Social inequalities in health among the elderly

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To my family.

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Abstract

This dissertation analyses socio-economic inequalities in health among the elderly through a combined framework of socio-economic position, gender, regional socio-economic development and social support. It is made up of three papers focusing on the different dimensions of socio-economic inequalities in health among the elderly. The population under study in the three cases consists in people aged 65-85 years with no paid work living, respectively, in Western Europe (paper I), in Catalonia (paper II) and in four Spanish Autonomous Communities (paper III). The most important findings are that socio-economic and gender inequalities in health persist in old age; that women present a poorer health status than men; that the impact of family characteristics on the health of older people differs by gender and the health indicator analysed; that social support constitutes an important determinant of health status; and that whereas regional socio-economic development constitutes a determinant of health status, it is not related to gender inequalities in health.

Resum

Aquesta tesi analitza les desigualtats en salut entre les persones grans a través d'un marc d'anàlisi on es combinen la posició socioeconòmica, el gènere, el desenvolupament socioeconòmic regional i el suport social. Està formada per tres articles, cadascun d'ells centrat en les diferents dimensions de les desigualtats

socioeconòmiques en salut entre les persones grans. El grup de població estudiat als tres casos és el de les persones de 65-85 anys sense una feina remunerada que viuen a l'Europa occidental (article I), a Catalunya (article II) i a quatre Comunitats Autònomes espanyoles (article III). Algunes de les troballes més importants han estat que les desigualtats socioeconòmiques i de gènere persisteixen entre les persones grans; que les dones presenten una pitjor salut que els homes; que l'impacte de les característiques familiars en la salut de les persones grans varia per gènere i segons l'indicador de salut analitzat; que el suport social constitueix un determinant important de l'estat de salut; i que tot i que el grau de desenvolupament regional constitueix un determinant de l'estat de salut, no està relacionat amb les desigualtats de gènere en salut.

Preface

Population ageing has been one of the most important demographic events of the twentieth century and is expected to remain significant throughout the twenty-first century. The demographic transition, resulting from the combined process of decreasing mortality and fertility along with lengthening life expectancy, has reshaped the age structure of the population in most regions of the planet by increasing the relative weight of older groups compared to the younger ones. By 2025-2030, projections indicate that the elderly population will be growing 3.5 times as fast as the total population. With this ageing process, analysis of health inequalities among the elderly has become a priority in public health. Research on this topic, however, is still scarce and presents some limitations that this dissertation has been tried to address. The identification of the best socio-economic and health indicators among the elderly, the analysis of the impact of the family characteristics and social support on health among this segment of the population or the analysis about regional inequalities in health are some of the issues covering this research.

Since the publication of *The Black Report* in the United Kingdom in 1982, many researchers have been interested in the analysis of social inequalities in populations' health. Chaired by Sir Douglas Black, this report elaborated by the expert committee into health inequality under the commission of the Department of Health and Social Security described the existence of social class health

inequalities in both sexes and in all age groups and that these inequalities had been increasing during the 20th century. Only until a few decades ago, research about social inequalities in health focused on working-age groups. When studying the elderly population, one of the most controversial issues is how to measure their socio-economic position. In a review about the socio-economic position indicators in the research about health inequalities among the elderly, Grundy and Holt stated that the social class or education combined with a deprivation indicator was the best measure.

The majority of older persons are women, but especially among the oldest old, that is, those above age 85. This greater longevity among women coexists with a higher prevalence of morbidity, that has been called '*The new paradox'*. In part under the influence of *The Black Report*, health variations among men have traditionally been studied using a social class framework, whereas women have been excluded from research or studied through the role approach. Marital status, parental status and employment status are the three roles most usually considered; although other researchers that have tried to more deeply characterise the domestic and family roles introducing variables such as the household size, living with elderly people or quantity of housework. Among the elderly, household composition is considered to be one of the most basic and essential determinants of well-being. Anson found that women living with a partner were the healthiest and women living alone or being head of families were the least healthy, pointing out that differences

between the several types of living arrangements are mainly due to differences in nurturing responsibilities and adult support.

In older age groups, social support constitutes an important determinant of health status. Social support is defined as the degree in which a person's basic social needs are met through the interaction with others, understanding basic needs as those related to affiliation, affect, membership, identity, security and approval. Two types of mechanisms have been described when studying the relationship between social support and health: the direct positive effects of support and the buffering effect, by which social support moderates the impact of acute and chronic stressors on health. Social support is related to socio-economic position, the social construction of gender and to age. Some studies describe the existence of a hierarchical order in the effect of the provision of support on depressive symptoms among the elderly people, emotional support from friends being more important than the one provided by the family.

Research carried out both in Europe and in the United States shows that lower socio-economic areas have poorer health than higher socio-economic areas, even after controlling for population composition. In the United States, *the Alameda County Study* is one of the pioneer approaches to area-based health inequalities research. This study showed that residents in a federally designated poverty area in Alameda County experienced a higher mortality rate than residents in non-poverty areas of the same county after controlling

by demographic, socio-economic, lifestyle and psychosocial factors. In Spain, the final report elaborated by the *Scientific Commission for the Study of Social Inequalities in Health* in Spain in 1994 included the first ecological study about social inequalities in health carried out in the country at small-areas in the whole Spanish territory. Since that report, several studies have been carried out in Spain following a similar approach. The pattern found in these studies shows an unequal distribution of mortality, life expectancy and poor self-perceived health status, presenting poorer outcomes those Autonomous Communities with higher poverty rates and income inequalities, that is, those in the south and north-west, and especially among women. Similar regional differences in health have been found in Italy, England and Wales. These studies' approach, however, is mostly centred on working-population groups.

This dissertation analyses health inequalities among the elderly through a combined framework of individual socio-economic position, regional socio-economic development, family characteristics and social support among the elderly. It covers different territorial areas: Western Europe (paper I), Catalonia (paper II) and four Spanish Autonomous Communities (paper III).

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1. INTRODUCTION

The aim of the three papers composing this dissertation is to shed light on the understanding of health inequalities among the elderly through a combined framework of gender, socio-economic position, regional socio-economic development and social support. With the continuing increase in longevity, many more people in the developed countries are surviving to advanced ages, when the prevalence of chronic illnesses and disabilities increases significantly. At this stage of life, past events and social environment constitute important determinants of health. Individual socio-economic position, regional socio-economic development, family characteristics and social support are closely related. An integrated approach in which all these factors are considered allows a better understanding of the social determinants of the health status among elderly men and women.

During the last decades, research about the social determinants of health inequalities has received attention from economics, sociology or social epidemiology among other disciplines. Despite the diversity in approaches and methodologies, one of the most important conclusions is that there are social inequalities in health even in the richest countries, and that there is a social gradient in the health outcomes[1-7]. The most recent approaches, however, share the aim of getting rid of mere descriptions and of trying to explain the causes of health inequalities among people. The creation in 2005 of the *Commission on Social Determinants of Health* by the World

Health Organization (WHO) renders evident the current relevance of social inequalities in health. The final report, published in 2008, summarises global evidence on the social determinants of health and their impact on health inequity, and calls into action the effort to promote health equity and close the gap in a generation[8].

Although research about social inequalities in health among elderly people has received less attention compared with the research focused on other age groups, one of the most important conclusions is that socio-economic inequalities in health prevail in old age[6,9-18]. In one of the few studies about health inequalities among the elderly carried out in Spain, Borrell and Ferrando[18] found inequalities in mortality by educational attainment in all causes of mortality among the elderly in Barcelona. There are, however, still many gaps in the research about social inequalities in health among the elderly that should be covered and many questions remain to be answered[19]. For instance, there still exists no consensus about the best indicators of socio-economic position to be used among the elderly[20,21]. Another important issue is related to gender inequalities among this segment of the population. Since the 1970s researchers are wondering why women live longer but on the other hand present higher morbidity rates than men[22-26].

This brief introduction includes i) a description of the measurement of social inequalities in health through the analysis of two traditionally parallel approaches, social class inequalities and the gender roles' framework, ii) a review about geographical

inequalities in health, iii) a description about the specific measurement of socio-economic position among the elderly population, iv) a description about the specific measurement of health among the elderly, v) a review about the importance of social support among the elderly and its relationship with gender and socio-economic position, vi) and finally a summary of the three papers conforming this dissertation.

1.1 Social class vs. gender roles

Published in the United Kingdom in 1980 and updated in 1986, *The Black Report* constitutes the beginning of the modern research on social inequalities in health. This report became a model in the elaboration of similar reports in countries like Australia, Canada, France, Ireland, Lithuania, the Netherlands, Norway, Spain and Sweden[27,28]. The main aim of *The Black Report* was to deeply analyse the magnitude and the causes of social inequalities in health in the United Kingdom. One of the most important findings was that there were health inequalities among the social classes in both sexes and in all age groups, and that these inequalities had been increasing during the 20th century. Several explanations have been offered for the persistence of these inequalities: artefact, natural or social selection, cultural explanations, the material explanation and social capital[2].

During the 80s and 90s, research about social inequalities in health has been expanded, focusing first on the relationship between some socio-economic variables and mortality rates, and later on widening the scope by incorporating different morbidity indicators as dependent variables. Together with the United Kingdom, the United States, the Scandinavian Countries and the Netherlands have led the research about social inequalities in health during this period. It should be highlighted research based on the Whitehall cohort of London civil servants that has analysed the causes of socio-economic inequalities in health during the last decades of the 20th Century[14,29,30]. Due to the important influence of *The Black Report* on research about social inequalities in health, on the other hand, health variations among men have traditionally been studied using a social class framework (usually through occupation), whereas women have been excluded from research or studied through the role approach (being married, having young children at home or other dependent people, working outside the household …)[27,31-33].

Regarding the social class framework, some of the variables that have been found to explain part of the association between the individuals' social position and their health outcomes are health-related behaviours, household and job environment and access to the health system. Some of the individual negative behaviours analysed as possible intermediate variables between the socio-economic position and health are smoking, drinking, the type of diet and doing or not physical exercise; finding a gradient between these behaviours/risk factors and the individuals' socio-economic

position[34-37]. The access to the health system, however, has been found to add very little to the explanation about socio-economic inequalities in health compared to other factors[38,39].

Household characteristics, poverty or deprivation and environmental conditions are important determinants of the individuals' health. Some studies show that people in the lower socio-economic groups suffer more stressful events and that the emotional impact of such events is higher than among the rest of the population[40]. Regarding the job environment, it has been found that those in lower socio-economic positions are subject to poorer working and employment conditions and to a higher risk of suffering work-related injuries and diseases, especially men[41,42]. The most common used indicators of the socio-economic position in the literature about social inequalities in health are social stratification/social class (the British Registrar General's Classification, Golthorpe's and Wright's classifications)[38,43-48], educational attainment[6,49-52] and income[15,53]. Housing tenure or the possession of a car has also been used, although less frequently[50,54].

Concerning the role approach, two models have traditionally dominated the relevant literature. The first one, denominated 'role enhancement', defends the benefits of combining roles, whereas the second one, the 'role overload' or 'role conflict' approach, assumes that the combination of roles will have negative health effects. However, there is no agreement about which is the valid model due to the fact that there are evidences in favour of both theories[55].

Marital status, parental status and employment status are the three roles most usually considered[56]. Yet other studies that have tried to more deeply characterise the domestic and family roles introduce other indicators such as household size, living with elderly people or quantity of housework[41,42,57,58].

Some of the most important findings in studies following the role approach are that, for instance, marriage and having a paid job are positively associated with good health[56,59-63]. In a study carried out recently in 23 European countries through the third wave of the European Social Survey, it has been found that, overall, married respondents or those in a civil relationship reported lower levels of depression than divorced, separated, widowed and single respondents[64]. As regards maternity, having young children at home has been used as a household burden indicator for working-age women, with contradictory results. Some have found a positive association with the presence of health problems[65-67], others a negative one[24,57,63,68,69] and yet others no association at all[47,70-72].

When considering the household size, it has been found that women living in larger households suffer more stress[58], a poorer self-assessed health, more physical limitations and chronic conditions[42]. Some studies that have tried to analyse the impact of living with elderly people on the health outcomes among working-age people have not found any relationship[55] or a beneficial effect on women's health[42]. These studies, however, only focus on the situation of working-age women (and sometimes working-age men, too),

forgetting the importance that the domestic and family roles could have on the health outcomes of both elderly women and men.

Yet another important issue regarding gender roles and their impact on health refers to caring tasks. According to the literature about family care, the majority of carers are women[73-77]. In advanced ages, family help is not only oriented towards elderly parents but includes also the care of grandchildren[78]. Additionally, considering that wives are usually younger than their partners, their probabilities of taking care of their husbands towards the end of their lives are greater[79]. And this may have an effect on the health outcomes. For instance, Walters[58] found that working-age women taking care of elderly or dependent family members suffered higher levels of stress and anxiety. In a study about nurses, the same author found that caring for a dependent elderly person constituted a risk factor for the health of women but nor of men[69].

In a study about time use, Gauthier and Smeeding found that, although women devoted more time to housework than men at all ages, as they become older, while women reduced the time dedicated to housework, men did the opposite[80]. Nevertheless, although it has been found that after retirement men contribute more to the housework than working age husbands, their share remains lower than the one of their wives[81]. When considering the care to other people, on the other hand, it is pointed out, for instance, that whereas women distribute their time between domestic tasks and personal care, men are more oriented towards sporadic activities

such as doing errands, going to the doctor or taking a walk[82,83]. And regarding grandchildren, older women take care of them more intensively than men in terms of both time and effort [84].

As stated before, whereas men have traditionally been studied through the social class framework, the analysis of social determinants of women's health has been based on the role approach. Even though men should not be forgotten when analysing gender roles and caring roles to other people, in particular, the tasks' division and the different gender profiles suggest that these tasks could have different impacts on the health of elderly men and women. For instance, due to the fact that men are more likely to use their strength than women, their physical health will suffer more as a consequence of these efforts. On the other hand, it is expected that these tasks will more negatively affect the mental health of women due to their higher psychological involvement[82].

Household composition, on the other hand, is considered to be one of the most basic and essential determinants of the wellbeing of older adults[85]. Considerable interest has focused on whether living alone increases the risk of negative health outcomes among the elderly, but less attention has been paid to other types of living arrangements very common among the elderly: couples living together, couples living with other people or elderly people not living with their couples but living with other people[86]. Additionally, research focussing on the living arrangements of the elderly is mostly centred on the health outcomes of women,

forgetting the impact that the household living arrangements can have in elderly men's health[86-89]. According to De Vos, the best indicator for measuring family household composition among the elderly is using a combination of people's relationship with the household head and marital status[90].

When analysing the association between household living arrangements and women's health, Anson[87] found that women living with a partner were healthier and women living alone or being head of families were the least healthy. She pointed out that differences between the several types of living arrangements are mainly due to differences in nurturing responsibilities and adult support. Living with a partner means receiving support from an adult, while women who are head of the family only have nurturing responsibilities. Moreover, in both sexes, it has been pointed out that large families increase the opportunities to both give and receive social, emotional, instrumental and financial support, but also increase their emotional stress and financial strain[23,91].

On the other hand, it has been found that single persons living in large households show poorer health outcomes than married persons living in large households, attributing it to the lack of spouses' support[92,93]. Since women are much more likely than men to take care of other persons and it has been found that women react to stress more strongly than men, the negative impact of large families is expected to be stronger among women[23,93,94]. Hughes and Waite[93], for instance, found that 51-61 years old married couples

living without other people or with children showed the best outcomes in self-rated health, mobility limitations and depressive symptoms, whereas single women living with children showed the worst outcomes in the three health indicators. They concluded that the effect of marital status on health depends on household context.

Only recently, some authors have started to simultaneously take into account the socio-economic position and gender dimensions of inequality between both men and women, recognising the importance that material conditions can have in the association between roles and health[33,41,49,57,95-98]. Some studies have even pointed out the fact that if the social roles of men and women were equivalent (if they devoted the same time to paid work and household work), women would be healthier than men[56,70]. The combined analysis of socio-economic position and gender, on the other hand, is even more recent in the study of social inequalities in health among the elderly[99].

1.2 Geographical inequalities in health

Health inequalities derive from the existence of inequalities in other domains of life, such as political, economical and social spheres[100]. Research carried out both in Europe and in the United States shows that lower level socio-economic areas have poorer health than higher level socio-economic areas, even when controlling by population composition[101-104.] The theoretical perspective under this

approach is that not only individual, but also the residence area and contextual factors matter when trying to explain health inequalities[105]. In addition to individual factors, there are contextual factors related to the geographical area explaining health outcomes. Some of these factors are environment, urbanism, productive sector, leisure facilities, the provision of public and private services or other socio-cultural aspects[106].

Strong positive associations between area-based indicators of deprivation and health outcomes have been reported in the United States[107-109] and in the United Kingdom[110,111]. In the United States, *the Alameda County Study* is one of the pioneer approaches to area-based health inequalities research. Haand *et al.*[107] found that residents in a federally designated poverty area in Alameda County experienced a higher mortality rate than residents in non-poverty areas of the same county after controlling for demographic, socio-economic, lifestyle and psychosocial factors. In a study carried out more recently in six European countries, it has been found a negative gradient in premature mortality from all causes by gross domestic product per capita in all the countries (Belgium, Finland, France, Italy and Spain), except in the Netherlands. The explanation attributed to this outlier case was the association between Roman Catholic affiliation and a higher prevalence of smoking in the Netherlands[112,113].

Although research about health inequalities in Spain is relatively new, several studies carried out during the last decade show the

existence of health inequalities associated with income inequalities, poverty, unemployment, illiteracy rates and other social indicators in the adult population[114-119]. In 1993, the Health and Consumer Affairs Ministry of the Spanish government constituted a *Scientific Commission for the Study of Social Inequalities in Health in Spain*. With the explicit aim of carrying out a study similar to that of the Black Commission in the United Kingdom more than one decade before, the *Scientific Commission for the Study of Social Inequalities in Health in Spain* was in charge of documenting and analysing social inequalities in health. The Scientific Commission, moreover, was invited to provide recommendations about how to improve the Spanish population's health through public policies that diminished social inequalities in health[117,120].

The final report elaborated by the *Scientific Commission for the Study of Social Inequalities in Health in Spain* included the first ecological study about social inequalities in health carried out in Spain at small-areas in the whole Spanish territory. Since that report, several studies have been carried out in Spain following a similar approach. The pattern found in these studies shows an unequal distribution of mortality, life expectancy and poor self-perceived health status, presenting poorer health outcomes those Autonomous Communities with higher poverty rates and income inequalities. For instance, life expectancy in 2002 differed both among men and women between those Autonomous Communities with lower poverty rates and income inequalities and those with higher poverty rates and income inequalities. Castilla y León and

Navarra (in the north) presented a life expectancy higher than 77 and 84 years for men and women, respectively; whereas on the other extreme Andalusia and Canarias (in the south) showed a life expectancy lower than 76 and 82 years for men and women, respectively[119]. Similar regional differences in health have been found in Italy, England and Wales[121-123.]

1.3 The measurement of socio-economic position among the elderly

One of the most controversial issues in the research about social inequalities in health among the elderly is how to measure their socio-economic position. Some of the indicators used are social class, educational attainment and household income. It has been criticised that most research about elderly people uses these indicators as a measure of their socio-economic position without a theoretical justification[15]. Arber and Ginn[11,50], however, state that the last occupation is the best indicator of the social class of elderly people because it is previous and therefore liable to determine their material resources during old age. In a study about elderly people, they found a strong association between a social class measure based on the individuals' last occupation and health.

However, one of the limitations when studying the occupational social class among the elderly is the fact that some elderly women have never worked outside their home or have had a discontinuous

working career due to family duties, especially in southern-European countries such as Spain. In those cases when women cannot be classified in an occupational social class, what researchers usually do is to use the 'conventional approach'. This approach, in contrast to the individual one, assigns to those women without occupational social class that of their husbands[50,124-127]. For instance, Arber found that the partners' occupational class of married women explained better their self-assessed health than their own labour market position[50].

Educational attainment is a good alternative to occupational indicators when the last cannot be operationalised. This indicator does not exclude those elderly people who have never had a relationship with the labour market or who left it a long time ago. In a review about the socio-economic position indicators in the research about health inequalities among the elderly, Grundy and Holt[21] stated that the social class or education combined with a deprivation indicator was the best measure. Moreover, in previous studies, education has shown to be strongly associated with health status and mortality[128-131]. Apart from enabling all adult people to be classified according to their own socio-economic position, educational indicators constitute a more stable measure during the life cycle than other alternative indicators and are correlated to the individual health-related behaviours[49,51,132,133].

Regarding the gender dimension, it has been pointed out that educational attainment constitutes the best indicator when studying

health inequalities among women. In a study carried out among 20,000 men and women of 20-59 years through the British General Household Survey in 1991 and 1992, educational attainment was found to be a better measure of women's self-assessed health than their occupational social class (measured both through their own and that of their husbands) or their job situation. Moreover, the educational attainment indicator made it possible to see a clear social gradient, meaning that the higher the educational attainment, the better the health outcomes[133].

The main criticism directed towards the use of education as a socio-economic position indicator of the individuals is that it ignores the class trajectory. However, it has been pointed out that occupational class may be a less discriminating indicator of health inequalities for women than for men because of women's more fragmented employment career, while educational qualifications may capture comparable or greater inequalities for women than men[50,132]. In the early years of the 21st century, few people remain in the same occupation for life, being an individual's occupational class more likely to change over time. There may therefore be advantages in using socio-economic measures other than occupational class, which can be applied to all adults and are more stable through the life course, such as educational qualifications[132]. Moreover, contrary to what happens when studying occupational indicators, there arise no reverse-causation problems from linking education with health outcomes at older ages[133].

Finally, a less frequently used indicator when studying socio-economic inequalities in health is income or wealth. It has been found that low income is associated with health problems[134-139]. Household income is a fair indicative of a standard of living and of the life chances that household members experience through the share of goods and services[133]. In a review about the optimal indicators of socio-economic status for health research, Duncan *et al.*[133] concluded that the most powerful associations with mortality were found for the economic indicators of wealth and family income, especially for women.

Income and wealth could still be good predictors of the health status of the elderly. It is probable that the economic situation of elderly people would be the outcome of their socio-economic position in the past and the pension level in their countries. In a study about people above 64 years old in Hong Kong it was found that people with economic difficulties suffered from poorer health than those without economic difficulties, especially in terms of mental health[140]. In Norway, on the other hand, Dahl and Birkelund[15] showed that the income of the elderly was related to the presence of serious illnesses and mental health problems among both men and women.

Wealth has been described as a better indicator of access to resources than income among the elderly and that it has the advantage of measuring a lifetime living standard, finding a stronger predictive capacity of the onset of illness[141,142]. As a proxy

of wealth, housing tenure or the household value has been found to be related to health and disability among the elderly[142-145]. In a study carried out among the elderly in Northern Ireland, Connolly *et al.*[145] found that housing tenure and housing value were strongly correlated indicators with other indicators of socio-economic status. For instance, they found that elderly people living in public houses showed worse self-reported health and higher mortality rates than owners. They also found significant gradients in health outcomes between those elderly living in the highest and lowest valued owner-occupied properties.

1.4 The measurement of health among the elderly

Macintyre[146] reported that the direction and magnitude of gender differences in health varied according to the particular symptom or condition in question, and according to the phase of life cycle. For this reason it has been recommended to use different health indicators in order to capture the complexity of health. Examining different health dimensions in the same study is important because independent variables may affect several dimensions of health with different magnitude, direction, and differently by sex, too[93,147,148]. As the European Commission points out, ageing may increase mental ill health due to factors such as decreasing functional capacity or social isolation. Elderly people, on the other hand, identify physical health as a very important aspect, closely related

to their psychological wellbeing[149]. When measuring health among elderly people, it is important to consider at least three different dimensions of health, that is: self-perceived health, functional health and mental health.

Self-perceived health is a self-reported morbidity indicator widely used in epidemiological and sociological studies. Self-perceived health status does not interfere with medical diagnostics[150] and constitutes a good predictor of mortality and loss of functional capacity or independence[38,151-156]. In a longitudinal study using seven waves of data from *the Australian Longitudinal Study of Ageing*, a global measure of self-perceived health constituted the best predictor of mortality among people older than 64. The authors concluded that this indicator is the most reliable measure of health for longitudinal research and population health estimates of healthy life expectancy in older adults[156]. Moreover, it has been found that self-perceived health predicts mortality better than the medical judgement[157]. Self-perceived health is an easily administered measure, not demanding in time and may indicate ill-health at ages when mortality is rare. Although this indicator is usually collected as a categorical response, divided into three or five categories, it is often collapsed into a dichotomous variable of good versus less than good health for its use as a dependent variable[158].

Functional health is a very important dimension of health among the elderly because it determines the extent to which they can cope independently in the community. It was not until the 1950s, when

the numbers of older and disabled persons grew and the prevalence of chronic diseases increased, when the importance of functional status was recognised[159]. Functional status is defined as a person's ability to perform the activities necessary to ensure wellbeing, being often conceptualised as the interaction of three domains of function: biological, psychological and social. Scales of functional status include activities of daily living (bathing, dressing, feeding, transfers, continence and ambulation) and instrumental activities of daily living (housekeeping, shopping, taking medicines, using transportation, using the telephone, cooking and managing money)[160].

Regarding mental health, it is expected that late life-depression and age-related neuro-psychiatric conditions, such as dementia, increase the burden of mental disorders. More than 27% of European adults are estimated to experience at least one form of mental ill health during any one year, being anxiety and depression the most common forms of mental ill health in the EU[161]. In the first half of older age (65 to 75-80 years), depression is the most prevalent psychiatric medical profile, whereas in the second half (from 75-80 years onwards) the prevalence of depression and dementia is similar[162]. Prevalence of mental health problems is higher among women, and Spain together with Italy constitutes the European country with the highest risk of suffering poor mental health[163]. Some of the instruments widely used to detect psychiatric disorders are the Goldberg's General Health Questionnaire (GHQ) and the EURO-D scale. The GHQ focuses on breaks in normal functioning,

covering personality disorders or patterns of adjustment when these are associated with distress[164]. The EURO-D scale, on the other hand, is a mental health subjective indicator composed by 12 items: depression, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness[165].

1.5 The relevance of social support among the elderly

According to Thoits[166], social support is defined as the degree in which a person's basic social needs are met through the interaction with others, understanding basic needs as those related to affiliation, affect, membership, identity, security and approval. Two types of mechanisms have been described when studying the relationship between social support and health: the direct positive effects of support and the buffering effect by which social support moderates the impact of acute and chronic stressors on health[167]. It has even been found that the lack of social support or social networks can have a stressing effect with a direct impact on health[168].

Several epidemiological studies describe a positive association of social support with both physical and psychological health among elderly people[139,169] and state that the association varies according to socio-economic position[170,171]. Perceived support has been found to protect individuals from the effects of stress[172-174] and to attenuate the effect of disability on depressive symptoms[175-178]. In a

study carried out in Spain, it was found that elderly people with more social links presented lower risks of mortality, cognitive deterioration, depression and disability, and even higher probabilities of recovering after a disability[179]. Yet in another study carried out among 1,174 community-dwelling older adults living in Leganés, a city in central Spain, contacts with family ties and having a confidant were associated with 6-year survival, even after adjustment for health and disability[180].

Broadhead *et al.*[181] identified two types of social support: confidential social support and affective social support. Confidential social support is related to getting information, counselling or guidelines, or having people with which sharing worries or problems. Affective social support, on the other hand, is related to signs of love, affection, esteem, friendliness and/or belonging to groups. Some studies describe the existence of a hierarchical relationship in the effect of the provision of support on depressive symptoms among elderly people, emotional support from friends (more likely to provide confidant social support) being more important than that from the family (more likely to provide affective social support)[182-183].

Social support is related both to the social construction of gender and to age, but also to socio-economic position. Some studies have found that while men tend to maintain less emotional relationships and are less embedded in their social networks, women's friendship focus more on intimacy and tend to provide and receive more

support from members of their network[171,184]. The type and amount of social support received and provided, on the other hand, changes as people get older, with losses but at the same time the inclusion of new ties. Regarding the relationship between socio-economic position and social support, in a study carried out in Spain Bellón *et al.*[185] found that those people with a higher educational level presented a higher perception of social support, suggesting that it made them feel more self-sufficient and independent in their social life.

1.6 The three papers

The three papers composing this dissertation integrate the different dimensions analysed above in the literature review: gender, socio-economic and regional inequalities, and social support in the research of health inequalities among the elderly. The three of them focus on 65-85 years people with no paid work; the first one uses data at European level (Western Europe), the second one at regional level (Catalonia) and the third one at national level (Spain) although focussing on four Autonomous Communities.

The minimum age of people participating in the study has been chosen based on the standard legal retirement age in the majority of the OECD countries[186,187], whereas the exclusion of all people with paid work is justified by the fact that the meaning of some of the independent variables used in the research and their impact on

health depends to a great extent on the employment status. For instance, it has been reported that whereas family demands measured through the number of people in the household is associated with poor health status among female manual workers, there is no relationship with health among full-time homemakers[42]. Moreover, the cross-sectional character of the data on which the three papers are based would have prevented us from testing the 'healthy worker hypothesis', meaning that good health increases the probability of getting or keeping a paid job[188,189].

The decision to take 85 years as the maximum age, on the other hand, was based on the fact that institutionalisation rates increase with age, depending on variables such as sex, socio-economic position or health[190-193]. In Spain, for instance, although institutionalisation rates are lower than in other countries, among those aged 85 and over they are almost 4 times higher than among the total elderly population. A summary precedes the presentation of the three papers.

a) Paper I

The first paper[194] sheds light on gender and socio-economic inequalities in health among the elderly in Western Europe. The choice of the best socio-economic and health indicators when studying health inequalities among the elderly and the measurement of gender inequalities among this segment of the population are

some of the issues being addressed in this paper. Data came from the first wave of the *Survey of Health, Ageing and Retirement in Europe (SHARE, 2004).*

Although research about socio-economic inequalities in health among the elderly has been increasing during the last decades, there is still no consensus about which are the best indicators to be used among this increasingly important segment of the population[19,20]. What seems to be clearer, however, is that when studying elderly people, a set of complementary socio-economic status indicators should be used[6]. Socio-economic position here was measured through educational attainment and household income, representing two different dimensions of the individual's socio-economic position. In both sexes, an association between educational attainment and poor health outcomes was observed and a consistent gradient was found. On the other hand, household income was only positively related to poor self-perceived health among women in the lowest income category. This result is consistent with other studies finding a strong association between education and health status and mortality[128-131].

Household composition is considered to be one of the most basic and essential determinants of the wellbeing among older adults[85]. Considerable interest has focused on whether living alone increases the risk for negative health outcomes among the elderly, but less attention has been paid to other types of living arrangements very common among the elderly[86]. For the purposes of this study, a five-categories of household living arrangements was generated by

combining household composition and marital status: living alone; living only with the partner; living with the partner and other people (one of the members of the couple being the household head); not living with the partner but living with other people and being the household head; and finally, not living with the partner but living with other people and not being the household head.

In both sexes, mental health was poorer among people not living with their partner but living with others and being the household head. Among men, a positive association with poor mental health status was also found among those not living with their partner but living with other people and not being the household head. Finally, women living with their partner and other people were more likely to report poor mental health status and limitations in mobility, whereas those living alone were more likely to report poor mental health status. These findings show the importance of considering the role of being the household head among the elderly and the need for analising more deeply the persistence of gender roles in older ages.

The choice of the best health indicators to capture health inequalities among the elderly constitutes another contribution of the paper. In research both about gender inequalities and among the elderly, it has been recommended to use different indicators of health to capture the complexity of health[93,146-148]. Self-perceived health, mental health and limitations in mobility (mobility, arm function and fine motor function) were used as dependent variables

in order to capture three different dimensions of health: the physical, the psychological and the functional one. An important finding was that household living arrangements were primarily related to poor mental health status, not to self-perceived health and only to limitations in mobility among women living with their partners and other people. Another important outcome highlighting the importance of examining different health indicators to fully understand the complexity of inequalities in health was that, as previously reported in other studies, elderly women's poor outcomes in functional and mental health coexisted with a smaller gender difference in self-perceived health[190].

b) Paper II

The aim of the second paper[195] was to go further through the study of gender and socio-economic inequalities in health among the elderly. After ascertaining the relevance of household living arrangements on the health of the elderly, the analysis tried to go further in the analysis of the association between family characteristics and health inequalities among the elderly. On the other hand, the positive relationship found between household living arrangements and poor mental health status in the previous study encouraged us to introduce social support as a possible mediator in the association between household living arrangements on mental health among women[93,196]. Data came from the *2006 Catalonian Health Survey*.

In that case, the characteristics of the database enabled us to go deeper in the analysis of socio-economic inequalities in health and to combine the educational variable with a material deprivation indicator. Grundy and Holt[21], in a review about the socio-economic position indicators in the research about health inequalities among the elderly, concluded that social class or education combined with a deprivation indicator was the best measure. In the present study, material deprivation was measured through the combination of five items: having a shower and/or a bath; having hot running water; having central or dispersed heating; having an elevator and having a washing machine. Educational attainment was more related to women's health and especially to self-perceived health status, being this result consistent with other studies describing educational level as a better indicator of health inequalities for women[51]. According to the literature describing an association between material deprivation and poor mental health[197,198], the measure of material deprivation used in this study was related to poor mental health, but only among women.

The two dimensions of social support described by Broadhead *et al.*[181] have been taken into account: confidant social support and affective social support. Confidant social support was negatively related to poor health status, whereas affective social support was only negatively related to poor mental health among women. Perceived support has been found to protect individuals from the effects of stress[172-174] and to attenuate the effect of disability on depressive symptoms[175-177]. On the other hand, affective social

support was positively associated with poor self-perceived health status among men. This unexpected finding could be explained by a reverse causation effect whereby elderly men with poor self-perceived health could get more attention from their couples or other family members.

Regarding family characteristics, apart from living arrangements, two new variables have been introduced into the analysis: living with a disabled person in the household and caring for a disabled person. Even after controlling for social support, living with a disabled person was positively related to the three health outcomes in both sexes, whereas taking care of disabled people at home was negatively associated with having a limiting long-standing illness (LLI) in both sexes and with having a poor self-perceived health among women. Once again, this paradoxical relationship could be explained by a probable reverse causation effect, whereby those taking care of a disabled person would represent a selection of the healthiest elderly, whereas living with a disabled person and not taking care of him or her could be related to a higher prevalence of poor health status. Shulz and Beach[199] found that individuals with a disabled spouse who were not providing care presented higher prevalences of diseases compared to the other three care-giving groups analysed.

Whereas living alone was associated with poor mental health status in both sexes, the association disappeared among men after adjusting for social support. This finding suggests that living alone

can have different meanings for elderly men and women, with a higher negative impact on women's mental health.

c) Paper III

Finally, the third paper in the dissertation incorporates the geographical dimension of health inequalities, but without forgetting the other variables of interest. This constitutes the first study analysing and comparing socio-economic and gender inequalities in health among the elderly in regions of Spain with different socio-economic development. The data came from the *2006 Spanish National Health Interview Survey (NHIS).* Elderly people living in four regions in extreme situations of socio-economic development were selected: two socio-economically developed regions situated in the north of Spain (the Basque Country and Navarra) and two less developed ones situated in the south (Andalusia and the Region of Murcia).

According to several studies carried out in Spain since the 90s, there is a north-south gradient in the distribution of health outcomes such as mortality, life expectancy or poor self-perceived health. Those Autonomous Communities with higher poverty rates and income inequalities, that is, those in the south, present poorer health outcomes than those with lower poverty rates and income inequalities, that is, those in the north-west[114-120]. The results of the present study showed that older adults living in the less socio-

economically developed regions (the Region of Murcia and Andalusia) presented a poorer self-perceived health status than those living in the most developed ones (the Basque Country and Navarra), but specially among women. Whereas these outcomes are consistent with other studies finding similar results among the working-age population, an unexpected result was that those elderly living in Navarra showed the poorest mental health status, but especially men, even after controlling by the other variables.

The north-south gradient described in the literature about socio-economic inequalities in health in Spain is also found when studying the Gender Development Index (GDI)[200]. In the present study, however, gender inequalities in health did not differ by regional socio-economic development, meaning that gender inequalities in health among the elderly are independent of socio-economic development. This finding could be related to the tendency towards regional convergence in gender inequalities among regions in Spain found in previous studies[200,201].

Social support, on the other hand, constituted an important determinant of health status among older adults regardless of the socio-economic development of the regions. Especially important, however, was the relation of confidant social support with mental health status both among elderly men and women. The association between social support and poor mental health among older adults has been described in other studies. Perceived support has been found to protect individuals from mortality, cognitive deterioration,

depression, disability, and with a higher probability of recovery after a disability[176-179]. Some studies, on the other hand, describe the existence of a hierarchical relationship in the effect of the provision of support concerning depressive symptoms among older adults, emotional support from friends (more likely to provide confidant social support) being more important than the one from the family (more likely to provide affective social support)[182-183].

2. PAPER I. HEALTH INEQUALITIES AMONG THE ELDERLY IN WESTERN EUROPE

Health inequalities among the elderly in western Europe

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ABSTRACT

Background: This paper analyses gender inequalities in health status and in social determinants of health among the elderly in western Europe.

Methods: Data came from the first wave of the "Survey of Health, Ageing and Retirement in Europe" (2004). For the purposes of this study a subsample of community-residing people aged 65–85 years with no paid work was selected (4218 men and 5007 women). Multiple logistic regression models separated by sex and adjusted for age and country were fitted.

Results: Women were more likely to report poor health status, limitations in mobility and poor mental health. Whereas in both sexes educational attainment was associated with the three health indicators, household income was only related to poor self-rated health among women. The relationship between living arrangements and health differed by gender and was primarily associated with poor mental health. In both sexes, not living with their partner but living with other people and being the household head was related to poor mental health status (adjusted odds ratio (aOR) 2.14; 95% CI 1.11 to 4.14 for men and aOR 1.75; 95% CI 1.12 to 2.72 for women). In addition, women living with their partner and other(s) and those living alone were more likely to report poor mental health status (aOR 1.67; 95% CI 1.17 to 2.41 and aOR 1.58; 95% CI 1.26 to 1.97, respectively).

Conclusions: Health inequalities persist among the elderly. Women have poorer health status than men and in both sexes the risk of poor health status increases among those with low educational attainment. Living arrangements are primarily associated with poor mental health status with patterns that differ by gender.

Over the past 50 years, the number of people aged 60 years or over has tripled worldwide, and it is expected that it will more than triple again over the next 50 years. In 2030, Europeans of 75 years and over are expected to account for 12% of the population and those aged 80 years and over for 7%. This "population explosion" has generated concern around the world related to health expenditure and the economic sustainability of national pension systems. Little is known, however, about health inequalities of this increasingly important segment of the population, nor about the social determinants of health, at least as compared with younger people.[1 2]

Although research about social inequalities in health among elderly people has received less attention compared with that focused on other age groups, one of the most important conclusions is that socioeconomic inequalities in health prevail in old age.[3–13] There are, however, still many gaps in the research about social inequalities in health among the elderly that should be covered.[14] For example, there is no consensus about the best indicators of socioeconomic position to be used among the elderly.[15 16] The Black Report[17] suggested that at older ages classification by occupational class becomes less meaningful than among younger people. Moreover, other researchers have proposed to use a set of complementary socioeconomic status indicators among elderly people.[4]

A substantial and to some extent parallel literature has shown that sociodemographic and psychosocial characteristics such as marital status and household living arrangements are also associated with health inequalities in older age groups. Reasons for these associations include both selection factors—good health increases the chances of marrying and remaining married for longer, for example—and the protective effects of care and support.[18] Although marital status constitutes one of the most used indicators when analysing the health outcomes of individuals, however, it has been found that the association between marital status and mortality/morbidity is weaker among the elderly.[18–21] Household composition is considered to be one of the most basic and essential determinants of the wellbeing of older adults.[2 22] Considerable interest has focused on whether living alone increases the risk of negative health outcomes among the elderly, but less attention has been paid to other types of living arrangements very common among old people such as living with their adult children.[23 24] In addition, like most studies about family characteristics and health, research focusing on living arrangements of the elderly is mostly centred on samples composed exclusively of women, assuming their traditional gender role as the person mainly responsible for domestic family tasks.[24–27] Among retired elderly men, however, living arrangements and family characteristics could have a higher impact than among younger men and, in addition, given the domestic gender division of labour, the pattern of associations may be different to that among women.

The objective of this study was to identify gender differences in health status and to assess gender differences in the impact of socioeconomic factors and living arrangements on health among the elderly in western Europe.

METHODS

Data

Data came from the first wave of the Survey of Health, Ageing and Retirement in Europe (SHARE, 2004). SHARE is a multidisciplinary and transnational database collecting information about

health, socioeconomic position and family networks of approximately 22 000 individuals over 50 years of age in 10 continental European countries (Denmark, Sweden, Austria, France, Germany, Switzerland, The Netherlands, Spain, Italy and Greece). Although SHARE was designed from the outset as a longitudinal database, this paper analyses the only wave available at present, that is, wave 1. The SHARE dataset is introduced in Börsch-Supan *et al*[3] and methodological details are contained in Börsch-Supan *et al*[28]. SHARE used design weights for multistage sample design and then calibrated to population totals within the country to reflect national populations.[28] For the purposes of this study a subsample of non-institutionalised people aged 65–85 years who had no paid work was selected (4218 men and 5007 women). The minimum age was chosen on the basis of the standard retirement age for men in the majority of the countries under study,[29] in an attempt to overcome certain limitations related to the inclusion of a mixture of people still in the labour market and those who have left it. The decision to take 85 years as the maximum age was based on fact that the weights in the database for the oldest old may be less accurate.[3] The household response rate of the sample was 61.8% (weighted average).

Dependent variables

Self-perceived health

Self-perceived health status was elicited by asking the respondents to describe their general health as ''very good'', ''good'', ''fair'', ''poor'', or ''very poor''. The variable was dichotomised by combining the categories ''fair'' and ''poor'' to indicate perceived health as below good. Self-perceived health is a broad indicator of health-related wellbeing and has also proved to be a good predictor of mortality.[30 31]

Mental health

A dichotomous variable based on the EURO-D scale was constructed, taking the value 1 when the individual reported suffering at least three of the depressive symptoms shown in the card, and 0 otherwise. The EURO-D scale is a harmonised symptom scale developed to enhance the analysis of the pooled EURO-DEP dataset, necessary because not all the centres included in the original dataset used the same depression assessment procedure.[32 33] To obtain a pooled dataset, the different instruments were harmonised and a 12-item scale was generated.[34] As a result, the EURO-D scale is a subjective indicator of mental health composed of the following 12 items: depression; pessimism; suicidality; guilt; sleep; interest; irritability; appetite; fatigue; concentration; enjoyment; and tearfulness. For each centre, the EURO-D has been shown to be internally consistent, with Cronbach's alpha of 0.72 for the current pooled sample.[35–37] It has been reported that this scale is consistent and permits the establishment of valid comparisons.[34 38]

Limitations in mobility (mobility, arm function and fine motor function)

The variable ''health and activities'', which enquires about people's possible difficulties in carrying out activities related to mobility as a result of health problems, was dichotomised in the

Table 1 General description of the population (in %): Survey of Health, Ageing and Retirement in Europe, 2004

	Men (n = 4218)	Women (n = 5007)	p Value
Age in years, median (25th–75th percentiles)	72 (68–77)	72 (68–77)	<0.001
Educational attainment			<0.001
Without formal education	6.5	9.9	
Primary education or less	31.5	34.5	
Secondary education	43.2	44.5	
Higher than secondary education	17.9	9.8	
Equivalised gross annual household income in PPP			<0.001
Lowest 25%	22.3	32.2	
25<50%	31.2	30.7	
50<75%	26.5	22.1	
Top 25%	19.9	14.9	
Household living arrangements			<0.001
Living alone	14.4	37.2	
Living with partner	71.7	48.1	
Living with partner and others	11.6	5.8	
Not living with partner but living with others (household head)	1.9	6.5	
Not living with partner but living with others (not household head)	0.5	2.4	
Self-perceived health			<0.001
Very good	13.2	9.2	
Good	41.3	38.0	
Fair	33.9	37.7	
Poor	8.9	12.1	
Very poor	2.5	2.9	
Mental health, mean (25th–75th percentiles)*	1.9 (0.0–3.0)	2.9 (1.0–4.0)	<0.001
Limitations in mobility, arm function and fine motor function, mean (25th–75th percentiles)†	1.4 (0.0–2.0)	2.4 (0.0–4.0)	<0.001

PPP, Purchasing power parity.
*The indicator of mental health used here goes from 0 (not depressed) to 12 (very depressed), the original variable generated by SHARE.
†The indicator limitations in mobility, arm function and fine motor function used here goes from 0 (not limited) to 10 (very limited), the original variable generated by SHARE.

SHARE database. The following activities were shown to the interviewed people: walking 100 metres; sitting for approximately 2 h; getting up from a chair after sitting for long periods; climbing several flights of stairs without resting; climbing one flight of stairs without resting; stooping, kneeling or crouching; reaching or extending the arms above shoulder level; pulling or pushing large objects such as a living room chair; lifting or carrying weights over 10 pounds/5 kilos, such as a heavy bag or groceries and picking up a small coin from a table. The final variable equals 1 when the interviewed individual reported being affected by three or more limitations, and 0 otherwise.

Independent variables

Socioeconomic position was measured through two indicators: educational attainment and household income. Although a high correlation between educational attainment and household income could be a limitation in this study, the correlation was not as high as anticipated ($r = 0.33$). Therefore, both of them were included because they measure two different dimensions of the individual's socioeconomic position.

Educational attainment was generated by following the original classification used in the SHARE questionnaire, the International Standard Classification of Education (ISCED-97). Some categories of this classification were collapsed because of the low number of individuals in some groups. The final variable was made up of the following categories: no studies; primary education or less; secondary education; and higher than secondary education.

Household income was measured through the gross annual household income purchasing power parity (PPP)-adjusted, which includes the following income sources: income from other household members PPP-adjusted, other household benefits PPP-adjusted, rent value at household level PPP-adjusted, imputed rent value at household level PPP-adjusted, bank account at household level PPP-adjusted, government or corporate bonds at household level PPP-adjusted, stocks or shares at household level PPP-adjusted and mutual funds at household level PPP-adjusted. As a result of the problem with missing data related to income variables, which particularly affects elderly people, the SHARE database uses multiple imputations, a technique that replaces each missing value with M (in this case M = 5) acceptable values representing a distribution of probabilities.[39] The income variable was divided by the square root of the number of people living in the household. Finally, the equivalised gross annual household income variable was introduced in the analysis as a categorical variable because of its asymmetrical shape.

The original nine-category household living arrangements variable was recoded into five new categories: living alone; living with their partner only (reference category); living with their partner and other people (one of the members of the couple is the household head); not living with their partner but living with other people and being the household head; and finally, not living with their partner but living with other people and not being the household head. Originally, the variable included the following categories: single; couple; single with children; couple with younger children (0 to 17 years); couple with older children (18 years and over); couple with young and old children; single or couple living with parent; three generation household and others. As a result of the limited sample size and household characteristics of the 65–85-year-old people studied here, it was decided to generate a typology with five categories more related to the population under study. Regarding the household heads, although SHARE does not specifically identify them, for the purposes of this study a proxy based on the household respondents of the questionnaires has been used. SHARE defines household respondents as "the person most capable of answering questions about the household members housing situation, household income, and family consumption questions …".[40]

Statistical analysis

Multiple logistic regression models were fitted in order to calculate adjusted odds ratios (aOR) and 95% confidence intervals (CI). Models were separated by sex, adjusted for age and country and weighted by using a calibrated individual weight for the main sample. Goodness of fit was obtained using the Hosmer–Lemeshow test.[41] In addition, to test for an independent linear trend between health outcomes and education and household income, logistic regression was performed fitting multivariate models including these predictor variables as continuous variables and the Wald test was used.

RESULTS

General description of the population

Table 1 shows a general description of the population under study. Men and women in the sample had a median age of 72 years. Women were overrepresented in the lowest educational levels and income categories. Approximately 10% of women had not received a formal education and 35% had primary studies or less, compared with 7% and 32% of men, respectively. Moreover, the percentage of people belonging to the lowest income group was higher among women. Conversely, they were less likely to belong to the highest income group.

Table 2 Odds ratios and 95% confidence intervals comparing health outcomes of women with men (reference category): Survey of Health, Ageing and Retirement in Europe, 2004

	aOR (95% CI)
Poor self-perceived health	
Adjusted for age	1.30 (1.14 to 1.49)**
Adjusted for age, country and socioeconomic position	1.17 (1.01 to 1.35)*
Poor mental health status	
Adjusted for age	2.47 (2.12 to 2.89)**
Adjusted for age, country and socioeconomic position	2.40 (2.05 to 2.82)**
Limitations in mobility, arm function and fine motor function	
Adjusted for age	2.37 (2.03 to 2.76)**
Adjusted for age, country and socioeconomic position	2.23 (1.90 to 2.62)**

aOR, Adjusted odds ratio.
*$p<0.05$; **$p<0.001$.

Table 3 Multivariate associations between the dependent variables and the socioeconomic and household living arrangements indicators: men 65–85 years old (Survey of Health, Ageing and Retirement in Europe, 2004).

	Poor self-perceived health status		Poor mental health		Limitations in mobility	
	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)
Educational attainment						
Higher than secondary	33.6	1††	12.2	1††	14.4	1††
Secondary	43.1	1.48 (1.08 to 2.03)*	15.2	1.54 (1.02 to 2.31)*	16.7	1.58 (1.06 to 2.35)*
Primary or less	51.5	2.38 (1.60 to 3.54)***	21.6	2.06 (1.30 to 3.24)**	25.8	3.09 (1.90 to 5.05)***
Without formal education	62.8	3.31 (2.03 to 5.39)***	35.4	3.49 (1.96 to 6.21)***	36.7	3.99 (2.19 to 7.27)***
Equivalised gross annual household income in PPP						
Top 25% (reference category)	35.4	1†	15.8	1	15.0	1
50<75%	42.8	1.10 (0.79 to 1.54)	15.0	0.82 (0.55 to 1.22)	17.5	0.80 (0.53 to 1.22)
25<50%	47.1	1.18 (0.84 to 1.65)	18.2	1.02 (0.64 to 1.64)	20.7	0.86 (0.59 to 1.27)
Lowest 25%	54.9	1.41 (0.97 to 2.06)	23.1	0.97 (0.64 to 1.47)	28.8	1.07 (0.70 to 1.63)
Household living arrangements						
Living with partner (reference category)	45.0	1	16.4	1	19.1	1
Living alone	43.1	0.89 (0.65 to 1.22)	21.3	1.12 (0.77 to 1.63)	23.5	1.17 (0.81 to 1.67)
Living with partner and others	50.1	1.12 (0.83 to 1.51)	20.6	1.21 (0.85 to 1.73)	24.4	1.31 (0.92 to 1.87)
Not living with partner but living with others (household head)	49.3	0.96 (0.51 to 1.80)	29.8	2.14 (1.11 to 4.14)*	25.3	1.26 (0.63 to 2.52)
Not living with partner but living with others (not household head)	47.8	0.64 (0.22 to 1.85)	45.0	3.47 (1.15 to 10.49)*	31.8	1.06 (0.33 to 3.38)

aOR, Adjusted odds ratio; PPP, purchasing power parity.
*p<0.05; **p<0.01; ***p<0.001; †Wald test p<0.05; ††Wald test p<0.001.
Adjusted by age and country.

Regarding type of household, women were more likely to live alone (37% versus 14%), whereas living with their partner was more frequent among men (72% versus 48%). Finally, the percentage of those not living with their partner but living with other people (regardless of being the household head or not) was higher among women than among men.

Women were more likely to report poor health status, poor mental health and limitations in mobility, arm function and fine motor function. Whereas 15% of women had poor or very poor health, the percentage among men was 11%. Moreover, the mean number of symptoms related to mental health problems and limitations in mobility, arm function and fine motor function stated by women was almost double those of men.

Gender differences in the determinants of health

The prevalence of poor health outcomes was significantly higher among women for all three indicators. After adjusting for age, women were more likely to report poor self-perceived health status, poor mental health and limitations in mobility, arm function and fine motor function (aOR 1.30; 95% CI 1.14 to 1.49; aOR 2.47; 95% CI 2.12 to 2.89 and aOR 2.37; 95% CI 2.03 to 2.76, respectively). Gender differences remained after additionally adjusting for socioeconomic indicators and country, although they decreased slightly for all three health outcomes (table 2).

In both sexes, an association between educational attainment and poor health outcomes was observed and a consistent gradient was found. People without a formal education had the

Table 4 Multivariate associations between dependent variables and socioeconomic and household living arrangements indicators: women 65–85 years old (Survey of Health, Ageing and Retirement in Europe, 2004).

	Poor self-perceived health status		Poor mental health		Limitations in mobility	
	%	aOR (95%CI)	%	aOR (95%CI)	%	aOR (95%CI)
Educational attainment						
Higher than secondary	36.7	1††	22.4	1††	25.0	1††
Secondary	47.6	1.64 (1.14 to 2.36)**	27.2	1.33 (0.89 to 1.98)	33.4	1.10 (0.75 to 1.61)
Primary or less	57.4	2.20 (1.47 to 3.31)***	40.9	1.84 (1.96 to 2.83)**	44.1	1.83 (1.20 to 2.79)**
Without formal education	74.9	4.45 (2.83 to 6.99)***	58.3	2.75 (1.72 to 4.41)***	64.1	3.22 (2.04 to 5.09)***
Equivalised gross annual household income in PPP						
Top 25%	40.1	1††	30.1	1	30.5	1†
50<75%	44.3	1.03 (0.73 to 1.43)	27.4	1.03 (0.67 to 1.57)	30.6	1.19 (0.81 to 1.75)
25<50%	54.5	1.36 (1.00 to 1.86)	34.2	1.04 (0.70 to 1.55)	40.8	1.41 (1.00 to 2.00)
Lowest 25%	62.6	1.65 (1.19 to 2.27)**	41.9	1.09 (0.73 to 1.62)	48.2	1.39 (0.97 to 2.00)
Household living arrangements						
Living with partner (reference category)	48.1	1	28.3	1	33.9	1
Living alone	53.1	1.08 (0.87 to 1.35)	37.6	1.58 (1.26 to 1.97)***	41.2	0.92 (0.74 to 1.15)
Living with partner and others	61.6	1.23 (0.85 to 1.78)	46.8	1.67 (1.17 to 2.41)**	49.6	1.45 (1.01 to 2.08)*
Not living with partner but living with others (household head)	67.7	1.43 (0.94 to 2.16)	48.9	1.75 (1.12 to 2.72)*	50.9	0.79 (0.51 to 1.21)
Not living with partner but living with others (not household head)	76.4	1.43 (0.64 to 3.16)	43.8	0.83 (0.43 to 1.59)	64.1	0.79 (0.41 to 1.55)

aOR, Adjusted odds ratio; PPP, purchasing power parity.
*p<0.05; **p<0.01; ***p<0.001; †Wald test p<0.05; ††Wald test p<0.001.
Adjusted by age and country.

highest probability of reporting poor health compared with those with higher educational attainments. No such consistency was found for household income. Only among women was a positive relationship for poor self-rated health found in the lowest income category (tables 3 and 4).

The association between household living arrangements and health differed by sex and the health indicator analysed. They were primarily related to poor mental health status but no association was found for self-rated health status in either sex and only a positive association with limitations in mobility was observed among women living with their partner and others (aOR 1.45; 95% CI 1.01 to 2.08). In both sexes, mental health was poorer among people not living with their partner but living with others and being the household head (aOR 2.14; 95% CI 1.11 to 4.14 for men and aOR 1.75; 95% CI 1.12 to 2.72 for women). Among men, a positive association with poor mental health status was also found among those not living with their partner but living with other people and not being the household head (aOR 3.47; 95% CI 1.15 to 10.49). In addition, women living with their partner and other people and those living alone were more likely to report poor mental health status (aOR 1.67; 95% CI 1.17 to 2.41 and aOR 1.58; 95% CI 1.26 to 1.97, respectively). Although not included here because of shortage of space, the results of interacting household living arrangements and sex were also statistically significant in their associations with poor mental health for living with a partner and others and also for living with others and not being household head.

DISCUSSION

Whereas traditionally literature about the relationship of living arrangements and socioeconomic position with health have developed in parallel, this study shows the importance of simultaneously considering both dimensions when studying health inequalities among the elderly. The main findings can be summarised as follows: first, and as is the case also in young people, health status among women was poorer than among men for the three health indicators analysed, although differences were lower for self-rated health status. Second, in both sexes educational attainment was negatively related to poor health with a gradient being found. Finally, the association between living arrangements and health differed by gender and was primarily related to poor mental health status.

Gender differences in health status

Our results show that older western European women have poorer health than their male counterparts. On the other hand, as has been reported previously, elderly women's poor outcomes in functional and mental health co-existed with a smaller gender difference in self-perceived health.[42] These different gender patterns depending on the health indicator analysed, as well as the differences in factors associated with each of them, emphasise the importance of examining different health indicators in trying to understand fully the complexity of inequalities in health.[43]

Gender differences in social factors related to health status

As in other studies, health inequalities related to the socioeconomic position were confirmed among both men and women using educational attainment as a socioeconomic indicator.[4] There was a social gradient in which the probability of suffering from poor self-perceived health, poor mental health and limitations in mobility, arm function and fine motor function decreased with higher educational levels. Our results are partly consistent with those of Grundy and Slogget,[18] which concluded that the best combination of variables for investigating health inequalities among the elderly was educational qualifications or occupational social class paired with a deprivation indicator. Unfortunately, not enough information on deprivation was available in the SHARE dataset. On the other hand, occupational social class was not used as an indicator of socioeconomic position because, contrary to the sample in the study by Grundy and Slogget[18] that included people over 50 years of age, our study sample was restricted to people over 64 years of age out of the labour market.

Living arrangements were primarily related to mental health status and the pattern of associations differed by gender. Although most studies about living arrangements and health have been based on physical indicators, our findings stress the importance of also considering mental health status. These results are not consistent with those of Liang *et al*,[44] who found that depressive symptoms were not significantly associated with living arrangements in a sample of community-residing older Americans. Although differences attributable to social and cultural contexts cannot be ruled out, that study did not separate the analysis by sex, an additional factor that could explain the contradictory results.

In interpreting the associations found it should be taken into account that the linkages between health and living arrangements are very likely to be reciprocal. Whereas among men living alone was not associated with any health indicator, women living alone were more likely to report poor mental health status. It has been pointed out that the likelihood of entering residential care is greater for the divorced, widowed and those never married than for married people.[20] Accordingly, it can be expected that older people living alone in the community are a selection of healthier people. Actually, living alone was not associated either with poor self-perceived health status or with limitations in mobility. The positive relationship found with poor mental status among women is consistent with the role played by the level of social support as a strong mediator of the impact of household living arrangements on mental health among women.[45 46]

In both sexes, those not living with their partner but living with others and being the household head were more likely to report poor mental health status. It is reasonable to think that among people who define themselves as the household head, the burden derived from being responsible for others, for example, dependent children or other adults, is related to poor mental health status and not the reverse, whereby living with others and being the household head in a family unit with no partner and other people is the result of poor mental health status. Different gender patterns were found for those people with no partner but living with others and not being the household head. Whereas men in this situation were more likely to report poor mental health status, among women there was no association with poor mental health. The persistence of gender roles in older ages may be responsible for this association. It could be that men were more likely to live with their children because of poor mental health status, whereas among women health would not determine this situation. This is mere speculation, however, and deserves further research. Literature about living arrangements uses heterogeneous categorisations of household composition but does not consider the difference between being the household head or not, which was taken into account in the present study and seems to play an important role.[44–47]

Whereas living with their partner and others was not associated with health status among men, women in this situation were more likely to report poor mental health status and limitations in mobility. Although a reverse causation effect cannot be ruled out, these findings can also be interpreted as the result of gender inequalities in the distribution of domestic tasks. It has been reported that among younger people married or cohabiting, the risk of poor health status increases with increasing household size.[48–50] Our results are consistent with those findings. Unfortunately, additional information about domestic burden was not available in the SHARE dataset.

Limitations

One of the limitations of this study is related to its cross-sectional design, a fact that prevents us from determining the causal direction. For example, as mentioned before, the relationship between living arrangements and health is likely to be reciprocal. We have, however, provided some possible explanations for both causality directions depending on the specific living arrangement and gender.

Another limitation is derived from the nature of the sample. Whereas in SHARE it is stated that it was desirable to collect information about individuals living in institutions, Austria, France, Italy and Switzerland were not able to provide this.[3] In order to make country samples more comparable, and as done in most studies about inequalities in health among the elderly, we restricted the study sample to community-residing people. This may be biasing the results in the sense that, as women are more likely to become widows and are then less likely to have a spouse to care for them when disabilities appear in old age, women have a higher probability of being excluded from the sample as a result of their higher institutionalisation rates.[2 42] It would be expected that less healthy women would be excluded from our study and yet there was still an excess of female morbidity for the three health indicators analysed.

CONCLUSION

This study has shown the importance of considering indicators of socioeconomic position and household living arrangements simultaneously when examining the health of older people. Moreover, it has pointed out the need to examine various health indicators in order to understand fully the inequalities in health among the elderly. Further work is needed to uncover the mechanisms explaining how the household workload of the elderly (resulting from their household living arrangements, living standards and family support from outside the household) is related to health. More research is also needed on the best indicators of socioeconomic position to be used among the elderly and the potential different meanings depending on gender. In this research both men and women should be included.

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What this study adds

- Although gender and socioeconomic inequalities in health have been extensively documented, few studies about health inequalities have been carried out among the elderly.
- This study shows that gender and socioeconomic inequalities in health persist among the elderly. The association between household living arrangements and health status depends on gender and is primarily related to mental health.

Policy implications

An integrated approach to socioeconomic inequalities, simultaneously including indicators of household living standards and living arrangements is needed both in the research of inequalities in health as well as in social and health policies addressed to the elderly.

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3. PAPER II. GENDER INEQUALITY IN HEALTH AMONG ELDERLY PEOPLE IN A COMBINED FRAMEWORK OF SOCIOECONOMIC POSITION, FAMILY CHARACTERISTICS AND SOCIAL SUPPORT

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Gender inequality in health among elderly people in a combined framework of socioeconomic position, family characteristics and social support

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ABSTRACT
This study analyses gender inequalities in health among elderly people in Catalonia (Spain) by adopting a conceptual framework that globally considers three dimensions of health determinants: socio-economic position, family characteristics and social support. Data came from the 2006 *Catalonian Health Survey*. For the purposes of this study a sub-sample of people aged 65–85 years with no paid job was selected (1,113 men and 1,484 women). The health outcomes analysed were self-perceived health status, poor mental health status and long-standing limiting illness. Multiple logistic regression models separated by sex were fitted and a hierarchical model was fitted in three steps. Health status among elderly women was poorer than among the men for the three outcomes analysed. Whereas living with disabled people was positively related to the three health outcomes and confidant social support was negatively associated with all of them in both sexes, there were gender differences in other social determinants of health. Our results emphasise the importance of using an integrated approach for the analysis of health inequalities among elderly people, simultaneously considering socio-economic position, family characteristics and social support, as well as different health indicators, in order fully to understand the social determinants of the health status of older men and women.

KEY WORDS – gender, inequalities, elderly, socio-economic factors, family characteristics, social support.

Introduction

Demographic changes taking place during the last few decades, such as increasing life expectancies and lower fertility rates, have generated population ageing in all parts of the world, but especially in developed

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countries. Between 1960 and 2004, the percentage of those aged up to 14 years old decreased from 25 per cent to 16 per cent in the 25 European Union countries, whereas the proportion of the population aged 65 and over rose from 10 to 12 per cent during the same period and is expected to rise to 30 per cent by 2050. Moreover, the biggest population increase affects those aged over 80 years, the number of whom is expected to double by 2050 to 51 million citizens (Eurostat 2007). Women account for 59 per cent of the population aged 60 or over in Europe and for 70 per cent of the oldest-old. According to the United Nations' population projections for 2050, Spain will be the second most aged country in the world (after Japan), with 33 per cent of the population 65 or more years and 12 per cent aged 80 and over (United Nations 2006).

These population changes have generated concern around the world about health expenditure and the economic sustainability of the national pension systems. Older people tend to experience more disability, dependency and morbidity, to be more at risk of living alone, and constitute the majority of those with health problems in developed countries (Grundy and Sloggett 2003; IMSERSO 2006*a*). Little is known, however, about health inequalities in this increasingly important segment of the population, or about the social determinants of their health status, at least as compared with younger people. Most of the studies about social inequalities in health among elderly people conclude that socio-economic inequalities in health prevail in old age (Arber and Ginn 1993; Dahl and Birkelund 1997; Marmot and Shipley 1996; Rahkonen and Takala 1998; Thorslund and Lundberg 1994). There are, however, still many gaps in our knowledge of social inequalities in health in old age that require further research (Beckett 2000; McMunn *et al.* 2006; Von Dem Knesebeck *et al.* 2007).

Research about the social determinants of health among older people has only recently started to integrate three different approaches that were usually studied separately: socio-economic position, family characteristics and social support. Although occupational or social class constitutes one of the most common indicators used in research about social inequalities in health, its measurement among elderly people is controversial because some elderly women have never worked or have had a discontinuous working career because of family duties, especially in southern European countries. Moreover, it has been suggested that social class indicators based on occupation are inadequate for older people because the impact of occupation on health decreases with time since leaving the labour market (Hyde and Jones 2007). Educational qualifications have usually been used instead because they can be applied to all adults and are more stable throughout the life-course (Arber and Cooper 2000; Arber and

Khlat 2002). In a review of socio-economic indicators in research on health inequalities among elderly people, Grundy and Holt (2001) stated that social class or education combined with a deprivation indicator was the most sensitive indicator.

Whereas health variations among men have traditionally been studied using a social class framework, women have been forgotten or studied through the role approach, emphasising their role in the domestic area (Lahelma *et al.* 2003; Nathanson 1980). Although household composition is considered to be one of the most basic and essential determinants of the well being of older adults (Evandrou *et al.* 2001; Zimmer 2001), research on the living arrangements of elderly people has mostly centred on samples made up exclusively of women and assumed their traditional role in family responsibilities, especially in the potential risks among those living alone (Anson 1988; Michael *et al.* 2001; Sarwari *et al.* 1998). On the other hand, providing direct care to other people has been associated with presenting worse health (Minkler and Fuller-Thompson 2001; Musil and Ahmad 2002), above all among women in relation to stress (Mui 1995; Walker, Pratt and Eddy 1995; Pavalko and Woodbury 2000; Hirst 2005). Although informal care to family members has usually referred to women, the literature about care-giving and its impact on health is increasingly incorporating men as important providers of care inside and between households (Baker and Robertson 2008; Crocker 2002; Gregory, Peters and Cameron 1990; Horowitz 1985; Kaye and Applegate 1993).

Regarding social support, several epidemiological studies have found a positive association with both physical and psychological health among elderly people (Grundy and Sloggett 2003; Oxman *et al.* 1992) and that the association varies by socio-economic position (Oakley and Rajan 1991) and gender (Shye *et al.* 1995). Two types of mechanisms have been described when studying the relationship between social support and health: the direct positive effects of support and the buffering effect, by which social support moderates the impact of acute and chronic stressors on health (Stansfeld 1999). Filial obligation in Spain, as in other Mediterranean countries, is a strong value and it has been stated that breaking the intergenerational contract of support has consequences for the physical and mental health of older adults (Zunzunegui *et al.* 2004).

The aim of this study is to analyse the social determinants of health in the Autonomous Community of Catalonia, Spain using a combined framework of socio-economic position, family roles and social support. The analyses are based on three health indicators shown to be important in gerontological research: self-perceived health, mental health and functional limitations (Beckett *et al.* 1996; Idler and Benyamini 1997).

Methods

Data

The data are from the 2006 Encuesta Salud de Catalunya (*Catalonian Health Survey*) (hereafter ESCA 2006), a cross-sectional study that collected information about morbidity, health status, health-related behaviours and use of health care services, as well as socio-demographic data from a representative sample of the non-institutionalised population of Catalonia, a region in the North East of Spain with about seven million inhabitants. In total, 18,126 subjects were randomly selected using a multiple-stage random sampling strategy with a maximum global error of ± 0.7 per cent. Trained interviewers administered the questionnaires at people's homes in a face-to-face interviews (Mompart *et al.* 2007).

For the purposes of this study a sub-sample of people aged 65–85 years who had no paid job was selected (1,113 men and 1,484 women). The minimum age has been chosen based on the standard legal retirement age in Spain (Consejo Economíco y Social 2000), and the exclusion of all people with paid work is justified by the fact that the meaning of living arrangements and their impact on health depends to a great extent on employment status (Artazcoz *et al.* 2004). Employment status is not a confounding variable but an interacting variable, *i.e.* the meaning of family characteristics and socio-economic status can be different and have a different impact on health depending on being in work. Moreover, with the available cross-sectional data it would not be possible to test for the 'healthy worker hypothesis', that good health increases the probability of getting or keeping a paid job (Ross and Mirowsky 1995).

The decision to take 85 years as the maximum age, on the other hand, was based on the fact that, although institutionalisation rates in Spain are lower than in other European countries, among those aged 85 and over, they are almost four times higher than among the total elderly population and depend on variables such as sex, socio-economic position, family characteristics and health (Arber and Cooper 1999; Grundy and Jitlal 2007; IMSERSO 2006*a*). More specifically, in Catalonia, the most recent data on institutionalisation rates showed that in January 2006, 75 per cent of elderly residents of public institutions were older than 80 years, and that among them, 83 per cent were women (IMSERSO 2008). Apart from that, taking people younger than 86 reduces the probability of social selection among the oldest old (Idler 1993; Orfila *et al.* 2000; Vuorisalmi, Lintonen and Jylhä 2006). Moreover, those aged over 85 presented a higher non-response rate in some of the predictor variables such as social support (37.5 % vs. 5.7 % among 65–85 years) and in the outcome variable mental health (37.7 % vs. 5.7 % among 65–85 years).

Health outcomes

Self-perceived health status was elicited by asking the respondents to describe their general health as 'excellent', 'very good', 'good', 'fair' or 'poor'. The variable was dichotomised by combining the categories 'fair' and 'poor' to indicate perceived health as below 'good' (Manor, Matthews and Power 2000). Self-perceived health is a broad indicator of health-related wellbeing and has also proved to be a good predictor of mortality (Ferraro and Farmer 1996; Idler and Benyamini 1997; Mossey and Shapiro 1982).

Poor mental health status was measured with the 12-item version of the Goldberg General Health Questionnaire (12-GHQ) (Goldberg *et al.* 1970). This is a screening instrument widely used to detect current, diagnosable psychiatric disorders (Goldberg 1972). The original variable was recoded into a dichotomy, taking scores higher than two to indicate poor mental health status (value 1).

Limiting long-standing illness (LLI) was generated through the combination of the questions, 'During the last 12 months have you had any trouble or difficulty for gainful employment, housework, schooling, studying, because of a chronic health problem (that has lasted or it is expected to last three or more months)?' and 'Apart from that considered before, during the last 12 months have you had to restrict or decrease everyday activities such as taking a walk, doing sport, playing, going shopping, etc. because of a chronic health problem?' The final variable was scored '1' when the interviewee answered positively to at least one of the questions, and '0' otherwise.

Predictor variables

Socio-economic position was measured through two indicators: educational attainment and material deprivation. Educational attainment was generated by collapsing some categories of the original variable because of the few individuals in some groups. The final variable was made up of the following categories: more than primary education (reference category), primary education, and less than primary education. Material deprivation was measured through variables measuring household material standards and generated by combining the following five items: having a shower and/or a bath, having hot running water, having central or dispersed heating, having an elevator, and having a washing machine. The resulting variable, household resources, had the following three categories: not lacking any of the items, lacking one of the items and lacking two or more of the items.

Family characteristics were measured through three variables: living arrangements, living with a disabled person in the household and caring

for a disabled person. Living arrangements were measured through the combination of the variables household size and marital status, generating a four-categories variable to reflect the most usual types of households among the population under study: living with partner (reference category), living alone, not living with partner but living with other people and being the household head, and not living with partner but living with other people and not being the household head. People were asked about living with anyone needing special attention through disability, dependence or limitations in carrying out familiar, social or job-related activities. It had the value '1' when answers were positive, and '0' otherwise. In addition, people were asked about who was the main carer of the disabled person at home. This variable was dichotomised to take the value '1' when the respondent stated being the main carer, and '0' otherwise.

Social support was measured through a reduced version of the original 11-items *Duke Social Support Scale*, the validity and reliability of which has been demonstrated in several studies in Spain and other countries (Bellón *et al.* 1996; Broadhead *et al.* 1988; De la Revilla *et al.* 1991). The version used in ESCA 2006 is based on the first validation of the questionnaire, in which three of the 11 original items could not be classified into the two dimensions of social support: confidant and affective social support (Broadhead *et al.* 1988). In the original questionnaire, people where asked eight questions about social support using a Likert-type scale with value '1' meaning 'less than desired' and '5' 'as much as desired'. The Cronbach's alpha coefficients of the two groups of items were 0.87 for the confidant social support questions, and 0.84 for the affective social support ones.

The confidant social support index is the result of combining the responses to the following prompts: 'I get invitations to go out and do things with other people', 'I get chances to talk to someone about problems at work or with my housework', 'I get chances to talk to someone about my personal and family problems', 'I get chances to talk to someone about money matters' and 'I get useful advice about important things in life', and scored from '5' (minimum confidant social support) to '25' (maximum confidant social support). The affective social support index is the result of combining the following questions: 'I get love and affection', 'I have people who care what happens to me' and 'I get help when I'm sick in bed', and scored from '3' (minimum affective social support) to '15' (maximum affective social support).

Statistical analysis

Multiple logistic regression models were fitted in order to calculate adjusted odds ratios (aOR) and 95 per cent confidence intervals (CI).

Separate models were run for each sex. The analysis was carried out following a hierarchical modelling strategy in which the explanatory variables of the conceptual framework were added in three steps (Victoria *et al.* 1997). First, logistic regression models adjusted for age and socio-economic position were fitted (model 1). To study the impact of the household characteristics, the type of household and the caring tasks were added at the second step (model 2). Finally, to control by the level of social support, the confidant social support and the affective social support indexes were introduced (model 3). Analyses included weights derived from the complex sample design. Goodness-of-fit was obtained using the Hosmer Lemeshow Test (Hosmer and Lemeshow 2000).

Results

General description of the population

Table 1 profiles the population under study. Women were slightly older than men and had lower educational attainment, whereas levels of material deprivation measured through lack of household resources were similar in both sexes. Regarding type of household, women were more likely than men to live alone (26 % vs. 9 %) or with people other than the partner both as household head (10 % vs. 4 %) and not as household head (11 % vs. 3 %), whilst living with the partner was more frequent among men (84 % vs. 52 %). Whereas no gender differences were found in living with a disabled person, the percentage of women taking care of disabled people at home was higher than among men (6 % vs. 4 %). Both kinds of social support were high among the men and women in the sample, but especially affective social support. Women were more likely to report poor self-perceived health status, their frequency of poor mental health status was more than double that of men, and they suffered more limiting long-term illnesses (LLI).

Gender differences in health status

The prevalence of poor health outcomes was significantly higher among women for all three indicators, but especially regarding poor mental health status (Table 2). After adjusting for age and socio-economic position, women were more likely to report poor self-perceived health status (aOR = 1.63; 95 % CI = 1.39–1.92), poor mental health status (aOR = 2.30; 95 % CI = 1.78–2.96) and LLI (aOR = 1.78; 95 % CI = 1.48–2.14). Gender differences in the three health indicators remained after additionally adjusting for household characteristics and social support.

TABLE 1. *General description of the study population (in percentages). Catalonian Health Survey, 2006*

	Men ($n=1113$)	Women ($n=1484$)	p
Age (median, 25%–75% percentiles)	73, 69–78	74, 70–79	<0.001
Educational attainment			<0.001
More than primary schooling	30.2	17.8	
Primary	33.8	30.7	
Less than primary	36.0	51.5	
Household resources			0.302
0 items lacked	63.8	60.7	
1 item lacked	33.5	37.6	
2 or more items lacked	2.7	1.7	
Type of household			0.032
Living with partner	84.3	52.1	
Living alone	8.6	25.9	
Not living with partner (household head)	4.5	10.5	
Not living with partner (not household head)	2.6	11.5	
Living with a disabled person	16.5	16.4	0.966
Taking care of a disabled person	3.7	5.6	0.024
Confidant social support[1] (median, 25%–75% percentiles)	21, 18–24	20, 17–24	0.001
Affective social support[2] (median, 25%–75% percentiles)	14, 12–15	14, 12–15	0.012
Self-perceived health			<0.001
Very good	3.2	1.1	
Good	8.8	6.9	
Fair	41.9	30.6	
Poor	36.8	44.5	
Very poor	9.4	16.9	
Poor mental health status	8.9	19.9	<0.001
Limiting long-standing illness	19.9	32.0	<0.001

[1] The Confidant Social Support Index ranges from 5 to 25.
[2] The Affective Social Support Index ranges from 3 to 15.

Relationship between the socio-economic position and household characteristics with the health outcomes

Tables 3 to 5 show step-by-step the hierarchical modelling carried out. In Model 1, only the socio-economic variables were introduced in the analysis as explanatory variables of the health indicators under study. In both sexes, an association between educational attainment and poor health outcomes was observed and a consistent gradient was found in almost all the health indicators considered. People with less than primary education had the highest probability of reporting a poor self-perceived health status (aOR=1.94; 95% CI=1.43–2.62 among men and

TABLE 2. *Odds ratios (aOR) and 95% confidence intervals (CI) comparing health outcomes of women to men. Catalonian Health Survey, 2006*

Health outcome and controls	aOR (95% CI)
Poor self-perceived health status	
Adjusted for age	1.79 (1.52–2.09)***
Adjusted for age and socio-economic position	1.63 (1.39–1.92)***
Adjusted for age, socio-economic position and household characteristics	1.79 (1.51–2.12)***
Adjusted for age, socio-economic position, household characteristics and social support	1.76 (1.49–2.09)***
Poor mental health status	
Adjusted for age	2.51 (1.95–3.22)***
Adjusted for age and socio-economic position	2.30 (1.78–2.96)***
Adjusted for age, socio-economic position and household characteristics	2.41 (1.86–3.11)***
Adjusted for age, socio-economic position, household characteristics and social support	2.38 (1.83–3.10)***
Limiting long-standing illness	
Adjusted for age	1.84 (1.53–2.22)***
Adjusted for age and socio-economic position	1.78 (1.48–2.14)***
Adjusted for age, socio-economic position and household characteristics	1.98 (1.61–2.42)***
Adjusted for age, socio-economic position, household characteristics and social support	1.94 (1.58–2.38)***

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

aOR = 2.55; 95% CI = 1.91–3.42 among women) and a poor-mental health status (aOR = 1.83; 95% CI = 1.05–3.20 among men and aOR = 2.44; 95% CI = 1.59–3.75 among women) compared to those with more than primary education. Low educational attainment was not significantly associated with having a LLI among men, whilst a positive relationship with a gradient was found for women (aOR = 1.64; 95% CI = 1.18–2.27 for less than primary education and aOR = 1.47; 95% CI = 1.04–2.08 for primary education, compared to more than primary education). Lacking one of the household resources considered in the material deprivation indicator was only positively related to poor mental health status among women (aOR = 1.51; 95% CI = 1.15–1.98), whereas lacking two or more items was only positively related to having a limiting long-standing illness among men (aOR = 2.19; 95% CI = 1.07–4.94).

When household characteristics were introduced in Model 2, living alone was the only type of living arrangement significantly associated with health status. Both men and women in this situation were more likely to report poor mental health status as compared to those living with the partner (aOR = 2.53; 95% CI = 1.31–4.89 and aOR = 1.98; 95% CI = 1.39–2.79, respectively), and only among women was it positively

TABLE 3. *Multivariate associations between poor self-perceived health status and the socio-economic, household living arrangements and social support indicators, men and women 65–85 years old, Catalonia 2006*

Gender, attribute and controls		Model 1	Model 2	Model 3
	%	aOR (95%CI)	aOR (95%CI)	aOR (95%CI)
Men		*n* = 1378	*n* = 1299	*n* = 1299
Educational attainment				
More than primary (ref)	34.9	1	1	1
Primary	49.3	1.76 (1.30–2.39)***	1.90 (1.38–2.62)***	1.89 (1.36–2.61)***
Less than primary	52.7	1.94 (1.43–2.62)***	1.90 (1.38–2.62)***	1.83 (1.33–2.53)***
Household resources				
0 items lacked (ref)	44.8	1	1	1
1 item lacked	47.7	1.09 (0.85–1.41)	1.20 (0.91–1.57	1.14 (0.86–1.50)
2 or more items lacked	60.9	1.75 (0.82–3.74)	1.74 (0.77–3.95)	1.59 (0.68–3.67)
Type of household				
Living with partner (ref)	46.9		1	1
Living alone	41.4		0.90 (0.57–1.41)	0.80 (0.50–1.29)
Not living with partner (household head)	35.0		0.61 (0.32–1.16)	0.64 (0.33–1.23)
Not living with partner (not household head)	58.9		1.27 (0.50–3.18)	1.07 (0.42–2.70)
Living with a disabled person	63.9		3.10 (2.06–4.60)***	2.85 (1.90–4.28)***
Taking care of a disabled person	52.4		0.54 (0.26–1.13)	0.52 (0.24–1.09)
Confidant Social Support	–			0.89 (0.86–0.94)***
Affective Social Support	–			1.09 (1.00–1.19)*
Women		*n* = 1734	*n* = 1633	*n* = 1633
Educational attainment				
More than primary (ref)	44.9	1	1	1
Primary	57.9	1.64 (1.21–2.23)**	1.66 (1.20–2.28)**	1.58 (1.15–2.18)**
Less than primary	69.2	2.55 (1.91–3.42)***	2.48 (1.83–3.36)***	2.28 (1.68–3.10)***
Household resources				
0 items lacked (ref)	59.4	1	1	1
1 item lacked	64.5	1.12 (0.90–1.41)	1.05 (0.83–1.32)	1.04 (0.82–1.31)
2 or more items lacked	65.5	1.15 (0.49–2.68)	1.19 (0.50–2.81)	1.17 (0.49–2.79)
Type of household				
Living with partner (ref)	62.2		1	1
Living alone	57.6		0.93 (0.70–1.23)	0.84 (0.63–1.12)
Not living with partner (household head)	63.0		0.95 (0.65–1.40)	0.92 (0.63–1.37)
Not living with partner (not household head)	64.8		0.77 (0.51–1.17)	0.77 (0.51–1.17)
Living with a disabled person	78.0		4.46 (2.74–7.26)***	4.15 (2.54–6.77)***
Taking care of a disabled person	64.9		0.33 (0.17–0.64)**	0.33 (0.17–0.64)**
Confidant Social Support	–			0.93 (0.90–0.97)***
Affective Social Support	–			1.02 (0.96–1.09)

Notes: Adjusted by age. aoR: adjusted odds ratios. CI: 95 per cent confidence interval.
Source: Catalonian Health Survey 2006. For details see text.
Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 4. *Multivariate associations between poor mental health status and the socio-economic, household living arrangements and social support indicators, men and women 65–85 years old, Catalonia 2006*

Gender, attribute and controls	Model 1		Model 2	Model 3
	%	aOR (95%CI)	aOR (95%CI)	aOR (95%CI)
Men		*n* = 1299	*n* = 1299	*n* = 1299
Educational attainment				
More than primary (ref)	6.2	1	1	1
Primary	8.9	1.44 (0.80–2.57)	1.37 (0.76–2.48)	1.33 (0.73–2.43)
Less than primary	11.3	1.83 (1.05–3.20)*	1.74 (0.98–3.07)	1.46 (0.82–2.63)
Household resources				
0 items lacked (ref)	8.3	1	1	1
1 item lacked	9.5	1.13 (0.72–1.77)	1.17 (0.77–1.86)	1.12 (0.70–1.81)
2 or more items lacked	15.4	1.89 (0.65–5.52)	0.74 (0.22–2.52)	0.85 (0.25–2.85)
Type of household				
Living with partner (ref)	8.3		1	1
Living alone	14.9		2.53 (1.31–4.89)**	1.49 (0.71–3.10)
Not living with partner (household head)	6.1		0.74 (0.22–2.52)	0.78 (0.23–2.69)
Not living with partner (not household head)	13.5		2.03 (0.52–7.92)	1.43 (0.35–5.83)
Living with a disabled person	18.4		4.03 (2.39–6.79)***	3.69 (2.15–6.32)***
Taking care of a disabled person	10.9		0.46 (0.15-1.35)	0.38 (0.12–1.20)
Confidant Social Support	–			0.92 (0.86–0.98)**
Affective Social Support	–			0.90 (0.80–1.01)
Women		*n* = 1633	*n* = 1633	*n* = 1633
Educational attainment				
More than primary (ref)	11.1	1	1	1
Primary	17.4	1.63 (1.03–2.58)*	1.69 (1.06–2.69)*	1.59 (0.99–2.55)
Less than primary	24.7	2.44 (1.59–3.75)***	2.62 (1.69–4.04)***	2.39 (1.54–3.73)***
Household resources				
0 items lacked (ref)	16.7	1	1	1
1 item lacked	24.8	1.51 (1.15–1.98)**	1.41 (1.07–1.86)*	1.39 (1.05–1.85)*
2 or more items lacked	27.1	1.69 (0.68–4.19)	1.65 (0.66–4.13)	1.51 (0.59–3.89)
Type of household				
Living with partner (ref)	17.4		1	1
Living alone	23.7		1.98 (1.39–2.79)***	1.60 (1.11–2.29)*
Not living with partner (household head)	22.3		1.31 (0.83–2.06)	1.23 (0.77–1.94)
Not living with partner (not household head)	20.9		1.35 (0.82–2.23)	1.45 (0.87–2.42)
Living with a disabled person	29.5		2.72 (1.81–4.09)***	2.49 (1.64–3.79)***
Taking care of a disabled person	22.6		0.60 (0.32–1.13)	0.59 (0.31–1.24)
Confidant Social Support	–			0.95 (0.91–0.99)*
Affective Social Support	–			0.89 (0.83–0.96)**

Notes: Adjusted by age. aoR: adjusted odds ratios. CI: 95 per cent confidence interval.
Source: Catalonian Health Survey 2006. For details see text.
Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 5. *Multivariate associations between limiting long-standing illness and the socio-economic, household living arrangements and social support indicators, men and women 65–85 years old, Catalonia 2006*

Gender, attribute and controls		Model 1	Model 2	Model 3
	%	aOR (95 %CI)	aOR (95 %CI)	aOR (95 %CI)
Men		*n* = 1378	*n* = 1299	*n* = 1299
Educational attainment				
More than primary (ref)	20.2	1	1	1
Primary	18.4	0.88 (0.60–1.28)	0.91 (0.61–1.38)	0.96 (0.64–1.45)
Less than primary	21.2	1.04 (0.72–1.50)	0.98 (0.65–1.46)	0.90 (0.59–1.35)
Household resources				
0 items lacked (ref)	20.4	1	1	1
1 item lacked	17.7	0.83 (0.60–1.15)	0.96 (0.67–1.37)	0.93 (0.65–1.32)
2 or more items lacked	37.7	2.19 (1.07–4.94)*	2.62 (1.14–6.02)*	2.51 (1.08–5.86)*
Type of household				
Living with partner (ref)	19.6		1	1
Living alone	19.0		1.39 (0.78–2.47)	1.37 (0.76–2.50)
Not living with partner (household head)	20.7		1.13 (0.53–2.44)	1.17 (0.54–2.53)
Not living with partner (not household head)	33.3		1.51 (0.49–4.71)	1.42 (0.45–4.54)
Living with a disabled person	37.2		4.52 (3.01–6.80)***	4.33 (2.87–6.53)***
Taking care of a disabled person	23.1		0.38 (0.11–0.86)*	0.39 (0.16–0.84)*
Confidant Social Support	–			0.95 (0.89–0.99)*
Affective Social Support	–			1.07 (0.96–1.18)
Women		*n* = 1734	*n* = 1633	*n* = 1633
Educational attainment				
More than primary (ref)	23.5	1	1	1
Primary	31.7	1.47 (1.04–2.08)*	1.38 (0.96–1.98)	1.31 (0.91–1.89)
Less than primary	35.0	1.64 (1.18–2.27)**	1.57 (1.11–2.20)*	1.42 (1.01–2.01)*
Household resources				
0 items lacked (ref)	30.5	1	1	1
1 item lacked	34.7	1.16 (0.92–1.45)	1.13 (0.88–1.45)	1.11 (0.87–1.43)
2 or more items lacked	26.6	0.77 (0.31–1.88)	0.83 (0.33–2.08)	0.77 (0.30–1.97)
Type of household				
Living with partner (ref)	29.7		1	1
Living alone	31.5		1.39 (1.02–1.88)*	1.20 (0.88–1.64)
Not living with partner (household head)	37.2		1.26 (0.85–1.87)	1.21 (0.81–1.79)
Not living with partner (not household head)	38.6		1.02 (0.66–1.60)	1.05 (0.67–1.65)
Living with a disabled person	46.4		3.45 (2.39–4.98)***	3.20 (2.20–4.64)***
Taking care of a disabled person	33.2		0.44 (0.25–0.77)**	0.43 (0.24–0.76)**
Confidant Social Support	–			0.94 (0.91–0.98)**
Affective Social Support	–			0.97 (0.90–1.03)

Notes: Adjusted by age. aoR: adjusted odds ratios. CI: 95 per cent confidence interval.
Source: Catalonian Health Survey 2006. For details see text.
Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

associated with LLI (aOR = 1.39; 95 % CI = 1.02–1.88). When controlling for social support in Model 3, however, living alone was only significantly associated with poor mental health among women. Living with a disabled person was positively and strongly associated with all the health indicators in both sexes, even after adding social support in the analysis. Taking care of disabled people at home, however, was negatively associated with having a LLI in both sexes (aOR = 0.38; 95 % CI = 0.11–0.86 among men and aOR = 0.44; 95 % CI = 0.25–0.77 among women) and with having a poor self-perceived health status among women (aOR = 0.33; 95 % CI = 0.17–0.64).

In Model 3, subjective social support, disaggregated in confidant and affective social support, was introduced together with all the other explanatory variables of the study. Confidant social support was negatively associated with all the health indicators in both sexes, whilst affective social support was only negatively and significantly associated with poor mental health status among women (aOR = 0.89; 95 % CI = 0.83–0.96) and positively associated with poor self-perceived health status among men (aOR = 1.09; 95 % CI = 1.00–1.19).

Discussion

This study is a contribution to the relatively new but growing literature about the multiple determinants of health inequalities among older people. As in Grundy and Sloggett's study (2003) carried out in England, we have included different dimensions of health status and of its determinants. Regarding health indicators, however, we have included one closely related to the age group under study, that is, long-standing illnesses generating functional limitations. And regarding the predictor variables, our study overcomes some shortcomings of previous research and provides other important dimensions that are not usually considered. First of all, educational attainment had three categories instead of being a dichotomous variable, making it possible to analyse the socio-economic gradient in health inequalities. Moreover, household living arrangements was used instead of marital status, a much more important determinant of wellbeing among elderly people, together with two other dimensions of household characteristics: living with a disabled person and taking care of a disabled person. Finally, social support has been measured with two dimensions, showing that the relationship between each of them and health is different depending on the kind of social support received.

The main findings of the study can be summarised as follows. First, as is also the case in younger adults, health status among elderly women is

poorer than among the men in the three dimensions of health considered. Secondly, even after controlling for social support, living with a disabled person is positively related to all the health indicators considered and in both sexes, whereas taking care of disabled people at home is negatively associated with having a LLI in both sexes and with having a poor self-perceived health among women. Thirdly, whereas living alone was associated with poor mental health status in both sexes, the association disappeared among men after adjusting for social support. Finally, confidant social support is negatively related to poor health status, whereas affective social support only behaves this way with poor mental health among women.

Gender differences in health status

The results show that elderly Catalonian women have a poorer self-perceived health status, a poorer mental health status and are more likely to report LLI than their male counterparts. Gender inequalities in health among older people are especially important regarding poor mental health, with women presenting a probability of suffering from it almost two-and-a-half times higher than men. These differences remained after controlling for all the other variables. The higher prevalence of mental health problems among women in all age groups has been reported in other studies (Sonnenberg *et al.* 2000; Zunzunegui *et al.* 1998). The different gender patterns depending on the health indicator analysed, as well as the differences in factors associated with each of them point out the importance of examining different health indicators in trying to understand fully the complexity of inequalities in health (Lahelma *et al.* 1999; Macintyre *et al.* 1996; Matthews, Manor and Power 1999).

Relationship of the socio-economic position, household characteristics and social support with the health outcomes by sex

Some research about social inequalities in health among elderly people has suggested using a set of measures of socio-economic position instead of a single indicator in order to explore the multidimensional nature socio-economic position has in old age (Avlund *et al.* 2003; Dalstra *et al.* 2006; Grundy and Holt 2001; Huisman, Kunst and Mackenbach 2003; Von Dem Knesebeck *et al.* 2007). Accordingly, two different indicators were used in our study. Educational attainment was more related to the health of women and especially to self-perceived health status, in line with the claim that educational level is a better indicator of health inequalities for women (Arber and Khlat 2002). The socio-economic gradient in health

among elderly people according to educational attainment found in the present study is consistent with previous research (Dalstra *et al.* 2006; Huisman, Kunst and Mackenbach 2003).

Material deprivation, as a measure of household material standards of living, was only related to poor mental health among women and more strongly to having a LLI among men after controlling for all the other variables. This result contrasts with other studies in which measures of material deprivation were more strongly associated with poor health among women than men (Borrell *et al.* 2004; Grundy and Sloggett 2003), but is in line with the finding of an association between material deprivation and poor mental health (Eachus *et al.* 1996; Groffen *et al.* 2007).

Anson (1988) found that women living with a partner were the healthiest and women living alone or being head of families were the least healthy, which pointed to the importance of adult support for health status. Consistently, living alone was associated with poor mental health in both sexes and with having a LLI among women, although only the association between living alone and poor mental health among women persisted (albeit weakened) after controlling for social support. This result is in line with those of a study carried out among 60–72 year-old nurses which found that social engagement and social network variables were associated with a decreased risk of decline in mental health among women living alone (Michael *et al.* 2001).

Our findings suggest that living alone can have different meanings for elderly men and women, with a high negative impact on women's mental health. A possible explanation of this outcome is the phenomenon of the 'feminisation of poverty' (Pearce 1978), together with higher widowhood rates among women, which especially applies in Spain, where many elderly widows live with very small pensions. The association between deprivation and poor mental health among women would support this hypothesis. As also found by the Caregiver Health Effects Study (Schulz and Beach 1999) in a sample of Americans aged 66 to 96 years, living with a disabled person was positively and strongly related to poor health; but unlike that study, we found that caring for a disabled person was negatively related to poor health. Surprisingly, whereas taking care of a disabled person presented a negative association with having a poor self-perceived health among women and with having a LLI in both sexes, living with a disabled person was positively and strongly related to all the health outcomes among both men and women, even after controlling for social support. These findings could be explained by a probable reverse causation effect, whereby those taking care of a disabled person would represent a selection of the healthiest elderly, whereas living with a disabled

and not taking care of him or her could be related to a higher prevalence of poor health status. Shulz and Beach (1999), for instance, found that individuals with a disabled spouse who were not providing care had higher rates of prevalent disease compared to the other three caregiving groups analysed.

Confidant social support was negatively associated with having a poor self-perceived health status, poor mental health and a LLI, whilst affective social support was only negatively related to poor mental health among women and positively associated with poor self-perceived health status among men. Perceived support has been found to protect individuals from the effects of stress (Cohen and Wills 1985, Kessler and McLeod 1985, Wethington and Kessler 1986) and to attenuate the effect of disability on depressive symptoms (Allen, Ciambrone and Welch 2000; Jang *et al.* 2002; Taylor and Lynch 2004; Turner and Noh 1988). In a study carried out in Spain, it has been found that those elderly people with more social links presented lower risks of mortality, cognitive deterioration, depression and disability, and even higher probabilities of recovering after a disability (Otero *et al.* 2006). This study, however, shows that affective social support is positively related to poor self-perceived health status among men. A possible explanation of this outcome is that elderly men with poor self-perceived health receive more attention from their spouses or other family members. This, however, is a speculation that deserves further investigation.

Although family networks are an important source of support in Spain, the family has been found to be more likely to provide both positive and negative interactions than friends (Aneshensel, Pearlin and Schuler 1993; Antonucci 1990; Rogers 1996). Some studies describe the existence of a hierarchical order in the effect of the provision of support on depressive symptoms among elderly people, emotional support from friends (more likely to provide confidant social support) being more important than that from the family (more likely to provide affective social support) (Dean, Kolody and Wood 1990; Harlow, Goldberg and Comstock 1991). In line with this evidence, in this study both affective and confidant social support protect elderly women against poor mental health, whereas in the case of men only confidant social support is significantly and negatively related to poor mental health. Given the nature of the sample, however, we cannot rule out the possibility that those with poor mental health receive the least support – the so-called 'contamination hypothesis' (George *et al.* 1989). Previous research, however, has demonstrated less support for the hypothesis of mental health affecting perceived social support than for perceived social support affecting mental health (Taylor and Lynch 2004).

Limitations

One of the limitations of this study is its cross-sectional design, a fact that prevents us from determining the directions of causation. For example, as mentioned before, the relationships between living arrangements, caring activities and social support with health are likely to be reciprocal. However, some possible explanations for both causality directions have been provided.

A second limitation seems from the nature of the sample. Limiting the study to community-residing people may have biased the results in the sense that, as men are more likely to have a spouse caring for them when disabilities appear in old age, women have a higher probability of being excluded from the sample because of their higher institutionalisation rates (Marmot, Koveginas and Elston 1987; United Nations 2005). It would be expected that less healthy women would be excluded from the study but yet there was still an excess of female morbidity for the three health indicators analysed. Institutionalisation rates in Spain, however, are among the lowest in Europe (IMSERSO 2006*a*).

Moreover, the way the variable dealing with taking care of a disabled person has been generated could explain the unexpected outcome, whereby those doing so were healthier. In this study, carers were considered as those defining themselves as the main carers of the disabled persons at home. Perhaps the model could be improved by taking into account the amount of care provided, but unfortunately this was not possible with the original database.

Policy implications

This study has provided evidence of the importance of simultaneously considering socio-economic position, household characteristics and social support, as well as different health outcomes, in order fully to understand health inequalities among elderly people. It has also emphasised the importance of examining family roles and health not only among women but also among men, as well as the different effects that gender patterns in old age have on different dimensions of health. An integrated approach to socio-economic inequalities, simultaneously studying indicators of household living standards, household structure and social support is needed both in research on inequalities in health as well as in social and health policies addressed to elderly people. Moreover, this study sheds some light on the mechanisms explaining gender inequalities in health among elderly people in Mediterranean countries. Unlike previous research, the hierarchical modelling strategy followed here enabled us to see the impact on health of the three dimensions examined by adding them

step-by-step, that is, socio-economic position, family characteristics and social support.

In Spain, as in the rest of Europe, the majority of elderly people prefer to live in their homes (77 %), and only with their children or in institutions as the last options in case of need (IMSERSO 2007). On November 30th 2006, the *Act for the Promotion of Personal Autonomy and Care for Dependent Persons* was passed in the Congress of Deputies, with implementation commencing at the end of 2007 and constituting a step forward in social policy in Spain (IMSERSO 2006*b*). The results of this study show the importance of developing specific policies oriented towards elderly people facing disabilities and their families, such as the one mentioned above. 'Ageing at home' requires the expansion of public care services, to date very underdeveloped in Spain, such as respite services to the family of the dependants, the expansion of home visits to elderly people by health professionals, and the adaptation of housing to the ageng process (*e.g.* installing elevators in flats and showers instead of baths).

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4. PAPER III. SOCIOECONOMIC AND GENDER INEQUALITIES IN HEALTH AMONG OLDER ADULTS IN SPAIN

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Abstract: The aim of this study is to compare socioeconomic and gender inequalities in health among older adults in Spanish regions with different socioeconomic development. Data came from the 2006 Spanish National Health Interview Survey (NHIS). A sub-sample of people aged 65-85 years with no paid work living in two socioeconomically developed regions situated in the North of Spain (the Basque Country and Navarra) and two less developed ones situated in the South (Andalusia and the Region of Murcia) was selected (535 men and 1067 women). The health outcomes analysed were self-perceived health status and poor mental health status. Multiple logistic regression models separated by sex and region were fitted and a hierarchical model was carried out in four steps.

Self-perceived health status among older adults was poorer in the less socioeconomically developed regions (Andalusia and the Region of Murcia), but especially among women, whereas the poorest mental health status was found in Navarra and especially for men. Social support was an important determinant of health status regardless of the socioeconomic development of the Autonomous Community, but especially confidant social support regarding mental health status and in both sexes. Gender inequalities in health did not differ by regional socioeconomic development.

These results emphasize the importance of carrying out comparative studies about health inequalities among older adults in the different regions of Spain. It also points out the relevance of using an integrated approach, simultaneously considering gender, individual socioeconomic position, regional socioeconomic development, social support, as well as different health indicators, in order to fully understand the social determinants of health status of older men and women in the different regions of Spain.

SOCIOECONOMIC AND GENDER INEQUALITIES IN HEALTH AMONG OLDER ADULTS IN SPAIN

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Abstract

The aim of this study is to compare socioeconomic and gender inequalities in health among older adults in Spanish regions with different socioeconomic development. Data came from the 2006 Spanish National Health Interview Survey (NHIS). A sub-sample of people aged 65-85 years with no paid work living in two socioeconomically developed regions situated in the North of Spain (the Basque Country and Navarra) and two less developed ones situated in the South (Andalusia and the Region of Murcia) was selected (535 men and 1067 women). The health outcomes analysed were self-perceived health status and poor mental health status. Multiple logistic regression models separated by sex and region were fitted and a hierarchical model was carried out in four steps.

Self-perceived health status among older adults was poorer in the less socioeconomically developed regions (Andalusia and the Region of Murcia), but especially among women, whereas the poorest mental health status was found in Navarra and especially for men. Social support was an important determinant of health status regardless of the socioeconomic development of the Autonomous Community, but especially confidant social support regarding mental health status and in both sexes. Gender inequalities in health did not differ by regional socioeconomic development.

These results emphasize the importance of carrying out comparative studies about health inequalities among older adults in the different regions of Spain. It also points out the relevance of using an integrated approach, simultaneously considering gender, individual socioeconomic position, regional socioeconomic development, social support, as well as different health indicators, in order to fully understand the social determinants of health status of older men and women in the different regions of Spain.

Keywords: Socioeconomic factors; Gender; Inequalities; Family characteristics; Social support; Spanish regions.

Introduction

Population ageing was one of the most distinctive demographic events of the twentieth century and is expected to remain important throughout the twenty-first century. Moreover, it should be taken into account that the majority of older persons (55 percent) are women and that among the oldest old, women represent 64 percent. According to the United Nations' population prospects for 2050, Spain will be the second most aged country in the world after Japan (United Nations 2006). These demographic tendencies together with the fact that retirement age is associated with the loss of economic and social resources and a higher risk of social exclusion (especially among women), reveal the importance of the evaluation of health inequalities among this important age segment of the population.

Health inequalities derive from the existence of inequalities in other domains of life, such as political, economical and social spheres (Peter & Evans 2001). Although research about health inequalities in Spain is relatively new, various studies carried out during the last decade show the existence of health inequalities associated with income inequalities, poverty, unemployment, illiteracy rates and other social indicators in the adult population (Benach et al. 2006; Caixa Catalunya, 2009; García-Altés et al. 2008; Navarro et al. 1996; Regidor et al. 1994; Rodríguez-Sanz et al. 2007).

The pattern found in these studies shows an unequal distribution of mortality, life expectancy and poor self-perceived health status, presenting poorer outcomes those Autonomous Communities with higher poverty rates and income inequalities, that is, those in the South and North-West, and especially among women. For instance, life expectancy in 2002 presented a variation of 2 years both among men and women between those Autonomous Communities with lower poverty rates and income inequalities, situated in the North-West, and those with higher poverty rates and income

inequalities; situated in the South. Castilla y León and Navarra (in the North) presented a life expectancy higher than 77 and 84 years for men and women, respectively; whereas on the other extreme were Andalusia and Canarias (in the South) with a life expectancy lower than 76 and 82 years for men and women, respectively (Rodríguez-Sanz et al. 2007). Similar regional differences in health have been found in Italy (Costa et al. 2004).

This North-South gradient in socioeconomic inequalities in Spain is also found regarding gender inequalities. When studying the GDI (Gender Development Index), Carrasco-Portiño and her collaborators situate Spain in a not very disadvantaged position compared to the other European countries, but describe important regional differences inside the country. Whereas Navarra and the Basque Country showed the highest GDI, Andalusia and Extremadura presented the lowest ones in the two periods analysed, 1990 and 2000 (Carrasco-Portiño et al. 2008). This and other studies, however, show a trend towards convergence in gender inequalities among regions in Spain, a faster convergence than that of the HDI (Human Development Index) (Carrasco-Portiño et al. 2008; Domínguez and Guijarro, 2005).

Social support is related both to the social construction of gender and to age. Some studies have found that while men tend to maintain less emotional relationships and are less embedded in their social networks, women's friendship focus more on intimacy and tend to provide and receive more support from members of their network (Kawachi and Berkman 2001; Shye et al. 1995). The type and amount of social support received and provided, on the other hand, changes as people get older, with loses but at the same time the inclusion of new ties. A positive association between social support and both physical and psychological health among older adults is described in the literature (Grundy and Sloggett 2003; Oxman et al. 1992; Zunzunegui et al. 2001) and

the association to vary by socioeconomic position (Oakley and Rajan 1991). Spain shows one of the highest correlations between social support and mental health (Ministry of Health and Consumer Affairs 2007). Although only a few studies focusing on the influence of social support on the mental health of older adults have been carried out in Spain, they show a clear association between both variables (Lahuerta et al. 2004; Rueda and Artazcoz 2009).

As the European Commission points out, ageing may increase mental ill health due to factors such as decreasing functional capacity or social isolation. Older adults identify physical health as a very important aspect, closely related to their psychological well-being (Mental Health Foundation 2005). It is expected that late life-depression and age-related neuro-psychiatric conditions, such as dementia, increase the burden of mental disorders. More than 27% of European adults are estimated to experience at least one form of mental ill health during any one year, being anxiety and depression the most common forms of mental ill health in the EU (European Commission 2005). Prevalence of mental health problems is higher among women, and Spain together with Italy constitutes the European country with the highest risk of suffering poor mental health (Ministry of Health and Consumer Affairs 2007). Various epidemiological studies have been carried out to estimate the prevalence of mental health disorders among older adults in various regions of Spain (Fernández et al. 2006; Fernández et al. 2008; Olivera et al. 2008; Vilalta-Franch et al. 2000), but not at a national level nor comparing the outcomes in different regions.

Only recently the literature about health inequalities has started to integrate socio-economic position and the gender dimension in Spain. Some studies have been carried out recently at an aggregated level (Artazcoz et al. 2004a**;** Artazcoz et al. 2004b) and in various Autonomous Communities or cities among the adult population

(Artazcoz et al. 2001; Borrell et al. 2004b; García et al. 2007) or among older adults (Rueda and Artazcoz 2009). This line of research corroborates the existence of health inequalities among men and women and the influence of the different roles assumed. One of the main findings is that family demands are positively related to poor health status among women, but specially among those of less privileged socio-economic positions (Artazcoz et al. 2004a; Artazcoz et al. 2001; Borrell et al. 2004b; García et al. 2007), a finding that has also being found among older adults (Rueda and Artazcoz 2009). However, there is a lack of regional comparisons regarding gender inequalities in health in Spain (Borrell et al. 2004a).

Despite all these evidences listed above, there are few studies about regional differences in socioeconomic and gender inequalities in health among the elderly in Southern European countries such as Spain. The aim of this study, then, is to analyse socioeconomic and gender inequalities in health in Spain through the comparison of two socioeconomically developed regions (the Basque Country and Navarra) with two less developed ones (Andalusia and the Region of Murcia). A combined framework of socioeconomic position, type of household and social support is presented. The analyses are based on two health indicators shown to be important in gerontological research: self-perceived health and mental health (Beckett et al. 1996; Idler and Benyamini 1997).

Four research questions lay behind this model: 1. Is the self-perceived health status of older adults living in the Basque Country and Navarra better than that of older adults living in Andalusia and in the Region of Murcia, as found among the general population? 2. Does the psychological dimension of health follow the same pattern? 3. Is the relationship of social support with both indicators of health status similar in the four regions? 4. Are gender inequalities larger in the less socioeconomically developed

regions (Andalusia and the Region of Murcia) than in the more developed ones (the Basque Country and Navarra)?

Based on the theoretical considerations and previous findings, four hypotheses were formulated to be tested in this analysis: 1. Self-perceived health status of older adults living in the two more socioeconomically developed regions is better than that of older adults living in the less developed ones. 2. Mental health status of older adults living in the two more socioeconomically developed regions is also better than that of older adults living in the less developed ones. 3. Social support has a protective effect for the health of older adults living in the four regions, but especially regarding mental health status. 4. Gender inequalities in health are larger in the less socioeconomically developed regions than in the two more developed ones.

Methods

Data

Data came from the 2006 Spanish National Health Interview Survey (NHIS), a cross-sectional study representative of the non-institutionalised population of Spain. This survey used multiple stage stratified sampling. Census tracts were the first-stage units, whereas family households were the second-stage ones. Within each household an adult (16 years or over) was selected to complete the questionnaire and if there were any children (0 to 15 years) one was also selected to be interviewed. The total number of people older than 16 interviewed was 29,476. Data were collected through face-to-face interviews at home between June 2006 and June 2007 (Ministry of Health and Consumer Affairs 2006).

For the purposes of this study a sub-sample of people aged 65-85 years who had no paid job living in four regions with differences in socio-economic development was selected: the Basque Country (102 men and 143 women), Navarra (128 men and 265 women), Andalusia (172 men and 371 women) and the Region of Murcia (133 men and 288 women). The Basque Country and Navarra, located in the North of Spain, have been chosen as representative of the more socioeconomically developed regions, whereas Andalusia and the Region of Murcia, located in the South, represent the less developed ones. For instance, whereas illiterate people in 2006 constituted 3.92% and 4.34% of the population in the Basque Country and Navarra, the data for Andalusia and Murcia were 17.06% and 16.32%, respectively. In the same period, GDP per capita in the Basque Country and Navarra represented 28.62% and 27.99%, whereas in Andalusia and in the Region of Murcia was 18.14% and 18.63%, respectively (INE 2008). And whereas public expenditure per capita in 2006 represented 6,147 and 3,650 euros in Navarra and the Basque Country, it was 3,407 and 2,761 euros in Andalusia and the Region of Murcia, respectively (own estimations based on Spanish Treasury Department 2009; INE 2009).

The minimum age has been chosen based on the standard legal retirement age for men in Spain (CES 2000) and the exclusion of all people with paid work in this study is justified by the fact that the meaning of living arrangements and their impact on health depends to a great extent on the employment status. For example, it has been reported that whereas family demands measured through the number of people in the household is associated with poor health status among female manual workers, there is no relationship with health among full-time homemakers (Artazcoz et al. 2004a). Moreover, the cross-sectional character of the data prevents us to test for the 'healthy

worker hypothesis' meaning that good health increases the probability of getting or keeping a paid job (Baillargeon 2001; Ross and Mirowsky 1995).

The decision to take 85 years as the maximum age, on the other hand, is based on the fact that, although institutionalisation rates in Spain are lower than in other European countries, among those aged 85 and over they are almost 4 times higher than among the total older adults population depending on variables such as sex, socioeconomic position or health (Arber and Cooper 1999; Grundy and Jitlal 2007; IMSERSO 2006).

Health outcomes

Self-perceived health status was elicited by asking the respondents to describe their general health as "very good", "good", "fair", "poor", or "very poor". The variable was dichotomised by combining the categories "poor" and "very poor" to indicate perceived health as below good (Manor et al. 2000). Self-perceived health is a broad indicator of health related well being and has also proved to be a good predictor of mortality and loss of functional capacity or independence (Bond et al. 2006; Idler and Benyamini 1997; Mossey and Shapiro 1982; Nielsen et al. 2009).

Poor mental health status was measured with the 12-item version of the Goldberg's general health questionnaire (12-GHQ) (Goldberg et al. 1970). This is a screening instrument widely used to detect current, diagnosable psychiatric disorders (Goldberg 1972) already validated in Spain (Sánchez-López and Dresch 2008). It focuses on breaks in normal functioning rather than on lifelong traits; therefore it covers personality disorders or patterns of adjustment when these associated with distress. A two-point scoring method was used, rating a problem as absent (0) or present (1). The

responses were summed, and the participants scoring 3 or more were classified as having a poor mental health (Goldberg 1978).

Predictor variables

Socioeconomic position was measured through educational attainment with the following categories: more than primary studies (reference category), primary studies and less than primary studies. Family characteristics were measured through type of household, a variable made up of the combination of the variables household size and marital status, generating a four-categories variable to reflect the most usual types of households among the population under study: living with partner (reference category), living alone, not living with partner but living with other people and being the household head, and not living with partner but living with other people and not being the household head.

Social support was measured through a reduced version of the original 11-items Duke's Social Support Scale, the validity and reliability of which has been demonstrated in several studies both abroad and in Spain (Bellón et al. 1996; Broadhead et al. 1988; De la Revilla et al. 1991). In the original questionnaire, people were asked 11 questions about social support in a Likert-type scale with value 1 meaning less than desired and 5 as much as desired. The social support indexes generated for this study, however, are based on the first validation of the questionnaire (Broadhead et al. 1988), in which three of the 11 original items could not be classified into the two dimensions of social support: confidant and affective social support.

The confidant social support index is the result of combining the following questions: "I get invitations to go out and do things with other people", "I get chances to talk to someone about problems at work or with my housework", "I get chances to talk

to someone about my personal and family problems", "I get chances to talk to someone about money matters" and "I get useful advice about important things in life", going from 5 (minimum confidant social support) to 25 (maximum confidant social support). The affective social support index is the result of combining the following questions: "I get love and affection", "I have people who care what happens to me" and "I get help when I'm sick in bed", going from 3 (minimum affective social support) to 15 (maximum affective social support). The Cronbach's alpha coefficients of the two groups of items were 0.89 for the confidant social support questions, and 0.85 for the affective social support ones.

Statistical analysis

Multiple logistic regression models were fitted in order to calculate adjusted odds ratios (aOR) and 95% confidence intervals (CI). Models were separated by sex and region. The analysis was carried out following a hierarchical modelling strategy in which the explanatory variables of the conceptual framework were added in four steps (Victoria et al. 1997). First, logistic regression models adjusted for age were fitted (model 1). Second, socioeconomic position was added (Model 2). To study gender inequalities, the type of household was added in the third step (model 3). Finally, to control by the level of social support, the confidant social support and the affective social support indexes were introduced (model 4). Because the results were similar when introducing separately the confidant social support and the affective social support indexes as when putting them together, they have been added together in the last step for better clarity of the tables (results not shown). However, in order to analyse the relationship of social support with both indicators of health status in the four regions, the results are shown for both indicators of social support and for both sexes (table 3).

Goodness of fit was obtained using the Hosmer Lemeshow Test (Hosmer and Lemeshow 2000).

Results

General description of the population

Table 1 shows the general description of the population under study. Women had lower educational attainments than men in all the Autonomous Communities analysed except in Navarra. Age, the type of household and the level of social support (both confidant and affective), however, were similar for both sexes in all four regions. Regarding health indicators, women were more likely to report poor self-perceived health status except in Navarra and their frequency of poor mental health status was higher than among the men in all Autonomous Communities.

Regional differences in health status

The prevalence of poor self-perceived health status was significantly higher in Andalusia and in the Region of Murcia, but especially among women, whereas self-perceived health status in Navarra was not statistically different to that in the Basque Country. Regarding poor mental health status, on the other hand, older adults living in Navarra showed the poorest outcomes of the four Autonomous Communities under study, especially men (Table 2).

In Table 2, first of all geographical differences in poor self-perceived health status comparing two socioeconomically developed Autonomous Communities with two less developed ones are shown. When only age was introduced as an explanatory variable, the Region of Murcia and Andalusia showed a higher prevalence of poor self-

perceived health status, but especially women (aOR=3.67; 95% CI=2.38-5.68 and aOR=2.09; 95% CI=1.41-3.11, respectively), compared to the reference region, the Basque Country. These associations remained even after controlling by socioeconomic position, family characteristics and social support, although they slightly decreased. No differences were found between the Basque Country and Navarra.

A quite different pattern emerged when regional differences in poor mental health status were analysed. In the first step, Navarra showed the highest prevalence, but especially among men (aOR=3.35; 95% CI=1.61-6.98), followed by Andalusia and the Region of Murcia, in these last cases especially among women (aOR=1.99; 95% CI=1.28-3.09 and aOR=1.82; 95% CI=1.16-2.86, respectively). When in subsequent steps socioeconomic position, family characteristics and social support were added as explanatory variables, some of these associations disappeared. This is the case of the Region of Murcia, where after adding socioeconomic position, poor mental health status was not any more significantly different to that in the Basque Country. In Andalusia, although these associations remained for women after adjusting for socioeconomic position and family characteristics, after adding social support they were not significant any more. In the case of Navarra, however, although slightly decreasing, the associations remained in both sexes after adjusting for all the other variables.

The relationship of social support with self-perceived health status and mental health status among older adults in different regions according to their socioeconomic development

Social support was an important determinant of health status regardless of the socioeconomic development of the Autonomous Community, but especially confidant social support regarding mental health status and in both sexes (Table 3). Confidant

social support was negatively and consistently associated with both indicators of health in both sexes, but especially with poor mental health status (aOR=0.79; 95% CI=0.68-0.93 among men and aOR=0.87; 95% CI=0.78-0.98 among women in the Basque Country; aOR=0.85; 95% CI=0.76-0.95 among men and aOR=0.85; 95% CI=0.78-0.92 among women in Navarra; aOR=0.90; 95% CI=0.82-0.99 among men and aOR=0.90; 95% CI=0.86-0.95 among women in Andalusia; and aOR=0.88; 95% CI=0.79-0.98 among men and aOR=0.88; 95% CI=0.83-0.93 among women in the Region of Murcia). Affective social support, on the other hand, was only negatively and significantly associated with poor mental health status among women in Navarra (aOR=0.73; 95% CI=0.62-0.85), Andalusia (aOR=0.85; 95% CI=0.76-0.94) and the Region of Murcia (aOR=0.71; 95% CI=0.62-0.82), among men in the Basque Country (aOR=0.68; 95% CI=0.53-0.86) and with poor self-perceived health status among women in Navarra (aOR=0.83; 95% CI=0.72-0.96).

Gender inequalities in health among older adults in different regions according to their socioeconomic development

Prevalence of poor health outcomes was significantly higher among women for both indicators, but especially regarding poor mental health status and in the two less socioeconomically developed regions (Table 4). After adjusting for age, socioeconomic position and family characteristics, women were more likely to report poor self-perceived health status in the Region of Murcia (aOR=2.29; 95% CI=1.42-3.72) and in Andalusia (aOR=2.13; 95% CI=1.43-3.17). Differences were almost statistically significant in the Basque Country, whereas gender differences were not statistically significant in Navarra. The pattern remains similar when additionally adjusting for social support.

Gender inequalities regarding poor mental health status emerged in all the Autonomous Communities under study, being as high in the less socioeconomically developed regions as in the more developed ones. After adjusting for age, socioeconomic position and family characteristics, women were more likely to report poor mental health status in Andalusia (aOR=2.82; 95% CI=1.70-4.67), followed by the Region of Murcia (aOR=2.51; 95% CI=1.47-4.28), the Basque Country (aOR=2.51; 95% CI=1.17-5.36) and finally in Navarra (aOR=1.69; 95% CI=1.06-2.67). Gender inequalities in health remained in all regions after adjusting for social support.

Discussion

This is the first study analysing and comparing socioeconomic and gender inequalities in health among older adults in regions of Spain with different socioeconomic development. The main findings can be summarized as follows. First, as is also the case for younger adults in Spain, self-perceived health status among older adults is poorer in the less socioeconomically developed regions, but especially among women. A quite different picture emerges when studying mental health status, finding the poorer outcomes in Navarra, even after adjusting by the other variables. Thirdly, social support constitutes an important determinant of health status among older adults both in the less socioeconomically developed and in the more developed ones, but especially confidant social support regarding mental health status and in both sexes. Finally, gender inequalities in health do not differ by regional socioeconomic development.

Regional differences in health status

The results show that older adults living in the less socioeconomically developed regions (the Region of Murcia and Andalusia) have a poorer self-perceived health status than those living in the most developed ones (the Basque Country and Navarra), but especially women. These differences remained after controlling for all the other variables, an outcome that confirms the first hypothesis risen. The higher prevalence of poor self-perceived health status among people living in less socioeconomically developed regions in Spain has been reported in other studies covering all the adult population (Benach et al. 2006; García-Altés et al. 2008; Navarro et al. 1996; Rodríguez-Sanz et al. 2007). These studies found a North-South gradient in the distribution of mortality, life expectancy and poor self-perceived health status, presenting poorer outcomes those Autonomous Communities with higher poverty rates and income inequalities, but especially women. This is the first time, however, that regional differences according to socioeconomic development in poor self-perceived health status are reported among older adults in Spain.

Regarding mental health status, and contrary to hypothesised, the poorer outcomes have been found in Navarra, but especially among men even after controlling by the other variables. On the other hand, poor mental health status among older adults in the less socioeconomically developed regions is similar to that in the Basque Country. Although this is the first time that regional differences in Spain regarding poor mental health status among older adults are analysed, the poorer mental health status shown in Navarra features a situation already described in literature. In 2003, for instance, Navarra's Ombudswoman handed the regional Parliament a special report about mental health. This report stated that neuropsyquiatric illnesses were the third most frequent (before infectious and cardiovascular diseases as well as cancer), cause of

premature mortality and disability, that 25-35% of the population suffered mental health problems in any time of their life and that only 22% of the patients recognise the illness in Navarra. This report, moreover, showed the limitations of the mental health system in the Autonomous Community and, among other measures, recommended a new management system, a better integration between the social and the health dimensions of the assistance to mental health patients and the elaboration of a Mental Health Integral Plan (Navarra's Ombudswoman 2003).

The relationship of social support with self-perceived health status and mental health status among older adults in different regions according to their socioeconomic development

Social support constitutes an important determinant of health status among older adults regardless of the socioeconomic development of the regions, but especially confidant social support regarding mental health status and in both sexes. The association between social support and poor mental health among older adults has been found in other studies. Perceived support has been found to protect individuals from mortality, cognitive deterioration, depression, disability and with a higher probability of recovery after a disability (Jang et al. 2002; Lahuerta et al. 2004; Otero et al. 2006; Taylor and Lynch 2004). Some studies, moreover, describe the existence of a hierarchical order in the effect of the provision of support concerning depressive symptoms among older adults, emotional support from friends (more likely to provide confidant social support) being more important than that from the family (more likely to provide affective social support) (Dean et al. 1990; Harlow et al. 1991). The results of the present study go in line with these findings and confirm hypothesis three.

Gender inequalities in health among older adults in different regions according to their socioeconomic development

This is the first time that gender inequalities among older adults in health are analysed at a regional level in Spain. Various studies carried out in Spain found a North-South gradient in the Gender Development Index (GDI), with those regions in the North presenting the highest numbers of GDI and those in the South the lowest ones (Carrasco-Portiño et al. 2008; Domínguez and Guijarro 2005). Contrary to hypothesised, however, in this study gender inequalities in health did not differ by regional socioeconomic development. That means that gender inequalities in health are independent of socioeconomic development. This outcome could be related to the tendency towards convergence in gender inequalities between the Spanish regions found in previous studies (Carrasco-Portiño et al. 2008; Domínguez and Guijarro 2005). It would be interesting to test these associations through the use of other gender indicators such as those related to domestic tasks and care to relatives.

Limitations

One of the limitations of this study is its cross-sectional design, a fact that prevents us from determining the direction of the relationship between social support and poor mental health. The results shown in this study, however, are in line with those found in longitudinal studies describing the relationship between social support and health outcomes (Nebot et al. 2002).

A second limitation is derived from the nature of the sample. Limiting the study to community-residing people may be biasing the results in the sense that, as men are more likely to have a spouse caring for them when disabilities appear in old age, females have a higher probability of being excluded from the sample due to their higher

institutionalisation rates (Marmot et al. 1987; United Nations Organisation 2005). Institutionalisation rates in Spain, however, as stated before, are among the lowest in Europe (IMSERSO 2006).

Another aspect that should be taken into account is that the Spanish National Health Interview Survey is a general health survey with a long questionnaire addressing many health-related issues, but with limitations regarding the availability of social indicators. In that sense, the remaining gender and regional differences that became no significant in the analyses may be a function of unobserved influences due to the limitations of the data source. The use of area-based socioeconomic measures derived from census data in combination with individual-based measures in a multilevel analysis would help us to uncertain some of the unexplained associations.

Research and policy implications

This study showed the importance of carrying out comparative studies about health inequalities among older adults in the different regions of Spain. It has also provided evidence of the importance of simultaneously considering gender, individual socioeconomic position, regional socioeconomic development, and social support, as well as different health outcomes, in order to fully understand socioeconomic and gender inequalities in health among older adults in different regions of Spain. Further work is needed to find the mechanisms explaining regional inequalities in health among older adults. The development of longitudinal analyses would be an important step in the research arena.

Regarding policies, on the other hand, the results of this study show the importance of implementing stronger gender equity policies, as well as reducing socioeconomic inequalities among regions. Although women working for pay in Spain

are no longer and exception, the women included in the present study belong to a generation with very irregular labour market careers due to the traditional male breadwinner model prevalent in Spain until very few decades ago. The Constitutional Act on Effective Equality between Women and Men, passed on March 2007, represents a step forward in a greater achievement of gender equity through the incorporation of equality plans and exclusive paternity leaves (Instituto de la Mujer 2008). Regarding the reduction of socioeconomic inequalities among regions, policies should not be only oriented towards the redistribution of economic resources but also towards achieving a greater equity in social policies in areas such as education and health.

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Table 1
General description of the population (in percentages). Spanish National Health Interview Survey (NHIS), 2006.

	The Basque Country					Navarra					Andalusia					The Region of Murcia				
	Men		Women			Men		Women			Men		Women			Men		Women		
	n	%	*n*	%	p	*n*	%	*n*	%	p	*n*	%	*n*	%	p	*n*	%	*n*	%	p
Age (median, 25%-75% percentiles)	*102*	73, 69-77	*143*	74, 70-78	0.132	*128*	74, 71-78	*265*	74, 70-79	0.835	*172*	73, 69-78	*371*	73, 69-78	0.988	*133*	73, 69-78	*288*	74, 70-78	0.534
Educational attainment					0.005					0.216					<0.001					<0.001
*More than primary	*41*	40.2	*32*	22.4		*22*	17.5	*29*	10.9		*29*	16.9	*31*	8.4		*23*	17.3	*13*	4.5	
*Primary	*50*	49.0	*88*	61.5		*75*	59.5	*171*	64.5		*61*	35.5	*109*	29.4		*46*	34.6	*86*	29.9	
*Less than primary	*11*	10.8	*23*	16.1		*29*	23.0	*65*	24.6		*82*	47.6	*231*	62.2		*64*	48.1	*189*	65.6	
Type of household					0.243					0.317					0.594					0.494
* Living alone	*27*	26.5	*60*	42.0		*32*	25.0	*85*	32.3		*37*	21.5	*153*	41.2		*25*	18.8	*107*	37.2	
* Living with partner	*67*	65.7	*67*	46.8		*79*	61.7	*124*	46.8		*128*	74.4	*158*	42.6		*101*	75.9	*139*	48.2	
* Not living with partner but living with others (hh)	*5*	4.9	*10*	7.0		*13*	10.2	*25*	9.4		*5*	2.9	*41*	11.1		*3*	2.3	*23*	8.0	
* Not living with partner but living with others (no hh)	*3*	2.9	*6*	4.2		*4*	3.1	*31*	11.7		*2*	1.2	*19*	5.1		*4*	3.0	*19*	6.6	
Confidant Social Support[1] (median, 25%-75% percentiles)	*95*	25, 21-25	*137*	25, 23-25	0.115	*128*	24, 21-25	*265*	25, 21-25	0.793	*163*	25, 21-25	*358*	25, 21-25	0.324	*131*	23, 19-25	*285*	23, 19-25	0.736
Affective Social Support[2] (median, 25%-75% percentiles)	*94*	15,14-15	*139*	15, 15-15	0.024	*128*	15, 13-15	*265*	15, 14-15	0.999	*163*	15, 14-15	*358*	15, 13-15	0.528	*132*	15, 12-15	*285*	15, 13-15	0.454
Self-perceived health					0.021					0.471					<0.001					<0.001
* Very good	*16*	15.7	*12*	8.4		*9*	7.0	*15*	5.7		*16*	9.3	*14*	3.8		*3*	2.3	*6*	2.1	
* Good	*49*	48.0	*58*	40.5		*54*	42.2	*108*	40.8		*74*	43.0	*105*	28.3		*53*	39.8	*54*	18.8	
* Fair	*27*	26.5	*53*	37.1		*41*	32.0	*88*	33.2		*54*	31.4	*159*	42.8		*54*	40.6	*139*	48.2	
* Poor	*8*	7.8	*16*	11.2		*21*	16.4	*44*	16.6		*17*	9.9	*62*	16.7		*18*	13.5	*68*	23.6	
* Very poor	*2*	2.0	*4*	2.8		*3*	2.3	*10*	3.8		*11*	6.4	*31*	8.4		*5*	3.8	*21*	7.3	
Mental health status					0.009					0.012					<0.001					<0.001
*Good mental health status	*87*	88.8	*107*	75.4		*88*	68.8	*147*	55.5		*124*	82.7	*214*	61.1		*108*	81.8	*180*	62.7	
* Poor mental health status	*11*	11.2	*35*	24.6		*40*	31.3	*118*	44.5		*26*	17.3	*136*	38.9		*24*	18.2	*107*	37.3	

[1] The Confidant Social Support Index ranges from 5 to 25.
[2] The Affective Social Support Index ranges from 3 to 15.

Table 2
Prevalence of poor self-perceived health and poor mental health status, odds ratios (OR) and 95% confidence intervals (CI) in Spanish Autonomous Communities. Men and women 65-85 years old. Reference category: The Basque Country. Spanish National Health Interview Survey (NHIS), 2006.

	Poor self-perceived health					Poor mental health status				
	%	aOR (95% CI) Model 1[1]	aOR (95% CI) Model 2[2]	aOR (95% CI) Model 3[3]	aOR (95% CI) Model 4[4]	%	aOR (95% CI) Model 1[1]	aOR (95% CI) Model 2[2]	aOR (95% CI) Model 3[3]	aOR (95% CI) Model 4[4]
Navarra										
• Men	50.8	1.71 (1.00-2.92)	1.47 (0.85-2.53)	1.48 (0.85-2.55)	1.63 (0.92-2.88)	31.3	3.35 (1.61-6.98)**	3.04 (1.45-6.39)**	3.06 (1.45-6.42)**	2.92 (1.37-6.25)**
• Women	53.6	1.09 (0.73-1.64)	1.00 (0.66-1.51)	0.99 (0.65-1.49)	0.98 (0.64-1.51)	44.5	2.44 (1.55-3.84)***	2.32 (1.47-3.65)***	2.30 (1.46-3.63)***	1.32 (1.44-3.73)**
Andalusia										
• Men	47.7	1.59 (0.96-2.63)	1.22 (0.72-2.04)	1.20 (0.72-2.02)	1.33 (0.77-2.31)	17.3	1.60 (0.75-3.42)	1.31 (0.61-2.81)	1.35 (0.62-2.91)	1.19 (0.54-2.62)
• Women	67.9	2.09 (1.41-3.11)***	1.60 (1.07-2.40)*	1.61 (1.07-2.41)*	1.53 (1.01-2.31)*	38.9	1.99 (1.28-3.09)**	1.59 (1.02-2.49)**	1.59 (1.02-2.48)*	1.57 (0.99-2.51)
The Region of Murcia										
• Men	57.9	2.36 (1.38-4.03)**	1.84 (1.07-3.18)*	1.80 (1.04-3.11)*	1.92 (1.08-3.40)*	18.2	1.67 (0.77-3.61)	1.34 (0.62-2.93)	1.38 (0.63-3.02)	1.10 (0.49-2.45)
• Women	79.2	3.67 (2.38-5.68)***	2.75 (1.77-4.29)***	2.74 (1.76-4.27)***	2.49 (1.59-3.93)***	37.3	1.82 (1.16-2.86)**	1.43 (0.91-2.27)	1.43 (0.90-2.26)	1.24 (0.76-1.99)

* p <0.05; ** p<0.01; ***p<0.001
[1] Adjusted for age
[2] Adjusted for age and socioeconomic position
[3] Adjusted for age, socioeconomic position and family characteristics
[4] Adjusted for age, socioeconomic position, family characteristics and social support

Table 3
Odds ratios (OR) and 95% confidence intervals (CI) showing the relationship of social support with health status. Men and women 65-85 years old. Spanish National Health Interview Survey (NHIS), 2006.

	aOR (95% CI)			
	Poor self-perceived health		Poor mental health status	
	Confidant Social Support	Affective Social Support	Confidant Social Support	Affective Social Support
The Basque Country				
• Men	0.89 (0.79-0.99)*	0.87 (0.72-1.04)	0.79 (0.68-0.93)**	0.68 (0.53-0.86)**
• Women	0.99 (0.88-1.10)	0.85 (0.65-1.09)	0.87 (0.78-0.98)*	0.92 (0.71-1.18)
Navarra				
• Men	0.93 (0.82-1.04)	0.90 (0.73-1.12)	0.85 (0.76-0.95)**	0.82 (0.68-1.00)
• Women	0.91 (0.84-0.97)**	0.83 (0.72-0.96)*	0.85 (0.78-0.92)***	0.73 (0.62-0.85)***
Andalusia				
• Men	0.97 (0.89-1.05)	0.91 (0.77-1.07)	0.90 (0.82-0.99)*	0.88 (0.73-1.05)
• Women	0.97 (0.92-1.02)	0.91 (0.81-1.02)	0.90 (0.86-0.95)***	0.85 (0.76-0.94)**
The Region of Murcia				
• Men	0.99 (0.91-1.09)	0.99 (0.86-1.15)	0.88 (0.79-0.98)*	0.87 (0.73-1.03)
• Women	0.89 (0.82-0.97)**	0.87 (0.74-1.03)	0.88 (0.83-0.93)***	0.71 (0.62-0.82)***

* p <0.05; ** p<0.01; ***p<0.001
Note: Adjusted for age, socioeconomic position and family characteristics.

Table 4
Odds ratios (OR) and 95% confidence intervals (CI) comparing health outcomes of women to men (reference category). Spanish National Health Interview Survey (NHIS), 2006.

	aOR (95% CI)			
	The Basque Country	Navarra	Andalusia	The Region of Murcia
Poor self-perceived health				
• Adjusted for age	1.80 (1.07-3.03)*	1.11 (0.73-1.70)	2.33 (1.61-3.38)***	2.75 (1.76-4.31)***
• Adjusted for age and socioeconomic position	1.64 (0.96-2.79)	1.08 (0.70-1.67)	2.14 (1.47-3.12)***	2.40 (1.51-3.82)***
• Adjusted for age, socioeconomic position and family characteristics	1.70 (0.98-2.94)	1.16 (0.74-1.81)	2.13 (1.43-3.17)***	2.29 (1.42-3.72)**
• Adjusted for age, socioeconomic position, family characteristics and social support	2.08 (1.14-3.79)*	1.24 (0.78-1.95)	2.17 (1.44-3.27)***	2.28 (1.40-3.72)**
Poor mental health status				
• Adjusted for age	2.56 (1.23-5.37)*	1.77 (1.13-2.77)*	3.06 (1.90-4.93)***	2.66 (1.61-4.41)***
• Adjusted for age and socioeconomic position	2.48 (1.17-5.24)*	1.74 (1.10-2.74)*	2.93 (1.81-4.76)***	2.63 (1.57-4.42)***
• Adjusted for age, socioeconomic position and family characteristics	2.51 (1.17-5.36)*	1.69 (1.06-2.67)*	2.82 (1.70-4.67)***	2.51 (1.47-4.28)**
• Adjusted for age, socioeconomic position, family characteristics and social support	3.11 (1.32-7.35)*	1.88 (1.15-3.07)*	3.13 (1.86-5.27)***	2.85 (1.63-4.99)***

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

5. DISCUSSION

The aim of this dissertation was to analyse socio-economic inequalities in health among the elderly through a combined framework of socio-economic position, gender, regional socio-economic development and social support. Paper I sheds some light on gender and socio-economic inequalities in health among the elderly in Western Europe. Paper II goes further in the analysis of the association between family characteristics and health inequalities among the elderly. Finally, without forgetting the other variables of interest, paper III incorporates the geographical dimension of health inequalities in the analysis. Some of the most important findings are that socio-economic and gender inequalities in health persist in old age; that women present a poorer health status than men; that the impact of family characteristics on the health of older people differs by gender and the health indicator analysed; that social support constitutes an important determinant of their health status; and that whereas regional socio-economic development constitutes a determinant of their health status it is not related to gender inequalities in health. These results are deeply analysed in the following paragraphs.

5.1 Socio-economic inequalities in health among the elderly

Health inequalities among the elderly have been studied through the combination of different socio-economic indicators and in different

contexts: Western Europe, Catalonia and four regions of Spain. The general conclusion is that socio-economic inequalities in health persist among the elderly. The choice of the best indicator of socio-economic position when studying health inequalities among the elderly is another important learning of this research regarding socio-economic inequalities in health among this important segment of the population.

Since the publication of *The Black Report* in the 1980s, many researchers have been interested in the analysis of social inequalities in health. Despite the diversity of approaches and methodologies, one of the most important conclusions is that there are social inequalities in health even in the richest countries, and that there is a social gradient in the health outcomes, meaning that poor health increases as socio-economic position increases[1-7]. Only until some decades ago, research about social determinants of health inequalities focused almost exclusively on working-age groups. In this dissertation, and as described in previous studies, socio-economic inequalities among the elderly have been found[9-18]. In paper I, for instance, the results show that elderly women without formal education have a 4.45 higher probability of reporting a poor self-perceived health than elderly women with a higher than secondary educational attainment.

When studying social inequalities in health among the elderly, one of the most controversial issues is how to measure their socio-economic position. Social class, educational attainment and household income are some of the most common indicators used in

this approach. In most studies, however, they are chosen without a theoretical basis. Some research about social inequalities in health among the elderly recommended to use different socio-economic indicators instead of a single one in order to explore the multidimensional character of socio-economic position at this stage of life[6,20,21,143]. Educational attainment and household income (paper I), educational attainment and material deprivation (paper II) and educational attainment (paper III) have been used in this dissertation as socio-economic indicators among the elderly population. According to previous findings, educational attainment and material deprivation seem to be the best indicators when measuring socio-economic inequalities in health among the elderly, but especially educational attainment[21].

In the three papers, an association between educational attainment and poor health outcomes is observed and a consistent gradient is found in both sexes, but especially for women. As in other studies, people with a less than primary education present the highest probability of reporting poor health compared to those with higher educational attainments[6]. Educational attainment is described as a better indicator of health inequalities for women, as also found in the present research[51,133]. This indicator does not exclude those elderly people who have never had a paid job or who left it a long time ago, as is still the case among an important proportion of today's elderly, but especially in southern European countries such as Spain. Women's important changes in their relation to labour market during the last decades, however, suggest that perhaps

educational attainment would not be any more the best socio-economic indicator when measuring health inequalities among the future women's elderly cohorts.

The association between material deprivation and health outcomes depends on gender and the health indicator analysed. In paper II, lacking one of the household resources considered in the material deprivation indicator is only positively related to poor mental health status among women, whereas lacking two or more items is only positively related to having a LLI among men. This result differs from other studies in which measures of material deprivation are more strongly associated with poor health among women than among men[21,202], but is consistent with other studies finding an association between material deprivation and poor mental health[197,198]. On the other hand, in paper I household income is only positively related to poor self-perceived health among women in the lowest income category. Material deprivation indicators would be a better proxy measure of the actual socio-economic situation of the elderly compared to household income indicators.

5.2 Gender inequalities in health among the elderly

The three studies composing this dissertation show that elderly women suffer from poorer health status than elderly men, that the association between living arrangements and health differs by sex

and the health indicator analysed and that living with a disabled person is positively related to poor health status in both sexes.

Health variations among men have traditionally been studied using a social class framework, whereas women have been excluded from research or studied through the role approach. The 'role enhancement' and the 'role overload' or 'role conflict' are the two hypotheses that have traditionally dominated the literature about roles, with evidences in favour of both theories[55]. Marital, parental and employment status, and less frequently other variables such as the household size, living with elderly people or the quantity of housework has been introduced in the analyses when studying the association between gender roles and health[41,42,56-58]. Household composition, on the other hand, is considered to be one of the most basic and essential determinants of the wellbeing of older adults[85] and is closely related to gender roles.

In the three papers composing this dissertation, the prevalence of poor health outcomes was significantly higher among women than among men even after controlling by the other factors. Gender inequalities in health among the elderly are especially important regarding poor mental health status. The higher prevalence of mental health problems among women in all age groups has been reported in other studies[203,204]. On the other hand, as has been previously reported, elderly women's poor outcomes in functional and mental health coexists wit a smaller gender difference in self-perceived health[190]. These different gender patterns depending on the health indicator analysed, as well as the differences in factors

associated with each of them, emphasise the importance of examining different health indicators in trying to fully understand the complexity of inequalities in health[97,146,205.]

Following De Vos[90], a household living arrangements indicator in which marital status and the relation to the household head are taken into account has been used in the analysis of gender inequalities in health. As a general conclusion, the main finding is that the association between living arrangements and health differs by sex and the health indicator analysed. Household living arrangements are mainly related to poor mental health, but especially among women. In paper I, women living with the partner and other people were more likely to report poor mental health status. On the other hand, mental health was poorer among people not living with their partner but living with other people and being the household head. These findings could be related to the negative effects on mental health associated with being responsible of caring for other people, effects that have been found to be higher than those in physical health[206]. It has been reported that among younger married or cohabiting, the risk of poor health status increases with increasing household size[45,71,207].

On the other extreme, women living alone also presented poorer mental health outcomes than those living with their partner. This outcome is consistent with previous studies finding an association between the perception of loneliness and poor mental health status among the elderly population[208,209]. The United Nations has also

called attention to older women living alone, as suffering a higher risk of social isolation and economic deprivation[210]. In a study carried out among elderly women living alone in the United States, Eshabaugh[211] found that the main problems derived from these women feeling less comfortable living alone were the lack of companionship, that they did not have anyone to help with housework and the fear of falling or getting hurt.

Also in paper I, a positive association with poor mental health was found among those men not living with their partner but living with other people and not being the household head. These results emphasise the importance of considering the role of household head as an important factor to take into account when analysing the relationship between household living arrangements and health among the elderly[93,196,211-213]. Whereas men in this situation were more likely to report poor mental health status, among women there was no association with poor mental health. The persistence of gender roles in older ages may be responsible for this association. It could be that men were more likely to live with their children because of poor mental health status, whereas among women health would not determine this situation.

In paper II, living alone was the only type of living arrangement significantly associated with health status. After controlling for social support, living alone is only significantly associated with poor mental health among women. This finding suggests that living alone can have different meanings for elderly men and women, with

high negative impact on women's mental health. A possible explanation of this outcome is the phenomenon of the 'feminisation of poverty'[214] together with higher widowhood rates among women, which especially applies in Spain, where many elderly widows live on very small pensions. The association between deprivation and poor mental health among women would support this hypothesis[210].

The characteristics of the *2006 Catalonian Health Survey* enabled us to go deeper in the analysis of gender inequalities in health among the elderly by introducing two new variables to the analysis related to caring roles: living with a disabled person in the household and caring for a disabled person. Living with a disabled person is positively and strongly associated with all the health indicators in both sexes, even after adding social support in the analysis. Taking care of disabled people at home, however, is negatively associated with having a LLI in both sexes and with having a poor self-perceived health status among women. These findings could be explained by a probable reverse causation effect, whereby those taking care of a disabled person would represent a selection of the healthiest elderly, whereas living with someone disabled and not taking care of him or her could be related to a higher prevalence of poor health status. Shulz and Beach[199], for instance, found that individuals with a disabled spouse who were not providing care had higher rates of prevalent disease compared to the other three care-giving groups analysed.

5.3 Geographical inequalities in health among the elderly

This is the first time that geographical inequalities in health have been analysed and compared among the elderly in regions of Spain with different socio-economic development. In paper III, elderly people living in two socio-economically developed regions situated in the north of Spain (The Basque Country and Navarra) and in two less socio-economically developed ones located in the south (Andalusia and The Region of Murcia) were selected.

The results show that those elderly living in the less socio-economically developed regions present a poorer self-perceived health status than those living in the most developed ones, but especially women. Several studies carried out in the United States and in Europe show a positive association between area-based indicators of deprivation and health outcomes[107-113]. During the last decades, several studies carried out in Spain also reported the existence of health inequalities associated with area-based socio-economic indicators such a poverty, unemployment or illiteracy rates[114-120]. This study, however, is the first to show the existence of geographical inequalities in health among the elderly in Spain.

Contrary to what could be expected, the poorer mental health outcomes emerge among the elderly living in Navarra, one of the most socio-economically developed regions of Spain. Although this is the first time that regional differences in Spain regarding poor mental health status among older adults are analysed, the poorer

mental health status found in Navarra has been previously reported[215,216]. The limitations of the mental health system in the Autonomous Community regarding the management system and the lack of integration between the social and the health dimensions are some of the explanations attributed to Navarra's mental health outcomes[215]. Another possible explanation of the unexpected result that should be explored in future studies is the urban-rural dimension. Previous research shows an association between sex, socio-economic status, population change and migration to rural areas on distress, rates of mental disorders and suicide in rural regions[217,218].

Yet another unexpected outcome was that gender inequalities in health do not vary by regional socio-economic development in Spain. This result could be related to the tendency towards convergence in gender inequalities between the Spanish regions found in previous studies[200,201]. It would be interesting to test these associations through the use of other gender indicators such as those related to domestic tasks and care provided to relatives, used in paper II.

5.4 The relevance of social support among the elderly

Social support, defined as the degree in which a person's basic social needs are met through the interaction with others[166], is

usually categorised into affective and confidential social support. Affective social support is related to signs of love, affection, steem, friendliness and/or belonging to groups, whereas confidential social support is related to getting information, counselling or guidelines or having people with whom to share worries or problems.

This dissertation shows that social support constitutes an important determinant of health status among the elderly, but especially confidant social support regarding mental heath status and in both sexes. This result is consistent with some studies describing the existence of a hierarchical relationship in the effect of the provision of support on depressive symptoms among the elderly, emotional support from friends being more important than support from the family[182,183]. At older ages, neighbourhood bonds tend to increase, especially in rural areas. If these associations are positive, they can represent an important source of satisfaction among the elderly, alleviating possible feelings of loneliness[219].

On the other hand, in paper II affective social support was positively related to poor self-perceived health status among men. Two possible explanations would account for this paradoxical finding. On the one hand, it could be that ill elderly men receive more attention from their couples or other family members. On the other hand, family networks have been found to be more likely to provide both positive and negative interactions than friends[220-222]. Although we cannot rule out the possibility that those suffering from poor mental health receive less support[223], previous research

has shown less support for the hypothesis of mental health affecting perceived social support than the reverse[177].

5.5 Strengths and limitations

Although this dissertation has tried to overcome some of the limitations existing in the previous research about socio-economic inequalities in health among the elderly, it still presents some shortcomings that should be taken into account. Regarding the contributions, the three papers composing this dissertation constitute the first research analysing health inequalities among the elderly through a combined framework of individual socio-economic position, regional socio-economic development, family characteristics and social support among the elderly.

One of the limitations of this dissertation is its cross-section design, a fact that prevents us from determining the causal direction. For instance, the relationships between living arrangements, caring activities and social support with health are likely to be reciprocal. However, some possible explanations for both causality directions have been provided for the results found in the different papers. Another limitation is derived from the nature of the samples. The population under study in the three papers is restricted to community-residing people due to restrictions of the surveys. This may be biasing the results in the sense that, as women are more likely to become widows and are then less likely to have a spouse to

care for them when disabilities appear in old age, women have a higher probability of being excluded from the sample as a result of their higher institutionalisation rates[1,190]. It would be expected that less healthy women would be excluded from the study and yet there was still an excess of female morbidity for the different health indicators analysed.

Regarding paper II, the way the variable dealing with taking care of a disabled person has been generated could explain the unexpected outcome, that is, that those doing so were healthier. In this study, carers are considered as those defining themselves as the main carers of the disabled persons at home. Perhaps the model could be improved by taking into account the amount of care provided, but unfortunately this was not collected in the database.

6. RECOMMENDATIONS

6.1 For research

- Research about the social determinants of health inequalities among the elderly requires an integrated framework in which individual socio-economic position, regional socio-economic development, gender and social support are simultaneously considered.

- The use of a combination of socio-economic and health indicators adapted to the circumstances of the elderly population should be also taken into account.

- The development of longitudinal analyses would be an important step in the research area.

- The use of area-based socio-economic measures derived from census data in combination with individual-based measures in multilevel analyses would help to ascertain some of the unexplained associations found in this research.

6.2 For public policies

- Public policies should also incorporate in their action the simultaneous consideration of individual socio-economic position, regional socio-economic development, gender and social support.

- 'Ageing at home' requires the expansion of public care services, currently very underdeveloped in Spain, such as respite services for the family of the dependants, the expansion of home visits to elderly people by health professionals, and the adaptation of housing to the ageing process (e.g. installing elevators in flats and showers instead of baths).

- It is important to implement stronger gender equity policies and the evaluation of these policies.

- Greater attention should be paid to poverty among the elderly, especially to the so-called 'feminisation of poverty' at older ages.

- When trying to reduce socio-economic inequalities among Spanish regions, policies should not be only oriented towards the redistribution of economic resources but also towards achieving a greater equity in social policies in areas such as education and health.

- Social support among the elderly should be strengthened through stimulating their participation in society, promoting social and educational activities addressed to groups of elderly people or offering opportunities for voluntary work.

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Alphabetical list

Annex

REVIEW PROCESS

ARTICLE I

Rueda S, Artazcoz L, Navarro V. Health inequalities among the elderly in western Europe. *J Epidemiol Community Health.* 2008;62:492-498.

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- *Review 1. Sent on 20 December 2006*

Dear editor, thank you for the careful revision of the manuscript and the useful comments and suggestions of the three reviewers. In the following paragraphs we detail the modifications that have been introduced and clarify all the points made by the reviewers.

Answers to reviewer 1: Ann Bowling

This study is based on the SHARE dataset which is a major European Survey of ageing and retirement in Europe – people aged 50+. It is good to see a user of this major secondary dataset.

The authors took a subset of data for people aged 65-86. Firstly there is no justification for this, and a wider range of age comparisons re: inequalities would have been helpful. They could then have made some comparisons with the English Longitudinal Survey of Ageing (ages 50+) which is a much more detailed dataset – especially as the UK was not included in SHARE. Second, why have a ceiling of age 85? This type of decision appears ageist itself.

As regards the definition of elderly people, the predominant administrative definition existing in the literature of aging is used, that is, 65 and more years old people (Bond et al., 1993). Moreover, by restricting the sample to people older than 64, we have tried to overcome the limitations related to the inclusion of people still in the labour market and those who have left it. We noticed that although we restricted the population to people over 64, there was a minority (n=187) that had a paid work. In the current version they have been removed and results are similar to the previous ones. This restriction is additionally justified by the fact that the meaning of living arrangements and its impact on health depends to a great extent on the employment status[1]. The objective of the study was not the comparison with other studies, that on the other hand would be very difficult due to their heterogeneity, but to provide new knowledge about social determinants of health among the elderly. Finally, the maximum age covered in this study, 85 years, is determined by some data characteristics and the age effect. In SHARE, weights are less accurate for those over-85 years old (Börsch-Supan et al., 2005).

I had not heard of the EURO-D before – was it developed specifically for SHARE? Is there any more evidence of its reliability and validity than ref. 30? Was the limitations in mobility indicator developed for SHARE too? Has it been tested? I appreciate the selection of indicators is not the authors' responsibility, but a little more information about their psychometric properties and background is required.

The EURO-D scale was developed as a European Union initiative to compare symptoms of depression in 14 European centres, not specifically for SHARE but for the EURODEP project about late-life depression in Europe. Other references about the use of the EURO-D scale are the following:

- Beekman A, Copeland J, Prince M. Review of community prevalence of depression in later life. *Br J Psychiatry*. 1999;174:307-11.
- Braam A, Prince M, Beekman A et al. Physical health and depressive symptoms in older Europeans. Results from EURODEP. *Br J Psychiatry*. 2005;187:35-42.

- Braam A, van den Eeden P, Prince M et al. Religion as a cross-cultural determinant of depresión in elderly from 11 European countries: results from the EURODEP collaboration. *Psychol Med*. 2001;31:803-814.
- Copeland J, Hooijer C, Jordan A et al. Depression in Europe: Geographical distribution among older people. *Br J Psychiatry*. 1999; 174:312-21.
- Copeland J, Hooijer C, Jordan A et al. Cross-cultural comparison of depressive symptoms in Europe does not support stereotypes of ageing. *Br J Psychiatry*. 1999;174:322-9.
- Prince M, Beekman A, Fuhrer R et al. Depression symptoms in later-life assessed using the EURO-D scale. Effect of age, gender and mental status in 14 European centres. *Br J Psychiatry*. 1999; 174:339-45.
- Prince M, Acosta D, Chiu H et al. Effects of education and culture on the validity of the Geriatric Mental State and its AGECAT. *Br J Psychiatry*. 2004;185:429-436.

Socio-economic position was measured using education and income. A paper published in JECH by Grundy and Holt on which SES variables were most useful in investigating health inequalities in older people concluded that the best pair of variables was educational qualification or social class paired with a deprivation indicator. Did the authors consider (also) using another deprivation variable – was there one (eg access to a standard material good) in SHARE? (see J Epidemiol Community Health. 2001 Dec;55(12):895-904.). This work needs referencing given the aim of the paper.

In their paper, Grundy and Holt used Townsend's deprivation index, based in the ownership of basic items, items considered essential for social exchange or normative. Unfortunately, the only question in SHARE more related to deprivation, although very different to the ones used by Grundy and Holt, is one asking whether the household was able to make ends meet. We did not use occupation-based indicators of socio-economic position given that our study population was made of people out of the labour market. Now the JECH reference of Grundy is included.

The response rate needs to be reported.

The individual response rate was 86%. Now, this information has been included in the first paragraph of the methods section.

Many of the findings are not new, but the study is important being based on a European dataset. The authors do make reference to some existing work in the field. What they do not do is interpret their finding in any depth. Of course the word limit prevents this to some extent. There is a rich social science and social gerontology literature on mental and physical health by age, gender and marital status as well as living arrangements. Some of it has been summarised in Grundy's publications. The authors make some reference to the literature - but without a focus on older women and men (p 16). They could discuss their findings more in relation to the gerontology literature, as well as adopt a more critical stance to the measurement of SES in old age.

As the reviewer mentioned, we are constrained by the word limit. However, in the introduction of the new version it is described more in-depth the debate about measuring socio-economic position among older people (2nd paragraph). Additionally, in the 3rd paragraph of the introduction there have been included some references to the role of living arrangements as well the potential reverse causation effect. Moreover, a more deeply discussion about these issues is included in the latter section of the article. References related to younger people have been reduced.

The authors discuss the limitations of their findings, including the cross-sectional design. They need to acknowledge, however, that SHARE is actually longitudinal and the second wave of data has been (or is about to be) released – although the data are admittedly not life-course.

Thank you very much for this information. Unfortunately, data from the second wave are not available yet and still we found that our results deserve attention on their own.

Table 1 shows a string of unrounded p values as 0.000 – it is usual to round these down to 0.001. Is the p= or p

Thank you very much for your observation. Now we have changed the values in the table.

Additional references:

1. Artazcoz L, Borrell C, Benach J, Cortès I, Rohlfs I. Women, family demands and health: the importance of employment status and socio-economic position. *Soc Sci Med*. 2004;**59**:263-74.

Answers to reviewer 2

The topic is of relevance to policy. I would be very unhappy if a paper was published that did not evaluate more carefully the gender comparisons being made - the authors could easily do this and then the paper should be publishable in my view. This paper adds to information on health inequalities at older ages and has the potential merit of being multi-national.

The main concern that I have about the paper is the lack of statistical testing of difference in effects by gender and also I seek reassurance that it is legitimate to combine the samples across countries. The conclusions about differences between genders may be exaggerating the reality; I think it is important to check this as gender differences could have important implications for policy. Having said that, there are interesting hypotheses on family responsibilities.

Studies about gender inequalities in health use a similar approach to that of our study, with models separated for sex and conceptual discussion about gender differences in the relationships between predictor variables and health outcomes. Moreover, a recent WHO report about social inequalities recommends that wherever possible, social inequities in health should be described and analysed separately for men and women[1].

In analysing interactions, either models with interaction terms can be fitted or the analysis can be disaggregated for different categories of the interacting variables. However, although the first position can be defended based on statistical grounds, an important part of theoretical richness and intuitive interpretation is lost. This latter approach, that requires a high N, is more easily understood and preferably when there are several terms of interaction or terms with many interacting variables[2]. This is usually the case in gender research. Social determinants of health can be extremely different for men and women and the same variable can have different meanings depending on gender (for example different indicators of socioeconomic position and family roles can have a different meaning for men and women).

Regarding the legitimacy of combining the samples across countries, one of the aims of SHARE is to make an effort to have comparable data across countries. The database has weights for the countries, making individuals representative of their countries and comparable among countries. If the individuals are representative of their countries, then it is legitimate to combine the samples across countries. However, we noticed that the inclusion of institutionalised people in some countries may be a factor decreasing the comparability of the data and now we have removed the 123 cases of institutionalised people in our sample from the analysis. Yet the results remain similar to those of the last version. Moreover, data were collected in all countries simultaneously and with identical questionnaires.

1. How were the country samples added together – I believe that the sampling designs differed between countries. On page 7 there is mention of a calibrated individual weight but without explanation of purpose of this weighting.

All the analyses are weighted by using a calibrated individual weight for the main sample. Calibrated weights have been computed for those interviewees for whom complete information about age and gender were available. To some extent, these weights compensate for unit nonresponse. Moreover, and as mentioned before, institutionalised people have been excluded from the study to make the samples more comparable across countries.

2. The outcomes are dichotomised – did the authors consider a multi-category outcome with either ordinal logistic regression or multinomial logistic regression? Could the mental health outcome have been treated as a continuous variable. It seems a waste of information to collapse it. I am not sure what is meant by 'permits the establishment of valid comparisons' on page 5 para 2.

We dichotomised the outcomes according to the recommendations of the SHARE manual in the case of mental health and limitations in mobility. Poor self-perceived health status was also treated as a dichotomic variable in order to make a consistent analysis and because it is the most usual way of analysing this indicator. The EURO-D scale was developed as a European initiative to compare

symptoms of depression in 14 European centres. In this context, the sentence 'permits the establishment of valid comparisons' means the comparability of mental health symptoms across Europe.

3. Independent variables – why were earnings from work not used in the income variable? Although a minority might still be in work in this age group – for those people it could be a major source of income; also, other members of the household could still be earning.

Earnings was not included as a measure of socio-economic position because our analysis was focused on older people out of the labour market. As it has been mentioned before, in the previous version of the manuscript there was a small percentage of people who had a paid work (n=187), that have been now removed from the analysis. Results have not significantly changed.

We restricted the population to those over 64 years, in order to eliminate the problems of interpretation resulting from including people in the labour market and those who have left it. Moreover, the meaning of SES measures as well as of living arrangements depend to a great extent on employment status.

4. How is household head defined?

In SHARE, household heads are not specifically identified. Due to this limitation, we decided to use a proxy of the household head in order to construct the household living arrangements' typology. The variable used to define the household head is a dichotomous one that classifies the interviewees as the household respondents or not for questions related to general characteristics of the household. In SHARE, household respondents are defined as 'The person most capable of answering questions about the household members housing situation, household income, and family consumption answers questions …..' (SHARE Project, 2004). Although not perfect, the household respondent seems to be a good proxy for the household head. For example, as expected, among people living only with their partner most household heads were men (62.6% vs. 37.4% with small differences among countries). This information was used in order to define only two categories of living arrangements, that is, persons not living with the partner but living

with others who are household heads, and those who are not household heads.

Moreover, this is one the most important innovations that our study provide. In both sexes, those not living with the partner but living with others and being the household head were more likely to report poor mental health status. It is reasonable to think that among people that define themselves as the household head, burden derived from being responsible for others – for example, dependant children – is related to poor mental health status and not the reverse whereby living with others and being the household head in a family unit with no partner and other people is the result of poor mental health status. However, a different gender pattern is seen in the category of those not living with the partner but living with others and not being the household head. Whereas men in this situation are more likely to report poor mental health status (OR=3.49), among women there is no association with poor mental health (OR=0.89). It could be that men are more likely to live with their children because of poor mental health status, whereas among women health does not determine this situation. However this is an speculation that deserves further research.

5. A minor point on grammar it would be clearer to omit 'couple' where 'couple/partner' is written. Partner can be defined to cover spouse and cohabitee. Were there any respondents who were living with partner but neither partner was household head? This group is not accounted for in the typology as described.

According to the reviewer suggestion, we have removed the term couple. The living arrangements variable was derived from two variables, household composition and position as a household head or not. As it has been mentioned before, the latter was used only for those not living with the partner but living with others.

We have looked for household heads on households made up the couple or the couple and other people in our sample and we have found that only in one of them the household head was none of the members of the couple, but the 60 years old daughter.

Statistical analysis.
6. Were there formal tests for interaction between gender and household living in their effects on health, otherwise one should not draw conclusions about different effects between the genders?

As we have mentioned before, no tests for the statistical significance of the interactions were performed. As in most studies about gender inequalities in health, we chose to separate models for sex and discuss the conceptual relevance of different patterns of associations by gender.

7. Were tests for trend and departure from trend carried out for table 3 – for education and income, this would be more interesting than the statistical significance of individual parameters. The study design may mean that log likelihood tests cannot be used to compare a trend model with one not assuming a trend but it should still be possible to do some testing.

According to the reviewers' suggestion, in order to test for an independent linear trend between health outcomes and education and income, logistic regression has been additionally performed using models including these predictor variables as continuous variables and the Wald test has been used. These results have been now included on tables 3 and 4.
Results
8. Is table 1 meant to describe the sample or to be generalisable to the combined population of the ten countries – this comes back to the legitimacy of combining country samples, referred to above.

See answer to the first comment about methods above.

9. I assume the distribution of age was skew; in this case the median age is more appropriate. On page 8, there is a typo (71% vs 4%)

Thanks for your comments. Now we have calculated the median age, 25% and 75% percentiles, and the typo has been corrected.

10. Results given in tables 3 and 4 – this is the appropriate section for tests of interaction between gender and socioeconomic position and between gender and household living arrangements. An aOR of

2.0 for men and 1.8 for women may not be statistically significant – but the test should cover the range of living arrangements anyway.

We absolutely agree with this comment. As we have mentioned in answer to point 4, there is no different gender patterns regarding this category of living arrangements, there is not conceptual relevance – and probably not statistical significance – for these small differences in odds ratios and the results have been described in this way.

Discussion
11. Even if tests for interaction back up the surmised gender differences in associations between living arrangements and health, the statement at the end of the first paragraph of the discussion is probably too sweeping. It seems to me that the situation would at best be mixed with some arrangements having a stronger association for men and others for women.

We agree with the reviewer. Now, we have replaced the sentence by: "Finally, the associations between household living arrangements and health differed by gender".

12. page 14 para 2 – what is meant by 'sensitive'?

Sensitive here means that gender differences in self-perceived health status are much lower than for other indicators such as mental health status or limitations in mobility. These results are consistent with other studies and point out the need of examining different health indicators. Now the sentence has been rewritten: "These different gender patterns depending on the health indicator analysed, as well as the differences in factors associated to each of them point out the importance of examining different health indicators in trying to fully understand the complexity of inequalities in health".

13. page 15. The hypothesis of worst health going along with highest domestic workload is interesting and I agree that further research should look more explicitly at women's control at home as a factor in health. The discussion may be affected by the results of tests for interaction. It is not obvious to me that women household

heads living with others (with or without their partner) would always have the highest domestic workload. Some may be people whose sons or daughters are looking after them; others may be still looking after a parent or sibling or child and have that responsibility of caring. I would like to see more back-up to the statement of higher domestic workloads before the statement in "what the paper adds" is made so boldly. The age group of the current study is older than that in some of the other studies about living arrangements and that could alter the circumstances in which domestic responsibilities are greatest.

Now we have further discussed the interesting result of a higher probability of reporting poor mental health status among those not living with the partner but living with others and being the household head. As mentioned before, it seems reasonable to think that persons who defined themselves as household heads are the main responsible for house management and not dependant people. Therefore, it could be that this responsibility, related or not to caring for dependant or disabled people, could have a negative impact on their health. It is interesting that whereas among men living with their partner and other, no association is found with health status, among women this situation is positively related to poor mental health status and limitations in mobility. Increasing risk of poor health status with household unit size among women but not among men has been previously reported in younger adults[3,4,5] and our results are consistent with that, although it is still an speculation that deserves further attention. Now, this observation has been included in the discussion.

Ref 45 is wrong . it was vol 58(10) pp 1869-87

Thanks for your comment, it has been now corrected.

Additional references:

1. Whitehead M, Dahlgren G. Levelling up (part 1): *A discussion paper on concepts and principles for tackling social inequities in health*. Copenhagen: Publications WHO Regional Office for Europe, 2006.

2. Kunkel SR, Atchely RC. Why gender matters: Being female is not the same as not being male. *Am J Prev Med*. 1996;**12**:294-296.

3. Artazcoz L, Borrell C, Benach J. Gender inequalities in health among workers: the relation with family demands. *J Epidemiol Community Health*. 2001;**55**: 639-647.

4. Borrell C, Muntaner C, Benach J et al. Social class and self-perceived health status among men and women: what is the role of work organization, household material standards and household labour. *Soc Sci Med*. 2004;**58**:1869-87.

5. Artazcoz L, Artieda L, Borrell C et al. Combining job and family demands and being healthy. What are the differences between men and women? *Eur J Public Health*. 2004;**14**:43-48.

Answers to reviewer 3

This paper uses the first wave of data from SHARE to analyse the health of older people aged 65-85 (n= 4384 men and 5151 women). The data is a pooled dataset from 10 European countries, although no examination is provided of the effects of country on any of the analyses.

The analyses are adjusted by country. When trying to separate the analyses by country, most of the results were not significant, probably due to the small number of cases when splitting the sample by sex and the independent variables.

The paper correctly identifies that there has been a relative lack of research on health inequalities among older people, therefore this paper is to be welcomed. The article provide a brief introductory literature review, which could have been extended in terms of other studies and the value and relevance of under taking the analyses in this paper.

Although we are limited by the maximum length required by the journal, now we have extended the introduction of the article by describing the difficulties associated with the measure of socioeconomic position among older people, as well as the meaning of living arrangements.

The paper analyses three dichotomous health measures – self-perceived health, depressive symptoms (3+), and a measure of functional abilities (3+). The analysis is restricted to the examination of three independent variables – educational attainment; a complex measure of equivalised household income divided into quartiles; and a measure of household living arrangements. It was surprising that the authors did not analyse marital status instead of (or as well as) household living circumstances, since marital status may have a more important association with measures of health than living arrangements.

Although marital status constitutes one of the most used indicators when analysing the health outcomes of individuals, it has been found that the association between marital status and mortality/morbidity is weaker among the elderly[1,2,3]. When studying

the elderly, marital status becomes a less important well-being determinant due to the fact that the majority of them are married or widowed. Household composition, on the other hand, is considered to be one of the most basic and essential determinants of the well-being of older adults[4]. This paper is based on the belief that integrating both dimensions, that is, marital status and household composition, would increase our understanding of the mechanisms explaining health inequalities among the elderly.

There is a typo on page 8 – women living with a couple/partner, should be 48% (not 8%). It was not clear how the adjustment for age was made – was this using age as a linear variable (if so, is this appropriate) or did the authors use 5 year age groups?

Thanks for the correction, it has now been changed in the text (48% instead of 4%). The age adjustment was made using age as a continuous variable.

As expected, older women have poorer levels of education, income and health status than men, and are more likely to either live alone or with others (because of higher levels of widowhood). Gender differences in health remained after adjusting for SES. A fuller discussion of the meaning and implications of the differences in the findings between the three health measures could have been provided.

Now we have further discussed this finding, which is consistent with Arber et al.[5], referring to minimal differences in self-.assessed health coexisting with substantial differences in disability as a new paradox. Additionally, and in contrast with other studies about inequalities among older people based on physical health indicators, our study provides interesting results regarding significant gender inequalities in mental health status. These results point out the need of analysing a broad range of health indicators in order to fully understand inequalities in health among older people. Now this observation has been included in the discussion.

A major problem was that the paper implied that household living arrangements had 'an impact' on health. There are major problems of reverse causation here, since older people (following

widowhood) and with increasing frailty are particularly likely to co-reside with others, so that the other household members can assist in providing care for them. Therefore, the authors should not use the term 'impact' here, and should provide a fuller discussion of reverse causation. In addition, there are issues associated with selective institutionalisation among frail older people. Older people who are widowed (divorced/never married – and who live alone) are more likely to enter residential care than the married (and those who live with others), but among the married, older married women are more likely to enter residential care than older married men with a given level of functional impairment. Thus, some of the effects that are seen in the data may be the result of selective institutionalisation.

We agree with the reviewer. A cross-sectional study prevents us of making any assumption of causality. Moreover, there is a clear potential reverse causation effect. Now it has been discussed in more detail. Living arrangements are likely to be related to health status. On the one hand older people who are widowed, single or divorced/separated are more likely to enter residential settings. Our study, as many previous ones, is based on a sample of non-institutionalised people (in this second version we have excluded the 123 institutionalised people from the sample), therefore we expect a selection of the healthiest people. We also agree with the statement that older married women are more likely to enter residential care than older married men with a given level of functional impairment. Now this has been discussed in more detail.

It has been reported that among those who are not married, functional status and cognitive functioning are significantly associated with the odds of corresidence with children and others. In contrast, neither physical nor mental health seems to make any difference with regard to living arrangements among those who are married[6]. According to previous findings, we would expect a selection of healthy older people among those who live alone. Actually no association among living arrangements and health status was found either in men or women. However, interesting gender differences were found among those living alone, with this situation being associated with poor mental health status among women but not among men.

As it has been mentioned before, it is reasonable to think that among people that define themselves as the household head, burden derived from being responsible for others – for example, dependant children – is related to poor mental health status and not the reverse whereby living with others and being the household head is the result of poor mental health status. Yet, a different gender pattern is seen in the category of those not living with the partner but living with others and not being the household head. Whereas men in this situation are more likely to report poor mental health status (OR=3.47), among women there is no association with poor mental health (OR=0.83). It could be that men are more likely to live with their children because of poor mental health status, whereas among women health does not determine this situation. However this is an speculation that deserves further research.

Some statements in the conclusion are too strong, or inappropriate. For example, at the bottom of page 14 – the data presented cannot be used to support this, although the authors could examine this using their data. Page 15, final paragraph – the authors cannot conclude from the data presented that older women living with other people have the highest domestic workload and that this is the reason for their poor mental health status. Page 16, last paragraph discusses 'the impact of the household structure on .. health', but it cannot be assumed from the data presented that 'differences between the various types of living arrangements were mainly due to differences in nurturing responsibilities and adult support', especially because of the problems of reverse causation. It would of course, be interesting to test these issues more explicitly, but to do so, the paper would need to include analyses of caring and levels of domestic responsibilities in different household types, etc.

As mentioned before, unfortunately data about domestic burden were not available in the SHARE dataset. Now we have more carefully discussed the interesting result of a higher probability of reporting poor mental health status among those not living with the partner but living with others and being the household head. It seems reasonable that persons who defined themselves as household heads are the main responsible for house management and not dependant people. Therefore, it could be that this responsibility, related or not to caring for dependant or disabled people, could have

a negative impact on their health. It is interesting that whereas among people living with their partner and other, no association is found with health status, among women this situation is positively related to poor mental health status and limitations in mobility. Gender inequalities in the impact of family responsibilities on health status have been previously reported among younger people[4,5,6] and our results are consistent with these, although this is an speculation that deserves further attention. Now, this observation has been included in the discussion.

The discussion on page 17 needs to be extended, since there are several other potential selection biases (as well as SES and health).

Now we have discussed the potential reverse causation bias and reciprocal relationship between health and living arrangements. Moreover, more discussion is provided about the selection bias related to the exclusion of people living in residential settings.

In the box on page 18 on 'what this paper adds' - the third point needs to be changed, since the paper cannot show that 'Household living arrangements have a higher impact on the mental health of women living in households with more family demands..' - because of the problems identified above.

We agree with the reviewer. We have changed the sentence by "The association between household living arrangements and health status depends on gender and is primarily related to mental health".

Additional references:

1.Macintyre S. The patterning of health by social position in the contemporary Britain: Directions for sociological research. *Soc Sci Med*. 1986;**23**:393-415.

2. Sorlie P, Backlund E, Keller B. US mortality by economic, demographic and social characteristics: The National Longitudinal Mortality Study. *Am J Public*. Health 1995;**85**:949-956.

3. Lund R, Due P, Moduig J, et al. Cohabitation and marital status as predictors of mortality-an eight year follow-up study. *Soc Sci Med*. 2002;**55**:673-679.

4. Zimmer Z. A further discussion on revisiting the classification of household composition among elderly people. *J Cross Cult Gerontol*. 2001;**18**:247-250.

5. Arber S, Cooper H. Gender differences in health in later life: the new paradox? *Soc Sci Med*. 1999;**48**: 61-76.

6. Liang J, Winchester J, Krause NM et al.. Health and living arrangements among older americans: does marriage matter? *J Aging Health*. 2005;**17**: 305.

- Review 2. Sent on 1 March 2007

Dear editor, thank you for the second careful revision of the manuscript and the useful comments and suggestions of the three reviewers. In the following paragraphs we detail the modifications that have been introduced and clarify all the points made by the reviewers.

Answers to reviewer 1: Ann Bowling

The authors appear to have responded to most points adequately but there are some minor problems. The main issue is that I can't tell from their 'Response to reviewers' where their replies to reviewers' points start after page 5 as they are not clearly marked as Reviewer point and as Response. The two merge. I also can't tell from many of their responses whether and where changes to the text have been made.

Many of the responses appear to be in the form of a discussion with the Reviewers' points than clearly stating how and where they have changed the text. In my view this needs clarifying throughout. I can't tell, for example, whether and where they have fully addressed the gender issue (p 5 of response) rather than acknowledging it.

Unfortunately our page numbers are not the same as those of the reviewer and we do not know the content of page 5. However, we have clarified the gender focus of our study at the end of the 1st paragraph in page 4 by adding this sentence, slightly different that in the former version:

"Additionally, like most studies about family characteristics and health, research focusing on living arrangements of the elderly is mostly centred on samples composed exclusively of women, assuming their traditional gender role as the person mainly responsible for domestic family tasks [24-27]. Yet, among retired elderly men, living arrangements and family characteristics could have a higher impact than among younger males and, additionally, given the domestic gender division of labour, the pattern of associations may be different to that among females."

Minor:

Page 2 response.
Reviewer A. I asked why an age ceiling of 85 had. They refer to Bond's 'administrative' definition of old age as 65+ (they need to explain and not just refer). They do continue in their response about their focus on economic activity. Much of the response is unclear. They finally point out the age ceiling is a limitation of the dataset used – but they do not say why. They need to return to the SHARE documentation and explain why the age ceiling was 85. This needs further clarification.

The age group making up this study has been the outcome of two decisions: the minimum age covered (65 years old) and the maximum one (85 years old).

Regarding the minimum age, two points should be highlighted:
- Bond et al[1] refer to the age of 65 as still being a convenient age limit for defining old age because it is the standard retirement age for men within the UK. And this is also true for the majority of the countries included in the sample: Austria, Denmark, Germany, Greece, the Netherlands, Italy, Spain, Sweden and Switzerland.
- In restricting the sample to people older than 64, we have tried to overcome limitations related to the inclusion of a mixture of people still in the labour market with those who have left it. The impact of family characteristics and of family roles is likely to be different depending on employment status. For example, it has been reported that the impact of family roles on mental health differ between the employed and the unemployed. It has been also reported that whereas among employed women high family demands are related to a broad range of health indicators, no association is found among housewives[2]. Moreover, in both cases different gender patterns were found[3]. Therefore, the same could happen among elderly people depending on whether they are employed or retired.

And regarding the decision to take 85 as the maximum age the main reason was:

- In SHARE, it is stated that, “Although the SHARE data on oldest-old are the first to show cross-sectional differences in a wide range of health measurements, interpretations must be done cautiously because weights may be less accurate for the oldest-old[4].

They state it was an EU measure and simply list references for the EURO D. They need to include further reference to its psychometric properties in the paper and reference selectively (most pertinent).

EURO-D is an harmonised depressive symptom scale developed to enhance analysis of the pooled EURO-DEP data-set, because not all centres included used the same depression assessment procedure. Of the countries included in SHARE, five centres used the Geriatric Mental State Examination (GMS): Amsterdam (the Netherlands), Berlin (Germany), Munich (Germany), Verona (Italy) and Zaragoza (Spain) (Copeland et al, 1986). Two used the Center for Epidemiologic Studies Depression Scale (CES-D): LASA (the Netherlands) and Aquitaine (France) (Radloff, 1977) and one used the Comprehensive Psychopathological Rating Scale (CPRS): Gothenburg (Sweden). To obtain a pooled EURODEP data-set, the different instruments were harmonised (for more information see Prince et al, 1999) and a 12-item scale was generated. For each centre, the EURO-D has been found internally consistent, with Cronbach α=0.72 for the current pooled sample.

Thank your very much for your suggestion about the references. The text now includes more references to the EURO-D psychometric properties (see pages 5 and 6 in the paper), the references included being the following:

- Beekman A, Copeland J, Prince M. Review of community prevalence of depression in later life. *Br J Psychiatry*. 1999;174:307-11.

- Braam A, Prince M, Beekman A et al. Physical health and depressive symptoms in older Europeans. Results from EURODEP. *Br J Psychiatry*. 2005;187:35-42.

- Copeland J, Dewey M, Griffiths-Jones H. Computerised psychiatric diagnostic system and case nomenclature for elderly subjects: GNS and AGECAT. *Psychol Med*. 1986;16:89-99.

- Copeland J, Hooijer C, Jordan A et al. Depression in Europe: Geographical distribution among older people. *Br J Psychiatry*. 1999;174:312-21.

- Prince M, Beekman A, Fuhrer R et al. Depression symptoms in later-life assessed using the EURO-D scale. Effect of age, gender and mental status in 14 European centres. *Br J Psychiatry*. 1999;174:339-45.

- Prince M, Reischies F, Beekman A et al. Development of the EURO-D scale –a European Union initiative to compare symptoms of depression in 14 European centres. *Br J Psychiatry*. 1999;174:330-338.

- Radloff L. The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977;1:385-401.

Page 4 response. Para 3.

They thank me for the info that SHARE is longitudinal. They state their cross-sectional results deserve attention. They do not state whether they have taken on board my points in the text. They need to state in the methods that they are analysing wave 1 of SHARE and not present it as a cross-sectional survey.

Thank you very much for the suggestion. We have now included this information in the text as follows: “Although SHARE was designed from the outset as a longitudinal database, this paper analyses the only wave available at the moment, that is, wave 1.”

I suggest these minor amendments and clarifications be made.

References:

1. Bond J, Coleman P, Peace S. *Ageing in society. An introduction to social gerontology*. Second Edition. British Society of Gerontology. 1993.

2. Artazcoz L, Benach J, Borrell C, Cortès I. Unemployment and mental health: Understanding the interactions among gender, family roles, and social class. *Am J Public Health*. 2004; **94**:82-88.

3. Artazcoz L, Borrell C, Benach J, Cortès I, Rohlfs I. Women, family demands and health: the importance of employment status and socio-economic position. *Soc Sci Med*. 2004;**59**:263-74.

4. Börsch-Supan A (coord), Brugiavini A, Jürges H et al. *Health, Ageing and Retirement in Europe. First Results from the Survey of Health, Aging and Retirement in Europe*. Mannheim Research Institute for the Economics of Aging (MEA). 2005, p.39.

Answers to reviewer 2

Thank you for considering our comments carefully and making extensive revisions.

I am happier with much of the text and I find it interesting but there are still some of my original points that I don't feel have been addressed adequately

You state in your comment on reviewer 2 "If the individuals are representative of their countries then it is legitimate to combine the samples across countries". However, I don't see that you justify that the samples are representative in each country – the text should be more explicit what the weights did. I believe that SHARE used design weights and then adjustments to reflect the national populations – then it is legitimate to combine. Was the multistage nature of the sample in some countries taken into account?

Thank you very much for your advice. SHARE documentation states that due to the great differences in the institutional conditions with respect to sampling, it was not feasible to employ a uniform sampling design for the entire project. In most countries, there were registers of individuals that permitted stratification by age, however some of these registers were administered at a regional level (Germany, Italy, Spain and the Netherlands). In such cases, it was necessary to use a two or multi-stage design in which regions were sampled first and then individuals selected within regions. And, finally, to answer your last question, the multistage nature of the sample in some countries was taken into account through the design weights[1]. The calibrated weights were obtained by adjusting the design weights. The adjustment factors were obtained in a "calibration" to know population totals[2]. This aspect is now mentioned in the Methods section (pages 4-6).

Also, I would still advocate use of tests of interaction. One can use the whole population of men and women and from a model with an interaction term extract the parameters for men and women separately. This is more difficult if there are several interactions terms, but, even if you end up with separate models for men and women, I would still like to know the p-values for tests for interaction in models containing all the main effects and one

interaction term at a time (e.g. education, income, living arrangement, sex and an interaction between sex and one of the first three). I suspect that one between living arrangements and sex would emerge as statistically significant for mental health and mobility.

The following four tables explore multivariate associations involving interactions with sex. In the first table sex appears as an independent variable without any interaction; the second presents the interaction between educational attainment and sex; the third, the interaction between household living arrangements and sex; and in the fourth both interactions at the same time. In tables 2, 3 and 4 all the constituent terms of the interaction models have been specified.

The results are in the same direction as in the separated models but due to problems of concurvity some interesting associations identified in the separated models do not achieve statistical significance. Moreover, from a conceptual point of view using a separated analysis implies the assumption that the situation of men and women is very different and so also the meaning and impact of social variables. From a statistical point of view the options appear to be either using interaction terms involving sex for all, or almost all, the variables of the logistic regression models, with the consequent problems of concurvity, or using an analysis separated by sex. In addition, the interpretation of interaction terms is less intuitive than the results coming from separated models.

Table 1. Multivariate associations between the dependent variables and the socio-economic and household living arrangements indicators. People 65-85 years old. Adjusted odds ratios (aOR) and 95% confidence intervals (CI). SHARE, 2004.

	Poor self-perceived health status		Poor mental health		Limitations in mobility	
	%	aOR (95%CI)	%	aOR (95%CI)	%	aOR (95%CI)
Sex (men reference category)		1.16 (1.00-1.34)*		2.20 (1.86-2.59)***		2.32 (1.96-2.74)***
Educational attainment						
Higher than secondary	33.6	1	12.2	1	14.4	1
Secondary	43.1	1.51 (1.19-1.92)**	15.2	1.39 (1.04-1.85)*	16.7	1.25 (0.95-1.65)
Primary or less	51.5	2.23 (1.68-2.96)***	21.6	1.91 (1.39-2.62)***	25.8	2.24 (1.63-3.07)***
Without formal education	62.8	3.85 (2.78-5.33)***	35.4	2.96 (2.06-4.24)***	36.7	3.56 (2.50-5.08)***
Equivalized gross annual household income in ppp						
Top 25% (reference category)	35.4	1	15.8	1	15.0	1
50%<75%	42.8	1.06 (0.84-1.34)	15.0	0.96 (0.70-1.30)	17.5	1.04 (0.79-1.36)
25%<50%	47.1	1.26 (1.00-1.60)*	18.2	1.04 (0.73-1.48)	20.7	1.18 (0.91-1.52)
Lowest 25%	54.9	1.53 (1.20-1.96)**	23.1	1.05 (0.77-1.44)	28.8	1.24 (0.94-1.63)
Household living arrangements						
Living with the partner (reference category)	45.0	1	16.4	1	19.1	1
Living alone	43.1	0.99 (0.84-1.19)	21.3	1.40 (1.16-1.69)***	23.5	0.98 (0.81-1.18)
Living with the partner and others	50.1	1.14 (0.90-1.43)	20.6	1.35 (1.06-1.73)*	24.4	1.33 (1.04-1.71)*
Not living with the partner but living with others (household head)	49.3	1.29 (0.92-1.83)	29.8	1.73 (1.18-2.55)**	25.3	0.88 (0.59-1.29)
Not living with the partner but living with others (not household head)	47.8	1.19 (0.62-2.29)	45.0	0.93 (0.51-1.71)	31.8	0.80 (0.44-1.49)

* p <0.05; ** p<0.01; ***p<0.001 Note: Adjusted by age and country.

Table 2. Multivariate associations between the dependent variables and the socio-economic and household living arrangements indicators including the interaction between educational attainment with sex. People 65-85 years old. Adjusted odds ratios (aOR) and 95% confidence intervals (CI). SHARE, 2004.

	Poor self-perceived health status		Poor mental health		Limitations in mobility	
	%	aOR (95%CI)	%	aOR (95%CI)	%	aOR (95%CI)
Sex (men reference category)		0.97 (0.64-1.49)		2.25 (1.35-3.75)**		2.80 (1.72-4.56)***
Educational attainment						
Higher than secondary	36.7	1	22.4	1	25.0	1
Secondary	47.6	1.25 (0.61-2.55)	27.2	1.72 (0.69-4.26)	33.4	2.03 (0.86-4.80)
Primary or less	57.4	1.77 (0.83-3.80)	40.9	1.76 (0.70-4.39)	44.1	3.11 (1.26-7.64)*
Without formal education	74.9	1.55 (0.60-4.04)	58.3	2.62 (0.85-8.07)	64.1	2.77 (0.89-8.53)
Higher than secondary*sex		1		1		1
Secondary*sex		1.15 (0.72-1.84)		0.88 (0.50-1.55)		0.73 (0.43-1.26)
Primary or less*sex		1.17 (0.72-1.90)		1.05 (0.60-1.86)		0.81 (0.46-1.40)
Without formal education*sex		1.78 (0.99-3.21)		1.07 (0.55-2.10)		1.14 (0.59-2.21)
Equivalized gross annual household income in ppp						
Top 25%	40.1	1	30.1	1	30.5	1
50<75%	44.3	1.06 (0.84-1.34)	27.4	0.95 (0.70-1.30)	30.6	1.03 (0.79-1.35)
25<50%	54.5	1.27 (1.01-1.60)*	34.2	1.04 (0.73-1.47)	40.8	1.17 (0.91-1.51)
Lowest 25%	62.6	1.54 (1.21-1.98)**	41.9	1.05 (0.77-1.44)	48.2	1.24 (0.95-1.63)
Household living arrangements						
Living with the partner (reference category)	48.1	1	28.3	1	33.9	1
Living alone	53.1	1.00 (0.84-1.20)	37.6	1.40 (1.16-1.69)***	41.2	0.98 (0.81-1.19)
Living with the partner and others	61.6	1.14 (0.91-1.43)	46.8	1.36 (1.06-1.74)*	49.6	1.33 (1.04-1.71)*
Not living with the partner but living with others (household head)	67.7	1.29 (0.91-1.83)	48.9	1.72 (1.17-2.54)**	50.9	0.87 (0.59-1.28)
Not living with the partner but living with others (not household head)	76.4	1.20 (0.63-2.32)	43.8	0.93 (0.50-1.71)	64.1	0.81 (0.44-1.49)

* p <0.05; ** p<0.01; ***p<0.001 Note: Adjusted by age and country.

Table 3. Multivariate associations between the dependent variables and the socio-economic and household living arrangements indicators including the interaction between household living arrangements with sex. People 65-85 years old. Adjusted odds ratios (aOR) and 95% confidence intervals (CI). SHARE, 2004.

	Poor self-perceived health status		Poor mental health		Limitations in mobility	
	%	aOR (95%CI)	%	aOR (95%CI)	%	aOR (95%CI)
Sex (men reference category)		1.03 (0.87-1.23)		1.95 (1.59-2.38)***		2.46 (2.02-3.01)***
Educational attainment						
Higher than secondary	36.7	1	22.4	1	25.0	1
Secondary	47.6	1.53 (1.20-1.94)***	27.2	1.39 (1.04-1.86)*	33.4	1.25 (0.95-1.64)
Primary or less	57.4	2.24 (1.69-2.97)***	40.9	1.90 (1.39-2.60)***	44.1	2.23 (1.62-3.06)***
Without formal education	74.9	3.89 (2.81-5.39)***	58.3	2.96 (2.07-4.26)***	64.1	3.54 (2.48-5.05)***
Equivalized gross annual household income ppp						
Top 25%	40.1	1	30.1	1	30.5	1
50<75%	44.3	1.06 (0.84-1.35)	27.4	0.95 (0.70-1.31)	30.6	1.04 (0.79-1.37)
25<50%	54.5	1.27 (1.00-1.60)*	34.2	1.04 (0.73-1.47)	40.8	1.18 (0.92-1.53)
Lowest 25%	62.6	1.53 (1.20-1.96)**	41.9	1.05 (0.76-1.44)	48.2	1.25 (0.95-1.64)
Household living arrangements						
Living with the partner (reference category)	48.1	1	28.3	1	33.9	1
Living alone	53.1	0.70 (0.36-1.37)	37.6	0.84 (0.38-1.84)	41.2	1.38 (0.65-2.94)
Living with the partner and others	61.6	0.77 (0.40-1.49)	46.8	0.63 (0.29-1.36)	49.6	1.09 (0.51-2.32)
Not living with the partner but living with others (hh)	67.7	0.45 (0.12-1.71)	48.9	1.77 (0.43-7.30)	50.9	1.93 (0.47-7.99)
Not living with the partner but living with others (not household head)	76.4	0.21 (0.02-2.05)	43.8	10.69 (1.08-105.3)*	64.1	1.24 (0.11-13.82)
Living with the partner (reference category)*sex		1		1		1
Living alone*sex		1.25 (0.86-1.83)		1.35 (0.88-2.08)		0.82 (0.53-1.24)
Living with the partner and others*sex		1.32 (0.84-2.07)		1.70 (1.04-2.77)*		1.16 (0.72-1.87)
Not living with the partner but living with others (household head)*sex		1.83 (0.87-3.87)		1.01 (0.45-2.25)		0.64 (0.29-1.43)
Not living with the partner but living with others (not household head)*sex		2.59 (0.70-9.58)		0.28 (0.08-0.99)*		0.79 (0.21-2.99)

* p <0.05; ** p<0.01; ***p<0.001 Note: Adjusted by age and country.

Table 4. Multivariate associations between the dependent variables and the socio-economic and household living arrangements indicators including the interaction between educational attainment with sex and household living arrangements with sex. People 65-85 years old. Adjusted odds ratios (aOR) and 95% confidence intervals (CI). SHARE, 2004.

	Poor self-perceived health status		Poor mental health		Limitations in mobility	
	%	aOR (95%CI)	%	aOR (95%CI)	%	aOR (95%CI)
Sex (men reference category)		0.89 (0.58-1.36)		2.01 (1.20-3.36)**		2.97 (1.81-4.87)***
Educational attainment						
Higher than secondary	36.7	1	22.4	1	25.0	1
Secondary	47.6	1.27 (0.62-2.59)	27.2	1.74 (0.71-4.27)	33.4	1.99 (0.84-4.73)
Primary or less	57.4	1.87 (0.87-4.02)	40.9	1.74 (0.70-4.33)	44.1	3.05 (1.23-7.60)*
Without formal education	74.9	1.70 (0.65-4.46)	58.3	2.65 (0.86-8.19)	64.1	2.61 (0.85-8.04)
Higher than secondary*sex		1		1		1
Secondary*sex		1.14 (0.71-1.84)		0.87 (0.49-1.53)		0.74 (0.43-1.27)
Primary or less*sex		1.14 (0.70-1.85)		1.05 (0.60-1.86)		0.81 (0.46-1.42)
Without formal education*sex		1.69 (0.94-3.07)		1.07 (0.55-2.09)		1.18 (0.61-2.29)
Equivalized gross annual household income in ppp						
Top 25%	40.1	1	30.1	1	30.5	1
50<75%	44.3	1.06 (0.84-1.35)	27.4	0.95 (0.69-1.30)	30.6	1.03 (0.79-1.36)
25<50%	54.5	1.27 (1.00-1.60)*	34.2	1.03 (0.73-1.47)	40.8	1.18 (0.91-1.51)
Lowest 25%	62.6	1.54 (1.20-1.97)**	41.9	1.05 (0.77-1.44)	48.2	1.25 (0.95-1.65)
Household living arrangements						
Living with the partner (reference category)	48.1	1	28.3	1	33.9	1
Living alone	53.1	0.72 (0.37-1.41)	37.6	0.84 (0.39-1.82)	41.2	1.43 (0.68-3.00)
Living with the partner and others	61.6	0.79 (0.41-1.54)	46.8	0.65 (0.30-1.41)	49.6	1.12 (0.52-2.39)
Not living with the partner but living with others (household head)	67.7	0.48 (0.13-1.78)	48.9	1.88 (0.45-7.78)	50.9	2.00 (0.48-8.28)
Not living with the partner but living with others (not household head)	76.4	0.25 (0.03-2.34)	43.8	11.70 (1.21-112.81)*	64.1	1.42 (0.13-15.14)
Living with the partner (reference category)*sex		1		1		1
Living alone*sex		1.23 (0.84-1.80)		1.35 (0.88-2.07)		0.80 (0.53-1.22)
Living with the partner and others*sex		1.30 (0.83-2.04)		1.66 (1.02-2.71)*		1.14 (0.70-1.85)
Not living with the partner but living with others (household head)*sex		1.78 (0.84-3.76)		0.97 (0.43-2.17)		0.63 (0.28-1.40)
Not living with the partner but living with others (not household head)*sex		2.39 (0.65-8.81)		0.26 (0.07-0.93)*		0.73 (0.19-2.72)

* p <0.05; ** p<0.01; ***p<0.001 Note: Adjusted by age and country.

Household head – I think it is an interesting point that the person designated head is "the person most capable of answering questions about the household members' housing situation …" - but it should be specified somewhere in the text.

Thank you very much for your suggestion. How the household head is designated is now explained in the text in the description of the independent variables (pages 7-8).

A few new points

Individual response rate of 86% - what was the base for this? I believe that it omits to mention that there was household non-response before this so that the achieved sample was not 86% of the eligible individuals in selected households. We all suffer from difficulty gaining response and I think a more realistic figure should be given.

Thanks for your advice. The household response rate of the sample was 61.8% (weighted average). This figure has now been introduced in the text instead of the individual response rate (page 5).

Table 3. The lower CI limit for living alone and mobility is above the central estimate – there must be an error.

Thank you very much for your comments. Effectively, it was an error and it has been corrected in the text (0.81 instead of 1.81).

In the discussion under limitations, you mention you have given evidence for both causality directions. I would say rather that you have put forward post-hoc hypotheses for effects in both directions that are consistent with your data. This is fine but I would reword it.

We have accordingly replaced the term evidence by explanations. The current sentence is: "However, we have provided some possible

explanations for both causality directions depending on the specific living arrangement and gender."(page 18).

References:

1. Börsch-Supan A (coord), Brugiavini A, Jürges H et al. *Health, Ageing and Retirement in Europe. First Results from the Survey of Health, Aging and Retirement in Europe*. Mannheim Research Institute for the Economics of Aging (MEA). 2005, p.352-353.

2. Börsch-Supan A, Jürgens H (eds.). *The Survey of Health, Aging and Retirement in Europe-Methodology*. Mannheim Research Institute for the Economics of Aging (MEA). 2005, p. 37.

Answers to reviewer 3

The authors provided a very lengthy response to the three reviewers original comments and satisfactorily addressed the range of issues raised.

While the revisions made to the paper broadly addressed the concerns of reviewers, the revised text is often written in an unclear way. In particular, on pages 15-18 the revisions to the paper are at times in poor English and some sentences are clumsy or difficult to understand. It is therefore essential for the authors to ensure that the paper is written in a clear and comprehensible way (without typographical or English language errors). Similarly, the additional text in the abstract is not entirely clear.

Thank you very much for your comments. Typographical and English language errors have been corrected in the text.

- Review 3. Sent on 10 May 2007

Dear editor, thank you for provisionally accepting the manuscript for publication and the useful comments and suggestions of the reviewers. In the following paragraphs we detail the modifications that have been introduced and clarify all the points made by the reviewers.

Answers to reviewer 1: Ann Bowling

This paper has been through a series of revisions which, overall, appear to satisfy the reviewers' concerns.

I am not sure why the authors argue that their page numbers are not the same as those of the reviewers. If they check their pdf conversion of their text they will see that the page numbers we read should match their copy.

The paper is much improved, although there are still a few grammatical corrections to be made – e.g. p. 16, lines 6-8 should be in the past tense (included not include) and the correct wording is 'sample in' not 'sample of' etc.

Thank you very much for your advice. These grammatical problems have been corrected in the paper.

In addition the authors have a curious - and incorrect - style in the text of not referring to both authors of dual author publications. This needs correction – e.g. p 16 line 2 'Grundy et al. needs correcting to Grundy and Slogget'. P16 line 7 'Grundy's study' needs correcting to 'Grundy and Slogget's study'.

Thanks for your advice. Now we have corrected it in the text.

On the whole they have inserted text as requested, although in some places still leaves the reader curious. For example: page 5, end of

last para: The authors explain their upper age limit of 85 (as requested) in terms of 'the weights in the database for the oldest-old may be less accurate (3)'. Why is this less accurate, and why can't a correction weight be applied? A brief explanation is required.

Reference 3 is not easily accessible and is to an apparently? unpublished internal paper – I don't think this is permitted by the journal.

Thank you very much for your comment. We have contacted with some members of the SHARE team (Stephanie Stuck and Anders Klevmarken) and they told us that the statement about weights for the oldest-old refers to the fact that those who live in special institutions for elderly did not always belong to the sampling frame in all countries. It should be taken into account that after 85 years old, the probability of entering institutions grows, and that risk of residence in an institution is associated with both health and socioeconomic status. In the sample there are 672 people aged +85, of which 59 were institutionalised in the countries providing information about institutionalised people. It represents an 8.7% of people aged +85, whereas in the group 65-85 it only represented a 1.2% (115 65-85 people were institutionalised in the countries providing this information).

Stephanie Stuck, on the other hand, communicated us reference 3 can be referred in the paper because it has been already published.

Answers to reviewer 2

Thank you for the revision.

In your reply to reviewers you state that you have expanded re the weights but on p I recommend that it is state explicitly that "weighted for multistage sample design where applicable then calibrated to population totals within the country" (or was to the totals for the combined countries?

Thanks for your advice. Now, your suggestion have been taken into account in the text and the following modification has been introduced: “SHARE used design weights for multistage sample design and then calibrated to population totals within the country to reflect the national populations [28].” (pages 4-5).

Looking at your interaction tables I also think you could mention that the interaction between sex and living arrangements in their associations with mental health were statistically significant for living with a partner and others and also for living with others and not being household head.

Thank you very much for your suggestion. Now the following sentence has been added to the text: “Although not included here because of shortage of space, the results of interacting household living arrangements and sex were also statistically significant in their associations with poor mental health for living with a partner and others and also for living with others and not being household head.” (page 12).

Be careful to distinguish 'being alone' from 'loneliness'.

Thank your very much for your warning regarding the difference between being alone and loneliness. Now this error has been corrected in the document (page 16).

ARTICLE III

Rueda S, Artazcoz L, Gender inequalities in health among elderly people in a combined framework of socioeconomic position, family characteristics and social support.. *Ageing & Society*. 2009;29(4):625-47.

Accepted: 26 November 2008

- *Review 1. Sent on 8 October 2007*

Dear editor, thank you for the careful revision of the manuscript and the useful comments and suggestions of both reviewers. In the following paragraphs we detail the modifications that have been introduced and clarify all the points made by the reviewers.

Reviewer: 1
Comments to the Author
This paper makes a contribution to the literature on gender differences in the social determinants of health among the elderly in Catalonia (Spain). It considers three dimensions of health including functional, mental and self-perceived health. Further, it considers the impact of both living with and caring for a disabled person on health. The literature review is thorough, the methodology competent. The paper is fairly well-written up to the discussion.

The main concern I have with this paper is that some findings are contradictory to the literature and these are not adequately explained in the discussion to convince me that they are 'real'. For example why would someone who cares for a disabled person be much 'healthier' than someone who does not? Also, why would social support be negatively related to better health? The discussion is very weak with regards to these points.

Thank you very much for your suggestion. We have tried to further explain these findings in the discussion section. Regarding the relationship between caring a disabled person and health, now the following text has been added in the discussion:

"Similar to what the Caregiver Health Effects Study (Schulz and Beach 1999) found in a sample of 66 to 96 years' Americans, living with a disabled person was positively and strongly related to poor health, whereas contrary to what these authors found, caring for a disabled person was negatively related to poor health. Surprisingly, whereas taking care of a disabled person presented a negative association with having a poor self-perceived health among women and with having a LLI in both sexes, living with a disabled person was positively and strongly related to all the health outcomes considered both among men and women, even after controlling by social support. These findings could be explained by a probable reverse causation effect, whereby those assessing taking care of a disabled person would be a selection of the healthiest elderly, whereas living with a disabled and not taking care of him or her could be related to a higher prevalence of poor health status. Shulz and Beach (1999), for instance, found that individuals with a disabled spouse who were not providing care had higher rates of prevalent disease compared to the other 3 caregiving groups analysed".

Regarding the relationship between social support and health, as can be seen in tables 3 to 5, there is not a negative association with better health, as reviewer states, but a negative association with poor health, i.e. it protects the elderly from having a poor self-perceived health, a poor mental health, and limiting long-standing illnesses, but specially confidant social support, and not the other way round. This issue has been better clarified in the discussion section.

Further, the authors, on page 12, go at great lengths to explain why gender differences in self-perceived health were smaller after controlling for other predictors. In fact, the odds ratios were only slightly reduced.

Thanks a lot for your comment. We agree that the change in the odds ratios is not as important as to provide such a strong statement. The discussion section has been modified taking this into account it.

The findings for material deprivation were very weak or not

existent. Too much is made of this finding in the discussion. It seems to me that this is not a very good measure of material deprivation, capturing 36-40% of the sample, and this may because of the criteria for being materially deprived was set very high (above the median).

We are very grateful for your suggestion. Now we have generated a new indicator, based on Grundy and Holt's 2001 paper, called household resources, in which we generated three categories: not lacking any of the items, lacking one of the items and lacking two or more items. With this new classification lack of resources was related not only to poor mental health status among women (as in the previous version) but also with LLI among men. It is further explained in the methods section.

The finding of poorer health experienced by those living alone may be reflecting their income status rather than the importance of 'nurturing' responsibilities for health.

Thanks a lot for your comment. After thinking about your suggestion and reviewing some literature, we have amended the text as follows:

"Anson (1988) found that women living with a partner were the healthiest and women living alone or being head of families were the least healthy, pointing out the importance of adult support for health status. Consistently, living alone was associated with poor mental health in both sexes and with having a LLI among women, although only the association between living alone and poor mental health among women persisted (albeit weakened) after controlling for social support. This result is in line with those of a study carried out among 60-72 year nurses in which social engagement and social network variables were associated with a decreased risk of decline in mental health among women living alone (Michael et al. 2001)".

"These findings suggest that living alone can have different meanings for elderly men and women, having a higher impact on women's poor mental health. A possible explanation of this outcome is the phenomenon of the "feminisation of poverty" (Pearce 1978), together with higher widowhood rates among

women, but especially in a context such as Spain, where elderly widows live with very small pensions. The association between deprivation and poor mental health among women would support this hypothesis".

I am not convinced for the explanation for not including those aged 85 and over in the study if only a very small percentage are institutionalized. Also why exclude those who are employed, one could have included them in the sample as well as a variable that measures employment status. Limiting the sample in this way, limits the ability to generalize to the population. Further, how does the sample compare to the population statistics?

The methodological decision of selecting 65-85 years non-working people has been further explained in the methods section as follows:

"For the purposes of this study a sub-sample of people aged 65-85 years who had no paid job has selected (1113 men and 1484 women). The minimum age has been chosen based on the standard legal retirement age for men in Spain (CES 2000) and the exclusion of all people with paid work is justified by the fact that the meaning of living arrangements and their impact on health depends to a great extent on the employment status (Artazcoz et al. 2004). Employment status is not a confounding variable but an interacting variable, i.e., the meaning of family characteristics and socio-economic status can be different and have a different impact on health depending on employment status. Moreover, with the available cross-sectional data it would not be possible to test for the "healthy worker hypothesis", meaning that good health increases the probability of getting or keeping a paid job (Ross and Mirowsky 1995)".

"The decision to take 85 years as the maximum age, on the other hand, is based on the fact that, although institutionalisation rates in Spain are lower than in other European countries, among those aged 85 and over they are almost 4 times higher than among the total elderly population depending on variables such as sex, socio-economic position, family characteristics or health (Arber and Cooper 1999; Grundy and Jitlal 2007; IMSERSO 2006). More specifically, in Catalonia, the last data available about institutionalisation rates showed that in January 2006, 75% of the

elderly in public institutions were older than 80 and that among them, 83% were women (IMSERSO, 2008). Apart from that, taking people younger than 86 reduces the probability of social selection among the oldest old (Idler 1993; Orfila et al. 2000; Vvorisalmi, Lintonen and Jylhä 2006). Moreover, in our database people over 85 presented a higher non-response rate in some of the predictor variables such as social support (37.5% vs. 5.7% among 65-85 years) and in the outcome variable mental health (37.7% vs. 5.7% among 65-85 years)".

Therefore, our results are generalisable to people 65-85 who has no paid work, that is most people aged 65 and over.

In conclusion, before the paper can be published the authors need to verify that their findings are indeed 'correct' and if so, provide an adequate explanation at to why they are contrary to so many existing studies.

Reviewer: 2
Comments to the Author
This is interesting paper which makes a contribution to the now quite well developed field of inequalities in health in later life taking account of both socio-economic and socio-demographic characteristics. This literature could perhaps receive rather more attention in the introductory sections. For example although it is the case that socio-economic inequalities in health in older age groups have tended to receive less attention than those of the middle aged, this balance has shifted somewhat recently and there is now a large body of work on this topic. Similarly a growing number of papers consider both socio-economic and socio-demographic characteristics.

Thanks a lot for your suggestion. We have tried to look more carefully to the recent literature about health inequalities among the elderly and introduce some amendments both in the introduction and in the discussion sections. For instance, now in the introduction it says:

"Research about the social determinants of health among the elderly has only recently started to integrate three different approaches that were usually studied in parallel: socio-economic position, family characteristics and social support".

Moreover I would disagree with the statement on page 4 that research focussing on the association between living arrangements and health and care and health has mostly been restricted to female samples. On the contrary there is quite a large volume of work on this, including some now quite old studies explicitly looking at male caregivers (e.g. Arber and Ginn) and many studies looking at family and household roles and health (e.g paper by Glaser and Evandrou; Dykstra; Sundstrom; Wolf; Agree; Henretta; Soldo; Grundy; and many others). I would disagree even more strongly with the statement on page 14 that 'as far as we know, this is the first time that the impact of living with a disabled person on the health of the elderly is studied' as there is a large literature on this.

Thank you very much for your useful suggestions regarding revising new literature. Although Glaser and Evandrou's papers

about the relationship between multiple roles and health are very interesting, they are mostly centred on mid-life people. Our study, however, is focused in people aged 65-85 years with no paid job, with the different implications it has.

Moreover, following your suggestion we have revised more deeply the literature about the impact of living with a disabled person on the health of the elderly, which is further discussed in page 15:

"As also found by the Caregiver Health Effects Study (Schulz and Beach 1999) in a sample of Americans aged 66 to 96 years old, living with a disabled person was positively and strongly related to poor health; unlike that study, we found that caring for a disabled person was negatively related to poor health. Surprisingly, whereas taking care of a disabled person presented a negative association with having a poor self-perceived health among women and with having a LLI in both sexes, living with a disabled person was positively and strongly related to all the health outcomes considered both among men and women, even after controlling for social support. These findings could be explained by a probable reverse causation effect, whereby those taking care of a disabled person would represent a selection of the healthiest elderly, whereas living with a disabled and not taking care of him or her could be related to a higher prevalence of poor health status. Shulz and Beach (1999), for instance, found that individuals with a disabled spouse who were not providing care had higher rates of prevalent disease compared to the other 3 caregiving groups analysed".

The paper in fact is similar in design the Grundy and Sloggett 2003 paper on England and giving some comparison of results would be interesting.

Thank you very much for your suggestion. Now the discussion section has been further developed through comparing our study with that of Grundy and Sloggett 2003:

"This study is a contribution to the relatively new but growing literature about the multiple determinants of health inequalities among the elderly. As in Grundy and Sloggett's study (2003) carried out in England, we have included different dimensions of

health status and of its determinants. Regarding health indicators, however, we have included one closely related to the age group under study, that is, long-standing illnesses generating functional limitations. And regarding the predictor variables, our study overcomes some shortcomings of previous research and provides other important dimensions that are not usually considered in this kind of research. First of all, educational attainment had three categories instead of being a dichotomous variable, making it possible to analyse the socio-economic gradient in health inequalities. Moreover, household living arrangements is used instead of marital status, a much more important determinant of well being in the elderly together with two other dimensions of household characteristics: living with a disabled person and taking care of a disabled person. Finally, social support has been measured with two dimensions, showing that the relationship between each of them and health is different depending on the kind of social support received".

I would strongly suggest undertaking a more thorough literature review and amending the paper accordingly as currently readers might think that the authors are trying to present themselves as the first to undertake the kind of study reported, rather than making a useful addition to a growing body of work in the same vein.

Thanks a lot for your suggestion. We have tried to amend the paper accordingly to new findings in the literature and to be more modest in the discussion of our results.

The analyses are well presented and described although I would suggest including Ns in the tables.

Thanks a lot for your suggestion. Now Ns have been included in tables 3 to 5.