The European Misery Report:

A cross-sectional study exploring the social determinants of health associated with unhappiness among adults in 22 European countries

October 2019

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Abstract

Background: The burden of unhappy individuals in society is a vast and costly public health issue. Europe hosts some of the happiest countries in the world, but there are still many health inequalities. Given the connection between poor health and unhappiness, research must investigate the micro and macro determinants of a person's life to better understand how policies can impact the lives and longevity of a population.

Aim: To explore how self-rated health and other social determinants of health are associated with unhappiness across Europe.

Methods: This study used cross-sectional data from the Round 8 (2016) European Social Survey of $n = 41,830$ adults across 22 European countries. The reported level of unhappiness was used as a dependent variable along with 15 explanatory variables considered as social determinants of health. Bivariate logistic regressions and multiple logistic regression were conducted to determine potential significant associations between unhappiness and various social determinants of health. Nagelkerke R^2 and Cox & Snell R^2 provided an indication of the amount of variation in the dependent variable that was explained by the final model.

Results: The strongest predictors for reporting unhappiness were poor self-rated health (*AOR = 2.70, 95% CI 2.54 – 2.85*), those struggling on their current income (*AOR = 2.59, 95% 2.44 – 2.75*), lacking social support (*AOR = 1.97, 95% CI 1.77 – 2.20*), those living in the Former USSR welfare regime (*AOR = 1.94, 95% CI 1.77 – 2.12*) and those who were separated/divorced or widowed (*AOR = 1.84, 95% CI 1.72 – 1.97*). The final model explained roughly *20* % of the variation in unhappiness across Europe.

Conclusion: The findings indicate unhappiness being strongly associated with various social determinants of health including certain welfare regimes across Europe. Overall, greater research is needed into the association between unhappiness and health to establish causality and minimize the prevalence of unhappiness across European countries.

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"Rise up with me against the organization of misery"

Pablo Neruda

Introduction

Although incomes have doubled in the last 50 years, people have become no happier (1). Existing literature shows that eliminating depression and anxiety would reduce misery by 20% compared to just 5% if policymakers focused solely on eliminating poverty (1). According to Marmot (2), the human cost of failing to achieve a fairer distribution of health would equate to 2.5 million years of life potentially lost to health inequalities for those dying prematurely each year in England alone. For public health practitioners and policymakers, the focus should then be on the prevention of unhappiness and reducing those inequalities which correlate more strongly to broad health outcomes (2,3). To understand the significance of unhappiness requires us to first understand happiness and its associated health benefits.

Veenhoven defines happiness as "the degree to which an individual judges the overall quality of his life favorably" (4: p1). The term 'overall' refers to how an individual generally feels and how positive one compares with various criterion of success (4). While there is no current comprehensive single measure of happiness, the question of "how happy are you" is commonly applied to understand subjective happiness (5). Understanding happiness has proven to be important for policy development and assessment (6) and is a reliable and cost-effective way to capture one's holistic view of their health (7). Health correlates more strongly to happiness than any other variable (8). Happiness and other positive psychological attributes have been linked to a lower risk of negative health outcomes, including cardiovascular disease, improved recovery rates after surgery and a longer life span (9–11). Positive affective emotions have also been associated with better health practices, such as improved sleep quality, more exercise and lower levels of stress hormones (12). The relationship between health and happiness is still very open and research does not presume that happiness determines health or vice versa (13,14), although evidence shows support for a causal link going from happiness to improved health (15). Even so, the existence of the positive effects of happiness and its association with measures of well-being are well substantiated as interconnected and influential on health (6,8,16–18).

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Every year, the United Nations Sustainable Development Solutions Network publishes a World Happiness Report comparing 156 countries by inequality and how happy citizens perceive themselves to be (19). European countries typically dominate in global happiness, with the Nordic countries (Denmark, Finland, Norway, Iceland and Sweden) regularly ranking in the top ten (19,20). However, the population-weighted average life evaluations between the Western, Central, Eastern and the Commonwealth of Independent States differ significantly across Europe (19,20). Even in the happiest ranking Nordic countries, there is an uneven distribution of happiness and inequality with overall general and mental health considered as the two leading measures of happiness and unhappiness (21,22). A reported 14% of those between the ages of 18 to 23 years and 16% of elderly above 80 years report that they are unhappy (21). While having high happiness scores, Denmark still has high global cancer rates (23), unemployment for Swedish youths at 7.1% is above the EU average of 6.1% (24), and the total alcohol per capita consumption (15+) in liters pure alcohol in Finland was recorded at 7.2 for females (compared to EU average 4.7) and 20.6 for males (EU average 18.3) in 2016 (25). Thus, unhappiness should not be viewed as the total absence of happiness nor should happiness be seen as the complete absence of unhappiness (6). At a certain point, however, a high degree of unhappiness can have severe consequences.

While the literature of unhappiness and health is still relatively scarce (26), some findings converge on common semantic themes that are linked to unhappiness such as the occurrence of negative experiences, personal failures and social disruption (27,28). As this thesis will demonstrate, such themes also seem to have an empirical grounding. The consequences of unhappiness and poor mental health are not limited to individuals and their surrounding environment, the entire social fabric is affected (29). Within the EU, more than 50% of the general population in middle- and high-income countries will suffer from at least one mental disorder sometime in their lives (29). These direct and indirect economic costs were estimated at €798 billion for 2010, an estimation expected to double by 2030 (30). In any given year, mental health problems such as depression, anxiety and substance abuse affect one in six people across the EU (31). Impacts on people's well-being and health aside, the total costs of mental ill-health exceed 4% of GDP across 28 EU countries (31). A large portion of these costs are attributed to lower employment rates and loss of productivity from people with mental health issues. Those who are relatively unhappy have lower pain thresholds (32) and report greater avoidance and negative affectivity as a result of painful experience (33,34). Research conducted in psychosomatic medicine demonstrates that negative mental states and chronic

unhappiness activate the fight-flight response, which will have harmful consequences in the long run that result in higher blood pressure and lower immune response (35,36). Happiness has a wider activating effect which keeps the body fit and resilient and, in the reverse, as in depression, there is a slowing of functioning which is possibly a reason why unhappy people are more susceptible to illness (7,35). Additionally, those who report lower levels of happiness and self-rated health were usually less active and had greater chances of being heavy smokers and drinkers (7,37). Researchers studying happiness agree that the toll of toxic stress far exceeds poor health on an individual level and the cost of chronic disease related to lifestyle choices has an enormous effect at the population level (38). Frey and Stutzer (39) report that major economic costs and financial losses to governments worldwide are a result of a high proportion of disability due to mental illnesses. Ultimately, high levels of unhappiness are costly for society and can have socioeconomic consequences resulting from the inability to work due to illness, low productivity and consumption of health services (21).

Reducing unhappiness vs increasing happiness

Every day, people make choices that influence their health and happiness in both the short and long-term. Researchers at the Harvard School of Public Health have highlighted that lifestyle choices, not genetics or mysterious causative factors, were responsible for 70-80% of heart attacks in the US (38). As health decisions and behavior frequently occur in emotionally-laden environments (40), negative emotions impact human decision-making (41). For example, cancer treatment involves managing fears about the disease and treatment side effects (42), choices about sexual risk and prevention occur in environments of arousal and lust (43), and when stress is chronic and emotional regulation is poor, healthy eating and exercise are compromised (44,45). If longstanding unemployment, depression or lack of income can be shown to be drivers of long-term suffering, then a convincing argument can be made for the inclusion of such measures to understand unhappiness (6).

The challenge lies in measuring the multiple dimensions of unhappiness. For example, a person who is chronically suffering or lacking hope may experience temporary reprieve or an enjoyable moment (6). Life events, such as marriage or the loss of a loved one, have a substantial effect on happiness, but these effects are mainly temporary (46–48). Overall, Kahneman and Krueger (19) believe the prevalent emotional state for the majority of people most of the time is positive, so any episode where a negative feeling is the most intense or a

reported emotion is meaningful. Thus, the selection of a negative feeling as more intense than positive, such as reporting low levels of happiness, is likely a "mindful and deliberate choice" (19: p.19).

At its most primary level, good government establishes and maintains an institutional framework so people can live better lives (19). If a policy could be enacted to reduce heart disease, diabetes, or depression, society could reduce a considerable amount of costs in treating chronic disease by lowering toxic stress early in life (38). Misery appears to be more strongly connected to broad social issues than does access to happiness (49). According to Lelkes (49), accessing pleasure and well-being is a more personal matter involving individual strategies and preferences somewhat unknown to the policymaker. Since a minority of people indicate their unhappiness (18) and given the significant costs to society for unhappy individuals, the priority for policy objectives should be to measure unhappiness, reduce human suffering and solve depression and poverty (49). Essentially, health policies could be more effective if they concentrated on reducing unhappiness instead of maximizing the happiness of those who are already happy. These efforts could then be complemented with individual or community-based strategy for promoting happiness. Thus, it is advantageous for policies to aim at reducing the negative effects as opposed to solely focusing on increasing positive emotions (50).

Literature Review – Key determinants of unhappiness

To see the crucial role of unhappiness on health, it is useful to look at its most important determinants (51). The focus of the literature review was to obtain pertinent information on the factors that relate to the broad spectrum of unhappiness, which included establishing the demographic and health characteristics that influence a particular evaluation of happiness. Due to the broad scope of unhappiness, concepts from various disciplines beyond health were derived from sociology, psychology and behavioral economics. Key terms and phrases included in the background search were happiness and self-rated health, health and unhappiness, mental health and happiness. Multiple variables are regarded as useful for understanding unhappiness, these include self-rated health, demographic factors of age and sex, family circumstances, levels of education and nationality (39,52).

Self-rated health. Coupled with perceived happiness, self-rated health is a common measure within public health to measure general health, well-being and illness (53). Scholars have highlighted that positive emotions are associated with greater levels of self-rated health, a lower risk of coronary heart disease (54), longevity and better health outcomes (16,55). Self-rated health is also useful for investigating the relationship between other determinants of health, such as the sociodemographic, physical and psychosocial variables to explain health and illness, behavior and describe population health (53,56,57). Poor health can cause unhappiness and poor health is believed to increase mortality, so unhappiness can be considered as associated with increased mortality (58).

Marital Status. High levels of happiness are associated with marriage (59). Even so, while couples are considered happier than those who are single, unhappy marriages may be just as harmful to health and can be associated to chronic stress and depression (52). Overall, age, gender, marital status, education and income have only been found to account for 8-20% of the variance in happiness (60).

Gender. The research on gender and unhappiness is mixed (39,47,61). While women are reportedly happier than men (5,39), unpleasant life events such as the loss of a loved one or losing a job can significantly effect mental health and wellbeing (62). In the first month after such an event, the mortality rate is double for men and three times as high as normal for women (62,63).

Social Support. A lack of social support is attributed to a great deal of suffering and unhappiness (51). Research shows that individuals who receive social support from a spouse or friends have a lower mortality risk than those who do not (64). Even if respondents were below the median income, a study found that those who reported high levels of satisfaction also reported having friends and family in times of need (65). So, social support can potentially protect against unhappiness despite having a low income.

Income. The socioeconomic factor of income is considered influential to unhappiness (51). However, money only buys happiness to a certain point and only for a short period of time (48,60,66–68). A study in Japan found that despite a fivefold increase in real income, the average self-reported happiness level did not increase in Japan between 1958 and 1987 (69).

As such, income does not appear to make people enjoy their daily lives more, although very low income is linked to suffering (6).

Immigration & Discrimination. Another factor linked to unhappiness is nationality and ethnic background (39). There is a clear link between ethnicity, discrimination and poor mental health (70). Studies conducted on many European countries have shown differing results with arriving immigrants reporting poorer health than the native population (71–73). Beyond the contrast between the origin and the reason for emigrating, the outcome of a migrant's integration, unhappiness and positive emotions largely depend upon the migrant's destination (74). While there has been extensive research on assimilation and studies on how immigrants compare to natives in relation to socioeconomic factors, few studies have investigated the perception of European immigrants on their self-rated health and happiness (75,76).

Welfare regimes. Research has increasingly drawn upon the positive association between health, socioeconomic resources and the importance of upstream contexts in generating inequalities of health from the start (77,78). The Nordic countries, for example, share many similar characteristics, including high-levels of equality and social-democratic governments (79). These qualities, while perpetuated by its citizens, have been largely shaped by the state and various policies related to education, family support, unemployment and healthcare (80). This creates a relevant point as to why welfare regimes are important as a unit of analysis, rather than individual countries.

There are two arguments to constructing welfare groupings in Europe. One argument is theoretical and the other concerns statistical inferences that will be addressed in the Methods section. "Welfare regimes" consider the institutional arrangements between the market, the state, and the family in which the state plays a central role in protecting individuals (81). The welfare regimes are also useful in research on the social determinants of health (77) and are considered suitable for explaining health and happiness (14). Eikemo *et al.* (22) further support the existence of an effect of the welfare regimes on overall health. The initial social welfare regimes contain four different geographical areas of Europe: the social-democratic Scandinavian/Nordic model, the liberal Anglo-Saxon model, the conservative Continental model and the Southern/Mediterranean model (77,82,83). Based on this, subgroups can be distinguished on the basis of between health-regime differences, population health and

socioeconomic inequalities of health. A generalized breakdown of welfare regimes across Europe is demonstrated in **Table 1.**

Purpose and Contribution

Unhappiness and its health implications provide a mandate for the area under investigation in this thesis. Although, the literature of unhappiness and health is scarce (26), happiness is a proven driver of economic, social and health advantages and supporting and producing a flourishing population requires reducing the level of unhappiness to improve health outcomes and breed economic prosperity (84). In his study, Sotgiu (28) writes that to assess sociodemographic differences in the representation of happiness and unhappiness, a large sample is needed from the general population that adequately represents genders, age groups and educational levels. Research is needed to discover what contributes to the variation of unhappiness across different geographies to adequately inform policy makers and health policies (28). Consequently, the aim of this thesis is to explore how self-rated health and other social determinants of health are associated with unhappiness across Europe.

Research Questions

On a more granular level, the first objective is to use the previously mentioned health determinants to predict the likelihood that people report that they are unhappy. The second objective is to quantify the utility of the prediction model i.e. to determine how much variation in unhappiness can be explained by the used health determinants. All of these objectives will be pursued in the context of a multiple logistic regression analysis. Accordingly, this thesis will investigate the following two questions:

> *RQ1:* What factors related to the social determinants of health best predict the likelihood that adults in Europe would report that they were unhappy?

> *RQ2:* How much of the variation in unhappiness across Europe can be explained by these social determinants of health?

Materials and Methods

This chapter covers the data collection and study design that were used for this thesis. It describes the study population and how variables were measured, selected and recoded. The final sections will touch on ethics, potential confounders and the statistical methods that were used to evaluate how well the data satisfied the assumptions of the final analysis.

Data collection

To explain the prevalence of unhappiness across European countries and their association with health outcomes, this study analyzed publicly available survey data from the Round 8 wave of the European Social Survey (ESS) for 2016 (85). The ESS gathers cross-national survey data across mostly European countries on various topics to gain an understanding of attitudes, beliefs and behavioral patterns. The variable selection concentrated on those variables which could address the demographic, behavioral and health correlates necessary to answer the research questions.

ESS sampling strategy aims to accomplish multiple key principles to achieve ample representation, minimize nonresponse bias, reduce any interviewer effects during data collection and correct for measurement error (86). Beyond establishing a representative sample and response rate that is balanced for different subgroups (87), individuals are selected by strict random probability methods at every stage. All countries must aim for the 'effective achieved sample size' of 1,500 or 800 in countries with ESS populations after discounting for design effects and response target rates are 70% (87). To correct for measurement error, the use of statistical techniques are exercised when information about the reliability and validity of measurements are available (88). The ESS source questionnaires are translated and conducted in the local languages (89) and held face-to-face by an interviewer who has been trained by the ESS Core Scientific Team (90).

Study Population

Inclusion criteria of the target population for the ESS Round 8 survey (89) was based on individuals over the age of 15 years residing in private households. Individuals were included regardless of nationality or citizenship, language or legal status. At the level of the individual, this dataset has a sample size of 41,830 units. At the contextual level, the 22 countries included

in this study from the Round 8 wave are: Austria, Belgium, Czechia, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Russian Federation, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. A more complete description of the ESS 2016 is provided on the website (please visit: http://nesstar.ess.nsd.uib.no/webview/).

Variables and Measures

As this thesis seeks to explore those social determinants of health that associate with unhappiness across Europe, this section examines and explains the selection and recoding of the dependent variable and explanatory variables.

Dependent variable

The dependent variable of this study is *unhappiness*. To determine those who are unhappy, the variable happiness is taken from the question: "Taking all things together, how happy would you say you are?" This question is based on a 10-point Likert scale where: 0 "Extremely unhappy" and 10 "Extremely happy" (**Figure 1**). In order to identify those who are unhappy, the variable "how happy are you", was dichotomized into the absence of the event where 0 = "happy" or 7 – 10 and the occurrence of the event is 1 = "unhappy" or 0 – 6. This variable cut-off at the 75th percentile score was conducted in a similar study which also transformed happiness from a Likert scale to binary (5). A report by the Nordic Council of Ministers (21) further utilized a Likert scale of happiness where those between 7 – 10 were considered "thriving", 5 – 6 as "struggling" and 0 – 4 as "suffering". As such, these limits were used as a criterion in this thesis to dichotomize the variable *unhappiness*. This also happened to fit well within the actual data. Further, this grants a relatively conservative measure of unhappiness where one has to be significantly below the average to be classified as unhappy, **Figure 2** displays the proportions for the final variable.

Explanatory variables

The domains of self-rated health, marital status, years of education, social support and income (91,92) are considered influential to happiness and can also be considered to influence one's level of unhappiness (17,83,93). Acting on these influential factors or social determinants of health are of key interest for the global public health community (94). Thus, the explanatory variables for this thesis consider the complex interplay of factors at the micro- (individual),

meso- (societal) and the macroeconomic (income distribution, welfare state) which impact and determine the health of an individual across a lifetime (95,96).

Self-rated health. The first explanatory variable was measured through the question: "How is your health in general?" based on a 5-point scale where 1 = "Very Good", 2 = "Good", 3 = "Fair", 4 = "Bad", 5 = "Very bad". This variable was transformed into a binary variable of "good" (very good and good) = 1 and "poor" (fair, bad and very bad) = 0. This method is consistent with the standard used for the global self-rated health item presented in other comparable studies (62,68,97,98). As there may be a positive association with poor health and unhappiness, the measurement of self-rated health was inverted where 0 is good and 1, the category of interest, is poor. A similar approach was used for *social support*, *member of a discriminated group* and *feeling about income*, where 0 is coded as the category of reference and 1 is the occurrence of the event i.e. the variable of interest that is assumed to have a positive association to unhappiness.

Social support. The original question asked, "How many people can you talk to about personal or intimate details?" was coded first as 0 = support, 1 = no support. To maintain response symmetry to other variables (where "no" = 0 and "yes" = 1), social support was relabeled to 0 = "No, does not lack social support" and 1 = "Yes, lacks social support".

Member of a discriminated group. The variable member of a discriminated group was recoded to no = 0 and yes = 1, presuming a positive association between discrimination and unhappiness.

Feeling about income. Two questions were considered to capture a respondent's socioeconomic status. The first question asked respondents to select the letter which best described their household income. Ten income range categories (e.g. F = €xx to under €xx) were given which corresponded broadly to the deciles of the actual household income range (weekly, monthly or annually) within the individual's country. These deciles were country specific and derived from different sources, with the median income being the reference point and the 10 deciles calculated with the median at the top of the 5th decile (99). However, these decile categories were not equally spaced and information loss could ensue as a result (100). Given how the majority of explanatory variables were being recoded to dummy variables, it was considered beneficial to see if another proxy for socioeconomic status existed in the data.

"How are you feeling about your present income" best captured the individual's perspective on their socioeconomic status. This variable was dichotomized as those who were "living comfortably" or "coping on present income" as 0 = "managing on present income" or if they felt it was "difficult" or "very difficult on present income", they became the category of interest of 1 = "struggling on present income".

Age. Age, a ratio-scale variable calculated by year of birth, was binned for the frequency tables and left continuous for the simple and multiple logistic regression.

Gender. Gender remained a nominal variable of sex as male, female.

Educational years. "Full-time years of education" was binned into two groups (12 years or less, 13 + years) for the descriptive statistics, but remained as a ratio variable (total number of full-years completed) for the analysis.

Marital status. "What is your marital status?" was recoded into 3 categories so that: 0 = Married/Civil union, 1 = Single (Never Married/Civil Union), 2 = Separated/divorced or Widowed.

Citizen status. While contingent upon the age at which an individual immigrated, self-rated health is reportedly higher for immigrants than native-born residents in the first decade after immigration (101,102). Constant *et al.* (101) found that the health status of immigrants who have lived in the host country for more than 20 years converges toward that of the native population. This provided information for creating the variable "citizen status", which was coded based upon the following question: "What year [respondent] first came to live in country?" The initial response consisted of a ratio measurement (year of arrival). This information was used to create 2 levels: 0 = Native-born (those who responded "not applicable") and those who immigrated in 1995 or before and 1 = Immigrated in 1996 or after (last data was collected in 2017).

Welfare state regimes. To reiterate, the data for this thesis was taken from a large sample of cross-sectional data. While this is an advantageous design because of its ability to generalize (103), a potential weakness of ESS data is the limited sample sizes for individual countries, which loses the ability to generalize to other samples (22,104). To manage the disparity in

sample sizes across countries and reduce loss of power, countries were grouped by their welfare regimes as inspired by Esping-Andersen (105). The goal was to potentially highlight the greatest differences and inequalities across Europe. Attempts were made to establish the truest between-regime differences in health and health inequalities (77), thus capturing differences in unhappiness.

The country division was created by recoding the variable "country" into the following:

1. *Nordic*: Sweden (SE), Iceland (IS), Finland (FI) and Norway (NO)
2. *Continental*: Austria (AT), France (FR), Germany (DE), Belgium (BE), the Netherlands (NL) and Switzerland (CH)
3. *Mediterranean*: Italy (IT), Portugal (PT), Spain (SP)
4. *Anglo-Saxon*: United Kingdom (GB), Ireland (IE)
5. *Former USSR*: Estonia (EE), Lithuania (LT), Slovenia (SI) and Russia (RU)
6. *Post-communist*: Czech Republic (CZ), Hungary (HU), Poland (PL)

For ease of interpretation, dummy variables were created for each welfare regime. Such that, the Nordic welfare regime became 0 = not Nordic, 1 = Nordic. The creation of dummy variables can offer a better understanding of possible associations between the predictor variables and unhappiness. Other statistical advantages include the easier calculation of odds for each predictor and the ability to represent intervals or levels with dummy variables which tend to increase the likelihood of events for a more powerful model (106). For the complete list of variable names as received in the original dataset with their description/question is presented in **Table 2**.

Potential confounders

Potential confounders that may influence health and unhappiness include age and sex (13). For the logistic regression analysis, age was left as a continuous variable. The reason for this is to reduce possible residual confounding and information loss (98). Weech-Maldonado, Miller and Lord (93) hypothesize that certain socio-demographics, such as age, gender and income may be mediated by self-rated health. In other words, socio-demographics may have a direct and indirect association with happiness via their relationship with perceived health (93). The multiple logistic regression technique – used in this thesis – is helpful for addressing

confounding variables as it produces adjusted odds ratios (107). However, this is only true for the variables that are included in the equation.

Ethical Issues

Anonymous and publicly-available data was used for this study. The ESS is the main authority for ethical considerations on their data collection. Beyond following very rigorous measures to ensure participant participation, maintain anonymity, gather a representative sample and reduce harm, the ESS ERIC Research Ethics Board subscribes to the Declaration on Ethics on the International Statistical Institute (85). Other issues pertaining to the author's use of secondary data include that the ESS' original idea was not perhaps collected to answer the research questions presented in this thesis. However, this thesis strived to achieve ethical rigor by writing this document in as transparent a manner as possible. The primary purpose of this research is to comply with the ethics codes as presented in the Helsinki declaration, specifically that the goal of this research is to generate new knowledge and minimize harm (108). Research quality will be further addressed in the Discussion chapter.

Statistical analysis

All analyses were conducted using the statistical software SPSS, version 25. As the aim of this thesis was to determine how the likelihood of unhappiness varied according to multiple social determinants of health, a multiple logistic regression analysis was deemed as the most suitable type of analysis.

The data was first explored visually and descriptively by looking at the associations of the social determinants of health to unhappiness. To examine the associations between the dependent variable and the explanatory variables (self-rated health, age, marital status, education, citizen status, feeling about perceived income, social welfare grouping etc.), simple logistic regressions were run with each explanatory variable and unhappiness. This demonstrated the likelihood of an event occurring for the response category compared to the reference category with odds ratios (OR) and a 95% confidence interval (95% CI). To further explain the relationship to unhappiness, a multiple logistic regression was conducted with all explanatory variables that were significant in the simple logistic analysis. Non-significant variables from the bivariate analysis, in this case ($p \leq .25$) were excluded from the final

analysis. The reason this criterion was used was because anything less than a p-value of .25 or less could run the risk of failing to identify a variable that could subsequently become a potential predictor in the final model (109). Adjusted ORs (AOR) from the multiple logistic regression analysis indicate the contribution of a particular predictor when other predictors are controlled or held constant. Finally, an analysis of the multiple logistic regression model's sensitivity and specificity was conducted by using the predicted probabilities of the final model. A common method for finding the optimum cut-off point is to draw a receiver operating curve (ROC) (109), which was the method used in this thesis.

Assumptions for logistic regression include the sample size, absence of multicollinearity and outliers (104). Sample size or lack of observations in any category was not a problem here as the Result's chapter will highlight. However, continuous variables should be examined for any strong correlations or overlap. As such, a bivariate analysis was employed to detect correlations between the variables. As no correlations were high, the next step thereafter was to perform a linear regression concentrating on the collinearity diagnostics. While there are mixed views on the cut-offs points and validity in statistics, anything less than .1 for tolerance or a variance inflation factor (VIF) greater than 10 are considered an indication of the presence of multicollinearity (110). The output for this procedure is shown in **Table 3**.

Results

This chapter covers the descriptive tables and results from the simple logistic regressions and the final multiple logistic regression model to establish the relationship between unhappiness and the social determinants of health.

Descriptive Statistics

Table 4 shows frequencies and total percentages among of all the explanatory variables between those who reported to be happy or unhappy ($n = 41,830$). The total age of respondents averaged 49 years of age (Std = 18.55), with the minimum and maximum ages being 15 and 100. While the distribution was fairly equal, those aged 56 – 67 years reported 24% unhappiness, compared to the next highest, 23% at age 67+ years. The average number of full-time completed education was 13 years (Std = 3.86). For those that reported poor self-rated health, 40% also reported that they were unhappy. Of those who reported good self-rated health, 15% also reported being unhappy. Of the marital status variable, 38% of those that reported being unhappy stated that they were also divorced/separated or widowed. Overall, there were more females (52.6%) than male (47.3%) respondents, with 33% of female respondents reporting that they were unhappy. 2,019 (4.9%) reported lacking social support and 8,588 (20.8%) were struggling on their current income. Of the welfare groupings, the Continental regime had the largest number of respondents at 11,904 respondents (28.5%) and Anglo-Saxon was the lowest at 4,716 (11.3%). At 31%, the largest welfare grouping with the greatest number reporting that they were unhappy was the Post-Communist regime.

Bivariate (Simple) Logistic Regression

To see the raw relationship between unhappiness and the explanatory variables, the bivariate analysis is presented in **Table 5**. Female participants were 1.05 times (95% CI: 1.00 - 1.09) more likely to report "unhappy" than their male counterparts. For every unit increase in age, the odds of being unhappy increased by 1.01 (95% CI: 1.01 - 1.01). For every unit increase in education, the odds of being unhappy decreased by .91 (95% CI: .91 - .92). A significant relationship was found between marital status and unhappiness, that is respondents who were never married (OR = 1.22, 95% CI: 1.16 - 1.29) and those that are separated/divorced or widowed (OR = 2.57, 95% CI: 2.42 - 2.27) are more likely to report they are unhappy compared to the reference group. Poor self-rated health (OR = 3.70, 95% CI 3.53 – 3.88), those who

lacked social support (OR 3.59, 95% CI: 3.28 - 3.94), members of a discriminated group (OR 1.79, 95% CI: 1.65 - 1.94), and those who were struggling on their current income (OR = 4.26, 95% CI: 4.05 - 4.49) were more likely to report high levels of unhappiness. There was a significant relationship between unhappiness and immigration where those that had immigrated '96 or after were .76 times (95% CI: .68 - .86) less likely to rate themselves as unhappy. Except for the Mediterranean welfare regime (p-value = .39), significant relationships were found between all other welfare regimes and unhappiness.

Multiple Logistic Regression

A multiple logistic regression was performed to test the effects of all significant explanatory variables from the simple logistic regressions on the likelihood that respondents would report that that they were unhappy. **Table 5** demonstrates the model containing the 14 independent variables (self-rated health, welfare regimes, gender, age, immigrated after '96, social support, education, marital status, member of a discriminated group and feeling about socioeconomic status). The full model containing all predictors was statistically significant, χ^2 (14, n = 39,105) = 6,561.97, p < .001, indicating that the model could distinguish between respondents that considered themselves to be happy or unhappy.

The variables of age (AOR = 1.00, 95% CI: 1.00 – 1.00) and immigrated after '96 (AOR = 1.06, 95% CI .93 – 1.21) lost their statistical significance in the final model. The strongest predictors of reporting unhappiness were those who reported poor self-rated health (AOR = 2.70, 95% CI: 2.54 – 2.85), those who were struggling on their current income (AOR 2.59, 95% 2.44 – 2.75) and those who were members of a discriminated group (AOR = 1.73, 95% CI: 1.57 – 1.90). Controlling for all other factors in the model, this indicates that respondents who reported poor self-rated health were 2.70 times more likely to report they were unhappy and those who reported struggling on their current income were 2.59 times more likely to report that they were unhappy compared to their counterparts. Regarding social welfare regimes, the Anglo-Saxon regime was 1.17 (95% CI: 1.05 – 1.30); the Former USSR had 1.94 (95% CI: 1.77 – 2.12); and the Post-Communist had 1.73 (95% CI: 1.57 – 1.90) times more likely of being unhappy than those that were not living in those welfare regimes. Regarding the gender of participants, compared to males, being female was associated with a 3% reduction in the odds of unhappiness. Likewise, for every unit increase of years of completed education the

odds of not being unhappy are multiplied by .97. That is, as years of education increase, the odds of being unhappy decrease by 3%, with all other factors held constant in the model.

Overall, the final model explained between 15.4% (Cox & Snell R^2) and 23.3% (Nagelkerke R^2) of the variance in happiness status, and correctly classified 79.0% of all cases. A sensitivity and specificity analysis was also conducted for the final model where a cut value of 0.46 was deemed as optimal. See **Figure 3** for a visual of ROC curve.

Discussion

The first section directly addresses the questions raised in this thesis and presents the main findings. Thereafter, an examination into critical consideration ensues. To end, the conclusion will cover suggestions for future public health research and final thoughts.

Main findings

The first objective of this thesis was to explore what social determinants of health would predict that adults in Europe reported that they were unhappy. With all other factors held constant, this research found that age does little to predict whether someone will be happy or unhappy. This finding departs from prior findings where those who were younger were more likely to have higher levels of happiness (5,111). However, these two studies were not taken from Western European samples and cultural differences could explain the differing results. Another area where research is ambiguous is gender. This thesis revealed that being female marginally protected against unhappiness (5,39) but being female can sometimes appear as an increased risk for that outcome (5,37). The results for this study are in line with previous studies that looked at marital status. Respondents who were single, separated/divorced or widowed had an increased risk for unhappiness (37,49). After adjustment, education only protected minimally against unhappiness, which is another finding in further agreement with the literature (49).

One's citizen status was associated with unhappiness before but was not significant after adjustment. Little research has been done on the unhappiness of European migrants who arrived within the last 10 - 20 years, especially among those who came as refugees (112–115). Helliwell *et al*. (116) report that when making decisions to migrate, people often choose the option they believe will make them or their families the happiest. Whether or not migrants originating from non-European countries are happy or unhappy after immigration is open for exploration within the European context.

Beyond one's marital status, some of the strongest predictors of unhappiness were self-rated health, how one felt about their current income, if they were members of a discriminated group or if they lacked social support. These findings have been supported by multiple studies (37,49,62,117,118). Respondents who reported any of these variables were at an increased risk of being unhappy compared to those who were not in those groups. It is worth noting that while

someone might report good self-rated health, they might have a lower socioeconomic status (37). In the Anglo-Saxon regime for example, 70% of people reported having good health (close to the EU average of 67%) (119), a region shown in this study to have an increased odds for unhappiness. Accordingly, one should be careful to conclude that because someone has good self-rated health, they are therefore happy. Even so, substantial gaps exist between self-rated health and socioeconomic status by the highest and lowest income quintiles (119). Variables should always be considered in the bigger picture hence why unhappiness might be a more interesting variable to explore coupled with self-rated health.

Welfare regimes were also investigated as social determinants of health in this thesis. Running all significant variables simultaneously within the multiple logistic regression model, the results showed that those respondents who were members of the Anglo-Saxon, Former USSR and Post-Communist welfare regime had an increased risk of unhappiness. The Anglo-Saxon welfare regime's position actually moved from a reduced odds of, or being protected from, unhappiness in the bivariate regression to a higher odds of unhappiness in the final model. Former research supports this position which found the Anglo-Saxon welfare regime to have the highest income-related health inequalities of the Western European countries (22). The finding of Central and Eastern European countries faring the worst in terms of happiness is also in agreement with another study (120), such that people in the Post-Communist and Former USSR European welfare regimes were 1.73 and 1.94 times more likely on average to be unhappy with all other factors held constant in the final model. In contrast, these odds ratios shift in the other direction when respondents are living in the Nordic and Continental welfare regimes. There, the odds of being unhappy are significantly reduced in that these welfare regimes served as protective factors against unhappiness. Differing political and social policies and historical backgrounds likely has an influence on the happiness and unhappiness of individuals from these different welfare regimes.

Despite the Nordic and Continental welfare regimes having reduced odds for unhappiness, one should account for the in-between country differences and that disadvantaged populations still exist. Behavioral risk factors were not included in the data, such as smoking and alcohol consumption. However, the OECD (121) reports that both of these risk factors are more predominant among people with low levels of income or education in Sweden. From a public health perspective, though one might live in the Nordics, disadvantaged subsets of the population still exist and should not be overlooked. Overall, based on the results related to the

social welfare regimes, the unhappiness of individuals in Europe appears to be strongly associated to the conditions created by social and governmental institutions. This and the previous sections provide a detailed answer to the first research question of this thesis.

The second research question focused on how much of the variation in unhappiness that could be explained by the selected social determinants of health. The final model managed to explain between 15.4 and 23.3% of the variation in unhappiness across Europe (depending on which pseudo R^2 measure one uses as a reference). This measure answers the second research question and gives a comparable indication as to the amount of variation of unhappiness that is explained by these particular social determinants of health in Europe.

Although not pertinent to the main objective, a miscellaneous analysis was conducted that related to the second research question. The ideal multiple logistic regression model would demonstrate only true positives (sensitivity 1 or 100%) with no false negatives (1 – specificity) (109). The *sensitivity* of the model represents the percentage of the group with the characteristic of interest (unhappiness) that were accurately identified by the model, the true positives (104). The *specificity* refers to the true negatives or the percentage of the group accurately identified without the characteristic of interest (those who are happy) (104). Various cut values were tested to find the optimal value between sensitivity and specificity. The final model was only able to correctly identify about 1/3 of the people that were unhappy while still preserving an overall high percentage of classification accuracy for the entire model (79%), see **Table 6**. As the ROC curve shows in **Figure 3**, one could increase the model's ability to identify more unhappy people, but a large proportion of those would become false positives. This suggests that the model would identify those that are happy as unhappy, which decreases the overall classification accuracy. Since unhappiness was a property of interest in this thesis, it would have been beneficial if the final model had correctly classified a higher proportion of those people. However, as outlined above, this could not be achieved without significantly decreasing the overall classification percentage of the model. For this reason, the cut-value of .46 was finally chosen.

In summary, the answer to the first research question illuminates which social determinants of health that best predict the likelihood of unhappiness in Europe based on their adjusted OR's. Those predictors would be: self-rated health (2.70), how one felt about their current income (2.59), if they lacked social support (1.97), if they lived in the Former USSR welfare regime

(1.94) or if they were separated/divorced or widowed (1.84). In relation to the second research question, pseudo R^2 measures indicated that about 20% of the variation in unhappiness could be explained by the final multiple logistic regression model. Although, the sensitivity and specificity of the final model was manipulated, it was still difficult to devise a model that could accurately identify unhappy people in Europe with these particular social determinants of health.

Critical considerations

This thesis has both strengths and limitations, some of which stem from the data. First, the nationally representative sampling design is a strength of ESS data. As ESS samples are representative of the adult population from mostly European countries, analysts can extract inferences to national adult populations, allowing for the further generalizability of results (122). Furthermore, while it is always possible to overlook a certain combination of search keywords, few health studies appear to have focused on unhappiness across Europe. Many studies either emphasized factors that increased happiness or used the measure of self-rated health as a measure of well-being and happiness (5,37,39,111,123).

Although this thesis might reveal an association between variables of interest, it cannot determine the cause and effect relationship between those variables. Given the nature of the individual and the cross-sectional data used for this thesis, reverse causality cannot be ruled out. For the results to bear true policy relevance, they must demonstrate causal pathways. Follow-up studies and longitudinal methods are needed to clarify whether positive and negative emotions are the predictor or the outcome or if the associations are reciprocal or occurring concurrently (6,68,111).

Another critical consideration concerns the dependent variable and the decision to dichotomize a Likert scale. In the case of "How happy are you", on a scale from 1 - 10, if taken at face value, reporting "6" would mean someone is twice as happy as someone who reports "3". Naturally, this would be an absurd statistical assumption since this, is at best, an ordinal scale. This type of ratio scale assumption is a suitable measure for body mass index (BMI), but due to its subjectivity, a Likert scale is not as useful due to the complexity of quantifying differences between individuals. In the case of this thesis, it was suitable to dichotomize this kind of variable (18). Scholars underscore that the dichotomous categorization of moments or episodes as unpleasant or pleasant can lose information about the intensity of positive and

negative emotions. However, Kahneman and Krueger (48) defend that the dichotomous definition of unpleasant versus pleasant episodes has a significant advantage by reducing interpersonal differences in the use of scales. Thereby, the question of how to scale subjective responses numerically is no longer an issue with a dichotomous measure. Based on these arguments, the decision was made to dichotomize the dependent variable and call it 'unhappiness'.

One should entertain the possibility of residual confounding and that differences exist within groups based on variables such as body mass index, tobacco or alcohol use or physical activity. However, this data does not exist in the Round 8 wave. There are certainly other variables that could've been considered and utilized for this study. Rigorous research efforts were made to determine the best possible variables to be used in the model.

While most of the results in this thesis were consistent with other findings, there are limitations to welfare groupings as the breakdown between the countries is not so clear (124). For example, the Netherlands and Austria have aspects of both the Continental and Nordic models, France and Germany, both continental countries, have separate policies in many areas including family benefits, and the UK health system is not the archetypal liberal model (124). Using information from welfare regimes is contestable as the variation in results when countries are grouped can be problematic for extracting generalizable conclusions related to where population health is better and health inequalities are smallest (120). Nevertheless, analyzing from a welfare regime level is still informative (120) and it is valuable to look at countries that share similar features and draw inspiration from policies that may improve health and reduce unhappiness.

The last critical consideration concerns the multiple logistic regression model. The final model managed to explain between 15.4 and 23.3% of the variation in unhappiness across Europe, according to the pseudo R^2 measures. Although, scholars are still debating what measure to use in the context of multiple logistic regression (109,125), the Nagelkerke R^2 and the Cox & Snell R^2 were the measures used in this case (104,110). Since the ideal model would approach 100%, a lot of the variation still remains unaccounted for. Ultimately, this discussion remains outside the scope of this thesis, but could be an avenue for future research.

Conclusion

Health practitioners should strive to help people flourish unhindered and reduce their suffering and unhappiness. As such, we must look to the micro and macro determinants of a person's life to better understand how policies can impact the lives and longevity of a population. This thesis illuminates that a minority in Europe experience unhappiness. Other predominant themes associated with unhappiness included poor self-rated health, struggling with income, lack of social support, discrimination, marital status and what social welfare regime one happened to live in. These are all areas which can be addressed in future public health research.

Future research and implications for public health

The data used for this thesis contains a repository of indispensable information on mostly European countries. The findings from this research indicate a need for social support networks, programs to combat discrimination, and policies that nudge people toward healthy behaviors. Policies should help people locate greater and better opportunities to establish and maintain relationships. This involves access to social support in the various aspects of one's life (family, community, unemployment).

Programs focused on integration and anti-discrimination remain imperative. The ESS data from non-European respondents who emigrated within the past 20 years is currently insufficient to draw larger conclusions about immigration. Researchers should dedicate to studying those factors which lead migrants and the people of the destination country to be happy as this could improve the health and economy of the overall population. Solving the gaps in unhappiness between different welfare regimes is undoubtedly a political and cultural challenge. Research targeting the various welfare regimes is necessary for finding cost-effective policies and health campaigns that address and understand the variation in unhappiness in certain regions.

This thesis offers evidential support for further research into the relationship between unhappiness and health. Out of the 14 independent variables, the variable with the strongest association to unhappiness in Europe is poor self-rated health. The empirical connection to health is quite clear and research in public health can continue down this line of inquiry.

Additionally, definitions matter. Clear definitions are important for conducting cross national surveys. It was difficult to find a coherent and clear definition of unhappiness. This is another area open for definition in research.

Finally, future research should also integrate both qualitative and quantitative data. Despite certain health policies, there are many disparities in understanding human behavior and choice. Public health practitioners need to apprehend the broader picture and developing health policies based solely on quantitative statistics is not sufficient. While quantitative data is essential for health reporting, qualitative information is useful for uncovering the experiences of individuals and communities. A balance between both research methods will allow health policies to be evidence-informed while also considering competing beliefs and political and economic institutions.

Why does understanding unhappiness matter? People with a higher socioeconomic status have a greater array of opportunities and also tend to have better health and happiness (2). If we only focus on those things that already make people happy, the groups and individuals that are the most unhappy and potentially experiencing the greatest suffering might be neglected. In closing, this thesis is an argument for health professionals to understand and in time reduce unhappiness as a way to improve overall health.

Acknowledgements

As my success has often been contingent upon the goodness of others, I would like to recognize a few individuals who provided support throughout my thesis. First, I extend appreciation to my supervisor for his guidance and feedback in helping to narrow down the scope of my research. I would also like to acknowledge another MPH student who provided useful suggestions and thoughtful input.

And last, but absolutely not least, a very special thank you to my husband for his emotional support, knowledge and patience throughout this endeavor.

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Appendix

Tables & Figures

Table 1. Description of welfare regimes.[*]

Welfare Regime	Countries	Short description
Socio-demographic Scandinavian model	Denmark, Sweden, Finland and Iceland	These countries rely upon a universal welfare provision of social services, gender equality, low poverty, high inclusion and some of the highest levels of social protection expenditure in GDP [126,127].
Continental conservative model	France, Germany, Austria, Belgium, Luxembourg, the Netherlands and Switzerland	These countries emphasize the importance of the role of labor law, extensively rely upon insurance-based, non-employment benefits and old-age pensions.
Anglo-Saxon model	Ireland and the United Kingdom	These countries are characterized by the principle role of markets, taxation and direct payments [128].
The Southern Mediterranean Model	Italy, Greece, Portugal, Spain	These countries are family-centered, with low unemployment benefits, social protection expenditures and high poverty risk [129].
Central/Eastern European Model	Former USSR	These countries can be characterized by an emphasis on redistribution to prevent poverty, extensive public sector, high economic growth and inflation, low pensions and lack of basic necessities [130].
	Post-Communist	Somewhat comparable to the traditional European welfare states, these countries are a blend between the Conservative and Social-Democratic models [130].

*Please note: No single country contains all the characteristics of a specific regime. This table produces a generalized description of welfare regime types.

126   Neesham C & Tache I, 2010

127   Scharpf FW, 2002

128   Busse RM, 1998

129   Püss T, Viies M, Maldre R, 2010

130   Fenger MHJ, 2007

Table 2. Variable Codebook

The complete list of potential explanatory variables as arrived with the variable name from the ESS wave 8 dataset with the corresponding recoded dummy variable.

| Variable Name in SPSS/Excel	Description	Values (measurement level)
Cntry	Country	AT = Austria BE = Belgium CH = Switzerland CZ = Czechia DE = Germany EE = Estonia ES = Spain FI = Finland FR = France GB = United Kingdom HU = Hungary IE = Ireland IS = Iceland IT = Italy LT = Lithuania NL = Netherlands NO = Norway PL = Poland PT = Portugal RU = Russian Federation SE = Sweden SI = Slovenia
WelfareRgn	Country by social welfare grouping	1 = Nordic (SE, FI, IS, NO) 2 = Continental (FR, DE, AT, BE, NL, CH) 3 = Mediterranean (IT, PT, ES) 4 = Anglo-Saxon (GB, IE) 5 = Former USSR (EE, LT, SI, RU) 6 = Post-Communist (CZ, HU, PL)
DummyNordic	Nordic yes, no	0 = Not Nordic 1 = Nordic
DummyContinental	Continental yes, no	0 = Not Continental 1 = Continental
DummyMediterranean	Mediterranean yes, no	0 = Not Mediterranean 1 = Mediterranean
DummyAnglo-Saxon	Anglo-Saxon yes, no	0 = Not Anglo-Saxon 1 = Anglo-Saxon
DummyFormerUSSR	Former USSR yes, no	0 = Not Former USSR 1 = Former USSR
DummyPostCommunist	Post-Communist yes, no	0 = Not Post-Communist 1 = Post-Communist
happy	Happiness of respondent	0 = Extremely unhappy 1 = 1 2 = 2 3 = 3 4 = 4

		5 = 5
		6 = 6
		7 = 7
		8 = 8
		9 = 9
		10 = Extremely happy
		77 = Refusal
		88 = Don't know
		99 = No answer

unhappiness	Dichotomous variable of unhappy and happy	0 = 7 – 10 Happy 1 = 0 – 6 Unhappy

health	Self-rated health of respondent	1 = Very good 2 = Good 3 = Fair 4 = Bad 5 = Very Bad 7 = Refusal 8 = Don't know 9 = No answer
SRHdummy	SRH as a dichotomous variable	0 = 1 – 2 Good 1 = 3 – 5 Poor

inprdsc (social support)	Number of people respondent has to discuss personal matters	0 = None 1 = 1 2 = 2 3 = 3 4 = 4 – 6 5 = 7 – 9 6 = 10 or more 77 = Refusal 88 = Don't know 99 = No answer
SocialSupport	Social support yes, no	0 = Yes, 1 or more 1 = No 77 = Refusal 88 = Don't know 99 = No answer
LackingSocialSupport	Lacking Social Support yes, no	0 = No does not lack support (1 – 6) 1 = Yes, lacks support (0) 77 = Refusal 88 = Don't know 99 = No answer

Dscrgrp	Member of a group discriminated against in this country?	1 = Yes 2 = No 7 = Refusal 8 = Don't know 9 = No answer
Discriminated	Member of a discriminated group? no/yes	0 = No 1 = Yes 7 = Refusal 8 = Don't know 9 = No answer

livecnta	First year respondent came to live in country	[Numerical value] year 6666 = Not applicable 7777 = Refusal

C

		8888 = Don't know 9999 = No answer
Citizen status	Native-born or immigrated 1996 or after, yes/no	0 = Native-born or immigrated before '95 1 = Immigrated '96 or after
Age	Respondent's age	[Numerical value] in years
Gen	Respondent's gender	1 = Woman 2 = Man 9 = No answer
maritalb	Legal marital status	1 = Legally married 2 = In a legally registered civil union 3 = Legally separated 4 = Legally divorced/civil union dissolved 5 = Widowed/Civil partner died 6 = None of these (never married/never civil union) 77 = Refusal 88 = Don't know 99 = No answer
Marital status	Marital Status 3 groups	0 = Married/Civil Union 1 = Single (never married/civil union) 2 = Separated/Divorced, Widowed
eduyrs	Number of years spent educating	[numerical value]
hincfel	Feeling about household income	1 = Living comfortably on present income 2 = Coping on present income 3 = Difficult on present income 4 = Very difficult on present income 5 = Refusal 8 = Don't know 9 = No answer
Incomefeeling	Feeling about income - Managing, Difficult	0 = Managing on present income 1 = Difficult on present income

D

Figure 1. Histogram of original "happiness" variable (*n* = 41,635) as a 10-point Likert scale.
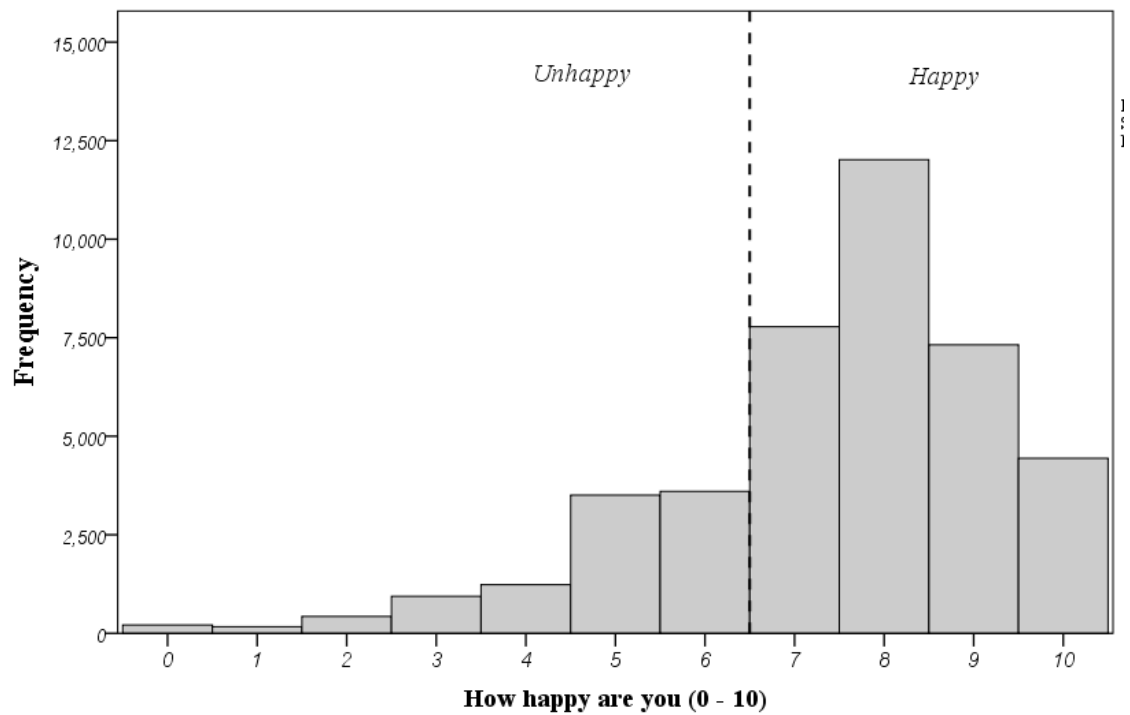
Figure 2. Bar diagram of happiness and unhappiness (*n* = 41,635) as a dichotomous variable based on the cut-off displayed in Figure 1.1

E
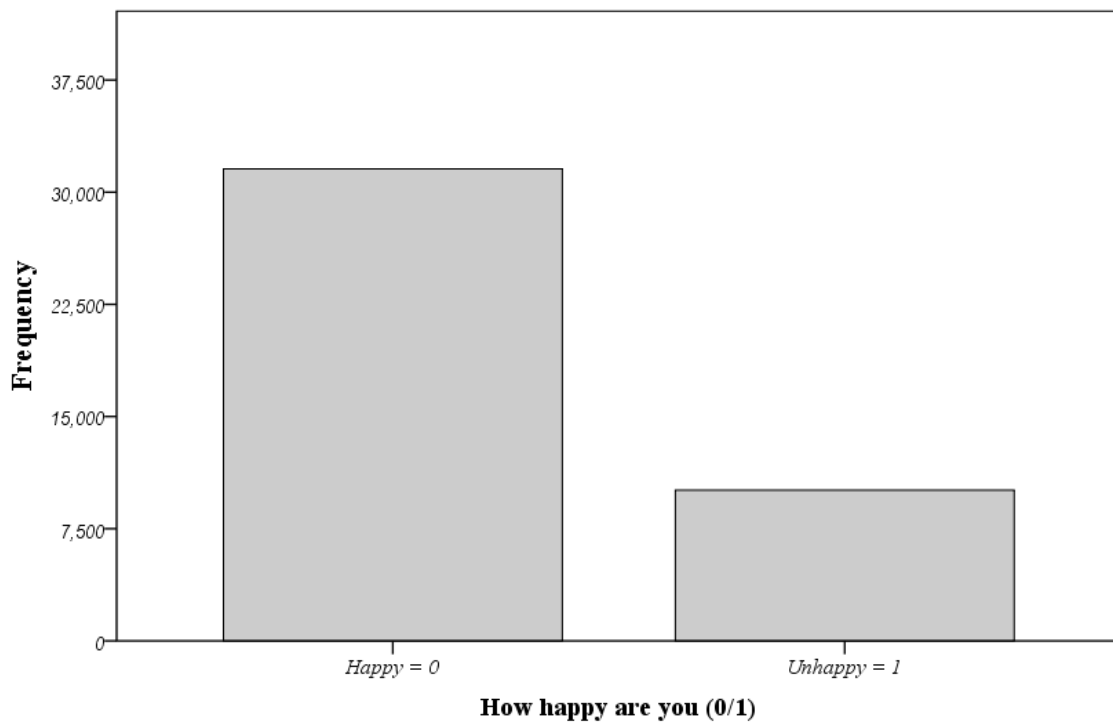
Table 3. To establish the presence of multicollinearity involves examining the collinearity diagnostics and the tolerance and VIF's scores. This is depicted below with the ratio explanatory variables.

Coefficients[a]		
	Collinearity Statistics	
	Tolerance	VIF's
Age of respondent, calculated	.946	1.057
Years of full-time education completed	.946	1.057

[a] Dependent Variable: Happy, Unhappy

Table 4. Descriptive statistics of explanatory variables among 2016 ESS Wave 8 dataset where $n =$ 41,830 (missing $n = 195$) of observed values and their frequencies within the dichotomous happiness variable.

Characteristic	Happy ($n = 31,558$)	Unhappy ($n = 10,077$)	Total
Self-Rated Health [a]			
Good	22,874 (73%)	4,183 (42%)	27,057 (65%)
Poor	8,667 (27%)	5,869 (58%)	14,536 (35%)
Welfare Regime [b]			
Nordic			
Yes	5,241(16%)	645 (6%)	5,886 (14%)
No	26,317 (83%)	9,432 (94%)	35,749 (85%)
Continental			
Yes	9,839 (31%)	2,045 (20%)	11,884 (29%)
No	21,719 (6%)	8,032 (80%)	29,751 (71%)
Mediterranean			
Yes	4,396 (14%)	1,438 (14%)	5,834 (14%)
No	27,162 (86%)	8,639 (86%)	35,801(86%)
Anglo-Saxon			
Yes	3,731 (12%)	983 (10%)	4,714 (11%)
No	27,827 (88%)	9,094 (90%)	36,921 (89%)
Former USSR			
Yes	4,672 (15%)	3,119 (31%)	7,791 (19%)
No	26,886 (85%)	6,958 (69%)	33,844 (81%)
Post-Communist			
Yes	3,679 (12%)	1,847 (18%)	5,526 (13%)
No	27,879 (88%)	8,230 (82%)	36,109 (87%)
Gender [c]			
Male	15,027 (48%)	4,679 (46%)	19,706 (47%)
Female	16,524 (52%)	5,398 (54%)	21,922 (53%)
Age (binned) [d]			
<= 31 years	7,127 (22%)	1,616 (16%)	8,743 (21%)
32 – 44 years	6,695 (21%)	1,840 (18%)	8,535 (20%)
45 – 55 years	5,891 (19%)	1,925 (19%)	7,816 (19%)
56 – 67 years	6,217 (20%)	2,415 (24%)	8,632 (21%)
68+ years	5,543 (18%)	2,245 (23%)	7,788 (19%)

Citizen status [e]			
Native-born	28,480 (91%)	9,180 (91%)	37,660 (91%)
Immigrated <= '95	1,358 (4%)	469 (5%)	1,827 (4%)
Immigrated >= '96	1,516 (5%)	374 (4%)	1,890 (5%)
Lacks social support [f]			
No, does not lack support	30,328 (97%)	8,852 (90%)	39,180 (95%)
Yes, lacks Support	972 (3%)	1,020 (10%)	1,992 (5%)
Years of full-time education (binned) [g]			
12 years or less	13,937 (44%)	5,791 (57%)	19,728 (47%)
13 years or more	17,621 (56%)	4,286 (43%)	21,907 (53%)
Marital status [h]			
Married/Civil Union	16,538 (53%)	3,953 (40%)	20,491 (50%)
Single (Never married)	9,607 (31%)	2,814 (29%)	12,421 (30%)
Divorced/Separated, Widowed	4,876 (16%)	2,993 (31%)	7,869 (19%)
Member of a discriminated group [i]			
No	29,472 (94%)	8,892 (90%)	38,364 (93%)
Yes	1,921 (6%)	1,039 (10%)	2,960 (7.2%)
Feeling about income [j]			
Managing	26,839 (86%)	5,824 (59%)	32,663 (79%)
Difficult	4,421 (14%)	4,091(41%)	8,512 (27%)

[a] missing n = 237   [d] missing n = 316   [g] missing n = 195   [j] missing n = 655
[b] missing n = 195   [e] missing n = 452   [h] missing n = 1,049
[c] missing n = 202   [f] missing n = 658   [i] missing n = 506

Table 5. Bivariate and multiple logistic regression predicting the likelihood of unhappiness and the explanatory variables from the ESS Wave 8 Dataset (n = 41,830) with the unadjusted odds ratios and the adjusted odds ratios and 95% confidence interval (95% CI).

Variable Name	Odds ratios of Unhappiness[a]			
	Crude OR[b] (CI 95%) **	P-Value	Adjusted OR[c] (CI 95%)	P-Value
Self-Rated Health				
Good	Reference		Reference	
Poor	3.70 (3.53 – 3.88)	.00	2.70 (2.54 - 2.85)	.00
Welfare Regime				
Nordic				
No	Reference		Reference	
Yes	.34 (.31 - .37)	.00	.56 (.50 - .63)	.00
Continental				
No	Reference		Reference	
Yes	.56 (.53 - .59)	.00	.86 (.79 - .94)	.00
Mediterranean				
No	Reference			
Yes	1.03 (.96 – 1.10) **NS**	.39		
Anglo-Saxon				
No	Reference		Reference	
Yes	.80 (.75 - .87)	.00	1.17 (1.05 – 1.30)	.00
Former USSR				
No	Reference		Reference	
Yes	2.58 (2.45 – 2.72)	.00	1.94 (1.77 – 2.12)	.00
Post-Communist				
No	Reference		Reference	
Yes	1.70 (1.60 – 1.80)	.00	1.73 (1.57 – 1.90)	.00
Gender				
Male	Reference		Reference	
Female	1.05 (1.00 – 1.09)	.04	.84 (.80 - .89)	.00
Age (continuous)				
	1.012 (1.01 - 1.01)	.00	1.00 (1.00 – 1.00)	.07

	Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
Immigrant within last 20 years				
Immigrated '96 or after				
No	Reference		Reference	
Yes	.76 (.68 - .86)	.00	1.06 (.93 – 1.21)	.41
Lacks Social Support				
No, does not lack social support	Reference		Reference	
Yes, lacks social support	3.59 (3.28 – 3.94)	.00	1.97 (1.77 – 2.20)	.00
Years of full-time education (continuous)				
	.91 (.91 - .92)	.00	.97 (.96 - .97)	.00
Marital status				
Married/Civil Union	Reference		Reference	
Single (Never married/civil union)	1.22 (1.16 – 1.29)	.00	1.52 (1.41 – 1.63)	.00
Separated/Divorced, Widowed	2.57 (2.42 – 2.72)	.00	1.84 (1.72 – 1.97)	.00
Member of a discriminated group				
No	Reference		Reference	
Yes	1.79 (1.65 – 1.94)	.00	1.73 (1.57 – 1.90)	.00
Feeling about income				
Managing	Reference		Reference	
Struggling	4.26 (4.05 – 4.49)	.00	2.59 (2.44 – 2.75)	.00

[a] Binary variable: unhappy = 1, happy = 0

[b] Crude OR, crude odds ratio; CI

[c] Adjusted OR, adjusted odds ratio, with all other variables held constant

NS – not significant

Table 6. The classification table output provides an indication of how well the model is able to predict the correct category (unhappiness). The model below correctly classifies 79.0% of cases overall, demonstrating a sensitivity (true positive) of 32.4% and a specificity (true negative) of 93.3%.

		Predicted		
		Unhappiness status		
Observed		Happy	Unhappy	Percentage Correct
Unhappiness status	Happy	27,922	2,016	93.3
	Unhappy	6,195	2,972	32.4
Overall Percentage				79.0

The cut value is .460

Figure 3. ROC curve for the predicted probabilities of the final model.
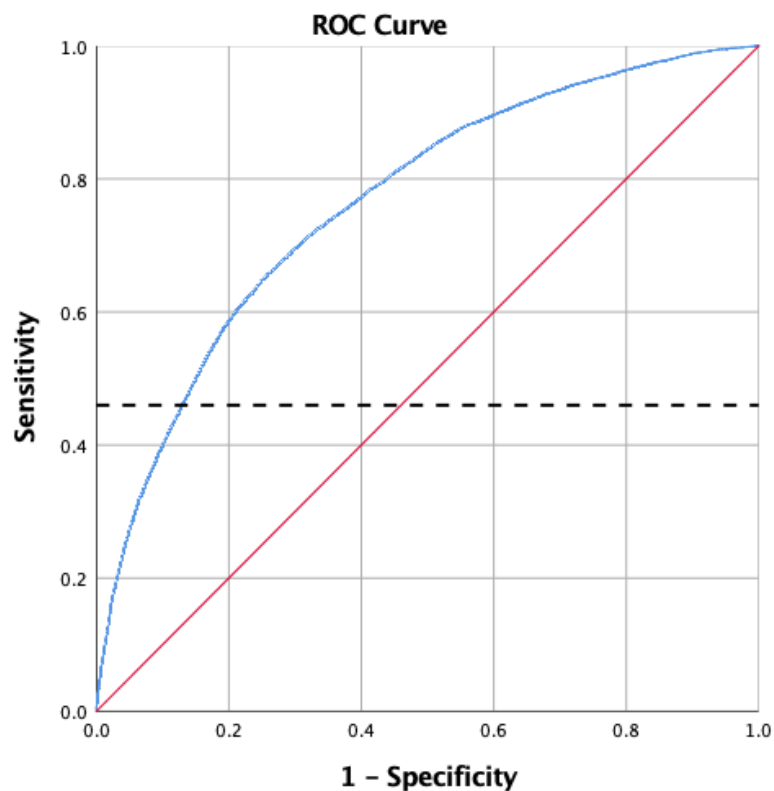
Note: Dotted line indicates the cut value (.46) used for the final model.

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Popular Science Summary

Unhappiness lessons for public health research and policy in Europe.

Would you rather increase your happiness or decrease your unhappiness? The burden of unhappy individuals in society is a substantial and costly public health issue. Many European countries, especially in the Nordics, regularly rank at the top of global happiness reports. However, levels of happiness vary vastly across European countries. Certainly, we all experience waves of happiness and unhappiness, but long-term sustained unhappiness can have serious consequences, to not only your health, but also to the environment around you. But what exactly influences unhappiness?

A study across 22 European countries examined what factors could best predict that an adult in Europe would be unhappy. The results indicated that some of the strongest predictors of unhappiness were individuals who had poor self-rated health, experienced discrimination, lacked social support and were struggling on their current income. When looking at similar country groupings across Europe, individuals from the Anglo-Saxon, Former USSR and Post-Communist areas were likely to report higher levels of unhappiness than other European regions in the study.

Altogether, the research on unhappiness and health across Europe is limited. While unhappy people are costly to society in both lost years of life, poor mental health and productivity, little is known about what exactly creates the conditions for unhappiness in various environments. Greater research is needed to understand what contributes to the great variation of unhappiness across different geographies. Once this is understood, policy makers can possibly aim at policies which reduce unhappiness, increasing the happiness for all.