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Impact of social isolation on mental health: an empirical analysis

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Resumen

El aislamiento social supone la falta objetiva de contactos sociales con familiares o amigos, siendo asociado en ocasiones a problemas de salud mental. El principal objetivo de este estudio consiste en analizar la relación entre aislamiento social y enfermedades mentales, tales como depresión o ansiedad, además de incluir otras variables socioeconómicas que pueden ejercer cierta significación. Para ello, se ha empleado como muestra los datos de la población adulta española correspondientes a la Encuesta Nacional de Salud del INE del año 2017, los cuales han permitido estudiar la prevalencia de las enfermedades mentales en nuestro país y llevar a cabo diferentes modelos econométricos en donde se analiza la probabilidad de padecer enfermedades mentales en función de diferentes variables explicativas – tales como el sexo, el nivel de estudios o la nacionalidad – convirtiéndose el aislamiento social en la principal a efectos de este estudio. Los resultados confirman la preexistente asociación entre aislamiento social y problemas de salud mental, es decir, a mayor aislamiento social, mayor probabilidad de padecer enfermedades mentales. Sin embargo, la falta de datos longitudinales supone una gran limitación en este estudio, ya que imposibilita establecer una relación de causalidad entre ambas variables. La falta de suficientes relaciones sociales estrechas o de calidad supone un problema cada vez mayor en las sociedades más desarrolladas, dado que además de su relación con problemas de salud mental en otros estudios ésta se ha vinculado a problemas de salud física. Es por ello por lo que resulta necesaria una intervención pública en donde se brinde un mayor apoyo a los colectivos más vulnerables para tratar de paliar los efectos de este problema social sobre la salud de las personas.

Palabras clave: aislamiento social, salud mental, apoyo social funcional, prevalencia, depresión, ansiedad.

Número de palabras: 14975.

Abstract

Social isolation is the objective lack of social contact with family or friends and is sometimes associated with mental health problems. The main objective of this study is to analyze the relationship between social isolation and mental illnesses, such as depression or anxiety, as well as including other socioeconomic variables that may be of some significance. To do so, data from the Spanish adult population corresponding to the 2017 INE National Health Survey have been used as a sample, which have allowed to study the prevalence of mental illness in our country and to carry out different econometric models in which the probability of suffering from mental illness is analyzed according to different explanatory variables – such as gender, education level or nationality – with social isolation becoming the main one for the purposes of this study. The results confirm the pre-existing association between social isolation and mental health problems, that is, the greater the social isolation, the greater the likelihood of developing mental illness. However, the unavailability of longitudinal data is a major limitation of this study, as it makes it impossible to establish a causal relationship between the two variables. The lack of sufficient close or quality social relationships is an increasing problem in developed societies, given that in addition to its relationship with mental health problems, in other studies it has been linked to physical health problems. This is why public intervention is needed to provide greater support to the most vulnerable groups to try to alleviate the effects of this social problem on people's health.

Keywords: social isolation, mental health, functional social support, prevalence, depression, anxiety.

Index

| | |
|---|-----------|
| 1. Introduction..... | 6 |
| 2. Background..... | 8 |
| 2.1. Social isolation: definition, causes and consequences..... | 8 |
| 2.2. Literature review..... | 9 |
| 2.3. Duke-UNC-11 questionnaire..... | 15 |
| 3. Health status and functional social support..... | 17 |
| 3.1.1. Prevalence of mental illnesses in Spain..... | 17 |
| 3.1.2. Perceived health status for the Spanish population..... | 20 |
| 3.1.3. Functional social support..... | 24 |
| 4. Methodology and data..... | 27 |
| 4.1. Data..... | 27 |
| 4.1.1. Spanish National Health Survey..... | 27 |
| 4.1.2. Descriptive statistics..... | 28 |
| 4.2. Methodology..... | 33 |
| 5. Results..... | 35 |
| 6. Conclusions..... | 39 |
| References..... | 42 |

Figure index

| | |
|---|----|
| Graph 1 Depression by economic activity on men | 19 |
| Graph 2 Depression by economic activity on women..... | 19 |
| Graph 3 Health status by age | 21 |
| Graph 4 Health status by education level | 21 |
| Graph 5 Health status by current economic activity | 22 |
| Graph 6 Health status by net monthly household income level..... | 23 |
| Graph 7 Health status by birth country..... | 23 |
| Graph 8 Perceived functional social support by gender | 25 |
| Graph 9 Perceived functional social support by educational level..... | 25 |
| Graph 10 Perceived functional social support by birth country..... | 26 |

Table index

| | |
|--|----|
| Table 1 Mental illnesses according to gender and age | 18 |
| Table 2 Descriptive statistics for mental illnesses | 29 |
| Table 3 Descriptive statistics for perceived health status | 30 |
| Table 4 Descriptive statistics for perceived functional social support | 31 |
| Table 5 Main statistics using the observations 1-23,089 | 32 |
| Table 6 Probit regression model with dependent variable depression..... | 36 |
| Table 7 Probit regression model with dependent variable anxiety..... | 37 |

1. Introduction

Social isolation is considered a public health problem in developed countries. More than 75 million people are socially isolated in Europe, a figure that is around 15% in the Spanish adult population (Joint Research Centre, 2023). This is why it is necessary for governments to undertake public prevention policies to prevent this situation from becoming a new XXI century pandemic.

Social isolation occurs when a person does not have enough contacts, whether family or friends, to confide their problems or when they feel that their social relations are not of sufficient quality and is therefore an objective feeling. It is important to highlight that social isolation is not a synonym for loneliness, as a person who is socially isolated may not feel lonely or, on the contrary, a person may feel lonely even if he or she is well surrounded. This is why the main difference between the two concepts is not simply a question of lexicon, as numerous authors have studied the possible relationship between social isolation and loneliness, obtaining results that may seem surprising, as the two situations are not as closely related as might be expected. Despite the symptomatologic differences between the two concepts, there are physical and mental health problems that have been associated with these situations as the subject has become of greater interest and has been studied by researchers in different countries.

Social isolation has been associated in numerous studies with mental health problems. For this reason, analysing the relationship between these variables will be the main objective of this work, with secondary objectives being to analyse the relationship between mental health problems – such as anxiety or depression – and other socioeconomic variables, such as gender, level of education or nationality. All the data used in this study were taken from the INE's 2017 National Health Survey. To obtain more accurate results, microdata from this survey were used in the methodology section. Another objective of this study consists of studying the prevalence of social isolation and mental illness in the Spanish adult population. This study is based on the hypothesis that social isolation has a negative influence on mental illness, with isolated people being more likely to suffer from depression or anxiety than those who are not isolated. By means of different tools, such as statistical tables or econometric models, the hypothesis will be accepted or rejected.

Finally, the structure of this paper opens with a literature review, in which articles related to the aim of this study will be presented and discussed, followed by a section on data and methodology, in which the Spanish adult population will be analysed on the basis of different demographic and socioeconomic variables, whose data will be used to estimate a probit regression model in which we will study how the probability of suffering from mental illness increases or decreases if a person is socially isolated together with other variables that can exert a significant influence. Finally, the main results obtained will be analysed, and whether they lead to the rejection or non-rejection of the initial hypothesis. All of this will be summarized in the section on conclusions, which will also include the main limitations that have arisen in the development of this research, as well as a series of recommendations for public policies.

2. Background

This chapter is a purely theoretical section, in which it will be explained what social isolation consists of, how it differs from loneliness, its main causes and consequences. This second section of the study focused on the compilation of articles by different authors who mainly dealt with the subject of social isolation, which served, on the one hand, to obtain more knowledge on this subject and, on the other hand, to be able to compare the results obtained in this project with those presented by the other authors. To conclude the literature review, a section was devoted to what is considered the measure of social isolation by excellence: the duke-UNC-11 questionnaire.

2.1. Social isolation: definition, causes and consequences

Social isolation is an objective term that refers to the lack of social contacts with family or friends, while loneliness is a subjective component, as it refers to the insufficiency of these social contacts in terms of quantity or quality, that is, it refers to the personal perception that everyone has of his or her own social relations. Culturally, there is a close association between the two concepts, with the belief that people who are socially isolated also feel lonely and *vice versa*. However, the study carried out by Martínez (2017) emphasizes the idea that being alone does not imply feeling lonely and vice versa. There are studies that concluded that a greater number of social contacts does not imply less social isolation. This is the example of northern European countries, where there are more people living alone and social relations are lower than in Mediterranean countries, yet the degree of perceived loneliness and social isolation is lower in these Nordic countries.

The possible causes of social isolation and loneliness are currently being further investigated and analysed, as more and more people worldwide report feeling lonely or being socially isolated, with the problems that this entails, as it has been shown that those who suffer from it tend to suffer from mental illnesses such as anxiety or depression and even have a higher risk of suffering from cardiovascular diseases, with the consequent increase in mortality (Arruebarrena and Cabaco, 2020).

According to the study carried out by Freedman and Nicolle (2020) there are various causes that explain a greater risk of suffering social isolation, differentiating between social, socio-demographic, and medical risk factors. The first group includes aspects

such as living alone, having few friends, being a caregiver of an elderly person or experiencing major changes such as becoming a widow or widower or moving house. The second group, corresponding to socio-demographic risk factors, is made up of aspects such as having a low income, living in isolated rural areas or being an elderly person. Finally, in the medical risk factors, the authors point to vision loss, mobility problems or cognitive decline as factors that can cause greater social isolation. In summary, the factors explained above may be the cause of increased social withdrawal.

Loneliness and social isolation are linked to mental health problems such as depression, cognitive decline, or cardiovascular problems. Although many studies lump the consequences of loneliness and social isolation together as similar, the authors Beller and Wagner (2018) conclude that loneliness is closely related to mental health problems, while social isolation is more closely linked to physical health problems. In fact, social isolation is closely linked to increased mortality. One study showed that those who suffer from social isolation are 29% more likely to end up dying (Holt-Lunstad et al., 2015).

In conclusion, the authors Arruebarrena and Cabaco (2020) point out that when evaluating public policies to support socially isolated people, it is necessary to consider certain components to objectively assess the degree of isolation of these people. Factors such as the number and frequency of social contacts or the size of the social network.

2.2. Literature review

The main objective of this section is to make a literature review of different articles that have been collected throughout the months of February and March 2023. To achieve this objective, databases such as Google Scholar, Scopus, PubMed, or Medline have been used. The main subject of all the articles to be reviewed is the association between social isolation and health (whether mental or physical).

Firstly, the article published in the *International Journal of Geriatric Psychiatry* published by Lara et al. (2019) will be analysed. This publication analysed whether individuals who were socially isolated experienced a greater decline in memory compared to those who were not. This study was carried out with data from a representative sample of the Spanish population, being the target population Spaniards over 50 years of age. To analyse memory decline, the data were evaluated at two different time periods. A total of 1,691 individuals were assessed through different surveys. In addition, a linear estimation method was used to determine the association

between social isolation and cognitive power, where variables such as time, socio-demographic characteristics or those related to physical activity, alcohol consumption or mental illnesses such as depression were included. According to Lara et al. (2019), main results highlight that those individuals analysed in the sample with greater social isolation were linked to lower verbal fluency, among other things, but not to a greater memory decline.

The next article to be reviewed was published in the journal *Perspectives in Public Health*. The authors Christiansen et al. (2021) analysed the relationship between social isolation and poor physical and mental health in adolescents. To achieve this aim, a data collection of Danish young people aged between 16 and 29 years from the *Danish Health and Morbidity Surveys* was carried out between February and May 2017. Individuals participated through surveys, with the final study population being 19,890 adolescents. To analyse the data, this study consists of a regression analysis to find out the relationship between social isolation with mental illness and somatic conditions. To measure social isolation, the authors used an index based on the *Social Network Index*. This index is based on five indicators, with a response range from 0 to 5, with values close to 5 indicating greater social isolation. Finally, according to Christiansen et al. (2021), it can be deduced that social isolation is related to long-term mental illness, anxiety, or depression. Furthermore, the authors did not observe any differences in the results obtained by men and women, so we can speak of a certain homogeneity of the results. However, given that the response rate was not high, it could be that socially isolated adolescents were not accurately represented.

The main aim of the next article to be reviewed, published by Matthews et al. (2015), is to examine whether children who suffer from social isolation in primary school are more likely to experience mental health problems in secondary school. To do so, the authors chose the United Kingdom as the country of study, collecting data on twins born in 1994 and 1995 in England and Wales from the Environmental Risk Longitudinal Twin Study in 1999 and 2000, that is, when the participants were five years old. Finally, the study population consisted of 2,232 English children. To investigate both the association between social isolation and family factors and mental illness, multinomial logistic regressions were carried out. Variables such as mental illness (anxiety and depression), behavioural disorders or family factors were included in the study. According to Mathews et al. (2015), children who suffer from some form of mental illness in the early years of school are more likely to develop social isolation in later grades, in contrast to those who

suffer from emotional problems, who do not show signs of increased social isolation in secondary school.

The following article was published in 2021 in the *Community Mental Health Journal*. The authors Evans and Fisher (2021) examined the relationship between social isolation, social support, and mental illness. The study was carried out in North Carolina by administering a survey to all university staff in this country. In sum, a sample of 83 individuals was obtained. In this study, social isolation was measured using the *Orth-Gomer Measure of Social Networks and Support*. This index analyses the quality of social relationships by asking the respondent if they have someone to confide in, or someone they feel very close to. This study ranges from individual t-tests to partial correlations, which analyse the relationship between the type of social support received and mental illnesses. Results indicate that more than one third of the surveyed population suffers from social isolation and, consequently, present higher levels of anxiety and depression compared to those who are not socially isolated. Furthermore, since the article also examines different types of social support, according to Evans and Fisher (2021), anxiety and depression levels are mostly reduced through nondirective emotional support – that which is manifested through displays of affection and trust – and this effect is magnified in socially isolated people. These results show the importance of social support as a reducer of social isolation.

The next article to be reviewed, published in 2022 in the journal *Aging & Mental Health*, aims primarily to demonstrate the influence of social isolation on health (both physical and mental). Using Germany as the reference country, the authors Seifert, Seddig and Eckhard (2022) used the *German Socio-Economic Panel* (GSOEP) to obtain data. Finally, the selected data corresponds to Germans over 50 years of age between the years 2004 and 2012, having a total final sample of 6,740 men and 7,189 women. The measure of social isolation used by these authors is based on understanding social isolation as the lack of frequent contact with close relationships, so that, depending on the answers given by individuals, they would be classified as socially isolated or not. To analyse the impact of social isolation on the health of the elderly, dynamic panel models with fixed effects using structural equation modelling and maximum likelihood estimation are carried out. Results finally show that greater social isolation is closely related to poorer mental health in the population analysed. However, this association depends on the model specified, since in one with random effects the relationship is maintained, but it becomes weaker in a model with fixed effects. As main limitations, the authors point out that the effects of social isolation on mental health may be somewhat biased, as well

as the fact that it was not possible to differentiate between short-term and long-term social isolation.

The study published by Newman-Norlund et al. (2022) analysed the effects of isolation caused by Covid-19 on the quality of life of older people. The study focused on the State of South Carolina, United States, being the study population those people between 60 and 80 years old who had participated in the year 2019 and 2020 in the *Aging Brain Cohort Study*, thus having a sample before and after the period of isolation imposed by Covid-19. The participants were invited to fill in different questionnaires analysing different measures related to quality of life and social isolation, which were answered through the *PROMIS-29 Profile V20*. Finally, the sample population consisted of a total of 62 participants. As main results, Newman-Norlund et al. (2022) point out that this brief period of social isolation had consequences on the quality of life of the participants surveyed, as shown in previous literature. Furthermore, this review suggests that even brief periods of isolation can have important consequences on the health of the elderly. As main limitations, Newman-Norlund et al. (2022) note that the study was based in the collection of data through a survey, which may imply incomplete information.

The research article published by Ge et al. (2017) investigated the relationship between different indicators of social isolation and loneliness, and then analysed their relationship with depressive symptomatology. Data were collected from the population living in the central region of Singapore through a health survey, which was aimed at all adults aged 21 and over. This questionnaire included items related to socioeconomic status, age, gender, marital status, and education level, which were subsequently used as independent variables in the analysis conducted in this study. Finally, the sample comprised a total of 1,919 individuals. The degree of social isolation was measured through three indicators, including marital status, degree of connectedness with family or friends, and living arrangement. That degree of connectedness with close people was measured by the six item *Lubben Social Network Scale-6*, which measures the frequency of social contact with the perceived social support from family and friends. To analyse the relationship between social isolation and the degree of depressive symptoms, this study consists of several linear regression models, where the degree of depression acts as the dependent variable. According to Ge et al. (2017), 26.3% of the sample reported being isolated, with the common characteristics of this sample percentage being unemployed, divorced, elderly or not having a formal education. Furthermore, this study also predicts that those suffering from social isolation have a higher degree of depressive symptoms, and that the influence of contact with friends on these symptoms has a

greater effect than that of contact with family members. The main limitation of this study is the impossibility of establishing any kind of causal relationship between the variables analysed, as this study cannot really establish whether an increase in social isolation leads to an increase in the degree of depressive symptoms or *vice versa* (Ge et al., 2017).

The next research article to be reviewed was published in 2012 in the *Journal of Aging and Health* and it analysed the relationship between loneliness and social isolation, and it also discussed the impact of these variables on mental health. The authors Coyle and Dugan (2012) used as a sample population U.S. adult over 50 years of age, whose data were extracted from a study known as the *Health and Retirement Study* (HRS). The HRS is a study that collects data every two years from the representative population over 50 years of age through questionnaires, corresponding the data used in this analysis to the 2006 and 2008 waves. Finally, the sample population had a total of 11,825 adults. Social isolation was measured through a scale based on ten concepts, where aspects related to the frequency of relationships with family or friends were included. Regarding the methodology used in this study to analyse the impact of loneliness and social isolation on physical and mental health, different regression models were used. The main results yielded by this study demonstrated that loneliness and social isolation are two variables that are not related to each other and can exist independently of one another. Furthermore, according to Coyle and Dugan (2012) loneliness is much more related to mental health than social isolation is, being the latter linked to self-reported health.

The research article published by Rohde et al. (2016) estimated the costs of social isolation on people's mental health. The data used were taken from the *Household Income and Labor Dynamics in Australia* survey, being this the country under study. The sample population were those individuals who, for external reasons, had been forced to move for study or work. These individuals have been chosen for the analysis because it is considered that those who habitually move from one city to another develop fewer social ties with friends or neighbours. The measure of social isolation used in this study consisted of responding to the statement "I sometimes feel very lonely", with a response range from 0 to 7, with values near 7 indicating greater agreement with this statement. To analyse the relationship between social isolation and mental health, Rohde et al. (2016) opted, in addition to estimating econometric models, to carry out kernel regressions. Once these regressions had been carried out, it was found that the association between the two variables was binary rather than causal and that this

association indicated a linearity that could be observed in the graphs obtained in this study. As main results, the authors emphasize that those individuals who experience a change in residence tend to be more socially isolated, as well as those who experience abrupt changes in their lives (such as a separation or the death of a family member) compared to those who have a higher level of education or a higher social class. In addition, according to Rohde et al. (2016), older people and women are more likely to experience social isolation.

The last research article selected for this literature review published by Read, Comas-Herrera and Grundy (2020) in *The Gerontological Society of America* has as the main objective to investigate the association between the degree of social isolation and memory decline in older people. The authors of this article chose England as the country for their analysis, collecting data on the population residing in that country over 50 years of age at different points in time, which in the article are known as data waves. Finally, a total of 6,123 women and 5,110 men over the age of 50 were part of this study conducted between the years 2002 and 2012. Social isolation was measured through an indicator formed by five binary terms, whose range of values oscillates between 0 and 5, with values closer to 5 indicating greater social isolation. The methodology used in this study focused on the Latent Change Score (LCS) model, a tool that enables the analysis of the consequences of the dynamics of short-term processes on long-term processes. In this case, this model was used to analyse the direction of the association between social isolation and memory in the sample population. This study confirms the existing relationship between social isolation and memory loss in the population studied, with social isolation being the cause of cognitive deterioration and not the other way around. This research article analysed men and women independently and, although the differences in both genders do not seem particularly notable, according to Read, Comas-Herrera & Grundy (2020) a greater cognitive impairment caused by isolation can be evidenced in women than in men. Finally, regarding the limitations found of the study the authors point out that the measure used to estimate the degree of social isolation was perhaps not entirely accurate in some cases, since it may be that people who visit family or friends less than once a month have other types of social contacts.

In summary, considering all previous literature, a first conclusion could be drawn: social isolation is seen by many authors as an aggravating factor in mental health, as isolated people are more likely to suffer from depression or anxiety. Women and older people are more likely to suffer from social isolation, a probability that also increases in those individuals who experience abrupt changes in their lives, such as a change of

residence or being widowed. All these results can be found summarised in the table in annex 1.

2.3. Duke-UNC-11 questionnaire

The literature review in the previous section has made it possible to analyse the different instruments used by the different authors to measure the degree of social isolation of the individuals under study. Most of the research articles have opted to measure social isolation by means of Likert-type questionnaires, with values ranging between 0 and 5 or between 0 and 7, with values closer to 5 or 7 indicating a higher degree of social isolation (Lara et al., 2019; Christiansen et al., 2021; Rohde et al., 2016; Read, Comas-Herrera and Grundy, 2020).

In other cases, authors such as Seifert, Seddig and Eckhard (2022) decided to measure the degree of social isolation through an indicator that analysed the lack of close contact relationships of the tested individuals. The degree of social isolation was also analysed in the study elaborated by Ge et al. (2017) through three different indicators which held aspects related to marital status, living arrangement and the degree of social connectivity with family or friends.

In the study conducted by Newman-Norlund et al. (2022) social isolation was measured through different questionnaires where the predominant variable was quality of life and social isolation, since this study focused on analysing the differences experienced in quality of life because of experiencing a period of compulsory social isolation caused by the Covid-19 virus.

Finally, the study conducted by Coyle and Dugan (2012) measured the degree of social isolation through a scale based on ten indicators, which included aspects related to the number and frequency of contacts with family or friends. This measure of social isolation is the one that most closely resembles the questionnaire globally known as the *Duke-UNC-11*.

One of the most widely used measures internationally to assess perceived social support is the *Duke-UNC-11* Functional Social Support questionnaire, first used in a study carried out by Broadhead et al. (1988). This study aimed to analyse the validity of the questionnaire in U.S. subjects, who were mostly female, white, and under 45 years of age. The questionnaire initially proposed by Broadhead et al. (1988) included aspects

related to support, instrumental, confidential, and affective support. This analysis showed that the questionnaire was indeed a reliable and valid measure of functional social support. Subsequently, the questionnaire only included aspects related to confidential and affective support.

This questionnaire was used in Spain for the first time in a study carried out by Saameño et al. (1996). The authors of this study concluded that this indicator is valid and reliable in Spain. The questionnaire is based on 11 items, whose response is represented in the form of a Likert scale, with values ranging from 1 to 5. The value 1 indicates "much less than I want" and the value 5 "as much as I want". This measure assesses perceived social support through two different variables. On the one hand, confidential social support represents the possibility of having people to whom one can tell about problems or concerns. On the other hand, affective support is that which is manifested through gestures of love or affection.

As explained above, this questionnaire is widely used internationally because of its brevity and simplicity of response and, moreover, in Spain its use is especially important for analysing the degree of social support received by caregivers. However, it should be noted that this is a measure of perceived social support and not of actual social support.

3. Health status and functional social support

This section of the report focuses on the analysis of the Spanish population over 15 years of age from the INE's 2017 National Health Survey. The sections chosen from this survey are those corresponding to mental illness, functional social support, and self-perceived health status. Each of these sections will be discussed in greater depth in the following sections, accompanying the explanations with tables and illustrations that facilitate the understanding of this information.

3.1.1. Prevalence of mental illnesses in Spain

In this section, the mental illnesses with the highest prevalence in the Spanish population over 15 years of age will be analysed. The mental illnesses that appear in the ENSE 2017 are depression, chronic anxiety, and other mental problems, so an analysis will be made of their prevalence in the surveyed population according to the variables age, gender, level of studies, country of birth and current economic activity. Respondents were asked to confess whether they had suffered from any of these mental illnesses in the last twelve months, this being a dichotomous response.

Firstly, with respect to the gender and age variables, that are shown in table 1, the percentage of the surveyed population suffering from depression increases notably in both sexes from the age of 45 onwards. This percentage reaches its maximum in both sexes in the same age bracket: from 75 to 84 years of age. However, while for men this percentage is around 7.2%, for women it is around 20%, which is the first significant difference. Women suffering from depression are twice the average of the opposite gender: for women the average is around 10%, while for men it is around 5%. This can be explained, partly, by the fact that depression in women has a biological component, hence, at certain stages of a woman's life, such as pregnancy, the postpartum period or the perimenopause, the percentage of women suffering from this mental illness increases (National Institute of Mental Health, n.d.). Similar findings are obtained by analysing the data for chronic anxiety. This mental illness is more prevalent in the population surveyed after the age of 45, with a peak in the 45-54 age group for men

(7.23%) and in the 55-64 age group in the opposite case (14.52%). Again, the percentage of women suffering from chronic anxiety is almost double that of the opposite gender. Finally, the data referring to "other mental problems" reflect a low prevalence in the surveyed population, although it is true that in the 85+ age group it increases significantly for both sexes, which may indicate the inclusion of common mental illnesses at that age, such as Alzheimer's disease.

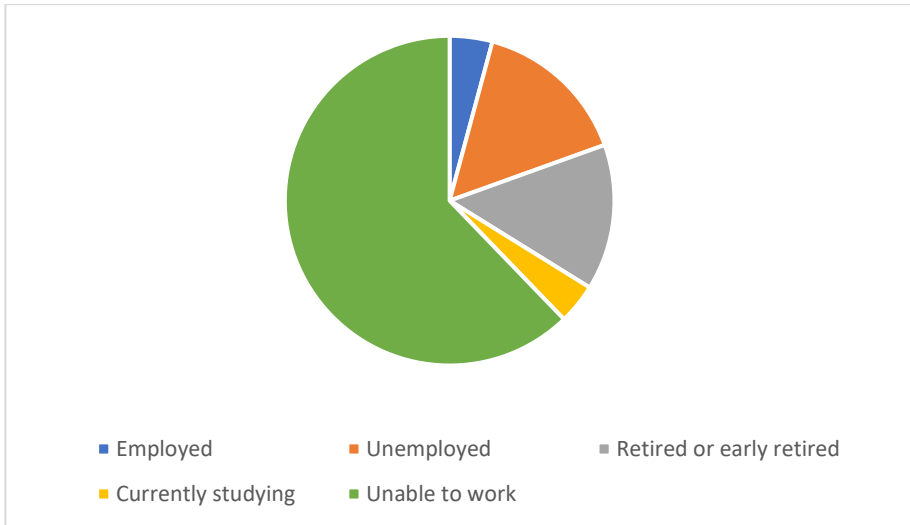
Table 1 Mental illnesses according to gender and age

| | Depression (%) | Chronic anxiety (%) | Other mental problems (%) |
|--------------------|----------------|---------------------|---------------------------|
| Men | | | |
| Total | 4.46 | 4.79 | 2.13 |
| 15 to 24 years old | 1.52 | 1.65 | 2.13 |
| 25 to 34 years old | 2.48 | 4.13 | 1.63 |
| 35 to 44 years old | 3.17 | 4.02 | 1.71 |
| 45 to 54 years old | 6.05 | 7.23 | 1.77 |
| 55 to 64 years old | 5.46 | 6.33 | 1.90 |
| 65 to 74 years old | 6.49 | 4.33 | 1.81 |
| 75 to 84 years old | 7.18 | 4.89 | 4.84 |
| 85 + | 6.12 | 3.52 | 7.43 |
| Women | | | |
| Total | 9.75 | 9.79 | 2.07 |
| 15 to 24 years old | 1.40 | 3.07 | 1.47 |
| 25 to 34 years old | 4.36 | 6.51 | 1.72 |
| 35 to 44 years old | 5.89 | 8.15 | 1.30 |
| 45 to 54 years old | 8.40 | 10.28 | 1.09 |
| 55 to 64 years old | 15.20 | 14.52 | 1.30 |
| 65 to 74 years old | 16.11 | 13.04 | 1.85 |
| 75 to 84 years old | 19.93 | 13.85 | 4.50 |
| 85 + | 14.78 | 9.19 | 11.34 |

Source: own elaboration based on INE (2023).

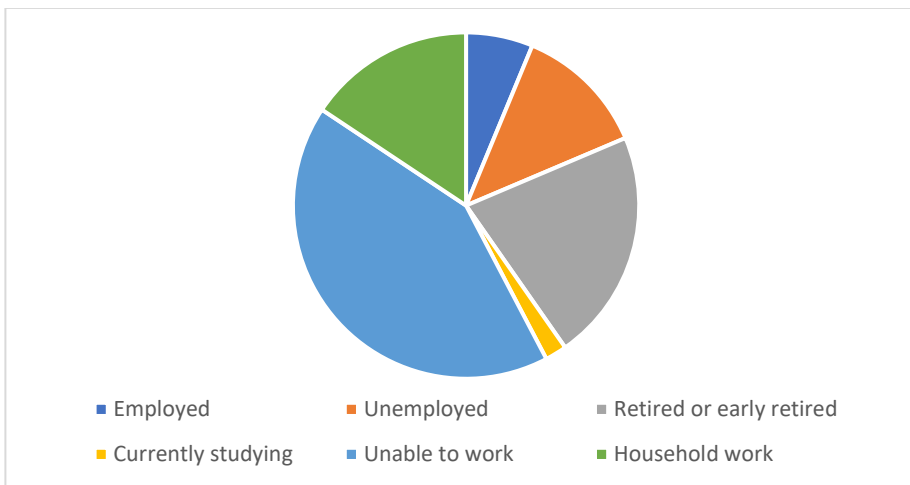
Secondly, the current economic activity variable is divided into various categories: employed, unemployed, retired, student, unable to work, household work and other. Graphs 1 and 2 reflect this data. The employed and the students have the lowest percentages of depression in both sexes, in contrast to the disabled for work who suffer the most from depression (28.96% in the case of men and 34.47% in the case of women). Chronic anxiety and the category "other mental problems" are also highest among those unable to work. Again, the gender differences suggest that women suffer more from these mental illnesses than men, irrespective of their economic situation.

Graph 1 Depression by economic activity on men



Source: own elaboration based on INE (2023).

Graph 2 Depression by economic activity on women



Source: own elaboration based on INE (2023).

Thirdly, the educational level variable is divided into basic, secondary and university studies. In this case, even though the percentage of the surveyed population who do not suffer from these mental illnesses exceeds 90% in most cases, there are significant differences between the different educational levels. Respondents with only primary education suffer more from mental illness than those with tertiary education. For men this difference is around three points in the case of depression (5.91% and 2.51% respectively), while for women this difference is over nine points (13.63% and 4.21%

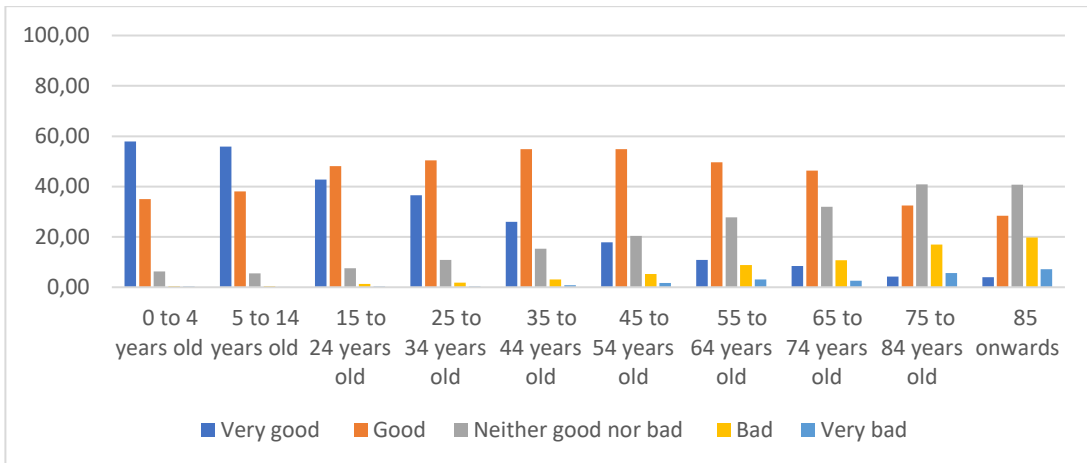
respectively). The conclusions obtained when analysing the data on chronic anxiety and other mental problems reaffirm the findings of the previous analysis: firstly, the higher the level of education, the lower the prevalence of mental illness in the surveyed population and, secondly, the percentage of women suffering from mental illness is higher than that of men, regardless of their level of education.

Finally, the variable country of birth – a variable that will be taken as a proxy for nationality – differentiates between those born in Spain and those born abroad. If the data on the percentage of the surveyed population suffering from depression or chronic anxiety are analysed, the differences are notable in two respects. Firstly, in terms of differences in nationality, there is a higher percentage of Spaniards suffering from mental illness compared to foreigners. Secondly, in terms of gender differences, women (both Spanish and foreign) suffer more from anxiety and depression than men.

3.1.2. Perceived health status for the Spanish population

The following graphs show the self-perceived health status according to the variables gender and age. The assessment of health status is classified into five groups: very good, good, neither good nor bad, bad, and very bad. As can be seen in graph 3, which collects data on the assessment of health status according to the variable age, the assessment of "very good" health status is predominant in the 0-4 and 15-24 age groups. As age increases, self-perceived health status decreases, with the "neither good nor bad" and "bad" groups gaining increasing weight. The data provided by the INE show that 47.38% of the surveyed population reveal that they have a "good" state of health, followed by 26.64% who say they have a "very good" self-perceived health. In both graphs showing the data for men and women (see annex 2), the first conclusion is similar to that obtained in the first graph analysed: as age increases, "neither good nor bad" and "bad" health status becomes more important. As for the differences observed by gender, in general terms, the male gender has a better assessment of its state of health than the female gender, with 28% of the men surveyed claiming to be in "very good" health compared to almost 25% of the women. In conclusion, according to the data shown here, 50% of men report a good state of health, compared to 45% of women with the same assessment, with the groups aged 0 to 4 years and 5 to 14 years having the best self-perceived health.

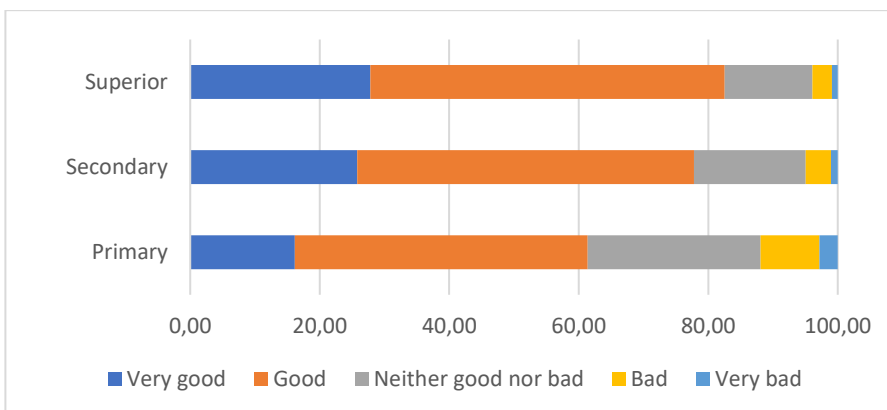
Graph 3 Health status by age



Source: own elaboration based on INE (2023).

Graph 4 reflects health status according to the variable educational level. Again, health status is divided into five groups, while educational level is divided into three groups: primary or lower, secondary, and superior. As can be seen this graph, respondents with secondary and higher levels of education have the best health status, with 25.8% and 27.8% respectively claiming to be in very good health, compared to 16% in the same category of those with only primary levels of education. However, 49% of the respondents have a good health status according to their level of education. The graphs reflecting health status by educational level and gender provide the same information: both men and women with a higher level of education are in the best health (see annex 2).

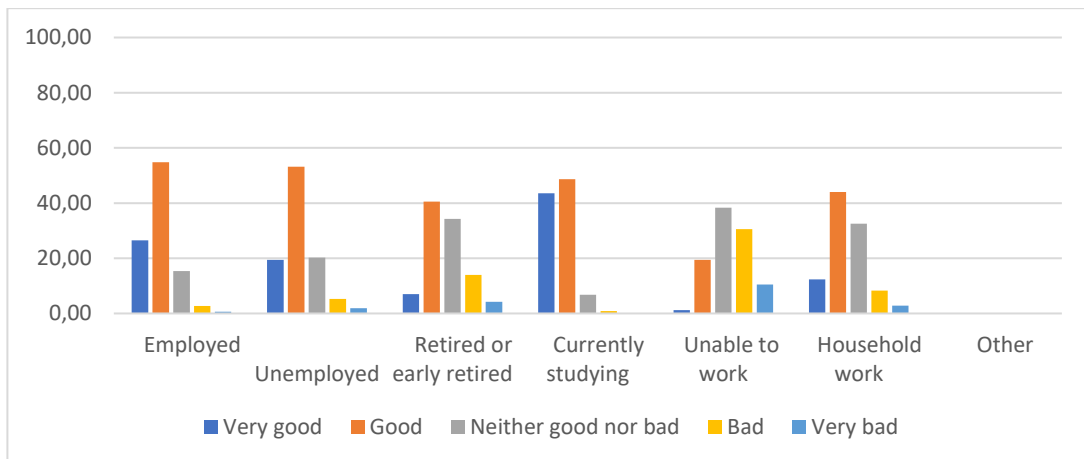
Graph 4 Health status by education level



Source: own elaboration based on INE (2023).

The following graphs again reflect the health status in five categories, but in this case according to the current economic situation of the respondents: employed, unemployed, retired, students, unable to work, housework and other. In graph 5, the category "very good" health status reaches its highest percentage among the employed, with 54.9% revealing very good health, followed by 53% of the unemployed with very good health status. The category with the worst health status is "unable to work", with 10.5% of respondents in very poor health. In terms of gender differences both men and women in the employed category are in the best health (55% and 53% respectively). It is worth noting that in the case of women there is also relevant data in the "housework" category, with 44% in very good health (see annex 2). By way of conclusion, and linking with previous graphs, it can be seen once again that as age increases, self-perceived health worsens, since retired people are those who obtain the lowest percentage in the "very good" health category, after those in the "unable to work" category.

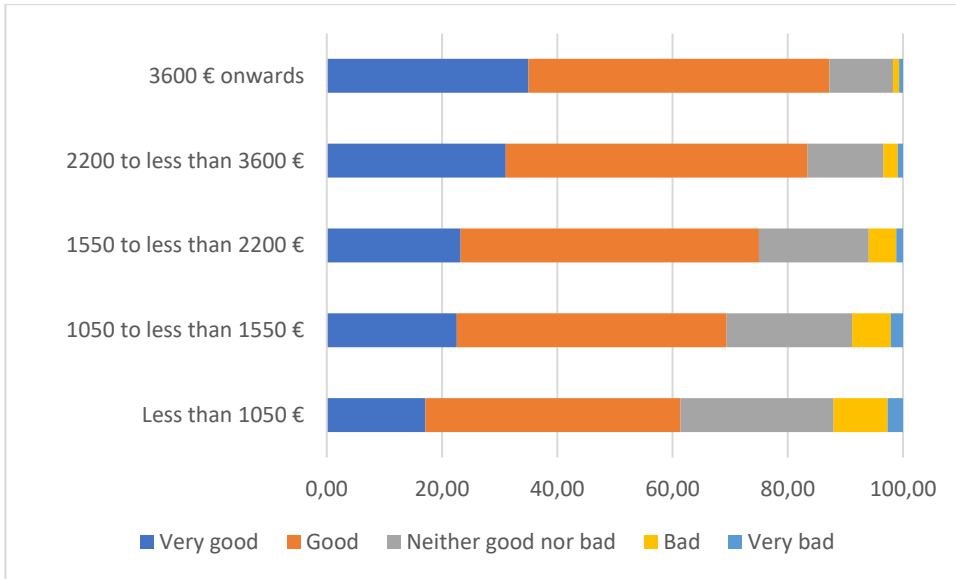
Graph 5 Health status by current economic activity



Source: own elaboration based on INE (2023).

Graph 6 reflects the state of health according to net monthly household income. As can be seen, those who enjoy better health are those with higher monthly incomes, as more than 30% of respondents with a monthly income of more than 2,200 euros per month claim to be in very good health. In line with what was explained above, it is again verified that those with a higher level of education, and therefore higher salaries, are those who enjoy better health. This can be explained because those individuals with higher incomes have a greater access to goods and services that promote a balanced diet or an active lifestyle, as well as greater access to private health services.

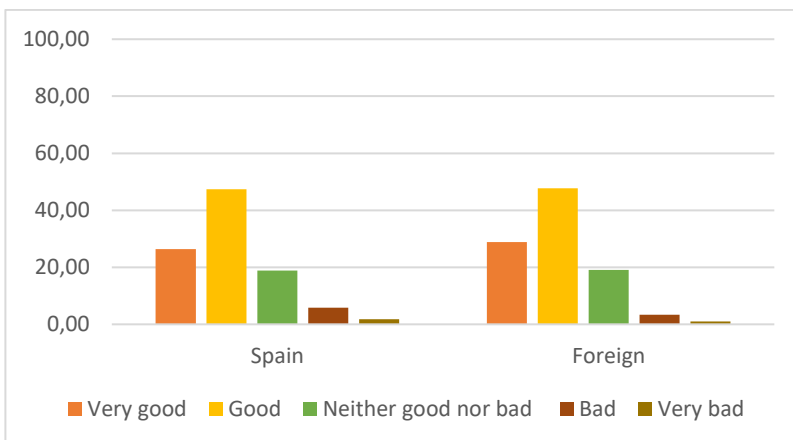
Graph 6 Health status by net monthly household income level



Source: own elaboration based on INE (2023).

Finally, graph 7 referring to health status by country of birth shows that 28.8% of foreigners are in very good health, compared to 26.34% of Spaniards. This phenomenon is known as the *Healthy Immigrant Effect*, which according to Rivera, Casal and Currais (2013) occurs when the immigrant population presents a better health status than the native population, but this difference is gradually reduced as the immigrant population experiences a decline in health status and converges with that of the national population. The majority of those surveyed, regardless of their country of birth, are in good health, with 47.38% of the votes.

Graph 7 Health status by birth country



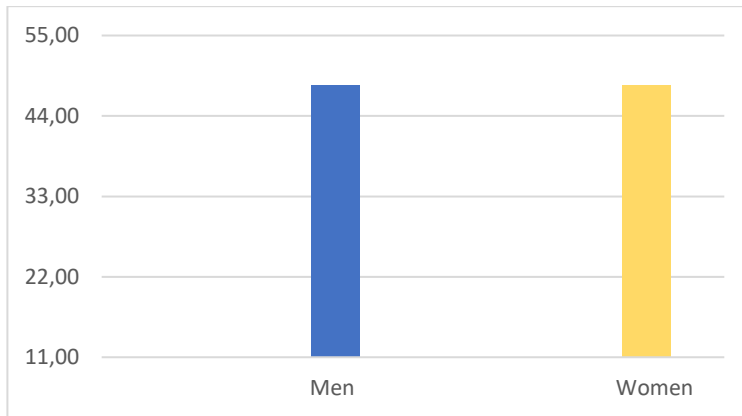
Source: own elaboration based on INE (2023).

3.1.3. Functional social support

The following graphs represent perceived functional social support by gender, age, educational level, and country of birth. Functional social support, as explained in previous sections, was first studied in Spain by Saameño et. al (1996) by assessing it through a questionnaire based on eleven questions whose response is based on a Likert scale. This questionnaire has five response options, thus causing the value of functional social support to range between 11 and 55. According to the data provided by the National Statistics Institute (INE), perceived functional social support is considered adequate when it exceeds 33 points. After this brief introduction to the questionnaire, the data for this section will be analysed.

Firstly, regarding perceived functional social support according to gender, as shown in graph 8, both the men and women surveyed have similar functional social support, with an average of 48.22 points for men and 48.20 for women. According to INE interpretations, both sexes show an adequate level of social support. If the data are analysed by age group the highest scores are reached in both sexes in the 15-24 and 25-34 age groups, coinciding with the student period, when social relations are more abundant than in other stages of life (see annex 2). However, a striking fact that contradicts some of the conclusions obtained by other authors who claim that in old age contacts with family or friends decrease – causing a decrease in social support and an increase in isolation – is that in the age groups 65-74 and 85 and older (for both sexes) the perceived social support, with an average of approximately 48 points, is higher than in the groups 45-54 and 55-64 years of age. Perhaps this is partly explained because during retirement the number of social contacts increases significantly, thus leading to higher perceived social support. In the age group over 85 years this increase in social support may be due to a greater tightening of family relationships, as it is at this stage that major health complications arise.

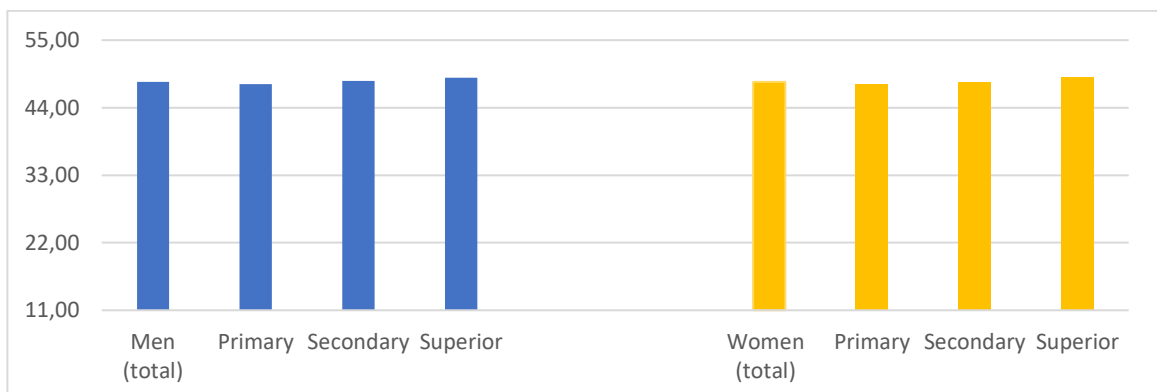
Graph 8 Perceived functional social support by gender



Source: own elaboration based on INE (2023).

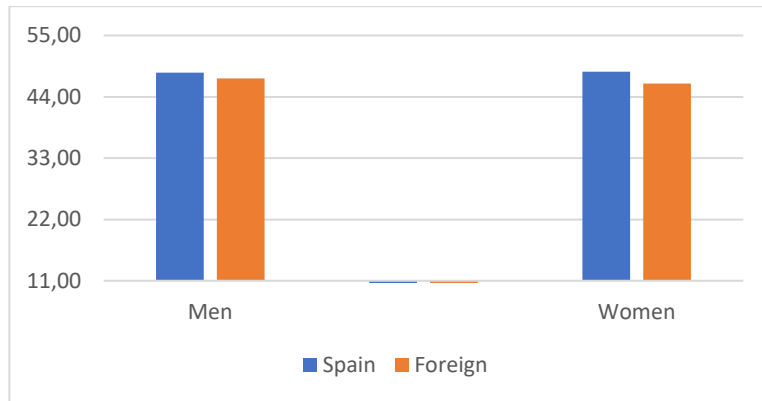
Secondly, the data on functional social support by educational level and country of birth are in line with previous studies. On the one hand, perceived functional social support according to level of education, information reflected in graph 9, reaches its highest score for those respondents with a higher education, with an average of 49 points for both sexes. Consequently, the lowest score is reached by those participants with only a basic education. On the other hand, if we analyse the data referring to country of birth, information reflected in graph 10, we can conclude that perceived social support reaches its highest score in women born in Spain, with an average of 48.51 points, followed by men born in Spain. Thus, it can be concluded that those born in Spain perceive greater social support than those born in other countries, as the degree of support tends to be slightly lower.

Graph 9 Perceived functional social support by educational level



Source: own elaboration based on INE (2023).

Graph 10 Perceived functional social support by birth country



Source: own elaboration based on INE (2023).

4. Methodology and data

In this section referring to data and methodology, a brief explanation will be given of the Spanish National Health Survey (ENSE) of the INE from which the data have been obtained to carry out the analysis corresponding to the Spanish population over 15 years of age. Finally, in the subsection referring to the methodology, to achieve greater precision in the results, the microdata of the ENSE 2017 has been used, thus having a total sample of more than 23,000 people.

4.1. Data

4.1.1. Spanish National Health Survey

The Spanish National Health Survey (ENSE) is a study that has been carried out since 1987 in Spain and that collects data on the health of the Spanish population. This information is collected through household interviews, which will subsequently be processed by the Ministry of Health, Consumer Affairs and Social Welfare. The ENSE also has the collaboration of the National Statistics Institute (INE), which aids with a better processing of the data to subsequently propose public health policies. This survey is carried out every five years, alternating two and a half years with the European Health Survey, which allows international comparisons to be made in the aspects covered (Ministerio de Consumo, n.d.).

The data to be discussed in this section of the study are taken from the ENSE 2017. The main objective of this survey, carried out in 2017, is to analyse the health of the resident population in Spain, considering demographic and socioeconomic characteristics. To collect all the information related to Spanish households, the survey is disseminated with questionnaires that can be completed online. All those who take part in this collection of information will face four large blocks of questions, corresponding to the sections on health status, health care, socio-demographics, and health determinants (Ministerio de Consumo, n.d.).

The section G corresponding to the ENSE 2017 corresponds to the health status module. In this section, the interviewer proposes a series of questions to the participant related to the state of health in the last year, whether they suffer from any chronic illness,

whether they have been limited in carrying out daily activities, and if so, if such limitation has been physical and/or mental. The last question in this section corresponds to a list of 32 illnesses in which the interviewee must recognize, one by one, whether he or she has suffered from it at any time in the last year, or whether the doctor has diagnosed this illness. The table shows both physical illnesses (heart attack, high blood pressure, arthrosis, or asthma) and mental illnesses. The mental illnesses described there are: depression, chronic anxiety, and other mental illnesses. Depression is described by the World Health Organization (n.d.) as "persistent sadness and a lack of interest or pleasure in previously rewarding or enjoyable activities". The causes of this illness include social or psychological factors and its effects can last from short periods of time to recurrent. There are several pharmacological treatments to help those suffering from the condition, as well as psychological treatments, although the availability of such treatments is much more limited in low-income countries (World Health Organization, n.d.).

Anxiety disorders, on the other hand, are characterized by changes in behaviour that lead to excessive worry and fear. The World Health Organization (n.d.) differentiates between generalized anxiety disorder, social anxiety, separation anxiety and panic disorder. It is perhaps the most prevalent mental illness today, with 301 million people worldwide suffering from the condition as reported in 2019. Psychological help can mitigate the effects of this illness on the day-to-day lives of those who suffer from it, as in some cases it is so disabling that pharmacological treatment is required.

Finally, the main variable in this study, social isolation, appears in the National Health Survey in the housing and social and work environment section. Social support is classified according to gender, age group, educational level, and country of birth. Social support is the variable that measures the degree of social isolation (duke-UNC-11 questionnaire), as its value ranges from 11 to 55 points.

4.1.2. Descriptive statistics

This section of the research focuses on the analysis of descriptive statistical tables for each of the selected variables: mental illness, functional social support, and self-perceived health status. Each of these variables is analysed according to gender, educational level, country of birth, current economic situation, and net monthly household income. These tables are a statistical compilation of the data already presented in the

graphs in the previous sections of this project. The selected data have been taken from the INE's National Health Survey of 2017.

Table 2 shows the data referring to the prevalence of mental illnesses (depression, anxiety, and others) in the Spanish population over 15 years of age. As can be seen, for each of the variables there are two response options "YES" and "NO", so that the percentage reflected in each of the cells shows the prevalence of these pathologies in the Spanish population. Thus, it can be affirmed that women who suffer from anxiety or depression account for double the percentage suffered by the opposite sex, that the prevalence decreases as the level of education increases, that individuals of Spanish nationality show a higher prevalence and, finally, those who are unable to work or retired are the categories that increase the prevalence of depression according to the current economic situation.

Table 2 Descriptive statistics for mental illnesses

| | Depression (%) | Anxiety (%) | Other mental problems (%) |
|----------------------------------|-----------------------|--------------------|----------------------------------|
| Gender | | | |
| Men | 4.46 | 4.79 | 2.13 |
| Women | 9.75 | 9.79 | 2.07 |
| Educational level | | | |
| Primary | 9.85 | 9.17 | 3.32 |
| Secondary | 5.35 | 6.19 | 0.80 |
| Superior | 3.40 | 4.75 | 0.76 |
| Birth country | | | |
| Spain | 7.60 | 7.85 | 2.34 |
| Foreign | 4.48 | 4.27 | 0.58 |
| Current economic activity | | | |
| Employed | 3.39 | 4.94 | 0.51 |
| Unemployed | 8.69 | 10.4 | 1.39 |
| Retired or early retired | 11.95 | 9.07 | 3.99 |
| Currently studying | 1.75 | 2.76 | 1.54 |
| Unable to work | 31.19 | 28.56 | 22.94 |
| Household work | 12.69 | 10.5 | 1.45 |

Source: own elaboration based on INE (2023).

The descriptive statistics for the variable self-perceived health status are shown in table 3. In this case, for each of the categories there are five response options, ranging from a very good to a very bad state of health. In this case, in general terms, the male

sex, individuals with higher education or foreign nationality, students and those with a monthly income of more than 3,600€ are those with the best health status.

Table 3 Descriptive statistics for perceived health status

| | Very good (%) | Good (%) | Neither good nor bad (%) | Bad (%) | Very bad (%) |
|----------------------------------|----------------------|-----------------|---------------------------------|----------------|---------------------|
| Gender | | | | | |
| Men | 26.97 | 45.97 | 19.6 | 5.66 | 1.8 |
| Women | 25.95 | 41.96 | 21.91 | 7.76 | 2.43 |
| Educational level | | | | | |
| Primary | 16.15 | 45.22 | 26.71 | 9.1 | 2.81 |
| Secondary | 25.81 | 52 | 17.25 | 3.91 | 1.03 |
| Superior | 27.8 | 54.74 | 13.54 | 3.04 | 0.88 |
| Birth country | | | | | |
| Spain | 26.34 | 47.33 | 18.81 | 5.78 | 1.74 |
| Foreign | 28.8 | 47.72 | 19.1 | 3.39 | 0.99 |
| Current economic activity | | | | | |
| Employed | 26.50 | 54.85 | 15.36 | 2.68 | 0.61 |
| Unemployed | 19.44 | 53.19 | 20.23 | 5.25 | 1.90 |
| Retired or early retired | 7.01 | 40.50 | 34.32 | 13.99 | 4.18 |
| Currently studying | 43.54 | 48.63 | 6.75 | 0.86 | 0.22 |
| Unable to work | 1.18 | 19.44 | 38.31 | 30.55 | 10.51 |
| Household work | 12.38 | 43.97 | 32.51 | 8.31 | 2.83 |
| Net monthly income level | | | | | |
| Less than 1050 € | 17.10 | 44.29 | 26.55 | 9.40 | 2.66 |
| 1050 to less than 1550 € | 22.55 | 46.83 | 21.79 | 6.72 | 2.12 |
| 1550 to less than 2200 € | 23.24 | 51.79 | 19.01 | 4.78 | 1.18 |
| 2200 to less than 3600 € | 31.05 | 52.39 | 13.17 | 2.52 | 0.86 |
| 3600 € onwards | 34.98 | 52.27 | 11.03 | 1.04 | 0.68 |

Source: own elaboration based on INE (2023).

Finally, table 4 reflects the prevalence of social isolation in the surveyed population through the functional social support variable. The social support scale is measured through the duke 11 questionnaire, so that its value ranges from 11 to 55. The higher this value, the higher the social support, or equivalently, the lower the social isolation. In this case, the data is not a percentage, but for each of the categories, the mean and standard deviation are shown for each sex. The conclusions are in line with the reasoning above: men suffer slightly less social isolation than women, as do individuals of Spanish

nationality compared to those of foreign nationality and those individuals with higher education.

Table 4 Descriptive statistics for perceived functional social support

| | Men | | Women | |
|--------------------------|-------|--------------------|-------|--------------------|
| | Mean | Standard deviation | Mean | Standard deviation |
| Age | 48.22 | 6.9 | 48.2 | 6.97 |
| Educational level | | | | |
| Primary | 47.84 | 7.24 | 47.79 | 7.22 |
| Secondary | 48.37 | 6.81 | 48.09 | 7.15 |
| Superior | 48.86 | 6.19 | 49.03 | 6.26 |
| Birth country | | | | |
| Spain | 48.36 | 6.77 | 48.51 | 6.72 |
| Foreign | 47.3 | 7.62 | 46.39 | 8.03 |

Source: own elaboration based on INE (2023).

With the aim of studying in greater depth the relationship between mental disorders (mental health) and social isolation, microdata from the ENSE 2017 of the INE has been used, with a final sample of 23,089 people over 15 years of age. To this end, a descriptive statistical table has again been drawn up with the data for each of the variables.

Table 5 shows the main statistics for the selected variables: age, gender, economic situation, nationality, level of education, alcohol and tobacco consumption, health status, social support, depression, anxiety, and other mental problems. The next section of this research involves the development of econometric models that can help to estimate the effects of social isolation on mental health. This whole process, which will be explained in greater depth in the methodology section, translates into the estimation of a probability model called probit, which estimates the probability that the dependent variable under study will occur. Given that this is a probability model, it was first necessary to code the variables so that they only take the value 1 if this condition is met and 0 otherwise. In this way, it has been considered that the variable *gender* takes the value 1 for men (0 for women); the variable *economic situation* takes the value 1 if the individual works (0 otherwise); according to *nationality*, this variable takes value 1 if the individual has a foreign nationality (0 otherwise); the *level of studies* takes the value 1 if the individual has university studies; the *consumption of alcohol and tobacco* takes the value 1 if the individual smokes daily or consumes alcohol; the *state of health* takes the value 1 if it is

good and very good; and, finally, the variables *depression*, *anxiety* and *other mental problems* take the value 1 if the individual has suffered from them in the last 12 months. The variables *age* and *social support* were considered continuous, so that the values of the variable age range between 15 and 103, and those corresponding to social support between 11 and 55. The following table shows the mean (or the percentage), standard deviation, minimum and maximum of all the variables explained above.

Table 5 Main statistics using the observations 1-23,089

| Variable | Label | Description | Mean / % | S.E. | Min. | Max. |
|----------------------------------|-------------------|--|----------|-------|-------|------|
| <i>Age</i> | <i>edad</i> | Continuous variable | 53.4 | 18.9 | 15.0 | 103 |
| <i>Gender</i> | <i>sex</i> | 1, if male, 0 otherwise | 45.9 | 0.498 | 0.000 | 1.00 |
| <i>Economic situation</i> | <i>trabaja</i> | 1, if employed, 0 otherwise | 43.0 | 0.495 | 0.000 | 1.00 |
| <i>Nationality</i> | <i>extranjero</i> | 1, if foreign nationality, 0 otherwise | 9.71 | 0.296 | 0.000 | 1.00 |
| <i>Level of studies</i> | <i>estudsup</i> | 1, if university studies, 0 otherwise | 18.1 | 0.385 | 0.000 | 1.00 |
| <i>Depression</i> | <i>depresion</i> | 1, if suffered depression in the last year, 0 otherwise | 74.7 | 0.435 | 0.000 | 1.00 |
| <i>Anxiety</i> | <i>ansiedad</i> | 1, if suffered anxiety in the last year, 0 otherwise | 84.6 | 0.361 | 0.000 | 1.00 |
| <i>Other mental problems</i> | <i>otrosprob</i> | 1, if suffered other mental problems in the last year, 0 otherwise | 94.1 | 0.236 | 0.000 | 1.00 |
| <i>Tobacco consumption</i> | <i>tabaco</i> | 1, if smokes daily, 0 otherwise | 21.3 | 0.409 | 0.000 | 1.00 |
| <i>Alcohol consumption</i> | <i>alcohol</i> | 1, if consumes alcohol, 0 otherwise | 25.4 | 0.435 | 0.000 | 1.00 |
| <i>Functional social support</i> | <i>apoyo</i> | Continuous variable | 47.9 | 7.30 | 11.0 | 55.0 |
| <i>Health status</i> | <i>estadsalud</i> | 1, if good or very good, 0 otherwise | 66.4 | 0.472 | 0.000 | 1.00 |

Source: own elaboration based on microdata from INE (2023).

The data reflected therein with respect to the selected socio-economic variables can be interpreted as follows: the average age of the respondents is 53.4 years; 45.9% of the sample are men; 43% of the respondents have a job and 18% have a university education; 9.7% of the sample is of foreign nationality; more than 20% of the respondents state that they consume alcohol or smoke and a 66.4% of the sample is in good health. Finally, with regard to the variables of greatest interest in this study – mental health and social isolation – it should be noted that around 75% and 85% of the respondents have suffered from depression and anxiety in the last year respectively, while the average degree of social support is around 50 points, a sufficiently good figure if we consider that the upper limit is 55 points.

4.2. Methodology

To analyse the relationship between the selected variables, a probit estimation model will be carried out, where the endogenous variables will be suffering or not suffering from depression or anxiety. As explanatory variables, age, gender, nationality, economic situation, educational level, alcohol and tobacco consumption, functional social support and self-perceived health status were considered.

A probit model is one in which the dependent variable is dichotomous, that is, it only takes the values 0 and 1, while the explanatory variables can be dichotomous or continuous. This type of model analyses the probability of a certain event occurring, that is, the probability that the endogenous variable takes the value 1 ($P/ Y=1$). Thus, the functional form of a probit model is as follows:

$$P(y=1 | x) = \phi(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k),$$

where X_k are each of the explanatory variables that make up the model, the coefficient matrix β accompanies each of the explanatory variables and estimates the effect they have on the regressor and, finally, the factor “ ϕ ” calculates the probability of the normal cumulative distribution function, that is, the probability of success of the endogenous ($Y=1$) as a function of the values taken by the regressors.

In this study, the probability of suffering from depression or anxiety will be analysed as a function of the different explanatory variables. Given that a probit model is not a model in which there is a linear relationship between the regressor and the regressors,

the interpretation of this model will differ from classical linear regression models. In this case, to estimate the effect of the independent variables on the endogenous variable, the slope of the explanatory variables on the endogenous variable, namely the marginal effect, will be taken as a reference.

5. Results

This section of the project will discuss the results obtained with the econometric models that were explained in the methodology section. The following tables show the estimations corresponding to the probit models carried out with the econometric program Gretl 2021c version. The dependent variables take the value 1 if these mental illnesses have been suffered in the last 12 months, with the rest of the explanatory variables also being dichotomous, except for the variables age and social support, being the latter continuous.

The econometric analysis was carried out as follows: econometric models were tested until a certain significance of the explanatory variables was reached and their marginal effect on the endogenous variable was as expected. In this way, table 6 (depression) and 7 (anxiety) show three different regressions, each one with its respective variables and their slope on the endogenous variable. The third model is the one considered as definitive in both cases, with the two previous ones serving as a guide to reach the final estimation (see annex 3). To interpret the results of the logistic regressions carried out, marginal effects on the mean have been used, which measure the discrete change, which means that the variation in the probability of an event occurring when the explanatory variable changes from 0 to 1 is analysed, provided that the rest of the independent variables remain constant at the mean, otherwise the marginal effect could vary. Next, the marginal effects of the explanatory variables on the probability of suffering from depression or anxiety will be explained.

The third model in table 6 is considered the optimal one since it presents the highest value for McFadden's R^2 (0.013395) compared to the other models, since the higher the value the better the estimation. In this case, unlike the classical linear models, this pseudo R^2 cannot be interpreted as the percentage of sample variance of the regressor that is explained by the regression carried out, so it will simply be said that the higher the value, the better the estimation. The sample size is also reported in the table ($N= 2,519$), as well as the slopes, which are the marginal effects of age, gender, economic status, educational level, nationality, alcohol and tobacco consumption and social support on the endogenous. Next, the marginal effects of the variables with the greatest influence on the explained variable will be explained.

Table 6 Probit regression model with dependent variable depression

| Slope | | | |
|----------------------------------|------------------------------|------------------------------|---|
| Variables | Regression 1 | Regression 2 | Regression 3 |
| Age | -0.00079089 (-0.00248194) | -0.00013106 (-0.00038157) | -0.00050392 (-0.00157158) |
| Sex | -0.0116025 (-0.0362100) | -0.0135706 (-0.0393919) | -0.0240114 (-0.0740469) |
| Economic situation | -0.0762706 (-0.229506) | -0.0541488 (-0.155008) | -0.0725578 *** (-0.217734) |
| Level of studies | -0.0890076 (-0.261605) | -0.100028 (-0.276875) | -0.0871071 *** (-0.255033) |
| Nationality | | 0.0515427 (0.156213) | 0.0465075 (0.151960) |
| Tobacco consumption | | 0.0169007 (0.0494951) | |
| Alcohol consumption | | -0.0129869 (-0.0376523) | |
| Functional social support | | | -0.00384516 *** (-0.0119919) |
| McFadden R ² | 0.007169 | 0.007475 | 0.013395 |
| N | 2667 | 1254 | 2519 |

Notes: Significance levels are * $p < 0.01$, ** $p < 0.005$, *** $p < 0.001$.

Source: own elaboration based on microdata from INE (2023).

First, if the rest of the variables remain constant above the mean – age (53.4), work (43%), higher education (18.1%), foreigner (9.71%) and social support (47.9) – the probability of suffering from depression is 2.4% lower for men than for women. In the case of higher education, again if the rest of the explanatory variables remain at the mean, the probability of suffering from depression is reduced by 8.71% if the individual has a university education. On the other hand, the probability of suffering from depression increases by 4.65% if the individual is of foreign nationality compared to Spanish nationality. Finally, the social support variable is a continuous variable, so that analysing the marginal effect on the regressor would not be entirely correct, given that, on occasions, a one-unit increase in the explanatory variable does not always

correspond to the marginal effect. This is why, given that the functional social support variable is not a large-scale variable, it can be assumed that a small increase in this variable (0.1) implies that the probability of suffering from depression is reduced by $0.003845 \cdot 0.1 = 0.0003845$. Despite the previously explained, it should be noted that, given that the unit of social support is small, it could be accepted that the effect of a unit increase in this variable is close to the marginal effect, which means that a unit percentage increase in social support implies a reduction in the probability of suffering from depression of 0.385%. Similar conclusions are obtained when analysing the results for the variable age, since the marginal effect of this variable indicates that, with a unit increase in age, the probability of suffering from depression decreases by 0.05%. In this case, the statistics contradict the desired results, as it would be expected that the higher the age, the greater the probability of suffering from depression, even though the marginal effect is practically unobservable.

Table 7 collects the same information as described above, but in this case estimating the probability of suffering from chronic anxiety. Again, the third regression is considered the definitive one because it presents the highest McFadden's R^2 (0.017752), as well as the highest significance of the explanatory variables, being in this case the sample size slightly larger than in the previous model ($N=2163$). In the following, the marginal effects of the regressors on the dependent variable, information provided by their slopes on the mean, will be explained.

Table 7 Probit regression model with dependent variable anxiety

| Slope | | | |
|--------------------|------------------------------|-----------------------------|-------------------------------|
| Variables | Regression 1 | Regression 2 | Regression 3 |
| Age | -0.00047076 (-0.00200137) | -0.00020542 (-0.0008089) | -0.00025244 (-0.00109205) |
| Sex | 0.0226104 (0.0983231) | 0.0179050 (0.0712693) | 0.0118054 (0.0517031) |
| Economic situation | -0.0642193 (-0.258487) | -0.0513013 (-0.198109) | -0.0569501 *** (-0.234613) |
| Level of studies | -0.0445725 (-0.177213) | -0.0645121 (-0.236306) | -0.0430190 * (-0.174094) |
| Nationality | | -0.0195765 (-0.0747464) | 0.00960856 (0.0423843) |

| | | | |
|----------------------------------|----------|--------------------------|---|
| Tobacco consumption | | 0.0125780 (0.0499841) | |
| Alcohol consumption | | 0.0389733 (0.159604) | |
| Functional social support | | | -0.00345634 *** (-0.0149519) |
| McFadden R ² | 0.009886 | 0.014901 | 0.017752 |
| N | 2275 | 1198 | 2163 |

Notes: Significance levels are * $p < 0.01$, ** $p < 0.005$, *** $p < 0.001$.

Source: own elaboration based on microdata from INE (2023).

Considering that the rest of the variables remain constant above the mean – age (53.4), work (43%), higher education (18.1%), foreigner (9.71%) and social support (47.9) – the probability of suffering from anxiety is 1.18% higher in the case of men than in that of women, information that contrasts with the probability of suffering from depression, as this was higher for the feminine sex. In terms of economic situation, the probability of suffering from anxiety is reduced by 5.7% when the individual is in the labor market, a probability that is also reduced by 4.3% when the individual has a tertiary education. On the other hand, as in the results obtained in the model corresponding to depression, the probability of suffering anxiety is also increased by 0.96% if the individual is not of Spanish nationality. Regarding the social support variable, it could be concluded that, if social support is increased by one percent, the probability is reduced by 0.35%.

Finally, regarding the significance of the variables, in both models social support, higher education and having a job are the most significant variables, all of them being significant at significance levels below 1% in the model for depression and in the model for anxiety, except for university studies, which in this model is significant at levels above 5%. The variable self-perceived health status was not used in any estimation since it presented multicollinearity problems with the social support variable.

In summary, the variables that increase the probability of suffering from mental illnesses such as anxiety or depression are having a foreign nationality in both cases or being a man in the case of anxiety. Consequently, being integrated in the workforce, having a university education, or having a high degree of functional social support (less social isolation) are the variables that, for the purposes of this study, seem to reduce the prevalence of these pathologies.

6. Conclusions

The main objective of this study was to analyse the relationship between social isolation, which was measured through the variable functional social support, whose values range between 11 and 55, with values approaching 55 indicating high social support; and mental health, which for the purposes of this study was limited to suffering from mental illnesses such as depression or anxiety. To analyse this relationship, other socio-demographic variables were included, such as gender, age, level of education or nationality, as these were also included in other studies that investigated the degree of social isolation with health, whether physical or mental.

Firstly, to study the association between social isolation and mental health, microdata from the INE's National Health Survey for 2017 were used. These data were subjected to different econometric models until the model that, for the purposes of this study, was the most appropriate and in line with the expected results was found. In the previous section, the relationship between the dependent and independent variables was analysed through logistic regressions that were carried out with probit models, which, in general terms, summarize the probability of suffering from depression or anxiety as a function of the different explanatory variables. In both models there are three variables that show to be significant at levels below 10% and these are: being employed, having higher education and social support. This is consistent with the results obtained in the study carried out by Evans and Fisher (2021), where it is concluded that, by introducing the social support variable, the effects of social isolation on depression and anxiety are reduced. Similar conclusions are obtained in the study by Ge et al. (2017), as the results of the study reflect that little contact with friends or family is associated with a higher degree of depression, highlighting the importance of meetings with friends to alleviate the symptoms of depression. These results are reinforced when analysing the correlations. The correlation is the association between two variables, whose value ranges between -1 and 1, so that if it is less than zero the relationship between the two variables will be inverse, while if it is positive the relationship will be direct. The INE microdata, with a sample of more than 23,000 people, have made it possible to obtain reliable correlation coefficients.

The correlation between social support and depression is around -0.08, while for anxiety it is around -0.086. This inverse correlation indicates that the higher the social support, the lower the prevalence of both mental illnesses. This is consistent with what was explained in the methodology section, since the probability of presenting these pathologies is reduced by 0.385% and 0.35% if social support increases by one percentage point. The association between higher education and both mental illnesses is also negative, -0.067 in the case of depression and -0.057 in the case of anxiety, a correlation that again agrees with the estimation made, since the probability is reduced in both cases if the individual has university studies, being this reduction more intense for depression (8.7%). On the contrary, possession of foreign nationality and smoking are positively related to depression (0.023 and 0.007 respectively) and anxiety (0.0053 and 0.013 respectively). Finally, regarding the variables age and gender, the associations with the dependent variables are very weak, so that no distinction can be made by gender or age ranges. This conclusion is consistent with the results of the study by Christiansen et al. (2021), in which, broadly speaking, the association between social isolation and mental health was not conditioned by gender, neither did it vary by age.

Summarizing, for the purpose of this study it is firstly verified that the probability of suffering from mental illnesses such as depression or chronic anxiety is reduced around 0.40% in both cases when there is a sufficient degree of social support, or, equivalently, this probability is reduced when the degree of social isolation decreases. Although the effect is not sufficiently noticeable in quantitative terms, the results are in line with those obtained by other studies since the important thing was to demonstrate the inverse relationship between mental illnesses and degree of social support (Evans and Fisher, 2021; Seifert, Seddig and Eckhard, 2022; Ge et al., 2017).

Secondly, the econometric models in this study also included demographic and socio-economic variables such as nationality, economic status, and level of education. The results are again in line with those obtained by other authors, since having a foreign nationality is a factor that has a negative influence on mental health in the population analysed, while having a university education or a job are the variables that most reduce the probability of suffering from mental illness (Rohde et al., 2016). It should be noted that, although the effects of some of the variables are not quantitatively very relevant, the expected effects in terms of association have been obtained. Thirdly, with regard to the mental health of the Spanish population analysed, it is worth noting that women who suffer from anxiety or depression account for double the percentage suffered by the opposite gender, the prevalence of these pathologies decreases as the level of education

increases, while, on the contrary, individuals of Spanish nationality and those who are unable to work or retired are the categories that increase the prevalence of depression according to nationality and current economic situation.

Finally, despite having achieved the desired results in this study, it should be noted that this research has certain limitations. On the one hand, the aim of this study was to analyse the relationship between social isolation and mental illness, concluding that the greater the social support (less social isolation), the lower the probability of suffering mental health problems. Despite obtaining these results, the main limitation of this study is that causality cannot be established between the two variables, which means that through this research it is not possible to conclude whether mental health influences social isolation or, on the contrary, whether it is social isolation that explains, to a greater or lesser extent, mental health problems. The main solution to this limitation would be the use of longitudinal data on the population analysed, however, these are not available, and if they were, the contents taught in the Degree in Economics have not covered these studies, so they could not be analysed either. A second limitation could have been the use of survey data, as these sometimes contain incomplete information about the respondents. The solution to this limitation would be to use other sources of information, however, given that this study focused on the Spanish adult population, the INE becomes the most reliable and useful tool.

Through this study an attempt has been made to give importance to a public health problem such as mental health and the illnesses associated with it. We are living in an era in which greater importance is given to social relations through technology, in which human values have taken a secondary place. This is why the governments of the different countries should establish policies of support and social integration for groups recognized as vulnerable, such as adolescents, foreigners, or the elderly. In addition, greater importance should be given to mental health problems, through talks in educational or cultural centres to break with a subject that even today is still sometimes treated as taboo, and in this way to normalize and deal with certain situations and to be able to help people who are at risk of social isolation. In the words of the President of the European Commission "we should take better care of each other. And for many who feel anxious and lost, appropriate, accessible, and affordable support can make all the difference" (Von der Leyen, 2022).

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Annex 1

| Author | Year | Reference country | Methodology | Main results | Main limitations | Social isolation's measure |
|---------------------------|----------------------------------|-------------------|---|--|--|--|
| Christiansen et al., 2021 | February to May, 2017 | Denmark | Collection of data of Danish citizens aged 16+ from the Danish Health and Morbidity Surveys. Regression analysis were carried out to find out the relationship between social isolation with mental illness and somatic conditions. | The main objective of this study was to evaluate the association between social isolation and poor mental and physical health in young people, and to discuss the influence of gender and age. Social isolation was related to anxiety, depression and long run mental illness. Moreover, age and gender almost did not have an impact on the association between social isolation and mental health. | The study is a cross-sectional design, so it does not establish causality. The response rate was low, which implies that people suffering social isolation may not be adequate represented. | Social isolation was measured using an index inspired by the Social Network Index. It is based on five indicators, with score range between 0 and 5, the closer to 5 the greater social isolation. |
| Coyle & Dugan, 2012 | Data from waves of 2006 and 2008 | United States | Collection of data from the Health and Retirement Study from 2006 and 2008 waves. This data was collected through interviews from individuals aged 50 or more in the United States. Regarding the methodology used in this study to analyse the impact of loneliness and social isolation on physical and mental health, different regression models were used. | The aim of the present study was to analyse the relation between loneliness and social isolation and its impact on mental health. They arrived at the conclusion that both loneliness and social isolation are not closely related and can exist independently of each other. Moreover, loneliness is much more related to mental health than social isolation is, being this last one being more related to self-reported health. | The study uses cross sectional data, which implies no possibility of establishing causal relations between loneliness, social isolation, and health, despite there exists a clear relation. The reliability of data could lead to an underestimation of older people living with mental illness. | Social isolation was measured using a 10-item scale, which included aspects related to the number and frequency of relationships with family, friends, or children. |

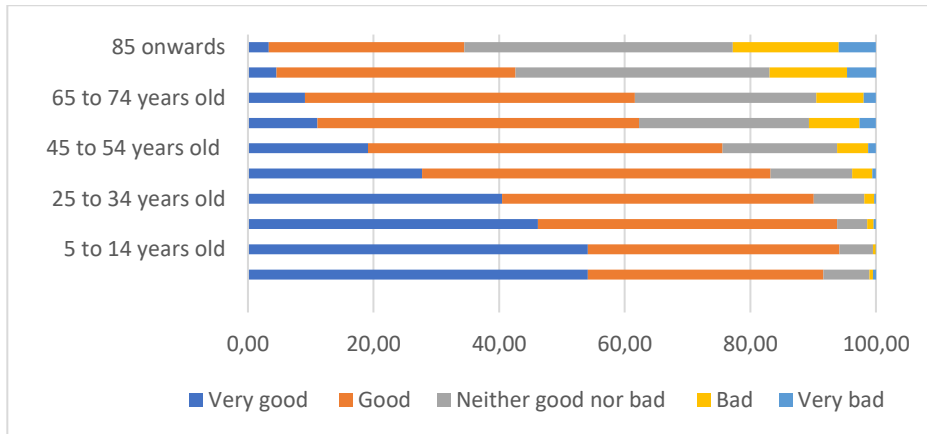
| | | | | | | |
|----------------------|---------------|-----------------------------|--|---|---|--|
| Evans & Fisher, 2021 | 2021 | State of North Carolina | Survey distributed to people over 18 years old in the University of North Carolina that had one common health problem among those that appeared on the list. This study ranges from individual t-tests to partial correlations, which analyse the relationship between the type of social support received and mental illnesses. | The main objective of this study is to analyse the existing relationship between social support, social isolation, and mental health problems among the population under study. More than one third of the sample was classified as socially isolated, and presented higher levels for anxiety and depression compared to those respondents that were not part of that classification. The present study examines which types of support can reduce anxiety and depression in a significant manner. The main finding is that nondirective emotional support was related to lower levels of both illnesses, and the effect was more remarkable among people that were socially isolated. | Limited number of responses to the survey, which does not allow to achieve a generalization of results. Some important variables were not included, and may have an impact on the variables of interest. The use of cross-sectional data does not allow to establish causality. | Social isolation was measured according to a measure known as Orth-Gomer Measure of Social Networks and Support. This measure evaluates the quality of one person's relationships, meaning that a person is socially isolated if they responded negatively to any of those questions. |
| Ge et al., 2017 | 2015 and 2016 | Central Region of Singapore | Collection of data from a health survey of adults above 21 years old. To establish a relationship between social isolation and depressive symptoms, a multiple linear regression was conducted. | The main objective of this study was to investigate the relationship of different social isolation indicators with loneliness, and later to investigate its relationship with depressive symptomatology. The 26.3% of the sample reported being isolated, and the common characteristics of respondents included in that percentage were, among others, to be older, without formal education, divorced or unemployed. Moreover, the study also predicted that those who were socially isolated presented a higher depressive symptomatology score, and that social connectedness with friends had a more significant effect on depressive symptoms | The present study uses cross sectional data, which does not allow to establish any kind of causal relation between social isolation and depressive symptoms, being not allowed to verify if an increase in social isolation leads to an increase in the score of depressive symptoms <i>or vice versa</i> . | Social isolation was measured using three different indicators, that included marital status, living arrangement and social connectedness with relatives and friends. This connection was measured by the six item Lubben Social Network Scale-6, which measures the frequency of social contact with the perceived social support from family and friends. This measure ranges from 0 to 30, with lower values being related to higher isolation. |

| | | | | | | |
|-----------------------------|----------------------------|----------------|--|--|---|--|
| | | | | than connectedness with relatives. | | |
| Lara et al., 2019 | 2011-2012 and 2014-2015 | Spain | Collection of data through surveys from a representative sample of Spanish population aged 18+ called "Edad con salud". Linear estimation method was used to determine the association between social isolation and cognitive power. | The main objective of this study was to examine whether those individuals that were socially isolated were experiencing a faster cognitive decline in the 3-year follow up compared to those that are not. The main finding is that individuals that present greater levels of isolation did not experience a faster cognitive decline. | Short period of follow up making unable to analyse the impact on cognitive decline of social isolation. There could exist a bias that led to an underestimation of the real association between social isolation and cognitive function. | Social isolation index based on five questions. Range score from 0 to 5, the closer to 5 the greater social isolation. |
| Matthews et al., 2015 | 1999 and 2000 | United Kingdom | Collection of data from the Environmental Risk Longitudinal Twin Study. To investigate both the association between social isolation and family factors and mental illness, multinomial logistic regressions were carried out. | The main objective of this project is to evaluate if those children who are socially isolated in primary school are more likely to experience mental health problems in secondary school. The principal result is that those children that face mental health problems such as hyperactivity in the early school are more likely to experience social isolation in the secondary school, whereas those who face emotional problems do not seem to experience greater isolation in the following years. | No possibility to establish causality. Since the study used twin data, results could lead to an underestimation of social isolation. | Childhood social isolation was measured using 6 criteria from the Children's Behaviour Checklist and the corresponding 6 criteria from the Teacher's Report Form. |
| Newman-Norlund et al., 2022 | September 2019 to May 2020 | South Carolina | Collection of data from the participants for the Aging Brain Cohort of the previous study during 2019 and the follow up during April and May of 2020. Surveys were made and the respondents were aged between 60 and 80. | The purpose of this study was to examine the effects of the Covid-19 isolation period on the quality of life of elderly people. As previous literature has demonstrated that period of isolation was directly linked to a decrease in the quality of life of the people in the sample. But this review also suggests that even brief periods of social isolation can have important consequences on elderly's health, since this | The study was based in the collection of data through a survey, which may imply incomplete information. Moreover, the study was limited to those people that had already taken part in the survey in the period pre-covid, since it was an unexpected | Participants were asked to answer different questionnaires, that included measures for quality of life before and after isolation, as well as different isolation measures, that were answered using the PROMIS- 29 Profile V20. |

| | | | | | | |
|---------------------------------|--------------|---------|---|--|---|---|
| | | | | study was focus on the collection of data of the same participants before and after the Covid- 19 restrictions applied by the government. | phenomenon. Finally, an important limitation is the subjectiveness of the quality-of-life concept. | |
| Read et al., 2020 | 2002-2012 | England | Collection of data from people aged 50+ from the ELSA. The methodology used in this study focused on the Latent Change Score (LCS) model. | The main objective of this study is to investigate the association between the degree of isolation and the memory decline in elderly people. The main result is that isolation is associated with memory decline. This study analysed separately men and women, although the gender differences cannot be formally assessed, there is slight evidence of women experiencing higher memory decline due to isolation than men. | Although the sample was initially aimed at the population over 50 years of age, those who had more social ties and better memory were more likely to agree to be part of the study. The measure used to evaluate the degree of social isolation might not be enough in some cases, since people visiting their family or friends less than once a month may have other type of social contacts. | Social isolation was measured through an index that was constructed from five binary terms. The score range was from 0 to 5, with values closer to 5 indicating a greater level of social isolation. |
| Seifert, Seddig & Eckhard, 2022 | 2004 to 2012 | Germany | Collection of data from the GSOEP of German households aged 50 or more. The present study used dynamic panel models with fixed effects to study the impact of social isolation on both physical and mental health. Models were estimated separately for both genders. | The aim of this study was to demonstrate whether being socially isolated had an impact on physical and mental health. Results predict that it does have an impact on mental health among older people (50 years old onwards), but it does not show to affect physical health. | Results were limited to those individuals for whom a transition in the level of social isolation was observed in the data. The present study is not biased free since the effect of social isolation on mental health could be upwardly biased. Moreover, it was not possible to differentiate between short and long run social isolation. | Employed two different measures. First one, describing social isolation as the lack of regular contact with close relationships: according to the individual's response to three criteria they were considered as socially isolated or not. The second measure considered those three criteria and another one. |

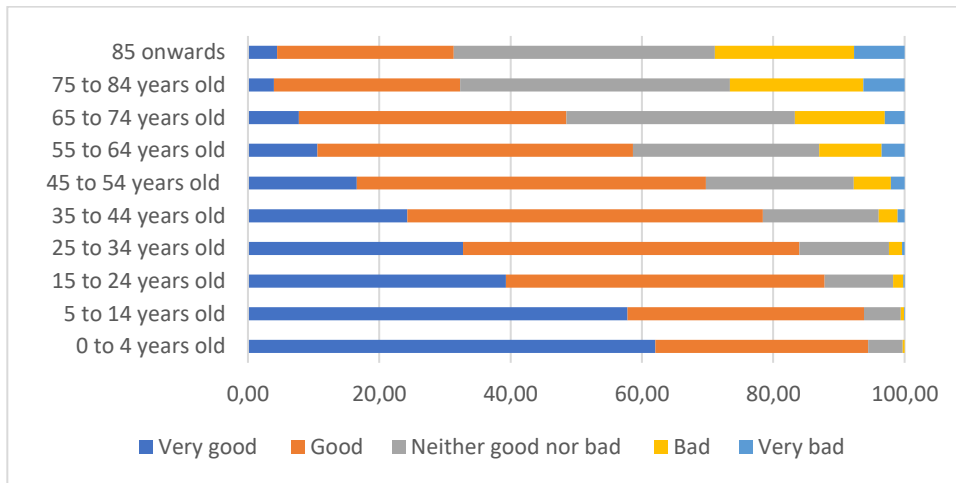
Annex 2

Graph 11 Health status by age on men



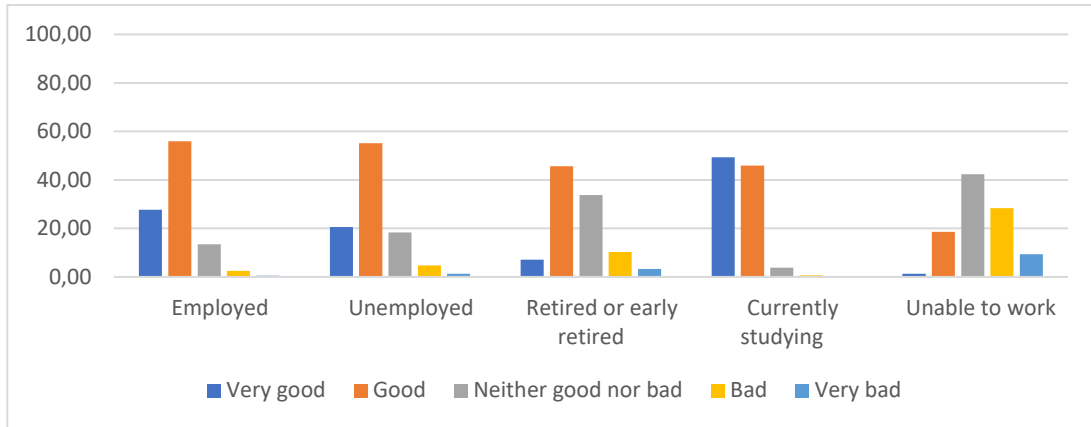
Source: own elaboration based on INE (2023).

Graph 12 Health status by age on women



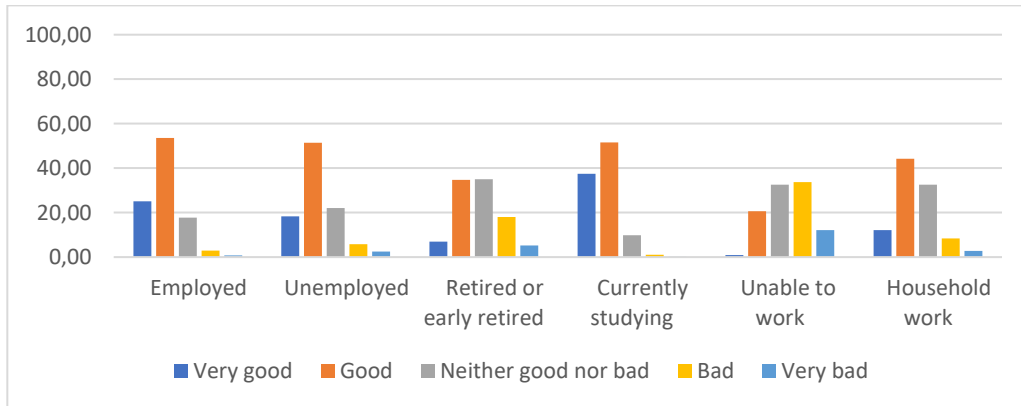
Source: own elaboration based on INE (2023).

Graph 13 Health status by current economic activity on men



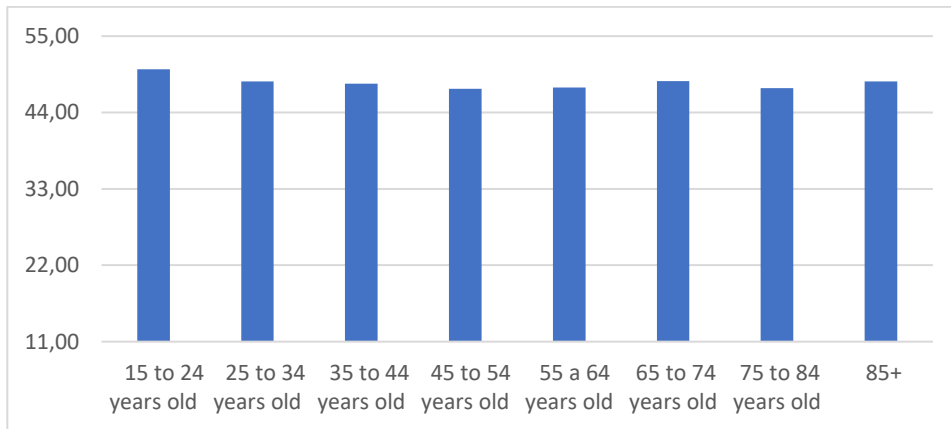
Source: own elaboration based on INE (2023).

Graph 14 Health status by current economic activity on women



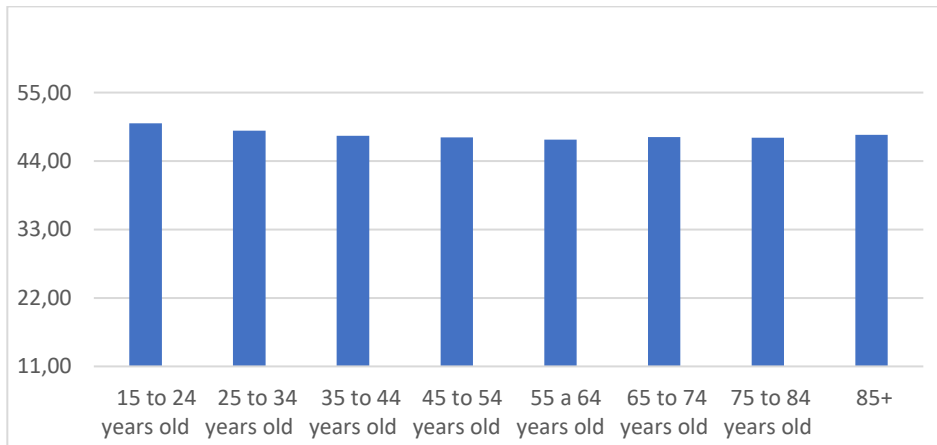
Source: own elaboration based on INE (2023).

Graph 15 Perceived functional social support on men by age



Source: own elaboration based on INE (2023).

Graph 16 Perceived functional social support on women by age



Source: own elaboration based on INE (2023).

Annex 3

Modelo 6: Probit, usando las observaciones 1-23070 (n = 2667)

Se han quitado las observaciones ausentes o incompletas: 20403

Variable dependiente: depresion

Desviaciones típicas basadas en el Hessiano

| | <i>Coficiente</i> | <i>Desv. Típica</i> | <i>z</i> | <i>Pendiente*</i> |
|------------------------|-------------------|-----------------------|----------|-------------------|
| const | 0.902271 | 0.131087 | 6.883 | |
| edad | -0.00248194 | 0.00187976 | -1.320 | -0.00079089 |
| sex | -0.0362100 | 0.0599456 | -0.6040 | -0.0116025 |
| trabaja | -0.229506 | 0.0726018 | -3.161 | -0.0762706 |
| estudsup | -0.261605 | 0.0941859 | -2.778 | -0.0890076 |
| Media de la vble. dep. | 0.747282 | D.T. de la vble. dep. | | 0.434652 |
| R-cuadrado de McFadden | 0.007169 | R-cuadrado corregido | | 0.003853 |
| Log-verosimilitud | -1496.852 | Criterio de Akaike | | 3003.704 |
| Criterio de Schwarz | 3033.147 | Crit. de Hannan-Quinn | | 3014.358 |

Modelo 7: Probit, usando las observaciones 3-23059 (n = 1254)

Se han quitado las observaciones ausentes o incompletas: 21803

Variable dependiente: depresion

Desviaciones típicas basadas en el Hessiano

| | <i>Coficiente</i> | <i>Desv. Típica</i> | <i>z</i> | <i>Pendiente*</i> |
|------------------------|-------------------|-----------------------|----------|-------------------|
| const | 0.646000 | 0.209788 | 3.079 | |
| edad | -0.00038157 | 0.00309428 | -0.1233 | -0.00013106 |
| sex | -0.0393919 | 0.0802314 | -0.4910 | -0.0135706 |
| trabaja | -0.155008 | 0.0938032 | -1.652 | -0.0541488 |
| estudsup | -0.276875 | 0.117103 | -2.364 | -0.100028 |
| extranjero | 0.156213 | 0.160587 | 0.9728 | 0.0515427 |
| tabaco | 0.0494951 | 0.0904874 | 0.5470 | 0.0169007 |
| alcohol | -0.0376523 | 0.0864707 | -0.4354 | -0.0129869 |
| Media de la vble. dep. | 0.706539 | D.T. de la vble. dep. | | 0.455529 |
| R-cuadrado de McFadden | 0.007475 | R-cuadrado corregido | | -0.003066 |
| Log-verosimilitud | -753.2748 | Criterio de Akaike | | 1522.550 |
| Criterio de Schwarz | 1563.622 | Crit. de Hannan-Quinn | | 1537.988 |

Modelo 12: Probit, usando las observaciones 1-23070 (n = 2519)

Se han quitado las observaciones ausentes o incompletas: 20551

Variable dependiente: depresion

Desviaciones típicas basadas en el Hessiano

| | <i>Coficiente</i> | <i>Desv. Típica</i> | <i>z</i> | <i>Pendiente*</i> |
|------------------------|-------------------|-----------------------|----------|-------------------|
| const | 1.36979 | 0.189475 | 7.229 | |
| edad | -0.00157158 | 0.00197191 | -0.7970 | -0.00050392 |
| sex | -0.0740469 | 0.0620399 | -1.194 | -0.0240114 |
| trabaja | -0.217734 | 0.0742870 | -2.931 | -0.0725578 |
| estudsup | -0.255033 | 0.0977632 | -2.609 | -0.0871071 |
| extranjero | 0.151960 | 0.119482 | 1.272 | 0.0465075 |
| apoyo | -0.0119919 | 0.00311257 | -3.853 | -0.00384516 |
| Media de la vble. dep. | 0.742755 | D.T. de la vble. dep. | | 0.437202 |
| R-cuadrado de McFadden | 0.013395 | R-cuadrado corregido | | 0.008521 |
| Log-verosimilitud | -1416.983 | Criterio de Akaike | | 2847.966 |
| Criterio de Schwarz | 2888.787 | Crit. de Hannan-Quinn | | 2862.780 |

Modelo 17: Probit, usando las observaciones 19-23089 (n = 1198)

Se han quitado las observaciones ausentes o incompletas: 21873

Variable dependiente: ansiedad

Desviaciones típicas basadas en el Hessiano

| | <i>Coficiente</i> | <i>Desv. Típica</i> | <i>z</i> | <i>Pendiente*</i> |
|------------------------|-------------------|-----------------------|----------|-------------------|
| const | 1.03542 | 0.223140 | 4.640 | |
| edad | -0.00080891 | 0.00343227 | -0.2357 | -0.00020542 |
| sex | 0.0712693 | 0.0935631 | 0.7617 | 0.0179050 |
| trabaja | -0.198109 | 0.0995867 | -1.989 | -0.0513013 |
| estudsup | -0.236306 | 0.113742 | -2.078 | -0.0645121 |
| extranjero | -0.0747464 | 0.179620 | -0.4161 | -0.0195765 |
| tabaco | 0.0499841 | 0.0996609 | 0.5015 | 0.0125780 |
| alcohol | 0.159604 | 0.108329 | 1.473 | 0.0389733 |
| Media de la vble. dep. | 0.825543 | D.T. de la vble. dep. | | 0.379661 |
| R-cuadrado de McFadden | 0.014901 | R-cuadrado corregido | | 0.000475 |
| Log-verosimilitud | -546.2720 | Criterio de Akaike | | 1108.544 |
| Criterio de Schwarz | 1149.251 | Crit. de Hannan-Quinn | | 1123.879 |

Modelo 13: Probit, usando las observaciones 19-23089 (n = 2275)

Se han quitado las observaciones ausentes o incompletas: 20796

Variable dependiente: ansiedad

Desviaciones típicas basadas en el Hessiano

| | <i>Coficiente</i> | <i>Desv. Típica</i> | <i>z</i> | <i>Pendiente*</i> |
|------------------------|-------------------|-----------------------|----------|-------------------|
| const | 1.21133 | 0.148356 | 8.165 | |
| edad | -0.00200137 | 0.00223452 | -0.8957 | -0.00047076 |
| sex | 0.0983231 | 0.0732610 | 1.342 | 0.0226104 |
| trabaja | -0.258487 | 0.0786617 | -3.286 | -0.0642193 |
| estudsup | -0.177213 | 0.0957354 | -1.851 | -0.0445725 |
| Media de la vble. dep. | 0.845714 | D.T. de la vble. dep. | | 0.361302 |
| R-cuadrado de McFadden | 0.009886 | R-cuadrado corregido | | 0.004775 |
| Log-verosimilitud | -968.7407 | Criterio de Akaike | | 1947.481 |
| Criterio de Schwarz | 1976.130 | Crit. de Hannan-Quinn | | 1957.932 |

Modelo 18: Probit, usando las observaciones 19-23089 (n = 2163)

Se han quitado las observaciones ausentes o incompletas: 20908

Variable dependiente: ansiedad

Desviaciones típicas basadas en el Hessiano

| | <i>Coficiente</i> | <i>Desv. Típica</i> | <i>z</i> | <i>Pendiente*</i> |
|------------------------|-------------------|-----------------------|----------|-------------------|
| const | 1.85489 | 0.234590 | 7.907 | |
| edad | -0.00109205 | 0.00233719 | -0.4672 | -0.00025244 |
| sex | 0.0517031 | 0.0759128 | 0.6811 | 0.0118054 |
| trabaja | -0.234613 | 0.0811030 | -2.893 | -0.0569501 |
| estudsup | -0.174094 | 0.0980499 | -1.776 | -0.0430190 |
| extranjero | 0.0423843 | 0.141236 | 0.3001 | 0.00960856 |
| apoyo | -0.0149519 | 0.00395171 | -3.784 | -0.00345634 |
| Media de la vble. dep. | 0.847434 | D.T. de la vble. dep. | | 0.359652 |
| R-cuadrado de McFadden | 0.017752 | R-cuadrado corregido | | 0.010176 |
| Log-verosimilitud | -907.4901 | Criterio de Akaike | | 1828.980 |
| Criterio de Schwarz | 1868.735 | Crit. de Hannan-Quinn | | 1843.520 |