity. To try to quantify something as complex as loneliness is not easily done. If the UCLA-scale does not capture the real sense of loneliness of the individuals in the sample, the validity would be compromised. Findings that could advocate for this are that women are more prone than men to label themselves as lonely (Borys & Perlman, 1985). Even if the UCLA-loneliness scale is supposed to measure loneliness indirectly, this could still affect the results.

Regarding causality, arguments were made when discussing the results that the *income* variable was to influence the *financial situation* variable and not the other way around. When it comes to the bigger picture of the relationship between loneliness and socioeconomics, the same arguments cannot be made. The relationship between *loneliness* and socioeconomics suffers from endogeneity, and reversed causality most certainly occurs. As an example, loneliness and mental health can mutually reinforce each other (Kung et.al., 2021, p.148). In the same way, it is reasonable to think that the relationship between socioeconomics and loneliness would be reciprocal. To be lonely could in different ways limit the individual and make them more likely to become both unemployed and to have a lower income or financial situation. Further on, there could also be confounders affecting both loneliness and socioeconomics at the same time. As for an example, if the individual's partner dies, this could affect both loneliness and the financial situation.

With that cleared out, instead of drawing a conclusion liked the proposed one above, the conclusion will land in that income, financial situation and unemployment are associated with loneliness to different extents, and that loneliness comes with substantial costs. By reducing unemployment, low levels of income and financial situation, loneliness could be reduced which in turn would decrease these costs and thus have a positive effect on the economy. If the relationship was to be in the reverse direction, loneliness would stimulate low salaries, a bad financial situation and unemployment, which in itself is negative for the economy.

These findings can also be used to draw conclusions about equality. If outcomes of being lonely are: a worse health, more sick leave, higher antisocial behaviour and reduced likeliness to vote, that would also mean that individuals with a lower socioeconomic status would, in turn be more likely to fall victim for these conditions and behaviours.

Furthermore, even if causality was to be established, that would not necessarily mean that political implementation should be set in place, for example to make a selected socioeconomic factor increase in order to make loneliness decrease. To implement a policy, its cost and utility needs to be considered and compared to other potential implementations. What brings most utility with the least cost will be the policy implemented. Since the Logistic regression model could only explain a small proportion of *loneliness* with respect to the socioeconomic factors investigated, there could be other factors that account for a lot of variation in perceived loneliness.

Some of these factors have been touched upon during this thesis. To examine their association using the same tools as I have done with some socioeconomic factors is beyond the scope of this paper, although it would be interesting to examine this in future research.

9. Sources

Barretto, M., Victor, CR., Hammond, C., Eccles, A., Richins, MT., Qualter, P. (2020). Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and Individual Differences 169 (3): 110066*. Available online: https://www.researchgate.net/publication/340943678_Loneliness_around_the_world_Age_gender_and_cultural_differences_in_loneliness [Accessed 15 May 2022]

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497–529. Available online: https://psycnet.apa.org/record/1995-29052-001 [Accessed 07 May 2022]

Beadle JN., Keady B., Brown V, Tranel D., Paradiso S. (2012) Trait Empathy as a Predictor of Individual Differences in Perceived Loneliness. *Psychological Reports*. 110(1):3-15. Available online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3555404/ [Accessed 07 May 2022]

Borys, S., Perlman, D. (1985). Gender Differences in Loneliness. *Personality and Social Psychology Bulletin*. 11(1):63-74.Available online: https://journals.sagepub.com/doi/abs/10.1177/0146167285111006?casa_token=Zmi7GQEtbMoAAAAA:Jwh6eaCiBo2DmPeS3Y2j2wRXqWIDq51k650XDIJOkOexrXtmsOhlvmB9eZTbGHlX1gjf-6btnuty [Accessed 08 May 2022]

Bower, M., Conroy, E., Perz, J. (2017) Australian homeless persons' experiences of social connectednedd, isolation and loneliness, *Wiley, Health and Social Care in the community*. Available through LUSEM: https://onlinelibrary.wiley.com/doi/10.1111/hsc.12505 [Accessed 25 April 2022]

Bu, F., Steptoe, A., Fancourt, D. (2020) Who is lonely in lockdown? Cross-cohort analyses of predictors of loneliness before and during the COVID-19 pandemic. *Public Health vol. 186*. Available online: https://www.sciencedirect.com/science/article/pii/S0033350620302742 [Accessed 16 May 2022]

Buecker, S., Mund, M., Chwastek, S., Sostmann, M., & Luhmann, M. (2021). Is loneliness in emerging adults increasing over time? A preregistered cross-temporal meta-analysis and systematic review, *Psychological Bulletin, 147*(8), 787–805, Available through: LUSEM Library website https://eds.s.ebscohost.com/eds/pdfviewer/pdfviewer?vid=3&sid=49eed570-d7a2-4d34-974d-2d3e0faaf2ab%40redis [Accessed 24 April 2022]

Cheung, Ck., Chui, W.H. (2021) Crime Costs to the Public in Hong Kong. *Social Indicators Research* **157,** 283–296. Available online: https://link.springer.com/article/10.1007/s11205-021-02640-8#citeas [Accessed 07 May 2022]

Cigna. (2018). Cigna U.S Loneliness Index [pdf], Available at: https://www.multivu.com/players/English/8294451-cigna-us-loneliness-survey/docs/IndexReport_1524069371598-173525450.pdf [Accessed 24 April 2022]

Egolf, B., Lasker, J., Wolf, S., & Potvin, L. (1992). The Roseto effect: a 50-year comparison of mortality rates. *American journal of public health*, *vol 82*(8), 1089–1092. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1695733/ [Accessed 25 April 2022]

GESIS - Leibniz-Institut für Sozialwissenschaften (2019). German General Social Survey - ALLBUS 2018. *GESIS Data Archive, Cologne. ZA5272 Data file Version 1.0.0,* Available online: https://search.gesis.org/research_data/ZA5272 [Accessed 07 May 2022]

Hansen, T., Slagsvold, B (2015). Late-Life Loneliness in 11 European Countries: Results from the Generations and Gender Survey. *Soc Indic Res* **129,** 445–464 Available online: https://link.springer.com/article/10.1007/s11205-015-1111-6 [Accessed 03 May 2022]

Hayashi, F. (2000) Econometrics, *Princeton University Press.* Available via pdf: https://daniellecarusi.files.wordpress.com/2009/07/s6946.pdf [Accessed 29 April 2022]

Holt-Lunstad, J., Smith, T.B., Bradley Layton, J. (2010). Social Relationships and Mortality Risk: A Meta-analytic Review *PLOS Medicine.* Available online: https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000316 [Accessed 25 April 2022]

Holwerda TJ, van Tilburg TG, Deeg DJ, Schutter N, Van R, Dekker J, Stek ML, Beekman AT, Schoevers RA, (2016). Impact of loneliness and depression on mortality: results from the Longitudinal Ageing Study Amsterdam. *Br J Psychiatry.* Available online: https://pubmed.ncbi.nlm.nih.gov/27103680/ [Accessed 25 April 2022]

Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A Short Scale for Measuring Loneliness in Large Surveys: Results From Two Population-Based Studies. *Research on aging, 26(6), 655–672.* Available online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2394670/ [Accessed 07 May 2022]

Kuiper JS, Zuidersma M, Oude Voshaar RC, Zuidema SU, van den Heuvel ER, Stolk RP, Smidt N, (2015) Social relationships and risk of dementia: A systematic review and meta-analysis of longitudinal cohort studies. *Ageing Res Rev39-57.* Available online: https://pubmed.ncbi.nlm.nih.gov/25956016/ [Accessed 25 April 2022]

Kung, C.S.J., Kunz, J.S., Shields, M.A, (2021) Economic Aspects of Loneliness in Australia *The Australian economic review* vol. 54,1 p.147-163. Available online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8250653/ [Accessed 27 April 2022]

Langenkamp, A. (2021). Lonely Hearts, Empty Booths? The Relationship between Loneliness, Reported Voting Behavior and Voting as Civic Duty. *Social Science Quarterly*, *Vol 102, number 4*. Available online: https://www.researchgate.net/publication/350091360_Lonely_Hearts_Empty_Booths_The_Relationship_between_Loneliness_Reported_Voting_Behavior_and_Voting_as_Civic_Duty [Accessed 25 April 2022]

MacDonald, K.J., Willemsen, G., Boomsma, DI., Schermer, J.a. (2020). Predicting Loneliness from Where and What People Do. *Social Sciences*. 2020; 9(4):51. Available online: https://www.mdpi.com/2076-0760/9/4/51#cite [Accessed 15 May 2022]

MacDonald, S.J., Nixion, J., Deacon, L. (2018). 'Loneliness in the city': examining socio-economics, loneliness and poor health in the North East of England, *public health vol 164 page 88-94,* Available online: https://www.sciencedirect.com/science/article/pii/S0033350618302841 [Accessed 25 April 2022]

Maciá, D., Cattaneo, G., Solana, J., Tormos, JM., Pascual-Leone, A., Bartrés-Faz, D. (2021) Meaning in Life: A Major Predictive Factor for Loneliness Comparable to Health Status and Social Connectedness, *Frontiers in Psychology*. Available online: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.627547/full [Accessed 15 May 2022]

McPherson, M., Brashears, M.A., Smith-Lovin, L. (2006). Erratum: Social isolation in America: Changes in core discussion networks over two decades, *American Sociological Review vol.71 (353-375)*, Available through: LUSEM Library website https://www.scopus.com/record/display.uri?eid=2-s2.0-65249083504&origin=resultslist&sort=plf-f&src=s&st1=Social+Isolation+in+America%3a+Changes+in+Core+Discussion+Networks+over+Two+Decades&sid=befea778a272fb7e5479f32f94b20c31&sot=b&sdt=b&sl=96&s=TITLE-ABS-KEY%28Social+Isolation+in+America%3a+Changes+in+Core+Discussion+Networks+over+Two+Decades%29&relpos=0&citeCnt=26&searchTerm=&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1 [Accessed 24 April 2022]

McDaid,D., Park, A., Fernandez, J.L, (2016). Reconnections Evaluation Interim Report, *London School of Economics*. Available via pdf: https://s3.eu-west-2.amazonaws.com/golab.prod/documents/McDaid_et_al._2016.pdf [Accessed 27 April 2022]

McDaid, D., Bauer, A., Park, A.L. (2017). Making the economic case for investing in actions to prevent and/or tackle loneliness: a systematic review. *London School of Economics*. Available via pdf: https://www.lse.ac.uk/business/consulting/assets/documents/making-the-economic-case-for-investing-in-actions-to-prevent-and-or-tackle-loneliness-a-systematic-review.pdf [Accessed 4 April 2022]

Mckee-Ryan, F., Song, Z., Wanberg, C.R., Kinicki, A.J. (2005) Psychological and physical well-being during unemployment: a meta-analytic study, *Journal of Applied Psychology*. Available online: https://pubmed.ncbi.nlm.nih.gov/15641890/ [Accessed 4 April 2022]

Michaelson, J., Jeffrey, K., Abdallah, S, (2017). The cost of Loneliness to UK employers, *New Economics Foundation*, Available via pdf: https://neweconomics.org/uploads/files/NEF_COST-OF-LONELINESS_DIGITAL-Final.pdf [Accessed 28 April 2022]

Morris ZA, (2019) Loneliness as a Predictor of Work Disability Onset Among Nondisabled, Working Older Adults in 14 Countries. *Journal of Aging and Health*. 32(7-8):554-563. Available online https://journals.sagepub.com/doi/full/10.1177/0898264319836549 [Accessed 27 April 2022]

Nachar, N. (2008) The Mann-Whitney U: A Test for Assessing Wheather Two Independent Samples Come from the Same Distribution, *Tutorials in Quantitative Methods for Psychology vol. 4(1), p.13-20*. Available via pdf: https://pdfs.semanticscholar.org/007b/c0936646c34abd369ceda930000c3d142228.pdf [Accessed 09 May 2022]

Nguyen, T.T., Lee, E.E., Daly, R.E., WU, T.C., Tang, Y., Tu, X., Van Patten, R., Jeste, D.V., Palmer, B.W. (2020). Predictors of Loneliness by Age Decade: Study of Psychological and Environmental Factors in 2,843 Community-Dwelling Americans Aged 20-69 Years, *The*

Journal of clinic psychiatry 10;81(6). Available online:
https://pubmed.ncbi.nlm.nih.gov/33176072/ [Accessed 15 May 2022]

Ninivaggi, F. J. (2019). Loneliness: A new epidemic in the USA, *Psychology Today*,
available online: https://www.psychologytoday.com/au/blog/envy/201902/loneliness-new-epidemic-in-the-usa [Accessed 24 April 2022]

Peplau, L. and Perlman, D. (1982). Perspectives on loneliness', in Loneliness: A Sourcebook
of Current Theory, Research and Therapy. New York, Wiley. Available via pdf:
https://peplau.psych.ucla.edu/loneliness/ [Accessed 25 April 2022]

Porru, Fabio & Burdorf, Alex & Robroek, Suzan. (2018). The impact of depressive
symptoms on exit from paid employment in Europe: a longitudinal study with 4 years follow-up. *The European Journal of Public Health.* Available online:
https://www.researchgate.net/publication/326589466_The_impact_of_depressive_symptoms_on_exit_from_paid_employment_in_Europe_a_longitudinal_study_with_4_years_follow-up
[Accessed 27 April 2022]

Relationships Australia. (2018). Is Australia experiencing an epidemic of loneliness? [pdf],
Available via pdf: https://relationships.org.au/document/is-australia-experiencing-an-epidemic-of-loneliness/ [Accessed 24 April 2022]

Siegel, S. (1957) Nonparametric Statistics, *The American Statistician, 11:3, 13-19*, Available
online: https://www.tandfonline.com/doi/abs/10.1080/00031305.1957.10501091 [Accessed
29 April 2022]

Steptoe, A., Shankar,A., Demakakos, p., Wardle, J. (2013). Social isolation, loneliness, and
all-cause mortality in older men and women, *PNAS, Vol.110 no.15* Available online:
https://www.pnas.org/doi/10.1073/pnas.1219686110 [Accessed 25 April 2022]

Stoltzfus, J, C. (2011). Logistic Regression: A Brief Primer. *Academic Emergency Medicine.*
Available through: LUSEM Library website
https://onlinelibrary.wiley.com/doi/full/10.1111/j.1553-2712.2011.01185.x [Accessed 1 May
2022]

Theeke, LR. (2009). Predictors of Loneliness in U.S. Adults Over Age Sixty-Five, *Archieves
of Psychiatric Nursing, Vol (23), Issue 5.* Available online:
https://pubmed.ncbi.nlm.nih.gov/19766930/ [Accessed 15 May 2022]

Trivedi-Bateman & Crook, (2021). The optimal application of empathy interventions to
reduce antisocial behaviour and crime: a review of the literature. *Psychology, Crime & Law*,
Available online:
https://www.tandfonline.com/doi/full/10.1080/1068316X.2021.1962870?scroll=top&needAccess=true [Accessed 14 May 2022]

Twenge, J.M., Sherman, R.A. & Wells, B.E. (2017). Declines in Sexual Frequency among
American Adults, 1989–2014. *Arch Sex Behav* 46, 2389–2401. Available online:
https://link.springer.com/article/10.1007/s10508-017-0953-1?correlationId=4d9ea02c-da9a-44df-a279-bfae59b39531 [Accessed 24 April 2022]

Valtorta NK, Kanaan M, Gilbody S, Ronzi S, Hanratty B, (2016). Loneliness and social
isolation as risk factors for coronary heart disease and stroke: systematic review and meta-

analysis of longitudinal observational studies. *Heart 102:1009-1016.* Available online: https://heart.bmj.com/content/102/13/1009 [Accessed 25 April 2022]

YouGov. (2019). Results for 4. Internal (Lonliness) 474 16.8.2019.xlsx [pdf], Available at https://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/dro933l3yl/YouGov%20-%20Loneliness%20Results.pdf [Accessed 24 April 2022]