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**Socio-Economic Inequalities in Reported Depression in Spain: A  
Decomposition Approach \***

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## Abstract

Recent evidence questions some conventional view on the existence of income-related inequalities in depression suggesting in turn that other determinants might be in place, such as activity status and educational attainment. Evidence of socio-economic inequalities is especially relevant in countries such as Spain that have a limited coverage of mental health care and are regionally heterogeneous. This paper aims at measuring and explaining the degree of socio-economic inequality in reported depression in Spain. We employ linear probability models to estimate the concentration index and its decomposition drawing from 2003 edition of the Spanish National Health Survey, the most recent representative health survey in Spain. Our findings point towards the existence of avoidable inequalities in the prevalence of reported depression. However, besides “pure income effects” explaining 37% of inequality, economic activity status (28%), education (15%) and demographics (15%) play also a key encompassing role. Although high income implies higher resources to invest and cure (mental) illness, environmental factors influencing in peoples perceived social status act as indirect path as explaining the prevalence of depression. Finally, we find evidence of a gender effect, gender social-economic inequality in income is mainly avoidable.

## Resum

Evidència empírica recent qüestiona la visió tradicional sobre l'existència de desigualtats relacionades amb la renda en el patiment de depressió tot i suggerint que altres determinants poden jugar un paper destacat, com ara l'estatus laboral i/o el nivell educatiu. Aquest tipus d'evidència sobre desigualtats socio-econòmiques és especialment rellevant per un país com Espanya que gaudeix d'una cobertura limitada en malalties mentals, a banda d'existir heterogeneïtats regionals. Aquest article pretén mesurar i explicar el grau de desigualtat socio-econòmica en el nivell de depressió (declarada) a Espanya. Utilitzem models lineals de probabilitat per a estimar l'índex de concentració i la seva descomposició utilitzant la informació de la Encuesta Nacional de Salud de 2003. Els nostres resultats assenyalen l'existència de desigualtats econòmiques evitables en la prevalència de depressió declarada. No obstant, a part d'un "pur efecte renda" que explicaria un 37% de la desigualtat mesurada, l'ocupació o estatus laboral (28%), el nivell educatiu (15%) i la demografia (15%) també jugarien un paper rellevant. Encara que una renda elevada implica haver d'invertir més recursos per curar malalties (mentals), els factors ambientals que afecten l'estatus social percebut per les persones actuarien de manera indirecta com a factors explicatius en la prevalència de l'obesitat. Finalment, trobem evidència d'un efecte segons el gènere.

**Keywords:** depression, socio-economic inequities in health, education, and occupational status.

**JEL Classification:** J18, I12

## 1. Introduction

In most European countries insurance coverage for mental health care is limited compared to other health care services. However, mental conditions are responsible for financial and social pressures on individuals and their families. Similarly, mental disorder are linked to a decline in workplace productivity, and changes in the use of treatment and support services, especially among lower income groups who cannot afford the costs of private mental health care. The overall cost of mental disorders is estimated to account for 3-4% of the GDP (WHO, 2003). The results of the ESMED project (Alonso and Haro, 2000) indicate that 19.5% of Spaniards (23% of women and 16% of men) have suffered some mental health problem at some point in life and 8.5% at some point during the year of the interview (11.4% women and 5.3% of men).

Among mental disorders, unipolar depression alone is responsible for 12% of overall years lived with disability, and ranks as the third-leading cause of the global burden of diseases (c.f. WHO, 2003). By 2020, depression is expected to be the number one disorder in the developed world (WHO, 2001). The European Commission suggests that 6.1% of the EU population ages 18-75 suffers from depression (in a 12-month period), which is estimated to cost 18.4 million euros (EU, 2005).

Depressive disorders have been found to affect an individual's perception of well-being and life satisfaction, which is a key component in the quality of life<sup>1</sup> and could influence physical health production. Interestingly, evidence from countries in southern Europe such as Spain suggests that depression can be explained by environmental and socio-cultural factors (Montero *et al*, 2004) and whether or not a socio-economic vector explains the onset of mental illness is a

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<sup>1</sup> C.f. Beck *et al.* (1974), de Leval (1999) and Holzinger *et al.* (2002).

key issue in determining health policy design. Indeed, the persistence of health inequalities in the western world could be hypothetically explained by the expansion of inequalities in mental conditions. Several studies have found evidence of a significant influence of income on mental health (Fiscella and Franks, 1997, and Kahn *et al.*, 2000). Indeed, although regional context seems to be an important predictor (La Gory and Fitzpatrick, 1992), a recent meta-analytical study finds compelling evidence of SES (socio-economic status) inequalities in depression (Lorant *et al.*, 2003) and several other studies reveal an association between income inequality (at a regional level) and depression among older Americans (Muramatsu, 2003, Scheffler *et al.*, 2001, Scheffler 1999).

The channels through which SES determines the onset of mental conditions are contentious. Indeed, on the one hand, SES may indicate the existence of a ‘pure income effect’ (e.g., the extent to which resources are available to individuals for investing in preventing and curing potential symptoms of depression). However, other explanations point to the significant role of indirect channels, namely those dependent on employment or employment status and wealth, along with education and demographic characteristics (Muramatsu, 2003). Recent studies have developed techniques to breakdown health-related inequality coefficients<sup>2</sup>, which in turn allow us to examine the existence of income-related inequalities in specific diseases and mental disorders, such as depression. By doing so, it is possible to isolate the effects attributable to SES determinants. An earlier study dealing with inequalities in mental health care in Great Britain found evidence of income-related inequalities, although it concluded that the evidence might be attributable

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<sup>2</sup> For instance, see Wagstaff and Van Doorslaer (2000), Van Doorslaer and Koolman (2004), Van Doorslaer *et al.* (2004) and Wildman (2003).

to the correlation between income and other (omitted) variables behind inequalities (Wildman, 2003).

On the other hand, mental health literature in Spain finds evidence of the effects of gender and age on the prevalence of certain depressive symptoms and other mental health disorders (Rajmil *et al.*, 1998 and Murray and López, 1994). Interestingly, marriage has a preventive effect on men while augmenting the effect on women (Murray and López, 1994). Biological explanations include pre-menstrual hormone fluctuation and the significance of post-maternity depression, along with the higher prevalence of women in seeking health care assistance (c.f. Montero *et al.*, 2004 and Hirsch, 1998). Finally, geography, or regional variability, may explain the variability in the onset of depression, as it influences lifestyles, values and weather conditions. For instance, 80% of chronic patients in Spain live with their families, a larger percentage than in any other EU country; however, significant variation exists within the country (Gómez-Beneyto *et al.*, 1986). On the other hand, stigmatisation is expected to lead to underreporting of certain mental conditions, which may in turn be income-dependent, although it is difficult to predict how that would affect inequality indicators. The WHO estimates that between 44 and 70% of patients with mental disorders in developed countries do not receive treatment (WHO, 2003). However, rather than income itself, other factors may be behind socio-economic inequalities in depression, such as differences in individual levels of education, which explains how social stratification takes place. Employment status is a parallel mechanism that may also explain the existence of inequalities in depression. One hypothesis is that people with lower employment status may suffer discrimination or abuse from those with higher socio-economic status.<sup>3</sup>

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<sup>3</sup> Interestingly, Frank and McGuire (2000) argue, as an example of the complex relationship between mental illness and income or labour market outcomes, “that personal characteristics which make a positive contribution to earnings (e.g., creativity, energy or attention to detail)

Indeed, as evidence from studies on happiness suggest, since income alone is subject to adaptation, non-pecuniary goods, cannot be measured through professional employment, may instead be the explanation for the decline in an individuals' perceived happiness (Easterlin, 2003). Finally, it has been argued that stress caused by the perception of income inequality leads to depression and poorer health (see Wilkinson, 1996).

This paper empirically examines SES inequalities in the prevalence of diagnosed depression in Spain and breaks down the contributions of each explanatory factor to the degree of inequality, using microdata from the 2003 Spanish National Health Survey that contains information on the population diagnosed with depression (MHCA, 2005). Yet, although some studies confirm the general existence of inequality in self-reported health in Spain (García-Gómez and López, 2004a,b), very little research has been conducted on the existence of a vector for mental health. Notable exceptions are García-Gómez and López' study (2004c) on mental health inequalities in Catalonia and Wildman's study (2003) on Great Britain. However, to our knowledge there is still no evidence on a decomposition of inequalities in depression. Our findings indicate that several income-related inequalities in diagnosed depression can be explained primarily by income and employment status and to a lesser extent by differences in educational attainment and demographics. This evidence supports the hypothesis that depression is environmentally driven (especially work-related depression) and that therefore, inequalities in depression may be an unintended consequence of hierarchy and particularly of lower employment status and levels of education, rather than absolute income itself.

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are (relatively) more common among persons who have mania or obsessive-compulsive disorders”.

The paper's structure is as follows: Section 2 is a description of the empirical model and data, Section 3 reports the results and Section 4 presents the conclusion.

## 2. Data and Methods

The data used in this paper were retrieved from the 2003 Spanish National Health Survey; a nationally representative cross-sectional health survey based on interviews obtained the information mainly in face-to-face interviews (telephone interviews were also made) so that the data can be envisaged as a “lay-interview external assessment” which is high quality data to obtain information on reported depression though ideally a double phase design using screening instruments and semi-structured psychiatric interview should be used to identify “diagnosed depression” cases, there the study refers mainly to reported depression. The original sample contained 21,650 adults ages 16-99 and after deleting several observations because of missing data on earnings, the estimated sample contained 16,167 individuals. Income was used as the SES proxy<sup>4</sup>; earnings refer to total net household income per month. Since it was measured as a categorical variable with eight weighted response categories, the interval regression model was used to obtain a continuous household income measurement (see the Appendix).

Our measure of depression derives from the respondents' answers on their chronic conditions as diagnosed by a physician, which was reported as a categorical variable to the question, *‘During the last 12 months, has your doctor*

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<sup>4</sup> There is a large literature on the reasons why income is better indication of SES than education or occupational variables which have been employed, but primarily the decomposition methodology employed here demands a continuous measure of SES.

told you that you suffer chronically from the following diseases or health problems at this time?’ . Hence, we categorised this variable as a measure of reported depression.

Up to sixteen chronic diseases were read to the interviewee, which ranged from arterial hypertension and high cholesterol to depression, of course, and prostate problems. We then transformed the dichotomous depression measure ( $y_i$ ) into a continuous variable by adjusting and using the OLS predictions of a Linear Probability Model (LPM) as below,

$$y_i = \alpha + \sum_k \beta_k x_{k,i} + \varepsilon_i \quad (1)$$

where  $y_i=1$  (if individual  $i$  suffers depression),  $\varepsilon_i$  is the random error term and  $x_k$  is a set of exogenous determinants of depression. It follows that,

$$P(y_i = 1) = \alpha + \sum_k \beta_k x_{k,i} \quad (2)$$

A LPM was employed on the grounds that for our purposes, linearity in parameters is a property which is useful in breaking down the inequality index of the probability of suffering depression (Van Doorslaer and Koolman, 2004, Van Doorslaer *et al.*, 2004, García-Gómez and López 2004a,b).

Moreover, following previous evidence<sup>5</sup>, our model considered this set of exogenous covariates ( $x_k$ ): i) the logarithm of equalised net household income<sup>6</sup>, ii) six age-gender categories corresponding to groups 16-34, 35-44, 45-54, 55-

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<sup>5</sup> See La Gory and Fitzpatrick (1992), Kahn *et al.* (2000), Lorant *et al.* (2003), Muramatsu (2003) and Zimmerman and Katon (2005).

<sup>6</sup> Once net household income was calculated, we divided it by an equivalence factor (the number of household members powered to 0.5) to adjust for differences in household size and composition.



64, 65-74 and 75+ for men and women; iii) four categories for educational level; iv) five categories for economic status; v) four categories for marital status; and vi) seventeen Autonomous Communities or regional variables. In case of dummies, one reference category was omitted to avoid problems of multicollinearity. The profile of the omitted reference category was a young, single, employed male with secondary education studies from the region of Andalusia.

The linear model outlined above should be not seen as a structural model of depression; neither should the results be interpreted as a causal relationship. However, it is useful to note that this regression equation can be interpreted as a reduced form model whose estimates provide an indication of how exogenous changes in depression covariates may affect the degree of socio-economic inequality in depression. **Table 1** presents variable definitions and descriptive statistics.

### *Measurement of inequality*

As is customary in literature on health inequalities, the concentration index (CI) of suffering depression on income is used to measure income-related depression inequality (Van Doorslaer and Koolman, 2004, and Van Doorslaer *et al.*, 2004). The CI of depression on income can be adequately calculated from individual level data, following the covariance method (Jenkins, 1998) since,

$$CI = \left( \frac{2}{\bar{y}} \right) \text{cov}(y_i, R_i) \quad (3)$$

where  $\bar{y}$  is the (weighted) mean of depression,  $R_i$  is the fractional income rank of the  $i^{th}$  individual (i.e., the cumulative proportion of the population ranked by

income up to the  $i^{th}$  individual) and  $cov(\cdot)$  denotes the (weighted) covariance. This CI coefficient ranges from a minimum value of  $-1$  to a maximum of  $+1$  and occurs when the depression in an entire population is concentrated in the richest or poorest person, respectively; a zero value indicates equality in the prevalence of depression (i.e., depression is equally distributed across all income groups).

We then proceeded to a direct breakdown of the contributions of each explanatory factor to the degree of inequality, as in previous studies (Wagstaff *et al.*, 2003). To do so, an LPM of depression must first be adjusted against a set of  $x_k$  exogenous covariates as described by equation (2). The CI for the probability of being depressed can then be expressed as,

$$CI = \sum_k \left( \beta_k \frac{\bar{x}_k}{\bar{P}} \right) C_k = \sum_k \eta_k \hat{C}_k \quad (4)$$

where  $\eta_k$  (or the term in brackets) is the elasticity of P (depression) with respect to  $x_k$  (evaluated at the population means) and  $C_k$  (defined analogously to CI) denotes the concentration index of  $x_k$  against income. In short, this means that the CI of the probability of depression is computed as a weighted sum of the inequality in each of its determinants, with the weights being equal to the depression elasticities (Van Doorslaer and Koolman, 2004). Moreover, total depression inequality can be usefully broken down into “potentially avoidable” and “unavoidable” (or intrinsic) inequality (Kakwani *et al.*, 1997 and Wagstaff *et al.*, 2003) and the latter attributed to differences in the age and gender composition of the population. Thus, by subtracting the age-gender expected inequality (CI\*) from the total CI, a measure of avoidable inequality or inequity is obtained ( $I^*=CI-CI^*$ ).

### 3. Results

After adjusting for missing values, the prevalence of diagnosed depression in our sample of Spanish adults (16 years of age and over) was 5.91% in 2003 (see **Table 1**), although the condition was significantly more pronounced in women (8.39%) than in men (3.28%) and also increased with age.<sup>7</sup> The estimated OLS regression coefficients of the (weighted) LPM are displayed in **Table 2** (column 2) and as expected, the income coefficient in women exerts a greater negative and statistically significant effect on the prevalence of depression. Interestingly, the prevalence of depression increases with age in women and this pattern seems to curve in the last stages of life. Individuals with little or no education are 2.8% more likely to suffer depression, compared to the reference category (i.e., secondary education), while this does not hold for those with more education. Finally, our data reveals a differentiated impact of depression by employment status. A higher propensity to depression can be found among disabled pensioners (11.8%), the unemployed (3.8%) and other pensioners (3.4%), as compared to individuals who are still working. Furthermore, marital status also affects the probability of suffering depression, since divorced or legally separated adults have far greater chances of suffering poor mental health.

**Table 2** reports the estimation of the depression elasticities and concentration indices for each explanatory determinant of income-related

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<sup>7</sup> Our sample overestimates the prevalence of diagnosed depression (5.4% in the original sample for adults aged 16-99).

inequalities (columns 3 and 4 respectively).<sup>8</sup> It is worth noting that the elasticity of depression with respect to equivalent household income is (evaluated at the mean sample) equal to -1.808, i.e., a 1% increase in household income leads to a 1.8% decline in the prevalence of depression. The CI of the log income (0.0461) shows an unequal income distribution that favours the wealthiest population sectors, after bootstrapped standard errors indicated that the index is statistically significant. As for other demographic determinants such as age and gender, we find older population concentrates in low-income groups, although income inequality appears more stringent and at earlier ages in women. As expected, Spanish adults with more education are strongly concentrated in the upper tail of income distribution, while the opposite is true for people with relatively little education (e.g., primary studies or illiterate/unschooled).<sup>9</sup> In the same vein, pensioners, the unemployed, and the inactive are more likely to display lower income levels, whereas the working population is concentrated among high incomes. Furthermore, the data shows evidence of pro-poor income distribution in widowhood, as most widows' income is made up of non-contributory pensions (García-Gómez and López 2004a,b). Finally, concentration indices for the regional variables confirms the existence of pronounced disparities in regional income in Spain (Van Doorslaer and Koolman, 2004, and García-Gómez and López 2004a,b ).

Next, **Table 3** shows the inequality index estimates for diagnosed depression in Spain. Interestingly, the CI of the probability of depression on income is negative (-0.2258) and statistically significant, indicating high income-related inequalities in depression consistent with previous studies

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<sup>8</sup> Given that the components of equation (4) are non-linear functions of the data with complex sampling distributions, we opted to use bootstrapping methods to derive standard errors of the concentration indices. The number of replications was set to 100.

<sup>9</sup> These features have also been observed within the EU context (see, Van Doorslaer and Koolman, 2004).

(Wildman, 2003). Hence, individuals ranked according to income seem to exhibit inequalities in the onset of depression (ill-mental health), since depression is concentrated in low income groups. The second row in **Table 3** depicts an estimate of the share of inequalities in diagnosed depression that are not explained by age and gender ( $I^*=CI-CI^*$ ), which would indicate what has been labelled here and in other studies as the degree of potentially “avoidable inequality”. In addition to showing the same pattern as its raw counterpart, the resulting figure ( $I^*=-0.1921$ ) thus indicates that only a modest share in the degree of income-related depression inequality is due to differences in the age-gender structure of population alone.<sup>10</sup>

Some interesting results emerge from the breakdown of the contributions of explanatory variables to the degree of income-related depression inequalities (**Table 3**). Although income is the fundamental contributor of SES inequalities in the prevalence of depression, our data reveals that other determinants account for an even higher proportion of such inequalities, which is consistent with recent studies on income-related effects (Zimmerman and Katon, 2005).<sup>11</sup> Hence, income-related depression inequality would still be substantial even if income had been equally distributed across the income range or if it had had zero depression elasticity. This evidence undoubtedly points towards other factors besides income (e.g., employment status, education and demographics) as key covariates in the onset of diagnosed depression amongst Spain’s adults.

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<sup>10</sup> At this stage, we performed a sensitivity analysis to assess the robustness of the estimation of the CI of depression. First, a fairly similar CI of depression was derived (-0.2389) after the effects of employment status were removed to avoid a potentially endogenous relationship between employment status and income. Second, after replacing the estimates of the marginal effects of a probit model rather than using a LPM specification, we again obtained a close CI of depression, -0.2245.

<sup>11</sup> This contrasts with findings by García-Gómez and López (2004c). However; these authors restrict the analysis to the region of Catalonia and use a shortened GHQ instrument to measure mental health.

Our results confirm that income and income-related variables account for 37% of income-related depression inequality, whereas employment status accounts for 28%. Together, these two dimensions represent almost two-thirds of SES inequalities in depression. Interestingly, once economic status is broken down into different categories, we find that the effects of pensioner status – chiefly retirement and widow pensions (13%) and secondly, disability pensions (8.5%) – play a major role in trumping unemployment or inactivity. Finally, education levels have a non-negligible effect as a determinant of the CI of depression (15%) that links depression to knowledge (e.g., awareness of mental health symptoms), time preferences and the array of associated mechanisms. On the other hand, as our data contains evidence of diagnosed rather than perceived depression, we cannot rule out the possibility that education influences access to mental health care services or the prevention of mental disorders, given the limited health care coverage in place in Spain. Finally, the remaining factors make a comparatively minor contribution to income-related inequalities in depression: 3.4% for region of residence and less than 2% for marital status.

## 4. Conclusions

This paper has addressed the issue of SES inequalities a major treated disorder namely, diagnosed depression within the context of Spain, a southern European country with limited mental health care coverage. We attempt to provide evidence on the extent of socio-economic inequalities in people's mental conditions so as to motivate health policy action on the provision and financing side. The evidence obtained here points towards the existence of avoidable socio-economic inequalities in diagnosed depression. The interpretation of this evidence is complex, yet it suggests that limited efforts should be made within the Spanish National Health System (NHS) to meet the mental health needs of the relatively less affluent Spanish population. Hence, by accepting a socially cohesive role for the NHS, this data calls for a re-examination of the limited mental health care coverage in Spain.

We find that SES and a measure of diagnosed mental ill-health are not only significantly related, but also that when individuals are ranked by income, the higher the individuals' social status, the lower the prevalence of depression. Yet, there are several contentious explanations for this evidence, including the correlation between income and other variables that improve mental health, which were omitted when estimating the concentration index. Furthermore, if mental health care has a significant effect on physical health, the existence of inequalities in mental health might be a possible explanation for the persistence of avoidable health inequalities in all countries. For instance, it could be argued that unless inequalities in mental health are reduced, inequalities in health are likely to persist over time. Indeed, limited mental health care coverage may prevent "pure income related inequalities" in mental health to appear, though it will still exist some income related inequalities that have to do with other features such as those environmentally related.

Our study concludes that socio-economic inequalities in diagnosed depression are not only the result of a pure “income effect” consistently with some previous research (Zimmerman and Katon, 2005) . Indeed, an individual’s economic status and level of education play a significant role that may well explain why inequalities differ across different social environments and suggests that equality of income would not solve the problem of social policy. Therefore, it would not suffice to increase the redistribution of income, as employment status<sup>13</sup> and education explain the existence of a health related socio-economic vector. Although high income implies the availability of funds for investing in preventing and/or curing mental illness, environmental factors that influence people perceived social status indirectly explain the prevalence of depression. This result is in turn consistent with the so-called income inequality hypothesis (Wilkinson, 1996) in that income inequality might be the results of environmental factors which in turn might increase the likelihood of depression. Therefore, reducing income-related inequalities requires coordinating health policies with other social policies, and possibly providing additional emphasis to the role of socio-environmental factors behind the onset of depression. Importantly, we find that although the effects of gender are non-dismissible, gender-related socio-economic inequalities in income are fundamentally avoidable through some form of income redistribution.

Among the main potential study caveats, one refers to the use of reported depression as noted. Moreover, it is worth mentioning that inequality studies depend on well-known econometric assumptions, and that the violation of some of this assumption can affect the reliability of some results. Yet, despite the cross-section nature of the evidence there is currently no data that contains representative and richer information in Spain. However, the cross-section nature of the data raises an issue on the direction of association that cannot be



totally identified unless panel data evidence becomes available and adequate instruments are employed. However, even when income alone does not necessarily lead to a higher prevalence of depression, as some studies indicate (Zimmerman and Katon, 2005), it may influence the willingness and ability to seek out depression counselling, which addresses the traditionally underfunded health system's need to strengthen mental health care, often somewhat subject to stigmatisation.

**Table 1. Variable definitions and descriptive statistics (N=16,167)**

<b>Variable</b>	<b>Definition</b>	<b>Mean</b>	<b>St. Dev.</b>
Depression	Dummy variable: 1 if diagnosed as depressed; 0 otherwise	0.0591	0.2358
Log. Income	Logarithm of total equalised monthly net household income	6.5152	0.5590
F16-34	Dummy variable: 1 if female aged 16-34; 0 otherwise	0.1677	0.3736
F35-44	Dummy variable: 1 if female aged 35-44; 0 otherwise	0.0964	0.2952
F45-54	Dummy variable: 1 if female aged 45-54; 0 otherwise	0.0697	0.2547
F55-64	Dummy variable: 1 if female aged 55-64; 0 otherwise	0.0603	0.2381
F65-74	Dummy variable: 1 if female aged 65-74; 0 otherwise	0.0675	0.2509
F75+	Dummy variable: 1 if female aged 75 or over; 0 otherwise	0.0532	0.2243
M35-44	Dummy variable: 1 if male aged 35-44; 0 otherwise	0.0978	0.2971
M45-54	Dummy variable: 1 if male aged 45-54; 0 otherwise	0.0722	0.2588
M55-64	Dummy variable: 1 if male aged 55-64; 0 otherwise	0.0568	0.2314
M65-74	Dummy variable: 1 if male aged 65-74; 0 otherwise	0.0502	0.2184
M75+	Dummy variable: 1 if male aged 75 or over; 0 otherwise	0.0377	0.1903
Unsch./ Illiterate	Dummy variable: 1 if unschooled or illiterate; 0 otherwise	0.1398	0.3467
Primary ed.	Dummy variable: 1 if primary education; 0 otherwise	0.3096	0.4623
University ed.	Dummy variable: 1 if university education; 0 otherwise	0.1442	0.3513
Disabled pensioner	Dummy variable: 1 if in receipt of a disability pension; 0 otherwise	0.0405	0.1970
Other pensioner	Dummy variable: 1 if in receipt of a retirement, widow or orphan pension; 0 otherwise	0.1857	0.3888
Unemployed	Dummy variable: 1 if unemployed; 0 otherwise	0.0833	0.2764
Inactive	Dummy variable: 1 if inactive; 0 otherwise	0.2877	0.4527
Married	Dummy variable: 1 if married; 0 otherwise	0.5782	0.4938
Widowed	Dummy variable: 1 if widowed; 0 otherwise	0.0748	0.2630
Divorced	Dummy variable: 1 if divorced or legally separated; 0 otherwise	0.0269	0.1619
Region 2	Dummy variable: 1 if resident in Aragon; 0 otherwise	0.0177	0.1317
Region 3	Dummy variable: 1 if resident in Asturias; 0 otherwise	0.0332	0.1792
Region 4	Dummy variable: 1 if resident in Balearic, Is. ; 0 otherwise	0.0256	0.1579
Region 5	Dummy variable: 1 if resident in Canary, Is. ; 0 otherwise	0.0584	0.2345
Region 6	Dummy variable: 1 if resident in Cantabria; 0 otherwise	0.0161	0.1260
Region 7	Dummy variable: 1 if resident in Castile-Mancha; 0 otherwise	0.0588	0.2352
Region 8	Dummy variable: 1 if resident in Castile-Leon; 0 otherwise	0.0503	0.2186
Region 9	Dummy variable: 1 if resident in Catalonia; 0 otherwise	0.1074	0.3096
Region 10	Dummy variable: 1 if resident in C. of Valencia; 0 otherwise	0.1029	0.3038
Region 11	Dummy variable: 1 if resident in Extremadura; 0 otherwise	0.0279	0.1647
Region 12	Dummy variable: 1 if resident in Galicia; 0 otherwise	0.0841	0.2776
Region 13	Dummy variable: 1 if resident in Madrid; 0 otherwise	0.0915	0.2883
Region 14	Dummy variable: 1 if resident in Murcia; 0 otherwise	0.0277	0.1642
Region 15	Dummy variable: 1 if resident in Navarre; 0 otherwise	0.0163	0.1265
Region 16	Dummy variable: 1 if resident in Basque Country; 0 otherwise	0.0626	0.2422
Region 17	Dummy variable: 1 if resident in La Rioja; 0 otherwise	0.0021	0.0462
Region 18	Dummy variable: 1 if resident in Ceuta-Melilla; 0 otherwise	0.0031	0.0558

*Note:* Variable means are computed taking into account sample weights. Education is measured as the highest level of education/professional training completed. Secondary education (omitted category) comprises the 1<sup>st</sup> and 2<sup>nd</sup> cycle of general secondary education, the 2<sup>nd</sup> stage of 2<sup>nd</sup> level of training education and higher professional training. University education includes the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> cycle of university studies or equivalent.

**Table 2. Coefficients, elasticity and concentration indices of depression**

Variables	LPM Coefficient ( $\beta_k$ )	Depression Elasticity ( $\eta_k$ )	CI of Dep. Determinants ( $C_k$ )
Ln (Income)	<b>-0.0164</b>	-1.8081	<b>0.0461</b>
F16-34	0.0051	0.0146	<b>0.0585</b>
F35-44	<b>0.0466</b>	0.0759	<b>0.1263</b>
F45-54	<b>0.0838</b>	0.0989	<b>0.1221</b>
F55-64	<b>0.0930</b>	0.0949	<b>-0.0518</b>
F65-74	<b>0.1014</b>	0.1159	<b>-0.3142</b>
F75+	<b>0.0537</b>	0.0483	<b>-0.4568</b>
M35-44	0.0090	0.0149	<b>0.1384</b>
M45-54	0.0078	0.0096	<b>0.1389</b>
M55-64	<b>0.0245</b>	0.0236	<b>0.0530</b>
M65-74	-0.0062	-0.0053	<b>-0.2187</b>
M75+	-0.0078	-0.0050	<b>-0.2823</b>
Unschooler/Illiter.	<b>0.0284</b>	0.0673	<b>-0.4311</b>
Primary ed.	0.0107	0.0561	<b>-0.1762</b>
University ed.	0.0037	0.0090	<b>0.4850</b>
Disabled pensioner	<b>0.1108</b>	0.0759	<b>-0.2520</b>
Other pensioner	<b>0.0344</b>	0.1082	<b>-0.2737</b>
Unemployed	<b>0.0376</b>	0.0529	<b>-0.1929</b>
Inactive	0.0069	0.0334	<b>-0.1122</b>
Married	0.0050	0.0487	<b>0.0162</b>
Widowed	0.0077	0.0097	<b>-0.3718</b>
Divorced	<b>0.0788</b>	0.0359	-0.0264
Region 2	0.0070	0.0021	-0.0204
Region 3	<b>0.0644</b>	0.0362	<b>0.1382</b>
Region 4	0.0047	0.0020	<b>0.3442</b>
Region 5	0.0106	0.0105	<b>-0.2516</b>
Region 6	-0.0179	-0.0049	<b>0.1622</b>
Region 7	-0.0001	-0.0001	<b>-0.2178</b>
Region 8	0.0104	0.0089	<b>-0.1629</b>
Region 9	0.0020	0.0037	<b>0.1291</b>
Region 10	-0.0042	-0.0072	<b>-0.0218</b>
Region 11	<b>0.0440</b>	0.0208	<b>-0.3669</b>
Region 12	<b>0.0635</b>	0.0904	0.0062
Region 13	-0.0013	-0.0021	<b>0.1842</b>
Region 14	0.0147	0.0069	<b>-0.2725</b>
Region 15	0.0205	0.0056	<b>0.5121</b>
Region 16	-0.0106	-0.0112	<b>0.2601</b>
Region 17	-0.0104	-0.0004	-0.0842
Region 18	-0.0098	-0.0005	-0.3553

Note: Coefficients are the estimates of a (weighted) Linear Probability Model. Coefficients which differ significantly from zero (at  $P < 0.05$ ) are in **bold typeface**. Statistical inference of the coefficients of concentration indices of regressors has been computed by bootstrapping methods.

**Table 3. Income-related inequalities in depression and contributions of determinants in Spain**

Concentration index (CI) of depression	<b>-0.2258</b>	
I*= CI-CI* (Avoidable inequality of depression)	<b>-0.1921</b>	
<hr/>		
<u>Contributions of depression determinants:</u>		<u>Percent</u>
Income	-0.0834	36.9
Demographics	-0.0337	14.9
Marital status	-0.0038	1.7
Education	-0.0345	15.3
Economic activity status	-0.0627	27.8
- Disabled pensioner	-0.0191	8.5
- Other pensioner	-0.0296	13.1
- Unemployed+Inactive	-0.0140	6.2
Region	-0.0077	3.4

Note: Concentration indices coefficients which differ significantly from zero (at P<0.05) are in bold typeface.

## Appendix

### Weighted interval regression for monthly net household income (N=16,167)

Variables	Coefficient	Robust St. Error	Student's t-test
Male	-33.8071	22.62994	-1.49
Age	5.41269	3.79361	1.43
Age squared	-0.0443197	0.033761	-1.31
Primary education	167.6726	19.24396	8.71
Secondary education	444.1993	33.09908	13.42
University education	1159.988	50.54151	22.95
Employed	374.8453	19.40653	19.32
Unemployed	-169.3283	37.01863	-4.57
Private health insurance	353.1323	45.77487	7.71
Region 2 (Aragon)	-98.38965	36.81587	-2.67
Region 3 (Asturias)	95.37578	39.11879	2.44
Region 4 (Balearic Is.)	270.3655	55.24631	4.89
Region 5 (Canary Is.)	-258.9504	35.09579	-7.38
Region 6 (Cantabria)	60.38062	49.72355	1.21
Region 7 (Castile-Leon)	-63.39649	29.31145	-2.16
Region 8 (Castile-Mancha)	-98.54179	37.52982	-2.63
Region 9 (Catalonia)	244.6904	46.28287	5.29
Region 10 (C. of Valencia)	-102.166	32.12069	-3.18
Region 11 (Extremadura)	-128.079	40.59854	-3.15
Region 12 (Galicia)	104.6894	38.31005	2.73
Region 13 (Madrid)	169.7408	44.57129	3.81
Region 14 (Murcia)	-211.5915	36.74214	-5.76
Region 15 (Navarre)	227.3829	49.19828	4.62
Region 16 (Basque Co.)	231.0671	46.03167	5.02
Region 17 (Rioja)	-140.5216	70.46919	-1.99
Region 18 (Ceuta-Melilla)	94.27175	57.37791	1.64
Constant	673.0149	103.8703	6.48
Sigma ( $\sigma$ )	747.4842	17.09564	
Log Pseudo-Likelihood	-47,355,214		

*Note:* Variables are referred to the head of the household. The omitted categories are: female, illiterate/unschooled, inactive, public health insurance and Andalusia.

## References

- Alonso, J and Haro, JM (2000). La epidemiología de los trastornos mentales en España: estudio ESEMED. ESMED project.
- Beck A., Weissman A., Lester D., Trexler L. (1974) "The measurement of pessimism. The Hopelessness Scale", *J Consult Clin Psychol*, 42, pp. 861-865.
- de Leval (1999) "Quality of life and depression: symmetry concepts", *Qual Life Res*, 8, pp. 283-291.
- Easterlin, R. (2003) "Explaining Happiness", Inaugural Article Special Series by Newly Elected Members, National Academy of Sciences, Volume 100(19), September 4, 2003.
- European Commission. *Improving the mental health of the population. Towards a strategy on mental health for the European Union*. Green Paper, COM(2005) 484 final.
- Fiscella, K., Franks P. (1996) "Poverty or Income Inequality as Predictor of Mortality: Longitudinal Cohort Study", *British Medical Journal*, 314 (7096), pp. 1724-1727.
- Frank, R.G., McGuire, T.G. (2000) "Economics and mental health", in Culyer, A.J., Newhouse, J.P. (eds.) *Handbook of Health Economics*, Ch. 16, Vol. 1B, 2000, Elsevier: North Holland.
- García-Gómez P., López, A. (2004a) The evolution of inequity in the access to health care in Spain: 1987-2001, UPF Economics Working Paper 756, 2004.
- García-Gómez, P., López, A. (2004b) Regional differences in socio-economic health inequalities in Spain, UPF Economics Working Paper 757, 2004.
- García-Gómez, P., López, A. (2004c) Socio-economic inequalities in health in Catalonia, UPF Economics Working Paper 758, 2004.
- Gomez-Beneyto M., Asensio A., Berenguer M.J. (1996) "Desinstitucionalización de enfermos mentales crónicos sin recursos comunitarios". In Espinosa, J (ed). *Cronicidad en Psiquiatria*. Madrid, Mayoría editorial.
- Hirsch, S. (1998) *Psychiatry beds and resources: factors influencing bed use and service planning*. Royal College of Psychiatrist, 1998, London.
- Holzinger, A., Matschinger, H., Stengler-Wenzke, K. (2002) "Depression and quality of life: results of a follow-up study", *International Journal of Social Psychiatry*, 48(3), pp. 189-199.
- Jenkins, S. (1998) "Calculating income distribution indices from micro-data", *National Tax Journal*, 41(1), pp. 139-142.
- Kahn RS, Wise PH, Kennedy BP, Kawachi I. (2000) "State Income Inequality, Household Income, and Mammal Mental and Physical

- Health: Cross Sectional National Survey”, *British Medical Journal*, 321 (7272), pp. 1311-1315.
- Kakwani, N.C., Wagstaff, A., Van Doorslaer E. (1997) “Socioeconomic inequalities in health: measurement, computation and statistical inference”, *Journal of Econometrics*, **77**(1), pp. 87-104
- La Gory, M., Fitzpatrick, K. (1992) “Effects of Environmental Context on Elderly Depression”, *Journal of Aging and Health*, 4(4), pp. 459-79.
- Lorant V, Delière D, Eaton W, Robert A, Philippot P, Ansseau M. (2003) “Socio-economic Inequalities in Depression: A Meta-Analysis”, *Am J Epidemiol*, 157, pp. 98-112.
- Ministry of Health and Consumer Affairs – MHCA. Encuesta Nacional de Salud 2003. Tablas con Resultados Nacionales y Autonómicos (available at <http://www.msc.es>), 2005.
- Montero I, Aparicio D, Gomez-Beneyto M, Moreno-Küstner B, Reneses B, Usall J, Vazque-Barquero J.L. (2004) “Género y salud mental en un mundo cambiante”, *Gaceta Sanitaria*, 18 (supl.1), pp. 175-81.
- Muramatsu N. (2003) “County-level income inequality and depression among older Americans: Empirical analyses”, *Health Service Research*, 38(6), Part II, pp. 1863-1883.
- Murray C. Lopez JJ. (1994) Global comparative assessment in the health sector. Disease burden, expenditures and intervention packages. Geneva, 1994: World Health Organisation.
- Rajmil, L, Gispert, R, Roset, M, Muñoz, P.E, Segura, A, (1998) “Prevalence of mental disorders in the general population of Catalonia”, *Gaceta Sanitaria*, 12, pp. 153-159.
- Scheffler, R.M (1999). “Managed Behavioral Health Care and Supply-Side Economics,” *Journal of Mental Health Policy and Economics* 2 (1): 21–28.
- Scheffler R, Zhang A, Snowden L. The impact of realignment on utilization and cost of community-based mental health services in California. *Adm Policy Ment Health* 2001 Nov; 29(2):129-43.
- Van Doorslaer E, Koolman X. (2004) “Explaining the differences in income-related health inequalities across European countries”, *Health Economics*, 13, pp. 609-628.
- Van Doorslaer E, Koolman X, Masseria C. (2004) Equity in the delivery of inpatient care in the European Union: A pooled analysis, Equity Project III, Working Paper 13, 2004. Department of Health Policy and management, Erasmus University, Rotterdam.
- Wagstaff A, Van Doorslaer E. (2000) “Income Inequality and Health: What Does the Literature Tell Us?”, *Annual Review of Public Health*, 21, pp. 543-67.
- Wagstaff, A., Van Doorslaer, E. and Watanabe, N. (2003) On decomposing the causes of health sector inequalities with an application to

- malnutrition inequalities in Vietnam, *Journal of Econometrics*, 112, pp. 207-223.
- Weissman M, Bland R, Joyce RP, Newman S, Wells JE, Wittchen HU. (1993) “Sex differences in rates of depression: cross-national perspectives”, *Journal of Affective Disorders*, 29, pp. 77-84.
- Wildman, J. (2003) “Income related inequalities in mental health in Great Britain: Analyzing the causes of health inequality over time”, *Journal of Health Economics*, 22, pp. 295–331.
- Wilkinson RG. (1996) *Unhealthy Societies: The Afflictions of Inequality*, London: Routledge, 1996.
- World Health Organization–WHO. *World Health Report 2001*, (<http://www.who.int/whr/2001>), WHO, Geneva, 2001.
- World Health Organization–WHO. *Investing in Mental Health*. WHO, Geneva, 2003.
- Zimmerman FJ, Katon W. (2005) “Socio-economic status, depression disparities and financial strain: what lies behind the income–depression relationship?”, *Health Economics*, 14(12), pp. 1197-1215.