Cite this article as:
Doménech-Abella, J., Mundó, J., Moneta, M.V. et al. Soc Psychiatry Psychiatr Epidemiol (2018) 53: 259. https://doi.org/10.1007/s00127-018-1480-7

**Title**

# The impact of socioeconomic status on the association between biomedical and psychosocial well-being and all-cause mortality in older Spanish adults.

**Authors**

Joan Doménech-Abella[1,2,3], Jordi Mundó[3] , Maria Victoria Moneta[1,2], Jaime Perales[6] , José Luis Ayuso-Mateos[2,4,5] , Marta Miret[2,4,5] , Josep Maria Haro[1,2,5], Beatriz Olaya[1,2]

1. Research, Innovation and Teaching Unit, Parc Sanitari Sant Joan de Déu, Universitat de Barcelona, Fundació Sant Joan de Déu, Sant Boi de Llobregat, Barcelona, Spain.

2. Instituto de Salud Carlos III, Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Madrid, Spain.

3.Department of Sociology, Universitat de Barcelona, Barcelona, Spain.

4. Department of Psychiatry, Universidad Autónoma de Madrid, Madrid, Spain.

5. Department of Psychiatry, Instituto de Investigación Sanitaria Princesa (IIS Princesa), Hospital Universitario de La Princesa, Madrid, Spain.

6. University of Kansas Medical Center, Department of Preventive Medicine and Public Health, Kansas City, KS, USA.

*Corresponding author:

Joan Domènech-Abella, MSc Research, Innovation and Teaching Unit, Parc Sanitari, Sant Joan de Déu.

Dr. Antoni Pujadas, 42, Sant Boi de Llobregat, Barcelona, Spain

E-mail: j.domenech@pssjd.org

Tel: (+34) 93 556 96 77; Fax: (+34) 93 652 00 51

**Abstract**

*Purpose* The aim of this paper was to analyze the effect of biomedical and psychosocial well-being, based on distinct successful aging models (SA), on time to mortality and determine whether this effect was modified by socioeconomic status (SES) in a nationally representative sample of older Spanish adults.

*Methods* Data were taken from a 3-year follow-up study with 2,783 participants aged 50 or over. Vital status was ascertained by using national registers or asking participants' relatives. Kaplan-Meier curves were used to estimate the time to death by SES, and levels of biomedical and psychosocial SA. Cox proportional hazard regression models were conducted to explore interactions between SES and SA models while adjusting for gender, age and marital status.

*Results* Lower levels of SES and biomedical and psychosocial SA were associated with low probability of survival. Only the interaction between SES and biomedical SA was significant. Biomedical SA impacted on mortality rates among individuals with low SES but not on those with medium or high SES, whereas psychosocial SA affected mortality regardless of SES.

*Conclusions* Promoting equal access to health care system and improved psychosocial well-being could be a protective factor against premature mortality in older Spanish adults with low SES.

**Keywords**

Successful aging; biomedical well-being; psychosocial well-being; socioeconomic status; survival analysis; Spain.

## Introduction

Socioeconomic status (SES) includes the social and economic factors that determine the hierarchical position of an individual in society [1]. SES has been demonstrated to predict all-cause mortality [2], as well as that from specific causes, such as cardiovascular disease [3] or cancer [4]. The association between SES and health or premature mortality has been explained by multiple mechanisms corresponding to certain theories: an increased risk in unhealthy life styles (behavioral); unequal access to the health care system and particular exposure to material deprivation (materialist); differing likelihood of isolation and lack of engagement in social networks (psychosocial); and damaging agents in the environment leading to illness according to SES (biomedical) [5]. In addition, life course theories propose that inequalities on health are partly attributable to the accumulation of hazard exposures [6].

Several studies on socioeconomic differences in mortality focused on the analysis of specific psychosocial, biomedical, behavioral and material factors as mediators in the association between SES and mortality and obtained significant results [7–9]. Material factors were revealed as the most important mediators between SES and mortality. Among material factors, inequality in access to the health care system could explain differences in mortality among people with similar diseases and risk behaviors according to SES. This is in line with studies showing that mortality rates from preventable diseases were found to be more strongly associated with lower SES than death from less preventable diseases [10] and other studies suggesting that the association between low SES and mortality remains after controlling for risk behaviors [2], psychological distress [11] or specific diseases such as acute myocardial infarction [12].

Less well understood are socioeconomic differences in mortality interacting with general measures of biomedical and psychosocial well-being simultaneously, despite the fact that greater understanding of this aspect could help explain the effect of SES on mortality. Successful aging (SA) models appear as useful general indicators of biomedical and psychosocial well-being among older adults since definitions of SA derive from biomedical and psychosocial perspectives related to the notion of "aging well" [13].

Five broad categories of SA components have recently been proposed: physiological status (physical and mental health and behavioral risk factors), commitment (social participation), well-being (satisfaction with life), personal resources (resilience and autonomy) and external factors (socioeconomic indicators) [14]. Physiological status and personal resources constitute the biomedical model whereas commitment and well-being form the psychosocial model [15, 16]. However, external factors, such SES, are not considered in these models, even though they seem to affect all SA components [17]. SES has been associated with physical health [18], mental health [19] and psychosocial well-being [20] while psychosocial wellbeing has also been found to be a protective factor for health among individuals with low SES [18].

SA models as predictors of mortality have been tested and have shown significant results [21]. However, the existing literature does not indicate whether biomedical and psychosocial SA predicts mortality differently according to SES. The aim of the present study was to investigate whether SES and biomedical and psychosocial models of SA significantly affect the survival of people aged 50 and over from a representative sample of Spanish older adults. We also aimed to determine whether SES moderated the effect of the SA models on the probability of survival. Based on the existing literature, we hypothesized that low SES and lower levels of biomedical and psychosocial SA would be significant predictors of mortality in a 3-year follow-up. We also expected to find that survival time among people with poor levels of biomedical SA would be shorter for those with low SES whereas psychosocial SA could be a protective factor for mortality among these individuals.

## Methods

### Study design

This study was part of the Collaborative Research on Ageing in Europe (COURAGE in Europe) project [22], a longitudinal survey of the non-institutionalized adult population (≥18 years). In Spain, the first wave was conducted between July, 2011 and May, 2012 and the second wave between December, 2014 and June, 2015.

Initially, a total of 4,753 participants were interviewed, 962 aged 18–49, 3,312 aged 50–79 and 479 aged 80 and over. To achieve appropriate representation of the Spanish population, a stratified multistage clustered area probability method was used. Age cohorts 50-79 and 80 and over were oversampled, given that these individuals were the main study target. The individual response rate was 69.9% in wave 1 and 69.5% in wave 2.

Face-to-face structured interviews were carried out by lay, trained interviewers at respondents' homes using Computer-Assisted Personal Interviewing (CAPI). The survey questionnaire was originally developed in English and then translated into Spanish following World Health Organization translation guidelines for assessment instruments [23]. Quality assurance procedures were implemented during fieldwork. During wave 1, participants with severe cognitive impairment, judged at the interviewer´s discretion or based on a previous diagnosis of dementia, were not interviewed and a shorter version of the questionnaire was administered to proxy respondents.

Vital status and date of death was ascertained for all participants just before the second wave took place, using data from the National Death Index, a civil registry with data on the vital status of all residents in Spain. Vital status was also updated during the household visit in the wave 2 assessment by asking respondents' relatives. A final update was conducted on June 30th, 2015 by consulting the National Death Index.

The present analysis focused on people aged 50 or older at baseline. We also excluded those participants with missing values in one or more of the variables used at baseline, resulting in a final sample of 2,783 participants. Sampling weights were used to compensate for the survey design and non-response in the follow-up assessment, so that the results were representative of the Spanish population [24].

**Ethics statement**

Ethical approval for the COURAGE study Spain was provided by Parc Sanitari Sant Joan de Déu, Barcelona, Spain, and Hospital la Princesa, Madrid, Spain. Written informed consent was obtained from participants.

**Measurements**

**Control variables**

Participants were asked to provide the following socio-demographic data: age, sex, household size, marital status (never married, currently married/cohabiting, separated/divorced, and widowed), and labor situation (working, retired/disabled, homemaker/unpaid work, and unemployed). Household size, marital status and labor situation were selected as control variables because they have previously been used by researchers to measure household income, or as confounding variables in the association between income and health outcomes among older adults" [25-27].

***Biomedical variables***

Chronic medical conditions in the previous 12 months were based on self-report diagnoses of chronic lung disease, asthma, hypertension, arthritis, stroke, angina pectoris, and diabetes. Additionally, a symptom algorithm was used to detect non-diagnosed cases of arthritis, stroke, angina, chronic lung disease, and asthma [28]. For diabetes, only a self-reported diagnosis was used. The presence of hypertension was based on self-reported diagnosis or presence of systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg [28, 29]. The 12-item interviewer-administered version of the World Health Organization Disability Assessment Schedule version II (WHODAS-II) (World Health Organization, 2012) was used to assess disability. Participants were asked to report the level of difficulty they had in performing various activities such as dressing or concentrating during the previous 30 days using a five-point scale (none = 1, mild = 2, moderate = 3, severe = 4, and extreme/cannot do = 5). The total score ranges from 0 to 100 with higher scores indicating greater disability.

An adapted version of the Composite International Diagnostic Interview (CIDI 3.0) was used to assess the presence of depression in the previous 12 months [30]. An algorithm based on the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders was used [31]. Cognitive functioning was assessed using five performance tests measuring three domains: learning and short-term memory, working memory and verbal fluency. A composite of these five scores was calculated [32]. The total score ranges from 0 to 100 with higher scores indicating better cognition.

Tobacco consumption was assessed by asking whether participants were daily smokers, non-daily smokers, former smokers, or had never smoked. Alcohol consumption was assessed by asking whether participants were lifetime abstainers, and if not, the pattern of alcohol consumption in the previous week. They were then classified as lifetime abstainers; occasional drinkers (no consumption in previous 7 days); non-heavy drinkers (consumed alcohol in previous 7 days); and heavy drinkers (consumed alcohol >1-2 days per week, with 5 or more standard drinks in past 7 days for men and 4 or more for women).

Physical activity was measured using the Global Physical Activity Questionnaire [33].Three categories were created to indicate levels of physical activity [34]: a) High (including vigorous activity on at least 3 days, representing a minimum of at least 1,500 MET-minutes per week or 7 or more days of any combination of walking, moderate or vigorous activities representing a minimum of at least 3,000 MET-minutes per week); b) Moderate (3 or more days of vigorous activity for at least 20 minutes per day or 5 or more days of moderate activity or walking for at least 30 minutes per day or 5 or more days of any combination of walking, moderate or vigorous activities reaching a minimum of 600 MET-minutes per week); and c) Low (a person not meeting any of the above-mentioned criteria).

***Psychosocial variables***

Social participation was measured using 11, five-point Likert-scale questions ranging from never to daily on how often in the previous 12 months the person had participated in activities such as attendance at public meetings, meetings with community leaders or at any group or organizational meeting, visiting sport clubs, taking part in competitions or doing sport with someone else, working with people from the neighborhood to fix or improve something, having friends over, visiting or hosting someone who lives in a different neighborhood and getting out to take part in social meetings. Social contacts were measured using 10, five-point Likert scale questions ranging from never to daily on how often in the previous 12 months the person had had contact with other people such as their partner, children, or neighbors.

Social support was measured using the Oslo social support scale [35]. This scale consists of three items: "*How many people are you so close to that you can count on them if you have great personal problems?* [from none (1) to more than five (4)]", "*How much interest and concern do people show in what you do?* [from a lot (1) to none (5)]", and *"How easy is it to get practical help from neighbors if you should need it?* [from very easy (1) to very difficult (5)]". A composite score was calculated as the sum of the three items, ranging from 3 to 14. Due to its high skewness, the median of the sample was used to categorize people into low (<12) or high social support (≥12) [15].Self-rated quality of life was measured with a single five-point Likert scale question with responses on a range from very good to very bad. Control and coping were measured using a five-point Likert scale question with responses ranging from never to very often on how frequently in the previous two weeks the participants had been unable to control important things in their lives and to cope with things they had to do.

***SA models***

The indicators used for the construction of the distinct SA models were selected on the basis of previous literature [14, 37, 38] and their operationalization has been previously reported [15]. Specifically, the following models and indicators were considered: i) biomedical: requiring no presence of any chronic medical conditions, a score below the median on the WHODAS-II (i.e., from 0 to 3), a value equal to or above the median in the cognition composite score (i.e., from 51 to 100), no presence of depression in the previous 12 months, not being a current smoker, being an occasional drinker or lifetime abstainer and being engaged in moderate or high physical activity. Biomedical SA scores can range from 0 to 7; ii) psychosocial: requiring engagement in three or more separate social activities at least once a month, three or more social contacts with at least one month of frequency, a score ranging from 12 to 14 ($90^{th}$ percentile) on the Oslo social support scale, good or very good self-reported quality of life, never or almost never unable to control important things in life, and never or almost never unable to cope with things they have to do. Psychosocial SA scores range from 0 to 6. In both cases higher scores indicate better SA.

***Socio-economic status***

SES has traditionally been determined through information on education, occupation and household income [39, 40]. However, there was a large number of participants in our study who were retired (39.8%) and thus, we opted for a resource-based measure of SES (including measures of educational attainment, total family income, labor market earnings, wealth, and SES composite scores) rather than an occupational prestige-based measure [39, 40]. An SES index based on education and household income has also been previously used as a proxy for individual location in occupational structure [41].

SES was calculated by taking into account the total number of years of education (0–22) and the quintiles of household income level (1–5) [42]. These two variables were multiplied to create scores from 0 to 55 and totaled to obtain combined scores ranging from 0 to 110, which were then categorized as 'low', 'medium' and 'high' using tertiles as cut-off points. It is not unusual in the quantification of SES for only two of its components to be combined depending on the age group of the participants [43, 44].

***Statistical analysis***

Unweighted frequencies and means were used for descriptive analyses. Deceased and living participants were compared using the Rao-Scott chi-square test for categorical variables and one-way ANOVA test for continuous variables.

Mortality was the outcome for these analyses. Kaplan-Meier survival curves were used to estimate the time to death (from the first interview). Participants who were alive at the end of the observational period ($30^{th}$ of June 2015) were censored. Graphics showed the time to death by levels of SES, biomedical and psychosocial SA and the differences between distinct categories were tested using the Log-Rank test.

Cox proportional hazards regression models were conducted to explore the interactions between biomedical SA and SES, and psychosocial SA and SES. These models were further adjusted for control variables. Only the interaction between biomedical SA and SES reached significance ($p$<0.05) and it was, therefore, included in the adjusted model to estimate the effect of SES on all-cause mortality. Finally, Kaplan-Meier survival curves were used to estimate the time to death depending on biomedical levels stratified by SES.

SA models were operationalized as continuous variables for the regression models whereas the scores were categorized in quartiles for Kaplan-Meier survival curves. All analyses were performed using Stata version 13 for Windows (SE version 13, College Station, TX) taking into account the complex sampling design. Weights were used to adjust for differential probabilities of selection within households, and post-stratification corrections to the weights were made to match the samples to the socio-demographic distributions of the Spanish population. Statistical significance was set at $p<0.05$.

**Results**

Table 1 shows the baseline characteristics of the total sample and the participants who died or remained alive during the follow-up. A total of 139 (4.9%) of the 2,783 participants had died by the end of the follow-up.  Females accounted for 54.6% of the whole sample and the mean age was 66.4 years (95% CI 65.8, 67.0). There were significant differences between deceased and living participants in terms of socio-demographic variables and psychosocial and biomedical successful aging measures. Deceased participants were more likely to be men, retired or disabled, living alone, widowed and with lower means in biomedical and psychosocial SA scores. However, there were no significant differences between the deceased and the living in terms of SES.

Table 2 shows unadjusted and adjusted Cox proportional regression models. In the unadjusted model, similar results to those obtained in descriptive analysis were found although greater likelihood of survival was significantly associated with high SES. Before performing the adjusted model shown in Table 2, we observed that the biomedical SA x SES interaction term was significant ($p=0.046$). Thus, the significant interaction was included in the final adjusted model. People who had lower levels of psychosocial SA were more prone to die, independently of other covariates, whereas the impact of biomedical SA on mortality depended on SES as indicated by the significant interaction. Additional adjusted models were run separately for people with high (*n*=892), medium (*n*=945) and low (*n*=946) SES (data not shown) according to which biomedical SA impacted on time to death among people with low SES (HR=0.6, 95% CI 0.50, 0.89 $p<0.05$) but not among those with medium (HR=1.03, 95% CI 0.84, 1.27 $p>0.05$) or high (HR=0.90, 95% CI 0.64, 1.26 $p>0.05$) SES.

The adjusted Cox proportional regression model also showed that, after adjusting by SES and remaining covariates, marital status showed a significant effect on mortality in which separated and divorced individuals have a greater likelihood of mortality whereas significant effect of labor situation and household size on mortality was not found. In the Kaplan-Meier analysis, lower levels of SES and biomedical and psychosocial SA were found to have a significant negative effect on survival (Figure 1). Figure 2 shows the survival curves as a function of biomedical SA stratified by SES levels. The probability of surviving to the end of the study was significantly lower among people with the lowest levels of SES and biomedical SA. Among people with medium SES, being in the second quartile of biomedical SA was related to a significantly lower probability of remaining alive, whereas in the high SES level, there were no significant differences between participants with distinct levels of biomedical SA in terms of survival.

## **Discussion**

To the best of our knowledge, the present study is the first to compare the ability to predict mortality between biomedical and psychosocial well-being through SA models, and how socioeconomic status (SES) modifies those predictions. Our results show that psychosocial and biomedical well-being as well as SES predict mortality over 3-year of follow-up in a representative sample of older people (aged 50 years and older) in Spain after adjusting for multiple covariates. In the case of the biomedical model, the association was modified by SES. Our results confirm the hypothesis that having lower levels of SA, according to a biomedical model, is related to significantly shorter survival time than older adults with higher successful aging only when their SES is low, whereas successful aging, according to the psychosocial model, is related to survival but is not modified by SES levels.The association between lower SES and biomedical factors, such as poorer physical and mental health, has been explained through multiple specific factors from material, psychosocial, behavioural and biomedical theories. For instance, debt has been found to be one of the major risk factors for common mental disorders [45], job loss has been associated with increased depressive symptoms in the United States and Europe [46], permanent income shocks lead to poorer health behavior [47] and income inequality is closely related to poor health status as increased social inequalities accentuate SES differences [48]. However, these factors would explain the association between lower SES and higher ratios of mortality [2] but not why the effect of biomedical well-being in older adults on time to death differs according to their SES levels.

Our findings suggest that socioeconomically advantaged older Spanish adults are more likely to survive despite not meeting all the criteria for successful aging Differences in access to health care according to SES could explain these results [5]; socially advantaged people might have private insurance which would ensure better access to health treatment and therefore increase their probability of survival. Inequalities in health access could have been exacerbated by the recent financial crisis in Europe and subsequent austerity policies. Although Spain has universal health coverage, a recent study on the impact of the financial crisis on health care systems in three European countries (UK, Germany and Spain) showed that Spain was the country most heavily affected by this crisis, as there have been more drastic cuts along with increases in copayment, exclusion from coverage, and cuts in staff expenditure [49]. Countries such as Greece, Spain and Portugal adopted strict fiscal austerity measures and their economies continue to shrink, placing further strain on their health care systems while suicides and infectious diseases become more common [50].

Exclusion from Health Service coverage could explain how the uninsured are at greater risk of suffering medical injury due to substandard medical care [51]. Among the elderly in Spain, these differences in access to health services by SES were confirmed by a cross-sectional study in 2 phases (2006-2012) showing a decrease in the use of health services. The same study also found that older adults with low SES used primary care services more often whereas the utilization of specialized care was greater among the elderly with high SES levels [52]. In contrast, we found that SES does not modify the impact of psychosocial well-being on mortality. Conversely, a previous study on the association between SES and health showed that psychosocial factors could be a protective factor for physical illness among people with low SES [18]. There is also evidence that poor neighborhoods have a higher incidence of health problems [53], although research suggests that the beneficial effects of social capital on mental health are stronger in vulnerable neighborhoods [54]. However, our results suggest that psychosocial factors would be protective against premature death in all social strata, irrespective of their SES level. Similarly, previous research has shown that high social support can increase survival of chronically ill older adults [55], showing the value of improving social connections as part of potential treatment programs for the elderly.

**Study strengths and limitations**

Strengths of this study include the use of a large nationally-representative sample of older adults with a heterogeneous socio-economic background, the inclusion of covariates, and the longitudinal design that enables us to examine time relationships. However, we need to consider several limitations associated with these findings. First, comparability across studies is difficult given the measurement inconsistencies among them. Second, SES information was missing in about 15% of participants. Results might have been different if these people had been included in the analysis. However, we did not find significant socio demographic differences between those included or excluded. Third, some of the variables were collected retrospectively through self-report, which may result in recall or reporting bias although it should be pointed out that most epidemiological studies have used self-reported data, and recall biases are usually considered minor [56]. Fourth, educational level and household income could have been used independently in the adjusted models. However, the use of composites scores may enhance the adjustment of measurement errors and the estimation of causal effects [57]. Finally, the follow-up period was short and results could vary with a longer follow-up. Moreover, it is possible that poor health status prior to the survey leads to low levels of income, or that the alleged relationship between SES and mortality is confounded by some unobserved factors. Future studies in different settings and countries are needed to replicate our findings on the role of socioeconomic conditions on the well-being of older people.

## Conclusions

The results of this study suggest that both biomedical and psychosocial well-being affect mortality in older adults and therefore they should be addressed as complementary. People with low SES are especially vulnerable to mortality if suffering from poor health status, whereas having an high SES might buffer this effect. Therefore, policies designed to close the social inequality gap would have an enormous impact on the quality of life and survival of older people. Our findings also suggest that improvement of social life among the elderly would contribute to improving life expectancy in general, regardless of the socio-economic position.

The adoption of austerity policies in response to the financial crisis affecting Europe, and especially countries such as Ireland, Greece, Portugal and Spain, are increasing inequalities in access to health care systems [58]. In the case of Spain, the recent implementation of reforms in the health system, such as the introduction of co-payments [59], might aggravate this situation. Future studies should specifically address the real impact of these policies on health, especially among the most disadvantaged classes.

**Acknowledgments**

This work was supported by the European Community's Seventh Framework Programme [grant number 223071-COURAGE Study]; the Instituto de Salud Carlos III-FIS [grant numbers PS09/00295, PS09/01845, PI12/01490, and PI13/00059 [Projects PI12/01490 and PI13/00059 were co-funded by the European Union European Regional Development Fund (ERDF) "A Way to Build Europe"]; the European Union's Horizon 2020 Research and Innovation Programme [grant agreement 635316]; and the Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Instituto de Salud Carlos III. Data on households were provided by the Spanish Statistical Office. Joan Domènech-Abella's work is supported by the FPU predoctoral grant (FPU16/05209) from the Spanish Ministry of Education, Culture and Sports. We thank Stephen Kelly for help in English language editing.

**Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**References**

1. Lynch J, Kaplan GA (2000) Socioeconomic position. In: Berkman L, Kawachi I (eds) Soc. Epidemiol., Oxford. New York, pp 13–35
2. Lantz PM, Golberstein E, House JS, Morenoff J (2010) Socioeconomic and behavioral risk factors for mortality in a national 19-year prospective study of U.S. adults. Soc Sci Med 70:1558–66.

3. Fried LP, Kronmal RA, Newman AB, et al. (1998) Risk factors for 5-year mortality in older adults: the Cardiovascular Health Study. JAMA 279:585–92.

4. Faggiano F, Partanen T, Kogevinas M, Boffetta P (1997) Socioeconomic differences in cancer incidence and mortality. IARC Sci Publ 65–176.

5. Adler NE, Newman K (2002) Socioeconomic disparities in health: pathways and policies. Health Aff (Millwood) 21:60–76.

6. Blane D, Smith GD, Bartley M (1993) Social selection: what does it contribute to social class differences in health? Sociol Heal Illn 15:1–15.

7. van Oort FV a, van Lenthe FJ, Mackenbach JP (2005) Material, psychosocial, and behavioural factors in the explanation of educational inequalities in mortality in The Netherlands. J Epidemiol Community Health 59:214–220.

8. Skalická V, Van Lenthe F, Bambra C, Krokstad S, & Mackenbach J (2009) Material, psychosocial, behavioural and biomedical factors in the explanation of relative socio-economic inequalities in mortality: evidence from the HUNT study. *International journal of epidemiology*, *38*(5), 1272-1284.

9. Schrijvers CT, Stronks K, van de Mheen H D, Mackenbach J P (1999) Explaining educational differences in mortality: the role of behavioral and material factors. *American Journal of Public Health*, *89*(4), 535-540.

10. Phelan JC, Link BG, Diez-Roux A, et al (2004) "Fundamental causes" of social inequalities in mortality: a test of the theory. J Health Soc Behav 45:265–85.

11. Lazzarino AI, Hamer M, Stamatakis E, Steptoe A (2013) The combined association of psychological distress and socioeconomic status with all-cause mortality: a national cohort study. JAMA Intern Med 173:22–7.

12. Van Oeffelen AAM, Agyemang C, Bots ML, et al (2012) The relation between socioeconomic status and short-term mortality after acute myocardial infarction persists

in the elderly: Results from a nationwide study. Eur J Epidemiol 27:605–613.

13. Bowling A, Dieppe P (2005) What is successful ageing and who should define it? BMJ 331:1548–1551.

14. Cosco TD, Prina  a M, Perales J, et al (2013) Operational definitions of successful aging: A systematic review. Int Psychogeriatrics 26:1–9.

15. Perales J, Martin S, Ayuso-Mateos JL, et al (2014) Factors associated with active aging in Finland, Poland, and Spain. Int Psychogeriatr 1–13.

16. Domènech-Abella J, Perales J, Lara E, et al (2017) Sociodemographic Factors Associated With Changes in Successful Aging in Spain: A Follow-Up Study. J Aging Health 89826431771432.

17. Jang S, Choi Y, Kim D (2009) Association of Socioeconomic Status With Successful Ageing: Differences in the Components of Successful Ageing. J.biosocSci 41:207–219.

18. Chen E, Miller GE (2013) Socioeconomic status and health: Mediating and moderating factors. Annu Rev Clin Psychol 9:723–49.

19. Hudson CG (2005) Socioeconomic Status and Mental Illness: Tests of the Social Causation and Selection Hypotheses. Am J Orthopsychiatry 75:3–18.

20. Pinquart M, Sörensen S (2000) Influences of socioeconomic status, social network, and competence on subjective well-being in later life: A meta-analysis. Psychol Aging 15:187–224.

21. Gu D (2015) Concordance and discordance between objectively and subjectively measured successful aging and their linkages with mortality. Int J Popul Stud 1:29–41.

22. Leonardi M, Chatterji S, Koskinen S, et al (2014) Determinants of Health and Disability in Ageing Population: The COURAGE in Europe Project (Collaborative Research on Ageing in Europe). Clin Psychol Psychother 21:193–198.

23. Üstun TB, Chatterji S, Mechbal A, Murray CJL (2005) Quality assurance in surveys:

standards, guidelines and procedures. Househ Sample Surv Dev Transit Ctries 199–230.

24. Moussavi S, Chatterji S, Verdes E, et al (2007) Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet (London, England) 370:851–8.

25. Grundy E, Holt G (2001) The socioeconomic status of older adults: How should we measure it in studies of health inequalities?. J Epidemiol Community Health. 55:895-904.

26. Darin-Mattsson A, Fors S, Kåreholt I (2017) Different indicators of socioeconomic status and their relative importance as determinants of health in old age. Int J Equity Health 16: 173.

27. Dowd JB, Zajacova A (2007) Does the predictive power of self-rated health for subsequent mortality risk vary by socioeconomic status in the US? Int J Epidemiol 36:1214–1221.

28. Garin N, Koyanagi A, Chatterji S, et al (2016) Global Multimorbidity Patterns: A Cross-Sectional, Population-Based, Multi-Country Study. J Gerontol A Biol Sci Med Sci 71:205–14.

29. Basu S, Millett C (2013) Social Epidemiology of Hypertension in Middle-Income CountriesNovelty and Significance. Hypertension 62:18–26.

30. Mancia G, Fagard R, Narkiewicz K, et al (2013) 2013 ESH/ESC Guidelines for the management of arterial hypertension. J Hypertens 31:1281–1357.

31. Haro JM, Arbabzadeh-Bouchez S, Brugha TS, et al (2006) Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health Surveys. Int J Methods Psychiatr Res 15:167–180.

32. American Psychiatric Association (1994) Diagnostic and statistical manual of mental disorder (4th ed.), DC: Author. Washington

33. He, W., Muenchrath, M. N., & Kowal, P. R. (2012). Shades of gray: a cross-country study of health and well-being of the older populations in SAGE countries, 2007-2010. US Department of Commerce, Economics and Statistics Administration, US Census Bureau.

34. Armstrong T, Bull F (2006) Development of the World Health Organization Global Physical Activity Questionnaire (GPAQ). J Public Health (Bangkok) 14:66–70.

35. Global Physical Activity Questionnaire (GPAQ) Analysis Guide. www.who.int/chp/steps. Accessed April 25, 2017

36. Bøen H, Dalgard O, Bjertness E, et al (2012) The importance of social support in the associations between psychological distress and somatic health problems and socio-economic factors among older adults living at home: a cross sectional study. BMC Geriatr 12:27.

37. Cosco TD, Prina AM, Perales J, et al (2013) Lay perspectives of successful ageing: a systematic review and meta-ethnography. BMJ Open 3:196–200.

38. Cosco TD, Matthew Prina A, Perales J, et al (2014) Whose“ successful ageing”?: lay- and researcher-driven conceptualisations of ageing well. Eur J Psychiatry 28:124–130.

39. Krieger N, Williams DR, Moss NE (1997) Measuring Social Class in US Public Health Research: Concepts, Methodologies, and Guidelines. Annu Rev Public Health 18:341–378.

40. Diemer MA, Wadsworth ME, Irene L, Reimers F (2013) Best Practices in Conceptualizing and Measuring Social Class in Psychological Research.

41. Blishen BR, Carroll WK, Moore C (1987) The 1981 socioeconomic index for occupations in Canada. Can Rev Sociol 24: 465-488.

42. Freeman A, Tyrovolas S, Koyanagi A, et al (2016) The role of socio-economic status in depression: results from the COURAGE (aging survey in Europe). BMC Public Health 16:1098.

43. Katsarou A, Tyrovolas S, Psaltopoulou T, et al (2010) Socio-economic status , place of residence and dietary habits among the elderly: the Mediterranean islands study. Public Health Nutr 13:1614–1621.

44. Lidfeldt J, Li TY, Hu FB, et al (2007) A Prospective Study of Childhood and Adult Socioeconomic Status and Incidence of Type 2 Diabetes in Women. Am J Epidemiol

45. Meltzer H, Bebbington P, Brugha T, et al. (2013) The relationship between personal debt and specific common mental disorders. Eur. J. Public Health 23:108-113

46. Riumallo-Herl C, Basu S, Stuckler D, et al (2014) Job loss, wealth and depression during the Great Recession in the USA and Europe. Int J Epidemiol 43:1508–1517.

47. Adda J, Banks J, von Gaudecker H-M (2009) The Impact of Income Shocks on Health: Evidence from Cohort Data. J Eur Econ Assoc 7:1361–1399.

48. Pickett KE, Wilkinson RG (2015) Income inequality and health: A causal review. Soc Sci Med 128:316–326.

49. Giovanella L, Stegmüller K (2014) The financial crisis and health care systems in Europe: universal care under threat? Trends in health sector reforms in Germany, the United Kingdom, and Spain. Cad Saude Publica 30:2263–2281.

50. Karanikolos M, Mladovsky P, Cylus J, et al (2013) Financial crisis, austerity, and health in Europe. Lancet 381:1323–1331.

51. Burstin HR, Lipsitz SR, Brennan TA (1992) Socioeconomic status and risk for substandard medical care. JAMA 268:2383–7.

52. Aguilar-Palacio I, Carrera-Lasfuentes P, Solsona S, et al (2016) [Health-care utilization in elderly (Spain 2006-2012): Influence of health status and social class]. Aten primaria

48:235–43.

53. Stafford M, De Silva M, Stansfeld S, Marmot M (2008) Neighbourhood social capital and common mental disorder: Testing the link in a general population sample. Health Place 14:394–405.

54. Marmot M, Bell R (2012) Fair society, healthy lives. Public Health 126:S4–S10.

55. Olaya B, Domènech-abella J, Victoria M, et al (2017) All-cause mortality and multimorbidity in older adults : The role of social support and loneliness. Exp Gerontol 99:120–126.

56. Kriegsman DMW, Penninx BWJH, Van Eijk JTM, et al (1996) Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly. J Clin Epidemiol 49:1407–1417.

57. Liang J, Lawrence R H, Bennett, JM, Whitelaw N A (1990) Appropriateness of composites in structural equation models. J Gerontol. 45: S52-S59.

58. McKee M, Karanikolos M, Belcher P, Stuckler D (2012) Austerity: a failed experiment on the people of Europe. Clin Med 12:346–50.

59. Aznar-Lou, I (2017) [The problem of non-initiation of drug treatment: evaluation with quantitative methods]. Article in Spanish (Doctoral thesis, Universitat de Barcelona, Spain).
http://www.tesisenred.net/handle/10803/404327. Accessed April 25, 2017

Table 1. Baseline characteristics of the sample and comparison between deceased and alive participants at the end of the follow-up.

| | Total sample (*N*=2,783) | Deceased participants (*n*=138) | Participants alive (*n*=2,645) | *P* value |
|---|---|---|---|---|
| Age, *mean (95%CI)* | 66.4 (65.8, 67.0) | 75.5 (73.2, 77.9) | 65.9 (65.3, 66.5) | <0.001 |
| Sex, *n (%)* | | | | |
| males | 1,253 (46.0) | 86 (62.8) | 1,167 (45.1) | <0.001 |
| females | 1,530 (54.0) | 52 (37.2) | 1,478 (54.9) | |
| Marital status, *n (%)* | | | | |
| single | 234 (8.4) | 10 (5.8) | 224 (8.6) | 0.019 |
| married/cohabiting | 1,715 (62.0) | 72 (53.0) | 1,643 (62.5) | |
| separated/divorced | 215 (7.4) | 13 (7.9) | 202 (7.4) | |
| widowed | 619 (22.2) | 43 (33.3) | 576 (21.5) | |
| Labor situation, *n (%)* | | | | |
| working | 676 (23.9) | 8 (6.8) | 668 (24.8) | <0.001 |
| retired / disabled | 1,257 (46.2) | 101 (72.0) | 1,156 (44.7) | |
| homemaker / unpaid work | 640 (22.3) | 27 (19.2) | 613 (22.5) | |
| unemployed | 210 (7.7) | 2 (2.0) | 208 (8.0) | |
| Socioeconomic status, *n (%)* | | | | |
| low | 892 (33.3) | 61 (40.5) | 831 (32.8) | 0.076 |
| medium | 946 (34.1) | 49 (37.3) | 897 (33.9) | |
| high | 945 (32.6) | 28 (22.2) | 917 (33.2) | |
| Household size, *mean (95%CI)* | 2.38 (2.29, 2.46) | 2.03 (1.84, 2.22) | 2.40 (2.31, 2.49) | <0.001 |
| Biomedical SA, *mean (95%CI)* | 3.59 (3.49, 3.68) | 3.12 (2.91, 3.32) | 3.61 (3.52, 3.71) | <0.001 |
| Psychosocial SA, *mean (95%CI)* | 4.06 (3.96, 4.16) | 3.67 (3.43, 3.90) | 4.08 (3.98, 4.18) | <0.001 |

Note: 95% CI= 95% Confidence interval; SA=Successful aging; Unweighted frequencies, weighted proportions and means. In Biomedical SA (scale from 0 to 7) or Psychosocial SA (scale from 0 to 6) higher scores mean better SA.

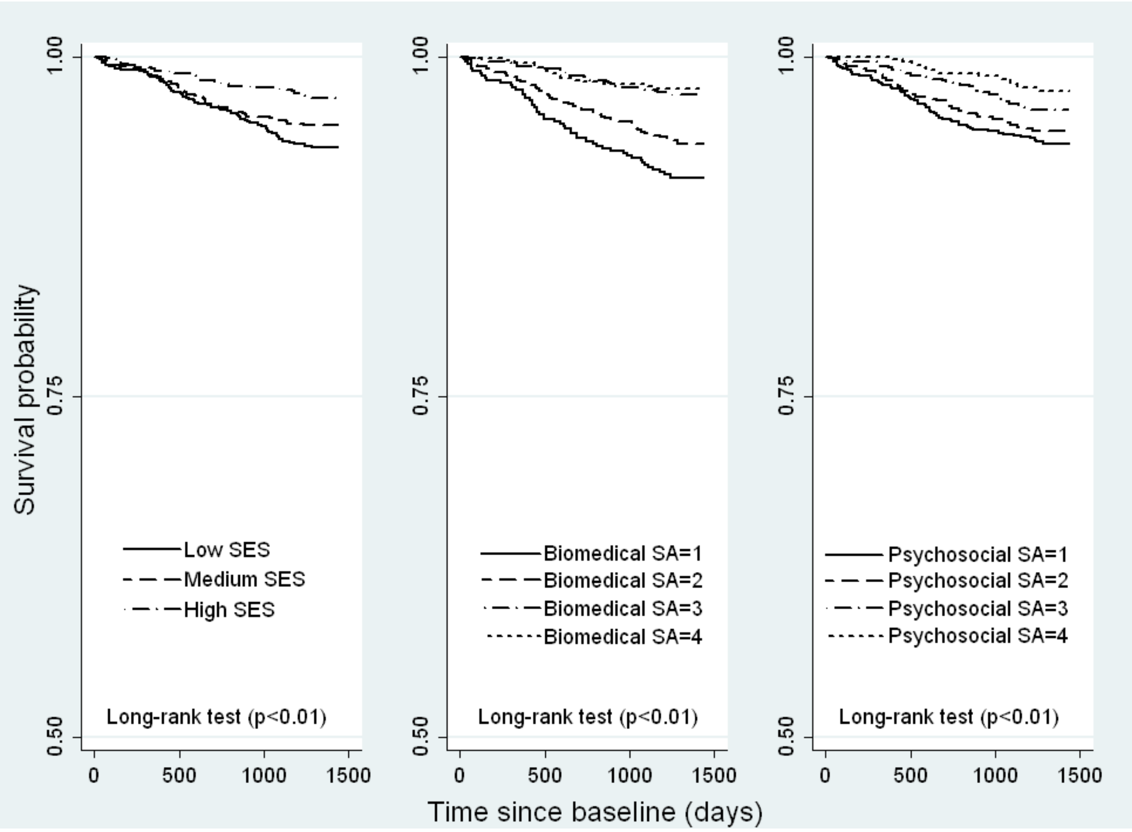
Table 2. Unadjusted and adjusted Cox proportional regression models in the total sample (*N*=2,783).

| Predictor | Unadjusted HR (95%CI) | Adjusted HR (95%CI) |
|---|---|---|
| Age | **1.09 (1.06, 1.11)*** ** | **1.08 (1.06, 1.11)*** ** |
| Sex | | |
| male | Ref. | Ref. |
| female | **0.50 (0.33, 0.74)*** ** | **0.34 (0.21, 0.54)*** ** |
| Marital status | | |
| single | Ref. | Ref. |
| married/cohabiting | 1.25 (0.55, 2.82) | 0.99 (0.41, 2.36) |
| separated/divorced | 1.56 (0.57, 4.28) | **2.73 (1.00, 7.40)*** |
| widowed | **2.23 (1.03, 4.86)*** | 1.23 (0.58, 2.60) |
| Labor situation | | |
| working | Ref. | Ref. |
| retired / disabled | **5.68 (2.15, 15.0)** ** | 1.53 (0.62, 3.76) |
| homemaker / unpaid work | **3.05 (1.03, 9.02)*** | 1.71 (0.60, 4.84) |
| unemployed | 0.90 (0.15, 5.27) | 0.89 (0.15, 5.15) |
| Socioeconomic status (SES) | | |
| Low | Ref. | Ref. |
| Medium | 0.89 (0.57, 1.39) | **0.30 (0.10, 0.88)*** |
| High | **0.55 (0.34, 0.90)*** | 0.34 (0.69, 1.62) |
| Household size | **0.74 (0.61, 0.89)** ** | 0.97 (0.83, 1.14) |
| Biomedical SA | **0.72 (0.62, 0.83)*** ** | **0.66 (0.49, 0.87)** ** |
| Psychosocial SA | **0.83 (0.74, 0.92)** ** | **0.84 (0.73, 0.95)** ** |
| Biomedical SA x SES | | |
| Low | - | Ref. |
| Medium | - | **1.54 (1.08, 2.20)*** |
| High | - | 1.40 (0.88, 2.23) |

*$p$<0.05; **$p$<0.01; ***$p$<0.001

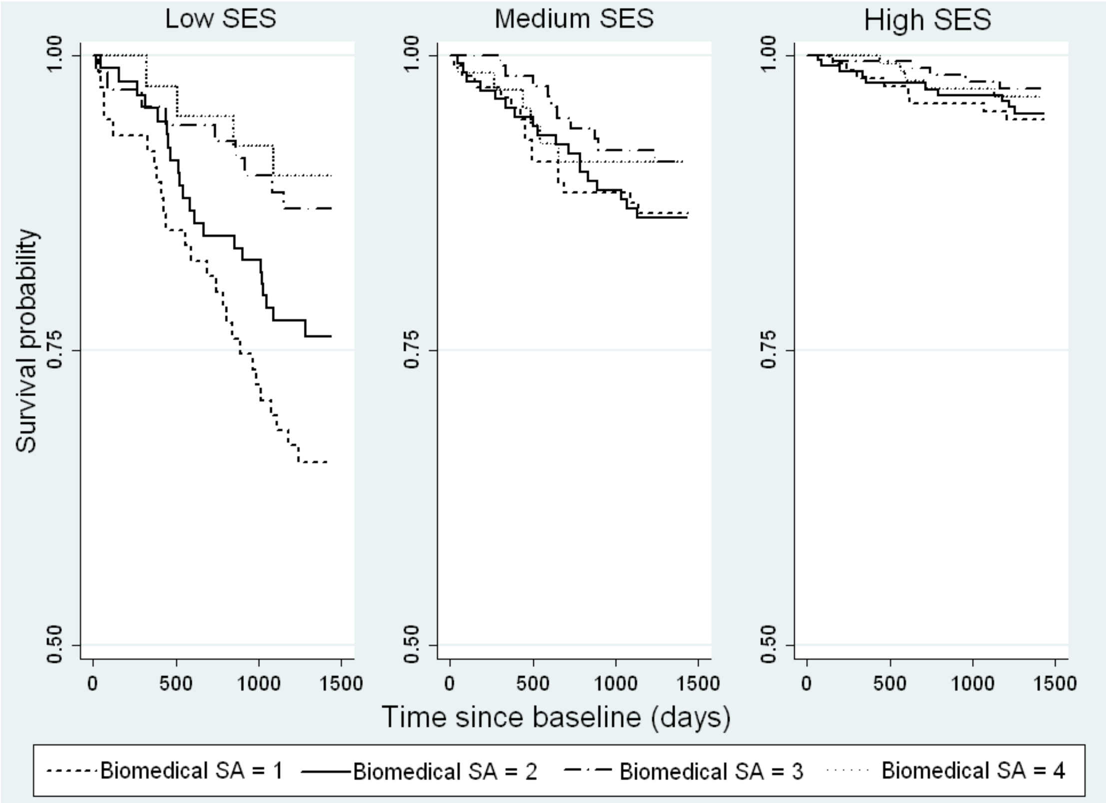
Note: HR=Hazard Ratio; 95%CI= 95%; Confidence Interval; SA=Successful aging; Ref=Reference category; SES=socioeconomic status. In bold, significant HR.

Figure 1. Kaplan-Meier estimated curves by biomedical SA, psychosocial SA and socioeconomic status (SES).




Note: SA=Successful Aging. SA models scores are grouped in quartiles. Higher quartiles mean better SA.

Figure 2. Kaplan-Meier survival curves for participants with low (*n*=892), medium (*n*=946) and high (*n*=945) socioeconomic status (SES)




Note: Adjusted for age, gender, marital status, labor situation and psychosocial SA. Reference categories (male, single and working) were used for categorical covariates, and the mean for continuous variables (age, household size, and psychosocial SA). SA=Successful Aging. Biomedical SA scores are grouped in quartiles. Higher quartiles mean better SA.