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ESSAYS ON AGEING, HEALTH AND DISABILITY IN ITALY

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Introduction

This thesis is a collection of three essays on ageing, health and disability for Italy.

Ageing is one of the greatest social and economic challenges of the 21st century for the European societies. The already high proportion of older individuals will increase to a level, which is historically unprecedented. Europe has experienced a demographic transition to aged population over the last century, with gentle adaption to the necessary changes. The implications of the very large increases in the oldest age group are only now being realized, and there is much discussion of the implications of a global ageing population.

Of the European regions, Italy has the highest proportion of population aged 60 or over. It is for this reason that we argue that for the analysis of ageing process and measurement of health status among older people Italy presents an interesting case, particularly in order to understand more deeply the determinants and consequences of its current situation by applying a multidimensional perspective.

The data for the three essays are drawn from the publicly-released version of the *Survey of Health, Ageing and Retirement in Europe* (*SHARE*). *SHARE* is the first cross-national and longitudinal study to explore topics related to work, retirement, health, health care, psychological factors, aspects of daily life and socio-economic positions among Europeans aged 50 or more. The application of this dataset is really innovative with respect to our topic. In fact, SHARE has been so far scarcely used to depict an exhaustive picture of the ageing process in Italy.

A natural consequence of the ongoing population ageing is that more people live to an old age with multiple health problems (Rosen and Haglund 2001). Several cross-sectional studies have shown that the end of life is dominated by sustained patterns of several functional declines (Meinow 2006; Lunney et al. 2002; Romoren and Blekeseaune 2003). If the prevalence of health problems has increased over time, it is likely that the number of people who have various troubles simultaneously will also increase. If the proportion of the population with multiple health problems and disabilities increases over time, this would have important implications for future policy and resource allocation.

Starting from the preamble of the WHO Constitution (1948) it has been strongly pointed out that a multi-dimensional perspective is always required when studying health. Research on population health status among older people has mostly focused on specific un-health situation, studied one at a time, e.g., physical decline, mental performance and psychological distress. Nevertheless, it has been increasingly emphasized that studying elderly population should involve approaches that allow for multiple measures of health to embrace all its complexity (Hallerod 2009; Lafortune et al. 2009). With regard to policy

analysis and eldercare system, interrelations in health indicators that cover several dimensions of health may be an important complement to single variables, which may follow different patterns and trends over time.

The first chapter aims at understanding the complex association among different indicators of older people's un-health and the subsequent inter-relations of un-health dimensions across time in Italy. In order to reach these purposes, the chapter firstly uses the cross-sectional information of the sample and explores the associations among a wide range of indicators of physical, cognitive affective and motivational health problems. This first goal is achieved by comparing and testing different structures of the data through confirmative factorial analysis (CFA) (Hu and Bentler 1999). This study is carried out by employing the Italian panel of the first and second wave of SHARE, conducted respectively during the 2004 and 2007.

The approach is to address a couple of innovative propositions that follow from the properties of health indicators. The first is that when various indicators are associated, it does not mean that they measure only one latent dimension, for it may be that one indicator is a partial measure of several different phenomena, which confuses the interpretation of the results. The analysis accordingly examines whether single indicators are associated with more than one phenomenon. In order to evaluate the complex and multidimensional structure of older people's un-health, the generally agreed assumptions that indicators tap only in one latent factor and their error terms do not correlate with each other is here purposely relaxed (Gignac 2007). The second proposition is that the prevalence of health problems differs substantially by age groups and between men and women, making it important to analyse if and to what degree the associations among them vary for different groups of older people. Age and gender group equality in the strucure of un-health is analysed by means of a multi-group method.

According to our results, confirmative factor analyses (CFA) reveals that a nested model is the best and clearest representation of the data. This solution permits to describe health with a certain amount of complexity. One global aspect of un-health (Glob) that relates to all the 27 indicators is generated. At the same time, there is evidence to suggest the existence of four residual dimensions, which measured the exclusive presence of physical (R_Phys), cognitive (R_Cogn), affective (R_Affect) and motivational problems (R_Motiv).

The findings illustrate in a convincing way that the selected indicators can tap in more than one factor and the residual variance of the manifest variables can be accurately used to depict a complex structure of older people's un-health. The existence of a global latent factor indicates that the different problems are inclined to accumulate and coexist into one dimension. At the same, the residual factors point out the presence of significant sub-groups of people who have problems just in one domain. R_*Phys* shows that some people are exposed to physical limitations without suffering from cognitive, affective and

motivational problems. *R_Cogn* reveals the occurrence of individuals who do not have physical and psychological troubles, but otherwise present restrictions in the cognitive function. *R_Affect* corroborates the existence of people who have some problems with affective suffering symptoms (depression, irritability, restlessness etc.), but do not report any deprivation with physical skills, cognitive function and motivation. Finally, the residual factor R_*Motiv* shows that some individuals have motivational problems (pessimism, lack of interest and lack of enjoyment), even if are not affected by other troubles, included usual affective suffering symptoms.

Going deeper into differences by gender and age, the result shows that regardless of large variations in prevalence, the basic relationship between health problems appeared to be the same among men and women and at different ages.

It is showed that various health problems are related to each other at a moment in time, but it is at least as important to sort out how problems inter-relate over time. If so, a second goal of the first chapter is to give a first picture of the temporal relationships among the retained un-health latent dimensions. We first investigate the factorial invariance across time and finally move to estimate a SEM to study the inter-relationships of the different un-health dimensions over time.

Using the available information of the longitudinal sample, the proposed latent structure of un-health turns out to be invariant across time, and the estimated SEM confirms some important temporal inter-relations. Global un-health, residual physical difficulties and residual cognitive problems present high stability coefficients. Residual affective symptoms and residual motivational troubles turn out to be comparatively less stable and tend to overlap over time. Global un-health at time 2 is consistently predicted by residual physical difficulties and residual cognitive problems at time 1. The results suggest that both residual physical and residual cognitive difficulties have an important role in driving people from one to multiple health problems.

The first chapter shows that different health problems are highly related to each other, but it is at least as important to understand if and how the different dimensions apply in various socio-demographic characteristics, socio-economic circumstances and previous experiences. The need to study health as a result of the previous conditions is increasingly emphasized, especially for older people (Lloyd- Sherlock 2002). Men and women spend more than a third of their working life time at the workplace. The work place characteristics, likewise material or non-material exposures (e.g. psychological distress), hence are major determinants of health. It is well documented that people who experience poor working conditions during a significant period of their employment trajectory are more likely to report poor health during retirement (Siegrist and Wharendorf 2009, Siegrist et. al. 2007).

The second chapter aims at understanding to what extent different dimensions of quality of work experienced in one's working life affect multidimensional health status in Italy, controlling for other social determinants and for gender differences. This application seems extremely needful since Italy has been found to score relatively poorly in terms of worker's satisfaction on working conditions (Clark, 2005) and its Southern European welfare regime shows a lower contrast to the negative effect of poor working conditions on worker's health status (Dragano, Siegrist & Wahrendorf, 2010).

The present application puts forward three elements of innovation. To the best of our knowledge, the chapter is the first exhaustive analysis of the relationship between health and quality of work which use a nationwide representative sample of older adults in Italy. Second, the application connects for the first time several aspects of work quality to a multidimensional and complex structure of health. In fact, the interaction between quality of work and health has been assessed more often with reference to the recurrence of specific diseases or to the effect of particular dimensions of the quality of work (Eurofound, 2010, 2011). Finally, following the recent contributions on the socio-economic determinants of health (Ostlin et al. 2006), the present essay introduces the gender perspective to the study of the association between health and quality of work. This study is carried out by employing the Italian sample of the second wave of SHARE.

The focus of the second chapter is therefore on the effect of working conditions on individuals' later health status. The sample is made up of individuals who are currently not in the labour force but who had work experience for at least five years of their lives. Quality of work refers to the prevalent work experience in the individual's working life, and the dimensions analysed are the outcomes of factor analyses on the different dimensions of the quality of work that the SHARE retrospective survey allows us to recover (Siegrist et al. 2004, Karasek et al. 1998).

The four quality of work dimensions that are obtained through factor analysis are:

- the physical dimension: whether the work was physically demanding and characterised by an uncomfortable work environment;
- the psychological dimension: whether the work was emotionally demanding and characterised by conflicts and disturbances, or by a heavy time pressure;
- the control dimension: whether the worker had the opportunity to develop skills, and whether s/he had freedom to decide how to do his/her work;
- the reward/support dimension: whether the worker received the recognition reserved for his/her work; whether s/he was treated with fairness, whether there was a good atmosphere in the workplace amongst colleagues and whether the salary was considered adequate considering all efforts and achievements.

The health status is measured using the nested factor model as presented in chapter 1. The retained latent un-health factors are chosen as continuous dependent variables of a

series of ordinary least squares regression models (OLS) in which the job quality dimensions and other social determinants of health are used as covariates. The models are estimated separately for men and women in order to detect gender differences in the definition of individuals' health.

Our results confirm the presence of a significant effect of quality of work on health, and they also suggest the existence of interesting gender differences. Global un-health is predicted by wealth and occupational status; the effect disappears once we add quality of work dimensions to the model. Higher scores in terms of reward/support and control at work significantly decrease the probability of being globally unhealthy, the effect being similar by gender. We also found that a high quality of physical work reduces the probability of being globally healthy for women, but not for men. Moreover, a past physical demanding job impacts significantly on women's residual physical dimension. This is probably due to the fact that women are more likely to feel the negative consequences of a physically demanding job that, for Italian women, is also more likely to be matched with a physically demanding unpaid care and domestic work due to the unequal allocation of unpaid work by gender in Italy (Addabbo, Caiumi & Maccagnan, 2010, Addabbo, 2003).

A psychological demanding job affects significantly residual physical limitations rather than global un-health, the effect being similar by gender. Work quality dimensions are not related to women's residual cognitive problems. On the contrary, higher levels of autonomy are associated with lower levels of men's residual cognitive problems. This is probably connected to the fact that workers with upper levels of autonomy during the main job are more educated people who generally have higher standards of intellectual and mental function.

Higher levels of control in men's work increase their affective problems after retirement. This suggests a loss in men's social sphere after retirement from a rewarding job or the underdevelopment of caring and relational dimensions during their working life. A past physical demanding job impacts significantly on women's affective problems. Finally, work quality dimensions are not associated with men's residual motivational problems. However, low support/reward and low control at work are strongly related to women's residual motivational troubles.

These results are particularly important with regard to policy implications, since long-term quality of work effects on employees' living conditions are considerable. Therefore, promoting quality of work by supporting these more distant determinants may have beneficial medium and long-term on the unequivocal process of reducing health connected with greater age.

The second chapter moves from the idea that health is a result of previous experiences and working conditions, but health plays also an instrumentally role in driving people to disability. There are no generally accepted ways to define and measure disability. It has been described from different perspectives, and several theoretical frameworks have been developed in different contexts and for different goals (Altman 2001).

Although Amartya Sen's capability approach (Sen 1985a, 1992, 1999) has been developed to study various concepts in welfare economics, it has been recently proposed as an innovative and valuable theoretical framework for defining disability, understanding its causes and consequences (Welch 2002; Burchardt, 2004; Terzi, 2005; Mitra, 2006; Trani and Bakshi 2008).

The capability approach offers two constructs of special importance: functionings and capabilities. The functionings of a person refer to the valuable things that one can do (such as "working") or be (such as "being socially integrated"). They can involve basic actions, such as "being well-nourished", but also more complex ones, such as "having self-respect" or "taking part in the life of the community". In addition to functionings, Sen introduces the important notion of capability which can be considered the central aspect of his approach. Capability is determined by the different combinations of functionings the person can or cannot achieve. These are based on a set of real opportunities and mainly connected with the freedom to accomplish valued beings and doings.

Sen states that persons' existence is compounded by functionings and capabilities, and accordingly he assumes that a concrete notion of equalitarianism should be based on these two constructs. The capability approach is intentionally open and incomplete. Sen does not specify any list of functionings/capabilities which depend on the circumstances and issue under consideration. Functionings and capabilities that are relevant for the evaluation can be elicited directly from people themselves as a social choice exercise, or can be based on some social standard as reflected by commonly values in the society. This makes the capability approach a flexible tool to be applied to different topics.

Welch (2002), Burchardt (2003), Terzi (2004) and Mitra (2006) extensively point out the strengths of using a capability perspective in disability studies. A health problem is considered an impairment, i.e. a conditions of the body or mind, such as being unable to move, having cognitive problems, or experiencing depression. The disability is conceptualized within the spectrum of the functionings and capabilities that the individuals value and have reason to value (Sen 1999). The passage from impairment to disability is not straightforward. In fact, the capability approach accounts for the interpersonal variations in the link between impairment and disability depending from a variety of factors, such as personal characteristics (age, gender etc), private resources and external circumstances. The human heterogeneity is a crucial feature of the capability approach (Sen 1992, 1993, 1999) and may explain that a given impairment yield a

disability through the complex interrelation between the individual's characteristics, her environment and her available resources.

The third chapter attempts to examine the relation between conditions of the body or mind (impairments) and achieved functionings (disability) among elderly people in Italy. To the best of our knowledge, this application is very innovative and it can be considered the first study that attempts to examine and model the complex relation between impairments and disability adopting a capability perspective. Although other studies (Trani and Bakshi 2008) show a different degree of functioning achievement between impaired and non-impaired people, so far little has been done in order to address the following two questions: (1) the impact of different impairments on disability and (2) its complex interrelationship with private resources, personal characteristics and external circumstances. This study is carried out by employing the Italian sample of the second wave of SHARE.

By adopting a capability perspective and considering aged people own agency in assessing valued dimensions, disability is conceptualized as a functioning deprivation in autonomy. Autonomy is constantly connected with the possibility of formulating plans of life in older age (Gilroy 2006, Raynes et al. 2006) and often selected as crucial and instrumental dimension of daily existence by elderly people themselves (Grewal et al. 2006). We then consider the SHARE question: "How often do you think that you can do the things that you want to do?" where the possible answers are "Often", "Sometimes", "Rarely" and "Never".

The impariments are measured using the nested factor model as presented in chapter 1. The given latent structure of un-health is included in a SEM where disability is the dependent variable and private resources, personal characteristics and external circumstances are modeled as exogenous predictors. The model is a two stage SEM where the stucture of un-health is used both as outcome and covariate. Subsequently, to explore differences in the complex relationship between impairments, disability and exogenous causes we look at the same model divided by four sub-groups of population (Chiappero-Martinetti and Salardi 2008): "younger old" men, "younger old" women, "older old" men and "older old" women.

The analysis sheds more light on the intricate interrelation between disability, impairments and exogenous causes. Understanding the complexity of this process might be a useful tool for the policy makers. In fact, they might be interested in to what extend impairments restrict the achievement of valued functionings, what is the role played by private resources and other characteristics in this relationship, and how this process differ among homogenous sub-group of population. It is certainly a more holistic way to study and understand the disability and might be a valuable tool in defining policy interventions.

The findings have several important implications which provide support for the use of a capability perspective to study disability. Considering the entire sample level, the factor of global impairment has the strongest impact on poor levels of achieved autonomy. As expected, the residual factors, which measure the extent to which people are exposed to only one type of impairment, have weaker associations with the outcome variable. The non-significant impact of the cognitive residual construct on autonomy is actually unexpected and deserves further investigations. Other studies report a cross-sectional and longitudinal relationship between cognitive impairments and some measures of independence (Braungart et al. 2007). The less restrictive definition of disability might reveal a different connection between cognitive problems and disability. In fact, the subjective question used for autonomy might fail to capture high deprived situations (Sen 1985b), such as large levels of mental disorder. Our results show that lack of emotional well-being can be disabling even though is not combined with other impairments. Residual motivational problems have a larger effect on the probability of experiencing poor levels of autonomy than usual symptoms of affective suffering (depression, irritability, restlessness etc), probably because part of planning life concerns enjoyment and meaningful activities.

By aggregating the population into four sub-groups by age and gender, the estimates show that the effects of impairments on autonomy are constantly higher among women. The non-significant effect of the physical residual factor for “older old” individuals is not surprising. That is not to say that physical problems are not disabling at all among older people, but rather that suffering only from physical limitations might not be perceived as such by people with greater age. On the contrary, among younger people, who usually cope with minor global problems, experiencing only physical limitations have a significant disabling effect.

At the sample level, higher amount of wealth have a protective effect on poor levels of autonomy, pointing out private assets as a crucial mean to release the effect of impairments. However, considering the four sub-groups of population, private resources play a significant role only among “younger old” Italians and are more important for men. Considering other important exogenous predictors, both living alone and in a rural area decrease the probability of achieving autonomy. The subsequent aggregation into four sub-groups of population point out large gender and age differences: both indicators are statistically significant among “older old” individuals, with larger values for women.

The third chapter contributes to our knowledge that autonomy of doing the things that we want to do can be used as non-standard indicator of functioning related to disability. Impairments have distinct effects on disability among sub-groups of population. Finally, resources, personal characteristics and external circumstances interact differently in the singular process of functioning achievement.

We conclude by listing some fundamental remarks that need to be solved in order to further the applied methodologies. The analysis of the temporal inter-relation of un-health dimensions needs to employ more refined models that are able to deal with introducing covariate in the proposed analysis. The impact of quality of work on un-health status need more appropriate econometrics techniques to deal with problems such as endogeneity and omitted variables. In the context of the operationalization of the capability approach, we would like to estimate the effect of impairments on more than one functioning as well as employ more data and longitudinal information. We also believe that not only the assessment of more than one functioning is necessary, but also the investigation of the possible interrelations existing among functionings is a key priority for a more comprehensive view of disability. Finally, as the present study is based on an Italian sample, further research is needed to confirm that the present findings can be applied to populations in other countries and cultures.

Chapter 1

Physical limitations, depressive symptoms and cognitive problems: exploring the complex structure of un-health among older people in Italy

Abstract: Although health has always been a multidimensional concept, the research on older people's health has been mostly focused on specific dimension or disease, studied one at a time. The present work aims at understanding the complex associations among different indicators of older people's un-health in Italy. In order to reach this purpose, the work uses the Italian panel of the *Survey on Health, Ageing and Retirement in Europe* (SHARE) and explores the associations among a wide range of indicators of health problems by applying a series of Confirmative Factor Analysis. Differences between men and women and between a numbers of age groups of old people are systematically scrutinized. Finally, a SEM is carried out in order to map the inter-relations of the retained un-health dimensions across time. The preferred representation of the data is a nested model that identified one global factor, which related to all manifest indicators, and four residual factors that measured the specific experiences of physical impairment, cognitive problems, affective suffering and motivational difficulties. The findings confirm the invariance of the proposed nested latent structure across time and improve our understanding about how health dimensions are connected over time.

Introduction

Examining and measuring multidimensional aspects of health among older individuals is of primary importance. The study of multiple domains in the aged is by all means the way to gain a complete picture of their health. For most people aging is connected with decline of various kinds of human performance dimensions. Hence as people get older, they are increasingly exposed to physical, emotional, mental and sensorial troubles that lead to difficult situations.

The need to study whether an individual present multiple problems has been progressively more emphasized (Rockwood et al. 2000, Bortz 2002, Hogan et al. 2003). However, recent research has demonstrated that older people's health cannot be fully described by one global dimension. In fact, such a simple approach misses to describe all the complexity of its multifaceted structure (Brayne et al. 2001, Meinow et al. 2006). In consequence of that, it has become increasingly clear that studying elderly population needs approaches that allow for multiple measures of health to embrace all its complexity (Lafortune 2009, Hallerod 2009).

Structures of multidimensional health problems in the elderly Italian population have never been studied. There have only been a limited number of studies based on self-perceived valuations (Ongaro and Salvini 1995, Tsimbos 2009). The present study will attempt to disentangle the complex associations of a large number of un-health variables in the aged Italians.

The analysis will be drawn from the *Survey of Health, Ageing and Retirement in Europe* (*SHARE*) which provides detailed information on a large national scale (Borsh-Supan et al. 2005, 2008). The present analysis will use the first and second wave of the Italian sample, conducted respectively during the 2004 and 2007.

The study covered physical, emotional and cognitive domains that are extremely important for the individual in maintaining well-being (Nagi 1976, Fernandez-Ballesteros 2010). Here the use of a simple additive procedure that brings together disparate information in a single index of global impairment will be avoided. Instead, in order to conceptualize multidimensional health without losing its degrees of complexity factor analysis will be used.

The analysis will be conducted in several steps. Firstly, through explorative factor analysis we will attempt to have a picture of the latent representation of the observed variables. Subsequently, we will explore the hierarchical structures of the data via Confirmative Factor Analysis (CFA), separately for time 1 and 2. In so doing, several models that allow for different relationships between the manifest variables and various levels of latent factors will be tested. In order to evaluate the multifaceted structure of elderly population health, the generally agreed assumptions that indicators tap only in one latent

factor and their error terms do not correlate with each other will be purposely relaxed (Gignac 2007). Thirdly, the analysis will attempt to understand if and to what extent the associations among the different indicators vary for age, gender and time. Finally, given that the structure of un-health is invariant across time, in order to evaluate the interrelations of un-health dimensions we will estimate a Structural Equation Model (SEM), where each latent dimension at time 1 is considered causal for each latent dimension at time 2.

The paper opens with a discussion of the previous research and some theoretical considerations. Section 3 presents the data, the variables and the data analysis strategy. Section 4 proposes our empirical results, and finally conclusions are provided in Section 5.

Previous research

In the preamble of the World Health Organization (WHO) Constitution the founders defined health multidimensionally as "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (WHO 1948). Over the half-century since the definition was set forth by WHO, many other contributions have improved the first vague proposition of health and developed more precise operational conceptualizations of its multidimensionality (Chen and Bryant 1975, Hansluwka 1985, Hunt et al. 1986, Bowling 1991, Salomon 2003). Currently, there is a wide consensus that a description of people's health consists of a series of values indicating level on different domains (Coons et al. 2000, Murray et al. 2002).

The research on older people's health has been mostly focused on specific dimension or disease, studied one at a time. Recently, original investigations have operationalized new concepts and perspectives of global health difficulties in the elderly (The Canadian Study of Health and Aging Working Group 2001). For example, in medical research the importance of "frailty" – when two or more problems are present together – has been well established (Rockwood et al. 2000, Bortz 2002). Initial investigations were based on small sample of patients in clinics and hospitals, subsequent studies have attempted to enlarge the field to a nationwide representative sample of older respondents. The first phenotypes of frail adults (Fried et al. 2001) were criticized to be comprised just of physical functionings (Hogan et al. 2003). The following definitions were expanded to include various domains of health, such as such mobility, psychological, cognitive and sensorial problems (e.g. Pel-Little et al. 2009).

While there is controversy concerning what aspects to consider, there is consensus that having health problems is a concept separated from chronic diseases. With this regard, several researches have showed that measures of frailty were associated with mortality independently of illnesses (Puts et al. 2005a, b, c). Salomon et al. (2003) suggested that not selecting medical condition as a domain of multidimensional health was in line with

the spirit of the WHO Constitution (1948) and the advancements of the WHO family of classification systems[1]. That is, the diseases are not equated with health status itself, but conceptualized as a possible cause that makes more difficult achieving specific functionings or good level of global health (Salomon et al. 2003).

Although frailty measures served as valid un-health predictors, they did not address the entire complexity of older people's situation. The majority of them used additive procedures and summed up all the information in a global index. However, recent research on population health suggested that elderly subgroups have singular pattern of presenting adverse outcomes (Lafortune et al. 2009). The differences in the accumulation of problems demonstrate large degree of human intricacy and warn against a simple and universal process of losing global level of health (Romoren and Blekeseaune 2003, Lunney et al. 2003). In fact, older people are highly heterogeneous in declining their status due to the variability and interdependence of the multiple health domains.

Thus, what has become increasingly clear is that elderly population health cannot be fully described by one global dimension (Brayne et al. 2001, Meinow et al. 2006,). That is, besides the presence of a significant and unequivocal group of older people who simultaneously suffer from global level of un-health, there are also individual who experience only specific problems. In view of that, it has been highly recommended to study older people's health and living condition using new approaches that can disclose all the complexity of its structure (Lafortune et al. 2009, Hallerod 2009).

Methods

Data

The data for the analysis were drawn from the publicly-released version of the *Survey of Health, Ageing and Retirement in Europe* (*SHARE* – Second Wave). What makes SHARE special is that it is the first cross-national and longitudinal study to explore topics related to work, retirement, mobility, disability, health care, psychological factors, cognitive function, aspects of daily life and socio-economic positions among non-institutionalized people aged 50 or more. The dataset also contains precious information about family composition and other individual socio-demographic characteristics (Borsh-Supan et al. 2005, 2008). The survey was conducted in a broad number of European countries (from Scandinavia to Mediterranean including a couple of Eastern nations). Based on probability samples in each participatory country, data were collected using computer-assisted personal interviews (CAPI) supplemented by two self-completion questionnaires (drop-off and vignettes). Our empirical analyses used the first and second wave of the Italian survey

[1] They include International Classification of Disease and Related Health Problems (ICD) (WHO 1992), and the International Classifications of Functioning, Disability and Health (ICF) (WHO 2001).

conducted respectively during the 2004 and 2007. The analysis sample was composed of 1761 observations.

Measures

The wide range of questions in SHARE allowed for a simultaneously analysis of a large number of un-health variables. Table 1 specifies the 27 examined indicators of impairment and their operational form. Each indicator was a dichotomous item in which a value of one represented the deprived situation. According to Nagi (1976), the variables were initially grouped into three categories: physical, emotional and cognitive impairment. Observe that this classification was tentative. It will guide the analysis but not determine the outcome.

Physical limitations concerned 10 indicators of problems with activities related to stamina, strength, arm and fine motor skills. All of the questions asked for a self-assessment and the respondents were invited to report the presence or the absence of a problem related to each task. The use of measures for people's abilities to lift or carry weight, ascend and descend stairs, walk, stoop, bend, or kneel, reach, and pick small objectives gained widespread success after appearing in works by Nagi (1969, 1976).

Recent debates on the measurement of physical performance have raised questions about whether strength, mobility and fine motor skills comprise one comprehensive domain or multiple related hierarchical factors. In Nagi (1976) all the indicators turned out to tap in one global physical dimension. According to the studies of Wolinsky and Jonshon (1992), Jonshon and Wolinsky (1993) and others (e.g. Fitzgerald et. al. 1993, Clark et. al. 1997) strength and mobility seemed to represent two high correlated factors: *lower* and *upper functioning*. The first one was comprised of such tasks as walking, stooping, kneeling and crouching. The upper functioning factor consisted of all the tasks related to reaching over one's head. Given the inconsistency in definitions of upper and lower body scales and the parsimony of a single scale, Long and Pavalko (2004) recently stated that there seemed to be little gained by separating physical skills into two domains.

Depressive *symptoms* concerned the 12 indicators that were validated as primary markers of a late-life depression during the EURODEP study (Prince et al. 1999a; b). Respondent at the survey were asked to report the presence or absence of each symptom. Since the beginning of the measure the EURODEP study (Prince 1999a, b) found that, across 14 European populations, the symptoms could be separated into two factors: *affective suffering* and *motivational problems*. The first factor included troubles with depression, sleeping, suicidal tendency, appetite, guilty, tearfulness, irritability and fatigue. Whereas, the second factor was comprised of the remaining four indicators: pessimism, lack of interest, lack of enjoyment and poor concentration. This latent

structure has been confirmed in subsequent applications (Copeland et al. 2004, Castro-Costa et al. 2008)

Cognitive problems were measured using both fluid and crystallized abilities indicators (Dewey and Prince 2005b). The first ones concern performance in learning, remembering, processing new material and as well as reasoning abilities. The second group is entirely related to accumulated knowledge, such as word meaning and vocabulary size. SHARE included three fluid abilities indicators (*orientation, memory* and *recall*) and two crystallized skills markers (*verbal fluency* and *numeracy)*. They were all performance tests during which the respondents were asked to demonstrate their own abilities without the attendance of any proxy interviewee.

Each indicator had its original scale: the higher the score, the better the performance. Here, the markers were all re-coded into binary variables. A generally agreed criterion for relative cognitive impairment was followed (Dewey and Prince 2005b). A person was considered to be relatively deprived when she had a value less than 1.5 standard deviation below the mean.

In SHARE cognitive function was not evaluated with the assistance of any standard instrument. This means that the selected variables were not comparable in terms of internal consistency and measurement properties. Nevertheless, using similar indicators from an equivalent survey in the United States (HRS/AHEAD), Herzog and Wallace (1997) found two separated domains of cognitive function problems: *memory and mental status.* The first factor was comprised of problems with the immediate and delayed recall. The second one consisted of the remaining variables that related to orientation items, numerical knowledge and words recognition. Although the same structure has been replied in Ofstedal et al. (2005), these findings deserve attention. In particular, the high correlation between the two separate components warned against a clear interpretation of the proposed structure.

Analyses

A latent variable approach was used to examine the inter-relationships among the 27 indicators of un-health. Factor analysis provides a powerful tool to discover latent patterns, because it searches for joint variations in response to unobserved factors. These factors are obtained on the analysis of correlations matrix and they are linear combinations of the indicators, clustering those that are higher correlated. In computing them, each indicator is explicitly considered to contain a certain degree of measurement error, contributing only partially to each factor.

Because all the variables were dichotomous, a method of analysis for ordinal variables was used (Muthen and Muthen 2006). This involved estimating the correlation matrix

using tetrachoric correlations and the parameters using weighted least-squared solutions with robust standard error and mean and variance-adjusted chi-squared (WLSMV).

Mplus software was used to conduct all the analyses. Firstly, Exploratory Factor analysis (EFA) was used to find a covariance structure in the data. Though EFA gave information about the type and the number of factors we should retain, it did not reveal much about the hierarchical structure of the underlying latent constructs. Hence, in order to uncover the best representation of the data, the second step of the analysis consisted in evaluating and comparing different theoretical models through Confirmative Factor Analysis (CFA). The models were initially estimated separately for time 1 and time 2.

According to Hu and Bentler (1999), a combination approach was used to assess model fit. Specifically, one baseline close-fit index (RMSEA) and two incremental close-fit indices (CFI and TLI) were chosen. Also in accordance with Hu and Bentler (1999), models are indicated as good fitting, when RMSEA is lower than 0.06 and the incremental close-fit indices are approximately 0.95 or larger. Since the main purpose was to test a series of models, a comparison strategy was also emphasized. According to Vanderberg and Lance (2000), a model is acknowledged to be practically superior to another one when the difference between TLI estimates was 0.01 or greater. This practical rule of improvement was used displacing the excessively powerful chi-square difference test (Gignac 2007).

In the third phase of the analyses, using a multigroup strategy we investigated whether the best-fitting structure of un-health was invariant across across age, gender and time. Separately for time 1 and 2, the factorial invariance across age and gender was investigated comparing the fit of a constrained multi-group model to the baseline. Similarly, factor invariance across time was evaluated comparing the fit of a freely estimated model to a fully constrained one.

In the last part of the analyses, we estimated a Structural Equation Model (SEM) where each latent dimension at time 1 was considered causal for each latent dimension at time 2. The coefficients between the same un-health dimensions for two different points of time are stability coefficients; whereas the coefficients between two different latent dimensions are regression coefficients.

Results

Exploratory factor analysis: uncovering the latent structure

Table 2 reported the prevalence of impaired situations for each indicator, respectively for time 1 and time 2. Depending of what type of problem was considered, large differences in prevalence were observed. Depressive symptoms were clearly more recurrent than physical difficulties and cognitive troubles.

The sample was divided arbitrarily into three age groups and we observed that occurrence of health problems dramatically increases with age. Turning to gender differences, the prevalence was often higher for women and most differences were large. Finally, the prevalence turned out to be quite homogenous across time. That was to be expected since differences cannot be explained after such a short period of time (2 years).

The first purpose was to scrutinize if and how the different un-health indicators related to each other and clustered together. A matrix of tetrachoric correlations was then generated and carefully inspected[2]. This first round of analysis supported a strong association among all the selected variables. As a consequence of that, all the indicators were kept for further investigations and the entire matrix was entered into an EFA.

Both at time 1 and time 2 the exploratory factor analysis of the tetrachoric correlations revealed that the first eigenvalue was substantially greater in magnitude than the remaining ones. Both for time 1 and time 2 the first four eigenvalues were greater than 1.0 and the remaining ones were smaller than 1.0.

One rule for determining the number of factors is the scree method which looks for a large drop in the eigenvalues and then a trailing off of the subsequent values (Rummel 1970). Another thumb-rule is to retain the factors that have eigenvalues greater than 1.0. If so, the first method suggested a one factor solution, while the second recommended a four-factor structure.

Tables 3.1 and 3.2 presented the estimated factor loadings for a four-factor model after oblique (Promax) rotation, separately for time 1 and 2. The physical limitation items had strong loadings on one factor. The indicators that reflect troubles with cognitive function loaded robustly on the second factor. Thus, the first aspect measured to what degree people have problems with body activity, while the second one was about mental performance. In line with Long and Pavalko (2004), these preliminary findings seemed to reject the two scales solution for the physical dimension. Regarding cognitive aspects, the analysis refused a two-factor solution (Herzog and Wallace 1997, Ofstedal et al. 2005) and combined the entire information into one dimension.

Consistent with previous findings (Prince 1999a, b, Copeland 2004, Castro-Costa et al. 2008), depressive symptoms formed two separated domains. Indeed, the third factor was related to problems of loosing enthusiasm, motivation and optimism (pessimism, lack of enjoyment, lack of concentration and lack of interest); whereas the remaining problems of affection had strong loadings on the fourth factor.

[2] The matrix was not reported, but it wil be provided upon request.

Even though the four-factor structure of impairment was reasonable and visible, the factors themselves had moderately strong correlations. This made the interpretation less clear and obvious. The presence of a global dimension underlying the four domains could not be completely refused.

Confirmative factor analysis: testing different models

With the exploratory factor analysis there was sufficient evidence to suggest both a one factor representation and a four-factor solution of un-health. The correlation structure of the multiple compositions indicated the presence of a significant group of older people who simultaneously suffer from all the types of problems. At the same time, the correlation coefficients around 0.5 might suggest the presence of people who had problems just in one domain.

In view of these findings, in this second part of the analyses a set of three models was tested via CFA, separately for time 1 and 2. Firstly, a global factor model with all the 27 indicators specified to weight on a single general factor of un-health. Secondly, an oblique second-order factor model, in which the covariation link between the four factors – physical difficulties (Phys), cognitive problems (Cogn), affection symptoms (Affect) and motivational troubles (Motiv) - was modeled as a second-order general factor of un-health.

The third model was finally a nested-factor solution. Even though less extensively used, Gignac (2007) pointed out this structure as a valuable and practical alternative to study multi-dimensional phenomena. This model basically combined the general factor and the multi-factor model into a single solution. In our specific analysis it was comprised of one first-order general factor of un-health (*Glob*) and four nested residual factors, corresponding to physical limitations (*R_Phys*), cognitive problems (*R_Cogn*), affective symptoms (*R_Affect*) and motivational problems (*R_Motiv*).

In the nested model the generally agreed assumptions that indicators tap only in one dimension and their error terms do not correlate with each other are relaxed (Gignac 2007, Hallerod 2009). The global factor was directly related to the manifest variables, capturing the common variation in all the manifest variables. The residual variances of the observed indicators were freed to correlate and used to estimate the residual factors.

Unlike the previous ones, this last representation permitted to model un-health with a certain extent of complexity. The advantage of the nested-factor model was the possibility to test hypothesis pertaining to the nature of specific impairment domains, beyond the presence of a general un-health factor (Gignac 2007). Hence, what this model did appropriately perform was to separate people who experienced global impairment from those who had problems just in one domain.

The first model was fully described in Table 4.1 and 4.2. The factor weightings on the general factor ranged from 0.47 to 0.85 and were all statistically significant ($p > 0.01$). However, it was associated with close-fit indices values that indicated unacceptable level of fit (Table 7).

The second model was fully described in Table 5.1 and 5.2. Factor pattern coefficients were all statistically significant. The higher-order factor correlated robustly with all the four first-order latent variables. Based on the Hu and Bentler's (1999) cut-off criteria, the second-order model was associated with close-fit indices that indicated a good-fit (Table 7). Following Vanderberg and Lance's (2000) rule, this model was also practically better fitting than the previous one ($\Delta TLI=0.023$).

The nested-factor model was fully reported in Table 6.1 and 6.2. It was clearly associated with close-fit indices that indicated excellent levels of fit (Table 7). Even if assuming that the four residual factors were uncorrelated, the model fitted the data practically better than the second-order model ($\Delta TLI=0.017$).

This last representation corroborated in a convincing way that all the 27 indicators tapped into a common global un-health factor (*Glob*), but at the same time formed specific independent residual factors (R_Mob, R_Cogn, R_Affect and R_Motiv). It was therefore confirmed that some older people suffer from one type of impairment without reporting any other problem. In fact, the analysis showed that all the residual factors were well-defined and clearly interpretable.

The interpretation of the nested model was rather simple. The degree to which people simultaneously suffer from all the deprived situations was measured by *Glob*. People who were exposed to physical limitations but not to cognitive, affective and motivational problems scored on R_*Phys*. *R_Cogn* measured to what extent individuals who did not have physical and psychological problems had however some restrictions in the cognitive function. People who have some problems with affective suffering symptoms but otherwise did not report problems with the body, cognitive function and motivation scored on R_*Affect*. R_*Motiv* measure to what degree individuals who did not have other problems were only affected by motivational ones (poor concentration, lack of enjoinment, lack of interested and pessimism).

All the reported coefficients were statistically significant ($p > 0.01$), with the exception of "*loss of appetite*" which did not share any variance with the residual factors, independently of a general dimension of un-health. This means that those who reported such a symptom were also more likely to suffer from physical limitations, other depressive markers and cognitive problems. In view of these results, this analysis conferred to "*loss of appetite*" ("*diminution in desire for food*") a crucial role in explaining global level of un-health in the aged Italians.

Gender, age and time differences

Table 2 showed that women were more likely than men to suffer from health problems and that there was a higher prevalence of problems among the 'oldest old' (aged 76 or more). The question is whether these differences also mean that the relationships between the manifest variables varied between men and women and at different ages. Starting with men and women, a constrained two-group model was fitted. This model was estimated from two sub-samples, one for men and one for women. Because the model was constrained, it was assumed that the relationships among the various indicators are identical in both groups. If the observed differences between the two groups are large, the constrained model will fit the data poorly. In that case the model has to be relaxed, allowing for differences between groups. This would also mean that we have to conclude that women and men behave differently and therefore need to fit models that, at least partially, are specific to each sex.

There was, however, no need to relax the constrained two group model. It fitted the data well, and indeed the RMSEA indicated that the fit was better than for the single group model (see Table 7), because the degrees of freedom dramatically increased.
The same basic procedure was followed to examine age-group differences. First, a constrained two-group model was estimated to test for differences between the younger old (50 - 65 years) and the oldest old (66–99 years). Because the dividing age is arbitrary, one additional model was tested and a three group model was defined (50–60, 61–75 and 76–99 years). Table 7 showed that the constrained models fitted the data very well, which demonstrated that the basic relationships among distinguishable health problems are independent of age.

Thus, even though there were large differences in prevalence, the pattern was similar among men and women and at different ages. It was therefore appropriate to proceed using the results from the parsimonious nested single-group model.

We next moved to check the factorial invariance of the proposed un-health structure across time. Table 8 shows the results in terms of goodness of fit for two alternative models: a freely estimated model and a fully constrained model. In the first model the factor loadings and error terms were allowed to vary across time measurement; in the second one all the parameter estimates were set equal across time. The results showed that the fully constrained model was practically superior to the freely estimated solution (ΔTLI=0.011), which gave clear evidence to a time invariance of the proposed un-health structure.

Interrelations of un-health dimensions across time

We finally moved to use the longitudinal information of the sample. It was showed that various health problems were related to each other at a moment in time, but it is at least as important to sort out how problems inter-relate over time. We then mapped the causal relationships among different un-health dimensions through Structural Equation Modelling (SEM) (Bollen 1989). Each retained latent un-health factor at time 1 was assumed to be causal for its respective at time 2. The time 1 latent dimensions also influenced the other time 2 dimensions, stepwise. The results were displayed in Table 9.

The coefficients between the same un-health dimensions for two different points of time are stability coefficients, whereas the coefficients between two different latent variables are standardized regression coefficients, which show the deviation from the average in the endogenous latent variable due to a deviation from the mean of 1% in the exogenous latent variable.

The highest stability coefficient was for Glob (0.91). There were also significant influences from R_Phys and R_Cogn at time 1 on Glob at time 2. That is, people with physical and cognitive residual problems at time 1 were more likely to be globally un-healthy at time 2. On the contrary, residual affective and motivational difficulties at time 1 did not share any significant association with global problems at time 2. These results suggested that both physical and cognitive difficulties had an important role in driving people from one to multiple health problems.

Residual physical problems had a very high stability coefficient (0.88). There were no significant influences from other un-health dimensions on R_Phys at time 2. This was to be expected since the latent inclination towards physical health cannot be explained with a short relatively two period framework.

Residual cognitive problems had a high stability coefficient (0.82). Motivational residual problems at time 1 had a positive influence on residual cognitive problems at time 2. This was to be expected since motivational troubles might often overlap and drive people into cognitive problems.

Both the residual affective dimension and the residual motivational dimension had a relatively lower stability coefficient (0.75 and 0.78 respectively). This was probably due to the volatility and subjectivity of the psychosocial measures. Finally, both these factors seemed to be quite associated over time.

Conclusions

Starting from the preamble of the WHO Constitution (1948) it has been strongly pointed out that a multi-dimensional perspective is always required when studying health. The research community and policy makers have paid progressively more attention to the implications of the accumulation and coexistence of health problems, especially in the older people. Nevertheless, it has been increasingly emphasized that studying elderly population should involve approaches that allow for multiple measures of health to embrace its complexity.

The present study has reported the findings of an analysis of the association among a wide number of un-health variables in the Italians aged 50 or more. Using nationally representitative data, we examined 27 indicators that reflect troubles in domains important for the individual in maintaining well-being: physical condition, emotional status and cognitive function.

Explorative factor analysis (EFA) gave plausibility to various latent solutions of un-health. However, confirmative factor analyses (CFA) revealed that a nested model was the best and clearest representation of the data. This solution permitted to describe health with a certain amount of complexity. One global aspect of un-health that related to all the 27 indicators was generated. At the same time, there was evidence to suggest the existence of four residual dimensions, which measured the exclusive presence of physical (R_Phys), cognitive (R_Cogn), affective (R_Affect) and motivational problems (R_Motiv).

The existence of a global latent variable indicated that the different problems were inclined to accumulate and coexist into one dimension. At the same, the residual factors pointed out the presence of significant sub-groups of people who had problems just in one domain. R_*Phys* showed that some people were exposed to physical limitations without suffering from cognitive, affective and motivational problems. *R_Cogn* revealed the occurrence of individuals who did not have physical and psychological troubles, but otherwise presented restrictions in the cognitive function. *R_Affect* corroborated the existence of people who had some problems with affective suffering symptoms (depression, irritability, restlessness etc.), but did not report any deprivation with physical skills, cognitive function and motivation. Finally, the residual factor R_*Motiv* showed that some individuals had motivational problems (pessimism, lack of interest and lack of enjoyment), even if were not affected by other troubles, included usual affective suffering symptoms.

The findings illustrated in a convincing way that the selected indicators can tap in more than one factor and the residual variance of the manifest variables can be accurately used to depict a complex structure of older people's health. Nevertheless, the results showed that some manifest variables cannot share any co-variance with the residual domains,

independently of the global measure. In fact, "*loss of appetite"* had strong loadings on the overall dimension, but was not statistically significant associated with the respective residual factors. It was inferred that this indicator had an important role in explaining global level of un-health. That is, aged Italians who experienced "*loss of appetite"* (diminution in desire for food) were highly more likely to suffer from other problems concerning physical, emotional and mental performance.

The prevalence of health problems differs substantially between men and women and by age. To determine whether the relationship between health problems differs for these groups, a series of multi-group models was fitted. The results showed that regardless of large differences in prevalence, the basic relationship between health problems appeared to be the same among men and women and at different ages. Using the available information of the longitudinal sample, the proposed latent structure of un-health turned out to be also invariant across time.

One advantage of the CFA method is that it produces factors that are empirically valid measures of distinctive aspects of people's health. Given the invariance of the nested latent structure across time, a SEM was finally put forward to study the interrelationships of the different un-health dimensions over time. Global un-health, residual physical difficulties and residual cognitive problems presented high stability coefficients. Residual affective symptoms and residual motivational troubles turned out to be comparatively less stable and overlapped over time. Finally, global un-health at time 2 was consistently predicted by residual physical difficulties and residual cognitive problems at time 1.

These findings cannot be considered the final stage of our analysis and will need further validations in other countries. Cross-cultural comparisons were then left for future investigations. The analysis offered a complete understanding of the complex structure of aged Italians' un-health. The findings provided sufficient evidence to reject simple descriptions of older situations based on merely one global domain. It was also abundantly well documented that the proposed nested structure of un-health was invariant across age, gender and time. It turned out to be also very needful to understand how health problems inter-related over time.

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Tables

Table 1. Indicator of un-health

Indicator	Definition and operational form
Walk	Has problems walking 100 meters (0 = no; 1 = yes)
Sit	Has problems **sitting** for about two hours (0 = no; 1 = yes)
Get up	Has problems **getting up** from a chair after sitting for long periods (0 = no; 1 = yes)
Climb several flights	Has problems **climbing several flights** of stairs without resting (0 = no; 1 = yes)
Climb one flight	Has problems **climbing one flight** of stairs without resting (0 = no; 1 = yes)
Stoop	Has any problems **stooping, kneeling, or crouching** (0 = no; 1 = yes)
Reach up	Has problems **reaching or extending** your arms above shoulder level (either arms) (0 = no; 1 = yes)
Pull	Has problems **pulling or pushing** large objects like a living room chair (0 = no; 1 = yes)
Lift weights	Has problems **lifting or carrying weights** over 5 kilos, like a heavy bag of groceries? (0 = no; 1 = yes)
Pick	Has problems **picking up** a small coin from a table (0 = no; 1 = yes)
Sadness/Depression	In the last month has been **sad or depressed** (0 = no; 1 = yes)
Pessimism	Does not have **any hopes** for the future (0 = no; 1 = yes)
Suicidal tendency	In the last month has felt that he or she would **rather be dead** (0 = no; 1 = yes)
Guilty	Tends to **blame** himself or herself and **fells guilty** (0 = no; 1 = yes)
Trouble sleeping	Recently has had **troubles sleeping** (0 = no; 1 = yes)
Lack of interest	In the last month has lost **interest in things** (0 = no; 1 = yes)
Irritability	Recently has been **irritable** (0 = no; 1 = yes)

Loss of appetite	Suffers from diminution in desire for food (0 = no; 1 = yes)
Fatigue	In the last month has had **too little energy** to do the things you wanted to do (0 = no; 1 = yes)
Poor concentration	Suffers from difficulty in concentrating on entertainment or reading (0 = no; 1 = yes)
Lack of enjoyment	Recently has not **enjoyed** doing anything (0 = no; 1 = yes)
Tearfulness	In the last month has often **cried** (0 = no; 1 = yes)
Orientation in time	Scored less than 1.5 standard deviation below the mean in the **orientation test**: day of the month, month, year and day of the week. Original values from 0 to 4. (0 = no; 1 = yes)
Memory	Scored less than 1.5 standard deviation below the mean in the **immediate memory test**: number of words the individual can instantaneously recall from a list of 10 items. Original values from 0 to 10. (0 = no; 1 = yes)
Recall	Scored less than 1.5 standard deviation below the mean in the **recall memory test**: number of words the individual can recall from a list of 10 items after a certain delay of time. Original values from 0 to 10. (0 = no; 1 = yes)
Verbal Fluency	Scored less than 1.5 standard deviation below the mean in the **verbal fluency test:** number of different animals the respondent can name within one minute. Original values from 0 to 80. (0 = no; 1 = yes)
Numeracy	Scored less than 1.5 standard deviation below the mean in the **numerical knowledge test**: four simple arithmetic calculations. Original values from 0 to 4. (0 = no; 1 = yes)

Table 2. Prevalence of un-health by gender and age groups
Left: Time 1 – Right: Time 2

	Gender		Age groups (years)			Total
Indicator	Men	Women	50 – 60	61 – 75	76 – 99	
			Percentages			
Walk	6.8 – 8.5	12.8 – 15.6	5.5 – 4.1	9.5 – 11.2	29.2 – 30.4	10.2 – 12.5
Sit	8.3 – 7.3	13.3 – 14.7	8.9 – 8.7	11.2 – 11.7	19.3 – 15.6	11.1 – 11-7
Get up	12.2 – 13.8	22.3 – 24.1	11.6 – 11.3	19.5 – 20.6	31.6 – 32.7	17.8 – 19.5
Climb several	21.1 – 28.4	35.6 – 40.3	21.0 – 21.7	33.5 – 35.8	55.6 – 57.8	31.0 – 35.3
Climb one flight	8.3 – 13.5	17.5 – 19.5	8.1 – 3.8	13.5 – 17.4	32.3 – 38.5	13.6 – 16.9
Stoop	23.1 – 29.3	36.4 – 46.6	24.5 – 23.6	34.1 – 40.1	55.8 – 61.2	32.8 – 38.8
Reach up	5.4 – 7.5	11.3 – 14.3	5.3 – 4.7	8.4 – 11.0	19.8 – 23.3	8.8 – 11.3
Pull	5.1 – 9.6	11.8 – 15.3	3.3 – 4.9	9.6 – 14.3	24.7 – 29.2	8.9 – 14.1
Lift weights	9.8 - 13.2	14.6 – 24.4	10.4 – 13.1	19.5 – 26.4	31.4 – 41.8	12.5 – 19.2
Pick	2.7 – 2.9	5.4 – 5.6	1.1 – 1-1	4.6 – 4.9	13.5 – 15.2	4.2 – 5.1
Sadness	31.4 – 32.3	52.3 – 52.0	45.4 – 40.8	41.4 – 44.8	47.7 – 45.6	43.3 – 43.9
Pessimism	19.5 – 16.9	21.6 – 17.6	15.3 – 10.7	21.3 – 17.6	34.9 – 27-8	20.5 – 17.3
Suicidal tendency	4.6 – 5.5	7.5 – 8.2	4.5 – 4.3	6.3 – 6.6	12.2 – 12.7	6.2 – 7.1
Guilty	8.8 – 11.7	8.9 – 11.0	8.6 – 13.1	9.9 – 11.8	8.4 – 7.1	8.8 – 11.3
Trouble sleeping	24.0 – 21.5	38.2 – 39.4	31.1 – 28.8	32.5 - 31.9	36.9 – 36.0	32.8 – 31.7
Lack of interest	8.7 – 11.7	12.6 – 16.8	9.8 – 12.6	10.2 – 14.3	17.5 – 19.1	11.0 – 14.7
Irritability	34.4 – 32.9	39.6 – 38.1	40.6 – 36.8	34.5 – 35.8	40.3 – 34.5	37.4 – 35.9
Loss of appetite	4.5 – 6.7	8.9 – 10.1	4.0 – 5.6	7.3 – 8.0	17.5 – 15.3	7.2 – 8.6
Fatigue	26.5 – 25.1	41.3 – 40.9	32.6 – 26.2	35.0 – 35.6	41.3 – 43.9	34.9 – 34.7
Poor concentration	25.6 – 26.1	33.3 – 33.2	25.6 – 21.9	29.7 – 29.9	47.1 – 44.8	30.1 – 30.2
Lack of enjoyment	22.1 – 22.2	28.7 – 25.2	23.5 – 21.2	24.7 – 20.9	38.3 – 36.6	25.8 – 23.5
Tearfulness	12.7 – 14.8	37.8 – 38.8	29.2 – 25.3	24.5 – 28.7	27.7 – 30.7	26.4 – 28.0
Orientation in time	15.1 – 17.5	12.5 – 14.7	9.1 – 9.2	14.5 – 15.1	29.2 – 30.1	13.2 – 15.5
Memory	6.3 – 6.2	5.2 – 5.9	1.9 – 1.6	5.8 – 4.9	18.0 – 16.2	5.7 – 5.5
Recall	16.6 – 15.1	14.3 – 13.8	8.5 – 6.2	16.2 – 14.3	35.8 – 30.7	15.7 – 14.3
Verbal fluency	2.4 – 3.0	5.1 – 4.8	1.6 – 0.8	3.9 – 2.9	8.7 – 8.5	3.6 – 3.4
Numeracy	9.5 – 11.4	5.0 – 5.5	3.5 – 3.9	11.9 – 10.7	26.7 – 27.7	10.4 – 11.8

Table 3.1 Exploratory factor analysis: factor loadings for a four-factor model - promax rotation (time 1)

Indicator	Factor I	Factor II	Factor III	Factor IV
Walk	0.82	.	.	.
Sit	0.68	.	.	.
Get up	0.82	.	.	.
Climb several flight	0.85	.	.	.
Climb one flight	0.78	.	.	.
Stoop	0.84	.	.	.
Reach up	0.74	.	.	.
Pull	0.82	.	.	.
Lift weights	0.80	.	.	.
Pick	0.68	.	.	.
Sad/Depressed	.	.	.	0.85
Pessimism	.	.	0.63	.
Suicidal tendency	.	.	.	0.55
Guilty	.	.	.	0.52
Troubles sleeping	.	.	.	0.56
Lack of interest	.	.	0.62	.
Irritability	.	.	.	0.56
Loss of appetite	.	.	.	0.67
Fatigue	.	.	.	0.53
Poor concentration	.	.	0.68	.
Lack of enjoyment	.	.	0.66	.
Tearfulness	.	.	.	0.79
Orientation in time	.	0.95	.	.
Memory	.	0.78	.	.
Recall	.	0.77	.	.
Verbal Fluency	.	0.58	.	.
Numeracy	.	0.59	.	.

Promax factor correlations				
	I	II	III	IV
I	1			
II	0.48	1		
III	0.51	0.36	1	
IV	0.53	0.45	0.56	1

Note: the table has no zero. The factor loadings with value less than |0.35| have been not reported for ease of comparison.

Table 3.2 Exploratory factor analysis: factor loadings for a four-factor model - promax rotation (time 2)

Indicator	Factor I	Factor II	Factor III	Factor IV
Walk	0.81	.	.	.
Sit	0.70	.	.	.
Get up	0.83	.	.	.
Climb several flight	0.87	.	.	.
Climb one flight	0.79	.	.	.
Stoop	0.86	.	.	.
Reach up	0.77	.	.	.
Pull	0.86	.	.	.
Lift weights	0.83	.	.	.
Pick	0.71	.	.	.
Sad/Depressed	.	.	.	0.83
Pessimism	.	.	0.66	.
Suicidal tendency	.	.	.	0.58
Guilty	.	.	.	0.56
Troubles sleeping	.	.	.	0.57
Lack of interest	.	.	0.64	.
Irritability	.	.	.	0.59
Loss of appetite	.	.	.	0.69
Fatigue	.	.	.	0.55
Poor concentration	.	.	0.71	.
Lack of enjoyment	.	.	0.64	.
Tearfulness	.	.	.	0.81
Orientation in time	.	0.93	.	.
Memory	.	0.80	.	.
Recall	.	0.78	.	.
Verbal Fluency	.	0.60	.	.
Numeracy	.	0.58	.	.

Promax factor correlations

	I	II	III	IV
I	1			
II	0.50	1		
III	0.56	0.41	1	
IV	0.58	0.48	0.60	1

Note: the table has no zero. The factor loadings with value less than |0.35| have been not reported for ease of comparison.

Table 4.1 Standardized parameter estimates (WLSMV) for one-factor solution (time 1)

Indicator	Glob
Walk	0.85
Sit	0.69
Get up	0.78
Climb several flights	0.77
Climb one flight	0.83
Stoop	0.78
Reach up	0.77
Pull	0.87
Lift weights	0.84
Pick	0.72
Orientation in time	0.63
Memory	0.63
Recall	0.63
Verbal Fluency	0.64
Numeracy	0.68
Sad/Depressed	0.65
Suicidal tendency	0.54
Guilty	0.53
Troubles sleeping	0.64
Irritability	0.55
Loss of appetite	0.74
Fatigue	0.79
Tearfulness	0.64
Pessimism	0.6
Lack of interest	0.69
Lack of enjoyment	0.58
Poor concentration	0.63

Note: all the parameter estimates were statistically significant ($p < 0.01$)

Table 4.2 Standardized parameter estimates (WLSMV) for one-factor solution (time 2)

Indicator	Glob
Walk	0.86
Sit	0.71
Get up	0.80
Climb several flights	0.79
Climb one flight	0.85
Stoop	0.77
Reach up	0.76
Pull	0.89
Lift weights	0.85
Pick	0.74
Orientation in time	0.66
Memory	0.61
Recall	0.65
Verbal Fluency	0.62
Numeracy	0.70
Sad/Depressed	0.66
Suicidal tendency	0.57
Guilty	0.55
Troubles sleeping	0.66
Irritability	0.57
Loss of appetite	0.76
Fatigue	0.81
Tearfulness	0.63
Pessimism	0.62
Lack of interest	0.71
Lack of enjoyment	0.60
Poor concentration	0.65

Note: all the parameter estimates were statistically significant ($p < 0.01$)

Table 5.1 Standardized parameter estimates (WLSMV) for a second-order factor solution (time 1)

Indicator	Glob	Phys	Cogn	Affect	Motiv
Walk		0.88			
Sit		0.75			
Get up		0.82			
Climb several flights		0.81			
Climb one flight	0.87	0.86			
Stoop		0.81			
Reach up		0.80			
Pull		0.89			
Lift weights		0.88			
Pick		0.79			
Orientation in time			0.73		
Memory	0.62		0.84		
Recall			0.71		
Verbal Fluency			0.75		
Numeracy			0.87		
Sad/Depressed				0.79	
Suicidal tendency				0.65	
Guilty				0.51	
Troubles sleeping	0.69			0.70	
Irritability				0.64	
Loss of appetite				0.79	
Fatigue				0.89	
Tearfulness				0.75	
Pessimism	0.86				0.75
Lack of interest					0.81
Lack of enjoyment					0.63
Poor concentration					0.83

Note: all the parameter estimates were statistically significant ($p < 0.01$)

Table 5.2 Standardized parameter estimates (WLSMV) for a second-order factor solution (time 2)

Indicator	Glob	Phys	Cogn	Affect	Motiv
Walk		0.90			
Sit		0.77			
Get up		0.83			
Climb several flights		0.82			
Climb one flight	0.88	0.85			
Stoop		0.80			
Reach up		0.82			
Pull		0.91			
Lift weights		0.89			
Pick		0.81			
Orientation in time			0.74		
Memory	0.63		0.86		
Recall			0.73		
Verbal Fluency			0.73		
Numeracy			0.88		
Sad/Depressed				0.81	
Suicidal tendency				0.64	
Guilty				0.53	
Troubles sleeping	0.70			0.72	
Irritability				0.65	
Loss of appetite				0.77	
Fatigue				0.91	
Tearfulness				0.73	
Pessimism	0.85				0.73
Lack of interest					0.83
Lack of enjoyment					0.65
Poor concentration					0.82

Note: all the parameter estimates were statistically significant ($p < 0.01$)

Table 6.1 Standardized parameter estimates (WLSMV) for a nested-factor solution (time 1)

Indicator	*Glob*	*R_Phys*	*R_Cogn*	*R_Affect*	*R_Motiv*
Walk	0.74	0.52			
Sit	0.61	0.40			
Get up	0.63	0.49			
Climb several flight	0.65	0.55			
Climb one flight	0.70	0.47			
Stoop	0.64	0.55			
Reach up	0.68	0.47			
Pull	0.70	0.49			
Lift weights	0.69	0.50			
Pick	0.61	0.42			
Orientation in time	0.52		0.39		
Memory	0.54		0.65		
Recall	0.51		0.56		
Verbal Fluency	0.53		0.52		
Numeracy	0.64		0.47		
Sad/Depressed	0.58			0.69	
Suicidal tendency	0.53			0.43	
Guilty	0.51			0.39	
Troubles sleeping	0.62			0.46	
Irritability	0.53			0.44	
Loss of appetite	0.75			**0.05**	
Fatigue	0.69			0.45	
Tearfulness	0.62			0.49	
Pessimism	0.54				0.49
Lack of interest	0.70				0.57
Lack of enjoyment	0.57				0.47
Poor concentration	0.66				0.40

Note: parameter estimates in red were not statistically significant ($p > 0.10$). The others were all statistically significant ($p < 0.01$).

Table 6.2 Standardized parameter estimates (WLSMV) for a nested-factor solution (time 2)

Indicator	*Glob*	*R_Phys*	*R_Cogn*	*R_Affect*	*R_Motiv*
Walk	0.76	0.50			
Sit	0.63	0.42			
Get up	0.65	0.51			
Climb several flight	0.67	0.53			
Climb one flight	0.72	0.48			
Stoop	0.66	0.54			
Reach up	0.68	0.45			
Pull	0.72	0.51			
Lift weights	0.71	0.49			
Pick	0.62	0.41			
Orientation in time	0.53		0.40		
Memory	0.52		0.63		
Recall	0.52		0.55		
Verbal Fluency	0.51		0.54		
Numeracy	0.62		0.45		
Sad/Depressed	0.60			0.67	
Suicidal tendency	0.55			0.41	
Guilty	0.49			0.41	
Troubles sleeping	0.60			0.43	
Irritability	0.55			0.45	
Loss of appetite	0.73			**0.07**	
Fatigue	0.71			0.47	
Tearfulness	0.63			0.51	
Pessimism	0.55				0.47
Lack of interest	0.71				0.55
Lack of enjoyment	0.58				0.48
Poor concentration	0.69				0.38

Note: parameter estimates in red were not statistically significant ($p > 0.10$). The others were all statistically significant ($p < 0.01$)

Table 7. The fit of the confirmatory factor analysis models of un-health (Time 1 and Time 2)

	Time 1			Time 2		
Model specification	RMSEA	CFI	TLI	RMSEA	CFI	TLI
One-factor model	0.077	0.913	0.932	0.072	0.916	0.935
Second-order factor model	0.044	0.947	0.966	0.040	0.952	0.968
Nested factor model	0.035	0.959	0.982	0.032	0.963	0.985
Nested constrained two group model: gender	0.034	0.960	0.983	0.031	0.964	0.985
Nested constrained two group model: age 50-65/66-99	0.035	0.959	0.983	0.030	0.965	0.987
Nested constrained three group model: age 50-60/61-75/76-99	0.034	0.960	0.984	0.031	0.964	0.985

Table 8. Time invariances tests for the nested model of un-health

Model specification	RMSEA	CFI	TLI
Freely estimated model	0.039	0.948	0.971
Fully constrained model	0.035	0.961	0.982

Table 9. Standardized parameter estimated for a stability model of un-health

	Glob_t2	R_Mob_t2	R_Cogn_t2	R_Affect_t2	R_Motiv_t2
Glob_t1	0.91***	-	-	-	-
R_Mob_t1	0.13***	0.88***	0.01	0.05	0.02
R_Cogn_t1	0.11**	0.05	0.82***	0.03	0.04
R_Affect_t1	0.02	0.01	-0.01	0.73***	0.09*
R_Motiv_t1	0.02	0.03	0.06***	0.10**	0.75***

Note: Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Chapter 2

Un-health and quality of work in Italy: multidimensional analysis and gender perspective

Abstract: Quality of work has been found to significantly affect health outcomes. In this paper we analyse the extent to which the quality of the work done in the past affects the health of the elderly in Italy. For this purpose, we use data drawn from the Italian sample of the Survey of Health, Ageing and Retirement in Europe (SHARE) and focus on individuals aged over 60. Using different types of factor analysis, we identify four dimensions of quality of work and five factors of un-health status. In particular, as regards the former, we distinguish among the physical dimension, psychological dimension, control dimension and the reward/support dimension of work quality. As regards health, using a nested factor model we obtain a factor of global health problems and four residual factors of cognitive problems, physical problems, affective problems and motivational problems. These factors are then analysed by gender using a multivariate analysis. Our findings suggest that global un-health is predicted by wealth and occupational status; the effect disappears once we add quality of work dimensions to the model. Higher scores in terms of reward/support and control at work significantly decrease the probability of being globally unhealthy, the effect being similar by gender. We also found that a high quality of physical work reduces the probability of being globally healthy for women, but not for men. Moreover, a past physical demanding job impacts significantly on women's residual physical dimension. A psychological demanding job affects significantly residual physical limitations rather than global un-health, the effect being similar by gender. A higher level of control in men's work increased their affective problems after retirement. Finally, low support/reward and low control at work are strongly related to women's residual motivational troubles.

Introduction

The need to study health as a result of the previous experiences and conditions is increasingly emphasized, especially for older people (Lloyd- Sherlock 2002). Men and women spend more than a third of their working life time at the workplace. The work place characteristics, likewise material or non-material exposures (e.g. psychological distress), hence are major determinants of health. People who experience poor working conditions during a significant period of their employment trajectory are more likely to report poor health during retirement (Siegrist and Wharendorf 2009, Siegrist et. al. 2007).

The aim of the present paper is to gain a better understanding of the link between dimensions of the quality of work and health status after labor market exit in Italy. Amongst industrialized countries, Italy has been found to score relatively poorly in terms of worker's satisfaction on working conditions (Clark, 2005) and its Southern European welfare regime shows a lower contrast to the negative effect of poor working conditions on worker's health status (Dragano, Siegrist & Wahrendorf, 2010). Moreover, Italy presents one of the lowest fertility rates in the world and an increasing elderly population.

The study assesses to what extent different dimensions of quality of work experienced in one's working life affect multidimensional health status, controlling for other socio-demographic factors and for gender differences. The analysis is drawn from the Italian sample of the Survey of Health, Ageing and Retirement in Europe (SHARE). The analysis sample is made up of individuals, aged 60 or more, who are not currently in the labor force, but who had work experience for at least five years of their lives. We use a wide range of indicators on the current health status together with quality of work assessments of the last main job in the individual's working career (lasting longer than 5 years).

How is quality of work defined and measured in this analysis? To measure quality of work theoretical models are needed that identify specific stressful job characteristics. Several such models were developed (Antoniou and Copper 2005), but two of them received special attention in occupational research: the demand-control-support model (Karasek et al. 1998) and the effort-reward imbalance model (Siegrist et al. 2004). The first model identifies stressful work by job task profile characterized by high demand, low control and low social support. The second model claims that an imbalance between high efforts spent and low reward received in turn (money, esteem, career opportunity and job security) adversely affects health. In our analysis all core dimensions of these two work stress models are used.

How is health status defined and measured in this analysis? To measure health status we take a move from the recent research on population health (Salomon et al. 2003, Coons

et al. 2000, Murray et al. 2002). What has become increasingly clear is that studying and measuring elderly population health needs approaches that allow for multiple measures to embrace all its complexity (Hallerod 2009, Lafortune 2009). That is, elderly population health cannot be fully described by one global dimension (Brayne et al. 2001, Meinow et al. 2006): besides the presence of a significant and unequivocal group of older people who simultaneously suffer from global level of un-health, there are also individuals who experience only specific problems. With this regard, it has been highly recommended to study older people's health and living condition using new measures that can disclose all the complexity of its structure. In this analysis health is measured using a nested factor model (Gignac 2007), which is perfectly able of capturing both the multidimensionality of a global un-health factor and the particular information enclosed in four residual dimensions of deprivation: physical, cognitive, affective and motivational problems.

The interaction between quality of work and health status has been assessed more often with reference to the recurrence of specific diseases or to the effect of particular dimensions of the quality of work. In this regard, the length of the working day and the timing of shifts have been found to negatively affect health. According to Kleiner & Pavalko's (2010) analysis on the US National Longitudinal Survey of Youth, a working week of between 40 and 59 hours is found to be related to worse physical and mental health. Work-related stress has been found to be associated with coronary heart diseases and mental health problems, this interaction is linked to the recurrence of work stress and to the degree of control on one's work (Eurofound, 2010, 2011).

According to Siegrist et al. (2004), effort-reward imbalance at work is associated with poor self-rated health outcomes in a cross-country analysis based on epidemiologic studies using a sample of workers in different sectors and countries. A health-adverse psychosocial work environment has been found to be associated with early retirement, and such poor working conditions are also associated with poor health during retirement (Siegrist & Wahrendorf, 2009, 2011).

Though these investigations reached valid and interpretable conclusions for separated domains of health, they have never related several aspects of work quality to a multidimensional and complex structure of health. Furthermore, the relationship between health and quality of work in Italy has never been studied in a nationwide representative sample of older adults. There have only been a limited number of studies based on small samples of workers and retired. SHARE has provided for the first time detailed information on a large enough scale to allow a reliable exploration. Finally, although the recent contributions on the socio-economic determinants of health showed that various factors impact differently from men to women (Ostlin et al. 2006), empirical investigations of health at work have never used a gender perspective.

Against this background, the aims of this study are:

- to assess the impact of different work quality dimensions on a multidimensional and complex structure of health in the older Italians after labor market exit;
- to apply a gender perspective and, accordingly, to check if the relationship between health and quality of work changes from men to women.

The paper has opened with a discussion of previous research and other introductory matters; the later sections present the methods, the empirical analysis and finally conclusions.

Methods

Data and sample

The data for the analysis are drawn from the publicly-released version of the *Survey of Health, Ageing and Retirement in Europe* (*SHARE* – second and third wave). What makes SHARE special is that it is the first cross-national and longitudinal study to explore topics related to work, retirement, work quality, health, health care, psychological factors, aspects of daily life and socio-economic positions among people aged 50 or over. The dataset also contains precious information about family composition and other individual and household socio-demographic characteristics (Borsh-Supan et al. 2005, 2008). The survey was conducted in a large number of European countries (from Scandinavia to the Mediterranean including a couple of Eastern nations). Based on probability samples in each participant country, data were collected using computer-assisted personal interviews (CAPI) supplemented by two self-completion questionnaires (drop-off and vignettes).

This study uses retrospective data on working history, information on current individuals' health status and variables that refer to some common socio-demographic characteristics of the respondents. For the homogeneity of the sample, we include all people aged 60 or more who reported to be employed at least once and longer than five years during the life course. Furthermore, since we are interested in the influence of quality of work on health during retirement, we restrict the sample to those who already left the labor market. Finally, individuals who had problems to respond to the retrospective questions (3%) are not included either. The analysis sample is made up of 432 women and 694 men.

Measures

Quality of work

SHARE contains an extensive module on work history, collecting information on each job the individuals had during their working career. In addition to general information (occupational status, working time, working sector etc.), the questionnaire includes an assessment of the psychosocial work environment of the last main job of their working career (lasting longer than 5 years).

For this analysis, we use the 11 questionnaire items taken from established work stress measures (Table 1). Each indicator corresponds to a core dimension of existing work stress models (Karasek et al. 1998, Siegrist et al. 2004): physical demands (2 items), psychological demands (3 items), control at work (2 items), reward (2 items) and social support at work (2 items). The indicators are four points Likert scaled (strongly agree, agree, disagree, strongly disagree). The original scale of items 7, 8, 9, 10, 11 is inverted in order to obtain higher values for better job assessments.

Health status

SHARE contains an extensive range of questions on health status which allows for a simultaneous analysis of a large number of variables. Specifically, we examine 27 indicators of un-health, which are initially grouped into three main categories (Nagi 1976): physical, emotional and cognitive problems. Observe that the classification is tentative; it guides the analysis but not determines the outcome. Table 2 reports the 27 un-health variables. Each indicator is a dichotomous item in which a value of one represents the presence of the problem.

Socio-demographic controls

Additional variables are age, occupational status (based on ISCO-codes) of the last main job of the working career, household composition (living with the partner or single-adult household), medical condition and wealth. The respective categories of occupational status are “legislators and professionals”, “associated professionals and clerks”, “skilled workers” and “elementary occupations”. In line with the spirit of the WHO Constitution (1948) and the advancements of the WHO family of classification systems[3], the diseases are not equated with health status itself, but conceptualized as a possible cause that

[3] They include International Classification of Disease and Related Health Problems (ICD) (WHO 1992), and the International Classifications of Functioning, Disability and Health (ICF) (WHO 2001).

makes more difficult to achieve specific functionings or good level of global health (Salomon et al. 2003). If so, we include in the analyses two dummy variables which indicate the presence of medical condition. Information available is related to a list of 17 chronic conditions that range from very severe to milder chronic diseases. A first dummy variable represents those who suffered from at least one chronic condition with not very serious consequences[4]. On the contrary, a second dummy variable refers to respondents who reported to suffer from at least one serious or incurable disease[5]. Wealth rather than income is used as a proxy of personal resources. Income is often criticized as a proper measure of socio-economic position, especially in the older persons (Grundy et al. 2001, O'Reilly 2002, Matthews et al. 2005). It is increasingly emphasized that wealth and assets can be expected to reflect more accurately the economic advantages accumulated over the life course (Robert and House 1996).

Statistical analysis

A latent variable approach is used to examine both the inter-relationships among work quality assessments and among un-health indicators. Factor analysis provides a powerful tool to discover latent patterns, because it searches for joint variations in response to unobserved factors. These factors are obtained on the analysis of correlations matrix and they are linear combinations of the indicators, clustering those that are higher correlated. In computing them, each indicator is explicitly considered to contain a certain degree of measurement error, contributing only partially to each factor. Because all the variables are ordinal, a method of analysis for ordinal variables is used (Muthen and Muthen 2006). This involves estimating the correlation matrix using tetrachoric correlations and the parameters using weighted least-squared solutions with robust standard error and mean and variance-adjusted chi-squared (WLSMV).

The analysis points to the association between health and work quality, controlling for other social determinants and applying a gender perspective. If so, the retained latent un-health factors are chosen as continuous dependent variables of respective ordinary least squares regression models (OLS) in which the job quality dimensions and the social

[4] High blood pressure or hypertension; High blood cholesterol; Diabetes or high blood sugar; Chronic lung disease such as chronic bronchitis or emphysema; Asthma; Arthritis, including osteoarthritis, or rheumatism; Osteoporosis; Stomach or duodenal ulcer, peptic ulcer; Cataracts; Hip fracture or femoral fracture; Other fractures.

[5] A heart attack including myocardial infarction or coronary thrombosis or any other heart problem including congestive heart failure; A stroke or cerebral vascular disease; Parkinson disease; Cancer or malignant tumor, including leukemia or lymphoma, but excluding minor skin cancers; Alzheimer's disease, dementia, organic brain syndrome, senility or any other serious memory impairment; Benign tumor (fibroma, polypus, angioma).

determinants of health are used as covariates. The models are estimated separately for men and women in order to detect gender differences in the definition of individuals' health.

Results

Measuring quality of work

The first purpose is to scrutinize if and how the different work quality indicators relate to each other and cluster together. A matrix of tetrachoric correlations is then generated and carefully inspected[6]. This first round of analysis supports a strong association among all the 11 variables. In this regard, all the indicators are kept for further investigations and the entire matrix is entered into an EFA.

A thumb-rule of the factor analysis is to retain the factors that have eigenvalues greater than 1.0. If so, the preliminary analysis of the tetrachoric correlations recommends a four-factor structure of work quality. Table 3 presents the estimated factor loadings for a four-factor structure after oblique (Promax) rotation. The physical demands items have strong loadings on one factor. The indicators that reflect troubles with psychological distresses load robustly on the second factor. Thus, the first aspect measure to what degree people have problems with a physical demanding job, while the second one concerns mostly emotional and disturbing situations at work.

In line with Kasasek et al. (1998), the items that reflect problems with freedom, new skills and control at work cluster together and load heavily on the fourth factor. Finally, regarding reward and social support at work, the EFA rejects the presence of two separated factors and combines the entire information in the third factor, which can be named *reward/support at work*. In contrast with the European findings (Siegriest and Wahrendorf 2011), the Italian case seems to indicate a close and strong interrelationship between reward and social support at work. The findings suggest that in the Italian workers significant problems at the workplace, such as lack of recognition, wage un-satisfaction, absence of social support and perception of bad atmosphere, tend to cluster and overlap.

Measuring un-health status

Our main research question points to the association of poor quality of work with health status after labor market exit. To this end, explorative factor analysis of the tetrachoric correlations is again used for revealing the best representation of the un-health

[6] The matrix was not reported, but it wil be provided upon request.

indicators. Unfortunately, these preliminary findings do not provide any sufficient evidence to a superior and clear factorial structure. Subsequently, various models are then evaluated and compared through Confirmative Factor Analysis (CFA). One advantage of the CFA method is the possibility to contrast the goodness of the models through a combination of several fit indices (Hu and Bentler 1999). In this case, the preferred structure turns out to be a *nested model* (Gignac 2007), which identifies five different dimensions of un-health. A global factor (*Glob*), which relates to all the examined indicators, and four residuals factors that measure the specific experiences of physical limitations (R_*Phys*), cognitive problems (R_*Cogn*), affective suffering symptoms (R_*Affect*) and motivational difficulties (R_*Motiv*). The final estimation of the health status measurement is fully reported in Table 4. The rationale and psychometric properties of this model are abundantly explained elsewhere (Fuscaldo, 2010).

Observe that the interpretation of the nested model is straightforward. The degree to which people simultaneously suffer from all the health problems is measured by *Glob*. People who are exposed to physical limitations but not to cognitive, affective and motivational problems score on R_*Phys*. *R_Cogn* measures to what extent individuals who do not have any physical and psychological trouble have nevertheless some restrictions in the cognitive function. Emotional performance is comprised of two residual factors. People who have usual symptoms of affective suffering (*Sadness/Depression, Suicidal tendency, Guilt, Trouble sleeping, Irritability, Loss of appetite, Fatigue and Tearfulness*), but otherwise do not report difficulties with mobility, cognitive function and motivation, score on R_*Affect*. R_*Motiv* measure to what degree individuals who do not have other health problems are only affected by motivational difficulties (*Pessimism, Lack of enjoyment, Lack of interest and Poor concentration*).

The model is essentially attractive because it takes into account that aspects of human performance overlap in some respect due to the multidimensionality of health and living condition in the aged (Hallerod 2009, Meinow et al. 2006, Brayne 2001). Considering our purpose to enlighten the impact of different quality of work dimensions on health after labor market exit, such a nested latent structure is perfectly able to capture both the multidimensionality of a global un-health status and the particular information enclosed in each residual factor.

Descriptive statistics: displaying gender differences

After discovering the best representation of the data, the five dimensions related to level of un-health and the four factors of the quality of work are retained, normalized and finally used for further investigations. Regarding un-health situations, the descriptive statistics (Table 5) are in line with the previous findings. Women are globally less healthy than men, report higher rates of residual affective symptoms (Castro-Costa et al. 2008,

Castro-Costa et al. 2007) and score worse on residual physical function (Parker et al. 1996, Mackenbach 2005, Hallerod 2009). However, women and men do not differ much in terms of residual motivational problems (Prince et al. 1999a, b; Copeland 2004) and residual cognitive problems (Dewey and Prince 2005).

The factors describing the quality of previous work show relevant gender differences. According to our statistics, women are better off than men in terms of physical and psychological demands, while the opposite is true in terms of reward/support and control at work dimension. The descriptive statistics suggest that women are less likely to do physically and psychologically demanding jobs, but also that they have lower levels of autonomy at the work, as well as receiving less recognition and support for their work. The lower average score in the reward/support dimension experienced by women is consistent with the existence of a gender wage gap and vertical segregation to Italian women's disadvantage (Addabbo and Favaro 2011, Addabbo et al. 2006, Simonazzi 2006).

Women in the sample are significantly older than men. Turning to the characteristics of the last main job in life, in line with the presence of vertical employment discrimination by gender in Italy, we find a higher presence of men in skilled work and professional positions, with women more likely to be employed in elementary occupations.

Multivariate analysis: association between un-health and work quality

After some introductive statistics, the analysis points to the association between un-health and work quality, controlling for other social determinants and applying a gender perspective. Given the continuity of their scores, the five latent un-health factors are chosen as dependent variables of respective ordinary least squares regression models (OLS) in which the four job quality dimensions and other social determinants of health are used as covariates.

The models are estimated separately for men and women in order to detect gender differences in the definition of individuals' health. The analysis is conducted in two steps. First, the five un-health factors are predicted by age, previous main occupational status, household composition, logarithm of wealth and the presence of at least one mild or severe chronic condition. Consequently, we estimate a second model in which we add the variables assessing the quality of the prevalent employment activity done during the working career.

The different regression model estimates (OLS) are reported in Table 6 and Table 7. As we are dealing with factors that result from a factor analysis, coefficients related to these variables are not easily interpretable. We have therefore decided to report the standardized solution of the regression models. In particular, we have standardized all the continuous variables, keeping dummy variables as such. Regression coefficients related to

continuous variables represent the change in standard deviations in the dependent variable that follows a 1 standard deviation change in the covariate. Coefficients related to dummy variables, on the other hand, must be read as the standard deviation change in the dependent variable, given the fact that the covariate dummy variable goes from 0 to 1.

Global problems

Age has a statistically significant large positive effect on the scores, the tendency being more pronounced among women. That is, older people tend to be more globally un-healthy than younger individuals and the ageing process is more prominent among women. Not surprisingly, the analysis shows that medical condition is a rather important predictor of *Glob* scores, the effect being higher among men with reference to both types of diseases. Men who had "at least one severe chronic condition" scored up to 0.42 standard deviation higher than those without any disease. There is a clear household composition effect. That is, "living as a single-adult", and thus lacking of intra-household support, is related to having more problems with global un-health, the effect being similar by gender. Finally, the analysis showed that wealth and some occupational status indicators turn out to be crucial predictors. That is, more private resources are associated with higher levels of global problems; having been occupied in elementary tasks is significantly related to being more globally un-healthy with respect to having been employed as a professional worker, the effect is not dissimilar by gender. Once we add the four dimensions of the quality of work to the model, the wealth effect completely disappear and the dummy variable "elementary occupations" shows a lower standardized coefficient. This may be connected to the introduction in the model of the reward/support dimension of the main job in life, which in turn may explain the observed level of wealth and occupational status reducing its importance in the analysis of the social determinants of health. As far as the dimensions of quality of work are concerned, good assessments in terms of reward/support and control at work significantly decrease the probability of being globally deprived, the effect being similar by gender. Finally, the higher the physical demands factor is, the lower the probability of being globally unhealthy for women, while this does not affect men's global health.

Residual physical problems

Age, medical condition and wealth are found to follow the same pattern observed for *Glob*. However, pre-retirement occupational status does not have any effect on R_Phys. Further analysis shows that the occupational gradient is mediated by wealth. Thus, *R_Phys* captures the unequivocal process of reducing physical ability connected with greater age, presence of diseases and less amount of private resources. The effect of "living as a single adult household" is found to be statistically significant and negative.

That is, people who live with the spouse scored highly. This means that they are more likely to decline their body function without experiencing any mental and emotional limitations. If so, having intra-household support is a crucial aspect that prevents older people from experiencing global health problems. Once added, the factors measuring the past work quality show many significant and noteworthy coefficients. There is evidence that a better level of reward/support assessments reduces residual men's physical problems. Such a result is not observed for women, who preserve the significance of wealth effect after adding the quality of work dimensions to the model. Lower levels of control at work increase the probability of having residual physical limitations, the effect being similar by gender. As above, the higher the physical demands factor is, the lower the probability of presenting residual physical problems among women. A previous work place with more amounts of psychological distresses is related to higher levels of residual physical troubles. These findings suggest that psychological demanding jobs are more likely to impact on residual physical limitations rather than on global health problems, the effect being similar by gender.

Residual cognitive problems

It is observed a not statistically significant effect for wealth and household composition, but fairly strong age and class effects. That is, older people and Italians previously occupied in elementary tasks score highly, the effect being similar by gender. "Having at least one severe chronic condition" is negatively associated with *R_Cogn* scores, the effect is similar by gender. This is not to say that older Italians with difficult medical situations are less exposed to cognitive problems compared to those without any illness. Nevertheless, people with no conditions are more likely to lose their cognitive function without experiencing physical limitations and emotional distress. Adding the four work quality dimensions to the models does not attach much information with respect to the previous results. Work quality has no significant effect on women's residual cognitive problems. However, higher control at work is significantly correlated to fewer residual cognitive problems among men. This is probably connected to the fact that workers with upper levels of autonomy during the main job are more educated people who generally have higher standards of intellectual and mental function.

Residual affective problems

There is a negative age effect, the tendency being similar by gender. Since age brings deterioration in several aspects of health, "older old" people had a larger probability to deal with global problems. Thus, residual affective symptoms seem to be more common among "younger" individuals. The medical condition has a positive impact only on women's residual affective problems. This is probably because women are less likely than men to be cared for. Household composition is a crucial predictor. Not surprisingly,

individuals “living in a single-adult household” tend to show more residual affective problems with respect to people living with the spouse, the effect being more pronounced among men. Wealth does not have significant effect on *R_Affect* scores. Residual affective problems among women seem to be independent of their past work experience. On the contrary, men who had a clerical or an elementary position turn out to have less residual affective problems than past professional employees. Once we add the four quality of work dimensions to the model, what is more interesting to note is that a higher level of control in men’s work increases their residual affective problems. This suggests a loss in men’s social sphere after retirement from a rewarding job, but it may also be connected to a lower development of social interaction outside working activities. Intense physical demanding jobs are related to higher levels of women’s residual affective problems. This result confirms the serious consequences of heavy works on women’s health.

Residual motivational problems

Regarding women, residual motivational problems turn out to be completely unrelated to age and medical condition. On the contrary, age and medical condition significantly predict men’s scores: *residual motivational problems* are mainly centered among younger men who do not present any chronic illness. Wealth and household composition turn out to be significant predictors. People who have higher levels of private resources and live with the spouse are more likely to have less residual motivational problems, the tendencies being more pronounced among men. Men’s scores seem to be independent of the past work experience. On the contrary, female clerical and elementary workers show higher levels of motivational residual problems with respect to professionals and legislators. Once we add the quality of work to the models, it has no significant effect on men’s residual motivational problems. However, higher levels of both reward/support and control at work are significantly and negatively correlated with women’s scores.

Conclusions

In this paper, we analyzed the effect of different dimensions of the quality of the main working activity during one’s life on the current level of health of the elderly in Italy, also taking gender differences in the mechanism that determines the level of health into account.

To this end, we used data drawn from the Survey of Health, Ageing and Retirement in Europe, and in particular the second and third waves, which are full of information respectively on health and the individual’s working history. In particular, we focused on a

sample of individuals aged over 60 who are currently retired but that have worked in the past, for at least five years.

In order to fully exploit the potential of this data, we used factor analyses to identify dimensions of un-health and quality of work. Factor analyses allow us to consistently aggregate a high number of variables into a more limited number of dimensions, at the same time preserving the multidimensional concepts of health and quality of work.

The factor analysis of the quality of work indicators gave enough plausibility to a multi-factor structure of the data. In fact, the results showed four oblique factors that refer to physical demands, psychological demands, control at work and support/reward at work. The presence of this last dimension supports the strong interrelationship in the Italians workers between social support and reward at work. The preferred factorial structure of un-health was a *nested model*, which identifies five different dimensions. Specifically, the findings uncovered a global factor, which relates to all the examined indicators, and four residuals factors that measure the specific experiences of physical limitation, cognitive problems, affective suffering symptoms and motivational difficulties.

The health factors were then analyzed in a multivariate setting, where they acted as dependent variables, affected by a number of socio-demographic factors and by the characteristics of past work. Our results confirmed the presence of a significant effect of quality of work on health, and they also suggested the existence of interesting gender differences.

Global un-health and residual physical problems were predicted by wealth and occupational status; the effects disappear or reduce once we added quality of work dimensions to the model. Higher scores in terms of reward/support and control at work significantly decreased the probability of being globally unhealthy, the effect being similar by gender. A psychological demanding job affected significantly residual physical limitations rather than global un-health, the effect being similar by gender. We also found that a high quality of physical work reduces the probability of being globally healthy for women, but not for men.

Moreover, a past physical demanding job impacted significantly on women's residual physical and affective problems. On the contrary, it did not seem to have any effect on the various dimensions of men's un-health. This is probably due to the fact that women are more likely to feel the negative consequences of a physically demanding job that, for Italian women, is also more likely to be matched with a physically demanding unpaid care and domestic work due to the unequal allocation of unpaid work by gender in Italy (Addabbo, Caiumi & Maccagnan, 2010, Addabbo, 2003).

Work quality dimensions were not related to women's residual cognitive problems. On the contrary, higher levels of autonomy were associated with lower levels of men's

residual cognitive problems. A higher level of control in men's work increased their affective problems after retirement. This suggests a loss in men's social sphere after retirement from a rewarding job or the underdevelopment of caring and relational dimensions during their working life. Finally, work quality dimensions were not associated with men's residual motivational problems. On the contrary, low support/reward and low control at work were strongly related to women's residual motivational troubles.

In conclusion, given the strong associations of good quality of work and multidimensional health, long-term effects on employees' living conditions are considerable. Therefore, promoting quality of work by supporting these more distant determinants may have beneficial medium and long-term on the unequivocal process of reducing health connected with greater age.

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Tables

Table 1. Indicators of quality of work

Dimension	Item
Physical demands	1. The job was physically demanding*
	2. My immediate work environment was uncomfortable*
Psychological demands	3. I was under constant pressure due to heavy workload*
	4. My work was emotionally demanding*
	5. I was exposed to recurrent conflicts and disturbances*
Control at work	6. I had very little freedom to decide how to do my work*
	7. I had an opportunity to develop new skills°
Reward	8. I received the recognition I deserved for my work°
	9. Considering all my effort and achievements, my salary was adequate°
Social support at work	10. I received adequate support in difficult situations°
	11. There was a good atmosphere between me and my colleagues°

* Scale: 1: strongly agree, 2: agree, 3: disagree, 4: strongly disagree

° Scale: 1: strongly disagree, 2: disagree, 3: agree, 4: strongly agree

Table 2. Indicators of un-health

Indicator	Definition (dichotomous variable 0=no; 1=yes)
Walk	Has problems walking 100 meters
Sit	Has problems **sitting** for about two hours
Get up	Has problems **getting up** from a chair after sitting for long periods
Climb several flights	Has problems **climbing several flights** of stairs without resting
Climb one flight	Has problems **climbing one flight** of stairs without resting
Stoop	Has any problems **stooping, kneeling, or crouching**
Reach up	Has problems **reaching or extending** your arms above shoulder level (either arm)
Pull	Has problems **pulling or pushing** large objects like a living room chair
Lift weights	Has problems **lifting or carrying weights** over 5 kilos, like a heavy bag of groceries?
Pick	Has problems **picking up** a small coin from a table
Sadness/Depression	In the last month has been **sad or depressed**
Pessimism	Does not have **any hopes** for the future
Suicidal tendency	In the last month has felt that he or she would **rather be dead**
Guilty	Tends to **blame** himself or herself and **fells guilty**
Trouble sleeping	Recently has had **troubles sleeping**
Lack of interest	In the last month has lost **interest in things**
Irritability	Recently has been **irritable**
Loss of appetite	Suffers from diminution in desire for food

Fatigue	In the last month has had **too little energy** to do the things you wanted to do
Poor concentration	Suffers from difficulty in concentrating on entertainment or reading
Lack of enjoyment	Recently has not **enjoyed** doing anything
Tearfulness	In the last month has often **cried**
Orientation in time	Scored less than 1.5 standard deviation below the mean in the **orientation test**: day of the month, month, year and day of the week. Original values from 0 to 4.
Memory	Scored less than 1.5 standard deviation below the mean in the **immediate memory test**: number of words the individual can instantaneously recall from a list of 10 items. Original values from 0 to 10.
Recall	Scored less than 1.5 standard deviation below the mean in the **recall memory test**: number of words the individual can recall from a list of 10 items after a certain delay of time. Original values from 0 to 10.
Verbal Fluency	Scored less than 1.5 standard deviation below the mean in the **verbal fluency test:** number of different animals the respondent can name within one minute. Original values from 0 to 80.
Numeracy	Scored less than 1.5 standard deviation below the mean in the **numerical knowledge test**: four simple arithmetic calculations. Original values from 0 to 4.

Table 3. EFA quality of work indicators: factor loadings for a four-factor structure (Promax rotation)

	Factor I "*Physical demands*"	**Factor II** "*Psychological demands*"	**Factor III** "*Reward/Support at work*"	**Factor IV** "*Control at work*"
1.Physical demanding	0.81			
2. Uncomfortable	0.78			
3. Time pressure		0.82		
4. Emotionally demanding		0.75		
5. Conflicts and disturbances		0.81		
6. Little freedom				0.71
7. New skills				0.79
8. Recognition			0.72	
9. Adequate salary			0.78	
10. Adequate support			0.82	
11.Good atmosphere			0.76	

Note: the table has no zero. The factor loadings with value less than |0.35| have been not reported for ease of comparison.

Table 4. CFA un-health indicators: factor loadings for a nested model

Indicator	*Glob*	*R_Phys*	*R_Cogn*	*R_Affect*	*R_Motiv*
Walk	0.74	0.52			
Sit	0.61	0.40			
Get up	0.63	0.49			
Climb several flight	0.65	0.55			
Climb one flight	0.70	0.47			
Stoop	0.64	0.55			
Reach up	0.68	0.47			
Pull	0.70	0.49			
Lift weights	0.69	0.50			
Pick	0.61	0.42			
Orientation in time	0.52		0.39		
Memory	0.54		0.65		
Recall	0.51		0.56		
Verbal Fluency	0.53		0.52		
Numeracy	0.64		0.47		
Sad/Depressed	0.58			0.69	
Suicidal tendency	0.53			0.43	
Guilty	0.51			0.39	
Troubles sleeping	0.62			0.46	
Irritability	0.53			0.44	
Loss of appetite	0.75			**0.08**	
Fatigue	0.69			0.45	
Tearfulness	0.62			0.49	
Pessimism	0.54				0.49
Lack of interest	0.70				0.57
Lack of enjoyment	0.57				0.47
Poor concentration	0.66				0.40

Note: parameter estimates in red were not statistically significant ($p > 0.10$). The others were all statistically significant ($p < 0.01$).

Table 5. Descriptive statistics divided by gender

	Men		Women		Gender difference	
	Mean	S.D.	Mean	S.D.	W-M	t-test
Un-health status (continuous 0 - 1)						
Global health problems	0.26	0.20	0.36	0.21	0.10	6.31***
Residual physical health problems	0.44	0.17	0.48	0.17	0.04	4.18***
Residual cognitive health problems	0.33	0.16	0.29	0.13	-0.03	-3.94***
Residual affective health problems	0.35	0.19	0.42	0.21	0.07	5.78***
Residual motivational health problems	0.18	0.08	0.17	0.08	-0.01	-2.62***
Quality of work (continuous 0 - 1)						
Physical demands	0.41	0.21	0.46	0.20	0.05	3.49***
Psychological demands	0.37	0.17	0.41	0.16	0.04	3.12***
Support/reward at work	0.56	0.18	0.51	0.19	-0.05	-2.57**
Control at work	0.45	0.17	0.42	0.16	-0.03	-2.16**
Age (continuous)	70.56	7.00	71.04	7.52	0.48	3.07***
Previous occupational status (the last main job)						
Elementary worker	0.38	0.46	0.48	0.49	0.10	2.66***
Clerical worker	0.22	0.41	0.21	0.39	-0.01	-0.28
Skilled worker	0.26	0.44	0.23	0.41	-0.03	-2.04**
Professional worker	0.14	0.25	0.08	0.29	-0.06	-4.09***
Household composition						
Living with the spouse or partner	0.89	0.34	0.73	0.29	-0.16	-3.17***
Single adult	0.11	0.14	0.27	0.25	0.16	2.67***
Loq wealth (continuous)	11.97	1.43	11.86	1.59	-0.11	-0.54
Medical condition						
No condition	0.21	0.29	0.16	0.18	0.05	2.11**
At least one mild chronic condition	0.55	0.50	0.67	0.36	0.12	3.12**
At least one severe chronic condition	0.24	0.42	0.17	0.27	-0.07	-1.70**

Note: Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 6. Predictors of un-health factors: ordinary least squared regression estimates - Men

	Glob		R_Mob		R_Cogn		R_Affect		R_Motiv	
age (continuous)	0.15 ***	0.13 ***	0.17 ***	0.17 ***	0.17 ***	0.17 ***	-0.10 ***	-0.10 ***	-0.11 ***	-0.11 ***
previous occupational status (ref.legislators and professionals workers)										
clerical workers	0.01	0.02	0.09	0.07	0.03	0.02	0.01	0.01	-0.01	-0.01
skilled workers	0.05	0.04	0.03	0.02	0.08 **	0.04 *	-0.08 **	-0.05	0.05	0.04
elementary workers	0.22 ***	0.11 ***	0.07	0.05	0.19 ***	0.10 ***	-0.04 *	-0.03	0.05	0.06
medical condition (ref. no conditions)										
having at least one mild chronic condition	0.19 ***	0.18 ***	0.22 ***	0.20 ***	0.06	-0.05	0.06	0.05	-0.13 ***	-0.13 ***
having at least one severe chronic condition	0.42 ***	0.39 ***	0.36 ***	0.31 ***	-0.12 ***	-0.10 ***	0.05	0.04	-0.09 ***	-0.09 ***
household composition (ref. living with the spouse or partner)										
single adult	0.05 **	0.05 **	-0.04 **	-0.04 **	0.01	0.01	0.12 ***	0.12 ***	0.08 ***	0.08 ***
wealth (continuous)	-0.10 ***	-0.03	-0.07 **	-0.02	-0.04	-0.02	-0.04	-0.03	-0.12 **	-0.10 **
quality of work (continuos)										
physical demands	-	-0.04	-	0.04	-	-0.05	-	-0.03	-	-0.06
psychological demands	-	-0.05	-	-0.08 ***	-	0.04	-	-0.04	-	-0.03
support/reward at work	-	-0.11 **	-	-0.09 ***	-	-0.02	-	0.01	-	-0.01
control at work	-	-0.10 **	-	-0.12 ***	-	-0.10 **	-	0.17 ***	-	-0.04
constant	-3.8 **	-2.2 **	-1.6 **	-1.6 **	-1.9 ***	-1.8 ***	0.4 *	0.3 *	1.3 ***	1.4 ***
adjusted R-squared	0.21	0.27	0.12	0.16	0.10	0.12	0.08	0.10	0.07	0.07

Note: Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 7. Predictors of un-health factors: ordinary least squared regression estimates – Women

	Glob		R_Mob		R_Cogn		R_Affect		R_Motiv	
age (continuous)	0.31 ***	0.29 ***	0.13 ***	0.17 ***	0.19 ***	0.19 ***	-0.12 ***	-0.10 ***	0.05	0.06
previous Occupational status (ref.legislators and professionals workers)										
clerical workers	0.04	0.05	0.06	0.05	0.02	0.01	-0.04	-0.05	-0.05	-0.04
skilled workers	-0.03	-0.04	0.02	0.03	0.07	0.05	0.03	0.02	0.14 ***	0.09 ***
elementary workers	0.25 ***	0.13 ***	-0.04	-0.05	0.18 ***	0.19 ***	0.07	0.06	0.10 ***	0.06
medical condition (ref. no conditions)										
having at least one mild chronic condition	0.25 ***	0.24 ***	0.22 ***	0.20 ***	-0.05	-0.04	0.10 ***	0.10 ***	0.06	0.05
having at least one severe chronic condition	0.33 ***	0.32 ***	0.33 ***	0.31 ***	-0.13 ***	-0.12 ***	0.21 ***	0.21 ***	0.03	0.02
household composition (ref. living with the spouse or partner)										
single adult	0.06 **	0.05 **	-0.06 **	-0.04 **	0.02	0.01	0.07 ***	0.06 ***	0.08 ***	0.07 ***
wealth (continuous)	-0.08 ***	-0.05	-0.12 ***	-0.07 **	-0.04	-0.04	-0.01	-0.01	-0.08 **	-0.04
Quality of work (continuos)										
physical demands	-	-0.12 **	-	-0.09 ***	-	-0.04	-	-0.15 ***	-	-0.03
psychological demands	-	-0.05	-	-0.10 ***	-	0.03	-	0.04	-	-0.02
support/reward at work	-	-0.15 **	-	-0.03	-	-0.05	-	-0.06	-	-0.10 ***
control at work	-	-0.10 **	-	-0.05 **	-	0.06	-	-0.05	-	-0.16 ***
Constant	-3.7 **	-3.3 **	-1.6 **	-1.6 **	-1.9 ***	-1.9 ***	1.2 **	1.2 **	-1.1 ***	-0.8 ***
Adjusted R-squared	0.25	0.31	0.11	0.16	0.09	0.09	0.07	0.09	0.06	0.10

Note: Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Chapter 3

A capability perspective on impairment and disability: an application among elderly people in Italy

Abstract: Over the last years the capability approach has been proposed as a valuable theoretical framework for disability studies (Welch 2002; Burchardt, 2004; Terzi, 2005; Mitra, 2006; Trani and Bakshi 2008). Following the capability approach the present paper attempts to examine the intricate relation between impairments (conditions of the body or mind) and disability among elderly people in Italy. The present study defines disability as a lack of autonomy and takes into account that impairments may restrict functioning, and thus yield a disability, through the complex interrelation between the individual's characteristics, her environment and her available resources. In order to reach this purpose a two stages Structural Equations Model (SEM) is used. Subsequently, to explore differences in relationship between impairments and disability the sample is divided by sub-groups of population. Analyses are based on the second wave of the Survey on Health, Ageing and Retirement in Europe (SHARE). The findings have several important implications which provide support for the use of a capability perspective to study disability. Considering the entire sample level, the factor of global impairment had the strongest impact on disability. As expected, the residual factors, which measure the extent to which people are exposed to only one type of impairment, had a weaker association with disability. By aggregating the sample into four sub-groups by age and gender, age and gender turned out to be decisive aspects that drive the relation between impairments and disability. Resources, household composition and area of residence had significant association with disability at the sample level, however the aggregation into four sub-groups pointed out large gender and age differences.

Introduction

There are no generally accepted ways to define and measure disability. It has been described from different perspectives, and several theoretical frameworks have been developed in different contexts and for different goals (Altman 2001). At the theoretical level, the main contraposition has always been between the *Medical Model*, which considers the disability a problem of the individual (Pfeiffer 2001), and the *Social Model* that sees the disability mainly as a social construct (Oliver 1996). In the last decade some innovative models have been put forward in order to integrate the previous frameworks and overcame the historical contraposition.

Although Amartya Sen's capability approach (Sen 1985a, 1992, 1999) has been developed to study various concepts in welfare economics, it has been recently proposed as an innovative and valuable theoretical framework for defining disability, understanding its causes and consequences (Welch 2002; Burchardt, 2004; Terzi, 2005; Mitra, 2006; Trani and Bakshi 2008). The capability approach shares with the social model of disability the idea that impairment and disability are two distinct concepts. Impairment is considered a personal characteristic, i.e. a condition of the body or mind such as being unable to move, having cognitive problems, or experiencing depression. On the other hand, disability occurs when an individual is deprived in achieving freedom and well-being due to the impairment.

Welch (2002), Burchardt (2003), Terzi (2004) and Mitra (2006) extensively point out the double strength of using a capability perspective in disability studies. Firstly, rather than using less restrictive concepts, such as bodily capacity, independence or societal oppression, the disability is conceptualized within the spectrum of the functionings and capabilities that the individuals value and have reason to value (Sen 1999). Secondly, it accounts for the interpersonal variations in the link between impairment and disability depending from a variety of factors, such as personal characteristics (age, gender etc), private resources and external circumstances. The human heterogeneity is a crucial feature of the capability approach (Sen 1992, 1993, 1999) and may explain that a given impairment yield a disability through the complex interrelation between the individual's characteristics, her environment and her available resources.

To the best of our knowledge, this paper is the first study that attempts to examine and model the complex relation between impairments and disability with a capability perspective. Although other studies (Trani and Bakshi 2008) show a different degree of functioning achievement between impaired and non-impaired people, so far little has been done in order to address the following two questions: (1) the impact of different impairments on disability and (2) its complex interrelationship with private resources, personal characteristics and external circumstances.

In this study we define and study the relation between impairments and disability among elderly Italian people. Disability is conceptualized as a functioning deprivation in autonomy, which is the perceived ability to control, cope with and make personal decisions about how one lives on a day-to-day basis, according to his own rules and preferences (WHO, 2002).

Using a Structural Equation Modelling (SEM) (Bollen 1989), the present analysis studies disability as caused by impairments, with private resources, personal characteristics and external circumstances modeled as exogenous variables. The estimation of the first model gives information about the impact that goes from impairments to disability. Instead, by disaggregating the population into sub-groups, we check if and how these effects differ among homogenous groups of population. The analysis will be drawn from the *Survey of Health, Ageing and Retirement in Europe* (*SHARE*) which provides detailed information on a large national scale (Borsh-Supan et al. 2005, 2008).

The analysis sheds more light on the intricate interrelation between disability, impairments and exogenous causes. Understanding the complexity of this process might be a useful tool for the policy makers. In fact, they might be interested in to what extend impairments restrict the achievement of valued functionings, what is the role played by private resources and other characteristics in this relationship, and how this process differ among homogenous sub-group of population. It is certainly a more holistic way to study and understand the disability and might be a valuable tool in defining policy interventions.

The paper opens with a discussion of the previous research and some theoretical considerations. Section 3 presents the data, the variables and the data analysis strategy. Section 4 proposes our empirical results, and finally conclusions are provided in Section 5.

Previous research and theoretical considerations

The capability approach – An overview

The capabilities approach, developed by Amartya Sen (1980, 1985a, 1985b, 1992, 1993, 1999), emerges as a response to theoretical difficulties in the conventional welfare economics. From the 1970s, Sen challenges the commonly agreed theories of utilitarianism and looks at ways of building alternative paradigms. Sen in his hallmark paper in 1980 poses the question “Equality of What?” and challenges the notion of egalitarianism, as perceived from the common perspective of utilitarianism. Capability theory does not postulate the importance of equality based on goods themselves or pleasures one derives from the use of them, but emphasizes people’s opportunities to make use of the resources to achieve beings and doings. Sen’s approach has received critical examination in economics, philosophy, ethics, women’s development. The purpose of this section is to discern measurable constructs of this theory and reify them

for understanding causes and consequences of disability. The capability approach offers two constructs of special importance: functionings and capabilities.

The functionings of a person refer to the valuable things that one can do (such as "working") or be (such as "being socially integrated"). They can involve basic actions, such as "being well-nourished", but also more complex ones, such as "having self-respect" or "taking part in the life of the community". In addition to functionings, Sen introduces the important notion of capability which can be considered the central aspect of his approach. Capability is determined by the different combinations of functionings the person can or cannot achieve. These are based on a set of real opportunities and mainly connected with the freedom to accomplish valued beings and doings.

Sen claims that functionings are constitutive of a person's well-being, that is how "well" is his or her "being"? Instead, advantage refers to real opportunities facing a person, from which he/she has the freedom to choose. If persons' existence is compounded by functionings and capabilities, Sen assumes that a concrete notion of equalitarianism should be based on well-being or advantage. In Sen's theory functionings and capabilities should be distinguished from resources which are only means to achieve well-being or advantage. If so, an evaluation of equality based on resources would be in terms of inputs rather than outputs. By introducing capabilities and functionings as core elements in assessing living existence, Sen's theory pays particular attention to human diversities. Both well-being and advantage could depend on a variety of factors, including personal characteristics (age, gender etc.), resources (income, assets, public goods etc.), external circumstances (environment factors and social/cultural arrangements etc.) and individual ability to convert resources into freedom or achievements**.**

The capability approach is intentionally open and incomplete. Sen does not specify any list of functionings/capabilities which depend on the circumstances and issue under consideration. Functionings and capabilities that are relevant for the evaluation can be elicited directly from people themselves as a social choice exercise, or can be based on some social standard as reflected by commonly values in the society. This makes the capability approach a flexible tool to be applied to different topics.

A capability perspective on impairment and disability

Health and disability are major concerns in Sen's capability approach. When he debates about disability (Sen 1992, 1993, 1999, 2004) his focus is on why and how some sort of handicap, including physical and mental problems, can make it harder to convert income into freedom and achievements. He wonders why disability has never been a central issue in the main theories of Social Justice, arguing that the relative lack of attention has been one of the principal reasons of the policy makers' inactivity (Sen 2004).

Welch (2002) can be considered the first clear proposal to study disability under a capability perspective. If according to Sen the development involves expanding freedom enjoyed by individuals, disability may be seen as an important source of restriction of the individual freedom and well-being. If so, the development in this context means alleviating or removing disability while promoting capability. In order to use the capability approach for this purpose, Welch claims for a list of capabilities drawn up by disabled people themselves. She explains that it may be needful to identify disabled people's needs and address interventions aimed at promoting their well-being or advantage.

If Welch (2002) is the first attempt that moves the disability definition away from its traditional models, the works of Burchardt (2004), Terzi (2005) and Mitra (2006) go much further in pinpointing the main concepts with the usual terminology of the capability approach and emphasizing the principal strengths to use Sen's ideas for disability issues.

Burchardt (2004) offers a significant comparison between the capability approach and the social model of disability. She comes to the conclusion that the two frameworks can be partially complementary. The explanation is mostly driven by the fact that both models openly refuse the medical model of disability. In fact, disability is not considered only a problem related to the individual (Pfeiffer 2001), but can be understood as the result of an interaction between impairments, physical and social environment. In these circumstances, impairments are defined as personal characteristics, i.e. conditions of the body or mind, such as being unable to move, having cognitive problems, or experiencing depression.
Burchardt (2004) states that the similarity of the two models is not complete due to the different definitions of disability. The social model sees disability as the loss or limitation of opportunities to take part in the life of the community due to the oppressive relationship between people with impairment and the rest of the society (Oliver 1996). On the contrary, the capability approach places its definition within the wider spectrum of functionings and capabilities. That is, whether the individual is actually disabled depends on whether the impairment places restrictions on the valued beings and doings.

Terzi (2005) does not believe that the capability approach and the social model of disability can be seen as similar frameworks. The difference in the classification of disability does not allow for any sort of complementariness. Hence, Terzi (2005) strongly points the need to put forward the capability approach as a new valuable and respectful tool in disability studies. She firmly believes that it can be the only theoretical framework which is able to consider disability as a specific variable of human diversity and evaluates its impact on the positions of the individuals within institutional and social arrangements.

Terzi (2005) attempts to examine the strengths of the capability approach, overcoming the main contraposition between medical and social model of disability. She clearly explains how and why both models have theoretical deficiencies that limit their values as

a basis for policy. In particular, if the medical model understates the relational and social characteristic of disability, the social model ends up over-socializing causes and misplacing responsibility for impairment and disability. With this regard, she argues that the social model does not completely address the heterogeneity in the relation between impairment and disability. It accounts only for diversity with respect to external circumstances, such as asset, environment factors, social and cultural arrangements. Instead, the capability approach explicitly deals with other two important kinds of human heterogeneity: personal characteristics, such as gender, age, talents etc., and inter-individual variation. The latter concept has been introduced by Sen himself (1985a, 1992, 1993, 1999) and refers to differences in the conversion of resources into achievements and freedoms. If so, impairment may restrict valued functionings and capability, and thus yield a disability, through the complex interrelation between the individual's characteristics, her conversion factors and her external circumstances.

Also Mitra (2006) attempts to go beyond the generally agreed models of disability and confers to the capability approach a specific role in understanding disability, its causes and consequences. With respect to the definition of disability, she clearly explains that all the previous theoretical frameworks can be seen as narrow applications of the capability approach. The reason is due to the selection of relevant functionings and capabilities as an explicit exercise of social choice. Concerning causes of disability, Mitra pays particular attention to its economic burden both at the individual and household level. She argues that only under the capability approach the resources can be seen as a factor that interacts with impairments, individual's characteristics and environment, leading to disability.

More importantly, Mitra (2006) is the only scientific work that reports a clear comparison between the capability approach and the *International Classification of Function, Disability and Health* (ICF) (WHO, 2001). The ICF has the strength to recognize that an individual may have restricted participation in major life area for many reasons, including personal and environment factors. However, Mitra makes sufficiently clear that the ICF does not cover circumstances that are not health related, for instance socio-economic factors. If so, even the ICF, a framework that is presented by the WHO as an attempt to integrated medical and social model and overcome their contraposition, does not take into account that resources available to the individual and the economic environment directly influence whether a person may be considered disabled.

To the best of our knowledge, Trani and Bakshi (2008) is the only work which utilized empirically the capability approach in disability studies. Considering nine crucial dimensions of well-being, they report the degree of functioning achievement among impaired and non-impaired Afghans. The results clearly display that the individuals who have at least one type of impairment are constantly worst off than those without any health problem. This first analysis is by all means a fruitful step in operationalizing the

conceptual framework for disability in the capability approach. However, in Trani and Bakshi (2008) some important issues remain partially unaddressed.

First of all, the complex relationship between impairment and disability is not examined. For instance, the results do not present any interaction between personal characteristics, impairment and disability. Furthermore, the analyses do not deal with the economic burden of disability. Finally, most of the reported functionings are related to "*limitations in normal daily activities*", such as "*self care*", "*contribution to household work*" and "*contribution to work outside house*". However, asking a person whether she can do actions on a day-to-day basis and tasks within or outside the house appears a rather restrictive solution to put into operation the capability approach.

The ability to perform functionings related to daily living is frequently called *independence* (WHO, 2002). This design assumes that a set of actions can be defined as normal. Yet, this concept is often used as main outcome of the disablement process in applied disability research (e. g. Johnson and Wolinsky 1993, Lawrence and Jette 1996). Even though independence may be seen as an important dimension that allows a person to take care of himself, it does not account for people's values and needs. Thus, in this paper we attempt to move away from the idea of disability as a "*lack of independence*" to embrace a more comprehensive view of human activities. Rather than using limitations in normal daily activities, we adopt a concept of disability related to a "*deprivation in autonomy"*. This last concept can be seen as the perceived ability to control, cope with and make personal decisions about how one lives on a day-to-day basis, according to his own rules and preferences (WHO, 2002).

The notion of autonomy is fairly close to Sen's idea of agency (Sen 1985b), which is the possibility to pursue the various goals and projects that one values and has reason to value. Under a capability perspective, it is principally adopted for abandoning presumptions that some human activities matter more than others. The value of freedom is a strong theme in the works of Sen (1992, 1993, 1999) and seems to be even more important in disability research. Human beings have different conceptions of the good and thus aim at different ends or objectives. If so, the liberation from disability concerns to having the possibility to undertake and achieve the activities that one values, instead of living in conformity to some notion of normality and independence (Burchardt 2004). A common problem faced by impaired people is the pervasive view that they are passive and dependent. The capability approach acknowledges impaired people own agency in constructing the criteria that lead to well-being and autonomy.

Methods

Starting from all these previous works, we model and examine the connection between impairments and disability among older people in Italy. The interrelationships among the constructs in our conceptual scheme are shown in Graph 1. Combining a capability perspective with a life course approach (Lloyd-Sherlock 2002), private resources, personal characteristics and external circumstances interact both with impairments and disability.

Statistical model

Structural Equation Models (SEM) is used to study the complex relationship between disability, impairments, private resources, personal characteristics and external circumstances. SEM is a set of techniques that permit measurement path analysis, as well as the treatment of measurement error and latent constructs, and the specification of error and error correlations (Bollen 1989, Kline 1998). As extensively pointed out by applied research on disability and disablement process (e. g. Johnson and Wolinsky 1993, Lawrence and Jette 1996), SEM technique is the most appropriate methodology to estimate the net effect of a complex construct like the one shown in Graph 1. All the analysis are carried out with MPLUS 4 (Muthén and Muthén 2006).

A given latent structure of impairments (Fuscaldo 2010) is include in a SEM where disability is the dependent variable and private resources, personal characteristics and external circumstances are modeled as exogenous predictors. The model is a two stage SEM where impairments are used both as outcomes and covariates. Subsequently, to explore differences in the complex relationship between impairments, disability and exogenous causes we look at the same model divided by sub-groups of population (Chiappero-Martinetti and Salardi 2008).

Because several of the variables are ordinal, including the dependent variable a method of analysis for ordinal variables is used. This involves estimating the parameters using weighted least-squared solutions with robust standard error and mean and variance-adjusted chi-squared WLSMV. Modelling of incomplete data is also used to handle the few cases of missing values (Muthén and Muthén 2006).

All of these models are tested using cross-sectional data. Although casual ordering is typically thought of as temporal ordering, specifying the casual ordering among a set of cross-section can be established from the order in which they occur naturally (Johnson and Wolinsky 1993). Because the analyses of these models are a prerequisite to prospective studies and the current findings are already complex and extensive, we reserve the longitudinal analyses for future investigations.

Data

The data for the analysis are drawn from the publicly-released version of the *Survey of Health, Ageing and Retirement in Europe* (*SHARE* – Second Wave). What makes SHARE special is that it is the first cross-national and longitudinal study to explore topics related to work, retirement, health, health care, psychological factors, aspects of daily life and socio-economic positions among people aged 50 or more. The dataset also contains precious information about family composition and other individual and household socio-demographic characteristics (Borsh-Supan et al. 2005, 2008). The survey was conducted in a broad number of European countries (from Scandinavia to Mediterranean including a couple of Eastern nations). Based on probability samples in each participatory country, data were collected using computer-assisted personal interviews (CAPI) supplemented by two self-completion questionnaires (drop-off and vignettes). Our empirical analyses use only the second wave of the Italian survey conducted during 2006 and 2007. The analysis sample has 2871 cases. The cross-national and longitudinal comparisons are left for future investigations.

Measures

Impairment.

By adopting a capability perspective, impairments can be viewed as functioning limitations at the level of individual organism. Nagi (1976) distinguishes three dimensions of human performance: *physical*, *emotional* and *mental*. Physical performance consider the sensory-motor functioning of the organism as indicated by limitations in such activities as walking, climbing stairs and reaching etc. Emotional performance refers to a person's effectiveness in psychological coping with life stress, anxiety and restlessness etc. Mental performance, often defines as cognitive function, denotes the intellectual and reasoning capacity of individuals.

The wide range of questions in SHARE allows for an analysis of a large number of health and performance indicators. Hence, impairments are modeled as latent variables with multiple indicators. Each variable is a dichotomous item in which a value of one represents the deprived situation. A sequence of confirmative factor analyses is used in order to reveal the best representation of the data. The preferred structure turns out to be a *nested model* (Gignac 2007, Hallerod 2009, Wu and Yao 2007). It identifies five different dimensions: global factor (*Glob*), which relates to all the examined indicators, and four residuals factors that measure the specific experiences of physical limitations (R_*Phys*), cognitive problems (R_*Cogn*), affective suffering symptoms (R_*Affect*) and motivational difficulties (R_*Motiv*). The rationale and psychometric properties of this model are fully explained elsewhere (Fuscaldo, 2010). Some descriptive statistics are presented in Table 1.

The interpretation of the nested model is straightforward. The model is abundantly descript in Fuscaldo (2010). The degree to which people simultaneously suffer from all the health problems is measured by *Glob*[7]. People who are exposed to physical limitations[8] but not to cognitive, affective and motivational problems score on R_*Phys*. *R_Cogn* measures to what extent individuals who do not have any physical and psychological trouble have nevertheless some restrictions in the cognitive function[9]. People who have usual symptoms of affective suffering[10], but otherwise do not report difficulties with mobility, cognitive function and motivation, score on R_*Affect*. R_*Motiv* measure to what degree individuals who do not have other health problems are only affected by motivational difficulties[11]. The model is essentially attractive because it takes into account that aspects of human performance overlap in some respect due to the multidimensionality of health and living condition in the aged (Hallerod 2009, Meinow et al. 2006). Considering our purpose to enlighten the impact of different impairments on disability, such a nested latent structure is perfectly able to capture both the multidimensionality of a global impairment and the specific un-health information enclosed in each residual factor.

Private resources.

Wealth rather than income is used as a proxy of personal resources. Income is often criticized as a proper measure of socio-economic position, especially in the older persons (Grundy et al. 2001, O'Reilly 2002, Matthews et al. 2005,). It is increasingly emphasized that wealth and assets can be expected to reflect more accurately the economic advantages accumulated over the life course (Robert and House 1996). In this analysis wealth[12] is calculated as the sum of several items, including the values of property and physical assets, mortages, bank deposit, stock holdins, bonds, mutual funds, life insurance

[7] All the indicators present in note 8, 9, 10, 11.

[8] *Walking 100; Sitting for about 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 your arms above shoulder level; Pulling or pushing large objects like a living room chair; Lifting or carrying weights over 5 kilos, like a heavy bag of groceries; Picking up a small coin from a table.*

[9] *Memory, Recall, Verbal fluency, Orientation in time and Numeracy*

[10] *Sadness/Depression, Suicidal tendency, Guilt, Trouble sleeping, Irritability, Loss of appetite, Fatigue and Tearfulness*

[11] *Pessimism, Lack of enjoyment, Lack of interest and Poor concentration.*

[12]Wealth is based both on reported and imputed values calculated by the central SHARE team (Borsch-Supan and Jurges 2005, 2008).

policies and individual retirment accounts. The descriptive statistics are presented in Table 2.

Personal characteristics

Personal characteristics are: age, gender, household composition and medical condition. The measures of gender and age are straightforward. Household composition distinguishes between living with the spouse/partner and living alone. This variable can be interpreted as an indicator of intra-household support (Ongaro and Salvini 1995, Verbrugge and Jette 1996).

According to the WHO Constitution (1948) and Salomon et al. (2003), the diseases are not equated with the impairments. If so, the presence/absence of chronic illnesses is conceptualized as a personal characteristic. The available information is used to set up two groups of diseases (Chiappero-Martinetti 2000). A first group includes those who suffer from at least one chronic condition with not very serious consequences[13] (hypertension, diabetes etc.); the second one refers to respondents who have reported to suffer from at least one serious or incurable disease[14] (heart attack, cancer, cerebral vascular disease etc). The descriptive statistics are presented in Table 2.

External circumstances.

In order to consider external circumstances the analysis accounts for four macro-regions and area of residence. The macro-regions are: North-East, North-West, Centre and South Italy. Area of residence distinguishes between living in an urban area and living in a rural village. The latter can be considered a disadvantaged area with less social infrastructure and more inclined to isolation. The descriptive statistics are presented in Table 2.

Disability.

By adopting a capability perspective and considering aged people own agency in assessing valued dimensions, disability is here seen as a lack of achieved autonomy. Autonomy is constantly connected with the possibility of formulating plans of life in older age (Gilroy 2006, Raynes et al. 2006) and often selected as crucial and instrumental dimension of

[13] High blood pressure or hypertension; High blood cholesterol; Diabetes or high blood sugar; Chronic lung disease such as chronic bronchitis or emphysema; Asthma; Arthritis, including osteoarthritis, or rheumatism; Osteoporosis; Stomach or duodenal ulcer, peptic ulcer; Cataracts; Hip fracture or femoral fracture; Other fractures.

[14] A heart attack including myocardial infarction or coronary thrombosis or any other heart problem including congestive heart failure; A stroke or cerebral vascular disease; Parkinson disease; Cancer or malignant tumor, including leukemia or lymphoma, but excluding minor skin cancers; Alzheimer's disease, dementia, organic brain syndrome, senility or any other serious memory impairment; Benign tumor (fibroma, polypus, angioma).

daily existence by elderly people themselves (Grewal et al. 2006). Autonomy and Sense of Control play also an important role in Ageing Quality of Life Measurements (Wiggins et al. 2004).

The concept of autonomy is notoriously very difficult to measure. In our analyses we use a single question and interpret it as subjective indicators of autonomy (Alkire 2008). We consider the question: "How often do you think that you can do the things that you want to do?" where the possible answers are "Often", "Sometimes", "Rarely" and "Never". The variable is kept divided into four categories in order to consider the complexity and fuzziness which are relevant ideas in the context of the capability perspective (Chiappero – Martinetti 2008).

Some descriptive statistics are presented in Table 3. One-third of the Italians aged 50 and older do not have any problem to do the things that they want to do (*Often*). On the other hand, a bit more than 13% of the sample reports serious problems in achieving autonomy (*Never*). As expected, problems increase with age. By dividing the sample into two groups - pre-retirement (50 – 65 years) and post-retirement (65+ years) - a higher proportion of those who report "Rarely" or "Never" is observed among "older old" people. Turning to gender differences, the prevalence of individuals who can "never" achieve the valued things is higher among women. The difference might be due to the upper mean age for women. However, controlling for age the prevalence remains significant. A more elevated proportion of deprived situations are also observed among respondents who are without spouse and live in rural areas. Looking at the private resources, there is a remarkable negative association with disability, i.e. full achievements of autonomy decrease with fewer amount of household wealth. Finally, a comparatively weak negative relationship between higher levels of education and poor autonomy is also observed.

Results

Structural Equation Models

The measurement model of impairments is fully described elsewhere (Fuscaldo 2010). The direct impacts of the exogenous variables on the five dimensions of impairment are not shown here, but abundantly discussed in Fuscaldo (2011).

Here, only the predictors of disability are presented. Given that our observed dependent variable is categorical, the paths from covariates to deprivation in autonomy are ordered probit regression coefficients (Xie 1989). This is to say that positive sign means that the probability of experiencing poor levels of autonomy is increased when the covariates value increases.

With respect to disability, the structural parameters for impairments and path coefficients for exogenous variables are reported in Table 4. In order to facilitate explanation, only standardized coefficients are presented. The interpretation of these coefficients is not straightforward, since both continuous and dummy variables are used. The value for latent and continuous variables explains the amount of standard deviation change in the dependent variable for one standard deviation change in the predictor. The coefficient for dummy variables explains the level of standard deviation change from 0 to 1, for instance male to female. Given the categorical nature of our dependent variable, the standardization is done with respect to the variance of the underlying continuous latent response variable.

Glob has the larger impact on poor autonomy. The association is fairly high. However, the value of the coefficient reveals that some people who suffer from global impairment do not experience autonomy problems or vice versa.

Since the residual factors of the nested model capture the degree to which people suffer only from one kind of heath problem, the structural effects of the remaining impairments have comparative lower values. R_Phys is positively and significantly associated with poor level of autonomy. On the reverse, R_Cogn does not have a statistically significant effect on the probability of lacking autonomy. That is not to say that cognitive function is not disabling at all. This could mean that having only cognitive problems is not significantly associated with worse autonomy, controlling for global impairment and exogenous variables. Since the outcome variable captures a subjective dimension, it might also be that mentally impaired people do not perceive themselves as individuals with comparative lower levels of autonomy (Sen 1985b).

The two latent variables of emotional performance have both a significant and positive impact on the probability of achieving poor autonomy. This finding supports the idea that psychological wellbeing is an important factor in causing disability (Bruce 2001), even when comes without any other health problems. R_Motiv has a comparative larger impact. Since lack of motivation can be seen as a particular deficiency in achieving interesting things, the greater effect of R_Motiv on autonomy may be due to the fact that the two indicators measure similar concepts.

Considering personal characteristics, age and gender have a statistically significant large positive impact on the probability of having autonomy problems. Medical condition has no direct effects on the probability of experiencing poor autonomy. Rather than directly influencing autonomy, the disease burden and being female impact disability only indirectly via the impairments (Fuscaldo 2010). Living alone, and thus lacking intra-household support, exacerbates the impact of given impairments on autonomy problems.

The effect of private resources goes in the expected direction. They are a crucial dimension in protecting elderly people from severe impairments (Fuscaldo 2011) and have a significant and negative direct impact on the probability of experiencing poor levels of autonomy. Hence, the results seem to confirm that private resources are an important factor to take into account when the connection between impairments and disability is examined.

Macro-regional dummies are not statistically significant or particularly informative, expect for South. Living in the Southern part of the country has a positive impact on lower levels of autonomy. Finally, living in a rural area is positively associated with the probability of experiencing reduced achievements.

Disaggregating by age and gender

If the previous findings consider the entire Italian sample, a further purpose of the analysis is to shed more light on the complex interrelation between disability, impairments, private resources, personal characteristics and external circumstances. In fact, we are interested in understanding if and how the consequences of impairments on autonomy differ among homogenous sub-groups of population and what is the role played by exogenous variables in each particular process.

In order to do so, the sample is disaggregated into different population sub-groups. The small number of observations allows just for a disaggregation into four sub-groups divided by gender and age: "younger old men", "younger old women", "older old men" and "older old women"[15]. The disaggregation is possible due to the fact that Fuscaldo (2010) has already demonstrates that the relationship among the different indicators of impairment is independent of gender and age.

With respect to disability of the four separated models, Table 5 reports the structural parameters for impairments and path coefficients for exogenous variables. *Glob* has a stronger impact on poor autonomy among women, considering both "younger" and "older old" individuals. This impact is partially driven by the higher scores of Glob among women. R_Phys is significantly associated with deprived levels of autonomy only among "younger old" Italians. This is probably because "older old" individuals tend to have several impairments at the same time and only physical problems might not significantly decrease their probability of perceiving lower levels of autonomy. On the other hand, among "younger old" respondents, who usually cope in a lesser degree with global problems, physical impairments are disabling even when come alone. R_Cogn follows the

[15] "Younger old" individuals are those who are less than 65 years old. Accordingly, "older old" adults are those with more than 64 years. The rationale is to divide the people who are still working from those who are already retired (Knesebeck et al. 2007)

same path observed for the entire sample. These results are a further warning about the complex relationship between cognitive function and subjective dimensions of autonomy and wellbeing.

R_Affect and R_Motiv are both positively associated with the probability of achieving poor levels of autonomy in all the four sub-groups. The impacts seem to be larger among women and “older old” individuals, even though suffering from affection problems without any other impairment is more common among younger Italians and residual motivational problems are more important among older male (Fuscaldo 2011).

Turning to exogenous variables, wealth is negatively and significantly related to the probability of lacking autonomy only among “younger old”, with a larger absolute value for men. This reveals that private resources have a protective effect merely among younger aged Italians. Under a capability perspective, this suggests that older people are worst off in converting resources into functionings. Concerning other important characteristics, living alone and in rural area are both positively and significantly associated with poor levels of autonomy only among “older old” people, with larger values for women.

Conclusions

The implications and the cause of the disability has always been an important topic in the research community and among policy makers. Recently, it has been strongly emphasised that a capability perspective might be required when studying impact of impairments on disability.

Following the capability framework, the paper reported the findings of an analysis of the connection between impairments and disability among elderly Italians, using Structural Equation Modelling. A latent structure of impairments was used in order to include disability as a dependent outcome in a causal model, where private resources, personal characteristics and external circumstances were modeled as exogenous variables.

Three elements of innovation have been put forward. First, disability was places at the level of achievement functioning and defined as a lack of autonomy, moving away from standardized classification of disability. Secondly, impairments were measured with a nested model, which took into account that the aspects of human performance overlap in some respect due to the multidimensionality of health and human performance. Finally, the sample was aggregated into four sub-groups of population in order to explore differences in relationship between impairments, disability and exogenous causes.

The findings have several important implications which provided support for the use of a capability perspective to study disability. Considering the entire sample level, the factor of global impairment had the strongest impact on poor levels of achieved autonomy. As

expected, the residual factors, which measure the extent to which people are exposed to only one type of impairment, had weaker associations with the outcome variable. The non-significant impact of the cognitive residual construct on autonomy was actually unexpected and deserves further investigations. Other studies reported a cross-sectional and longitudinal relationship between cognitive impairments and some measures of independence (Braungart et al. 2007). The less restrictive definition of disability might reveal a different connection between cognitive problems and disability. However, it might also be that the subjective question used for autonomy failed to capture high deprived situations (Sen 1985b), such as large levels of mental disorder. Research that focuses on disability arising from emotional problems was less extensive (Bruce 2001). Our results showed that lack of emotional well-being can be disabling even though is not combined with other impairments. Lack of motivation had a larger effect on the probability of experiencing poor levels of autonomy than usual symptoms of affective suffering (depression, irritability, restlessness etc), probably because part of planning life concerns enjoyment and meaningful activities.

By aggregating the population into four sub-groups by age and gender, the estimates showed that the effects of impairments on autonomy were constantly higher among women. The non-significant effect of the physical residual factor for “older old” individuals was not surprising. That is not to say that physical problems are not disabling at all among older people, but rather that suffering only from physical limitations might not be perceived as such by people with greater age. On the contrary, among younger people, who usually cope with minor global problems, experiencing only physical limitations had a significant disabling effect.

The effect of private resources is often neglected by the applied research on disability. Even the ICF, the WHO newest theoretical framework, does not specify any role for them. At the sample level, higher amount of wealth had a protective effect on poor levels of autonomy, pointing out private assets as a crucial mean to release the effect of impairments. However, considering the four sub-groups of population, private resources played a significant role only among “younger old” Italians and were more important for men. Under a capability perspective, the findings seemed to indicate that “older old” people were more vulnerable for two reasons. Firstly, aging process was connected with larger impacts of impairments on disability. Moreover, individuals with greater age were worst off in converting resources into ability of achieving autonomy. Considering other important exogenous predictors, living alone and in a rural area had positive impacts on disability. However, the aggregation into four sub-groups of population pointed out large gender and age differences. Both indicators were statistically significant among “older old” individuals, with larger positive values for women.

The reported analyses are by no means the final step and must be validated and complemented using longitudinal and cross-national data. It has been shown how

different impairments interact with private resources, personal characteristics and environment circumstances at a moment in time. However, it is also important to add the time dimension and look carefully at the longitudinal impact of the nested latent construct. Moreover, in a capability perspective cross-national analyses are needful to examine the role played by available national public resources. If so, cross-cultural and longitudinal comparisons will be left for future investigations. The present study contributed to our knowledge that autonomy of doing the things that we want to do can be used as non-standard indicator of functioning related to disability. Impairments have distinct effects on disability among sub-groups of population. Finally, resources, personal characteristics and external circumstances interact differently in the singular process of functioning achievement.

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Graphs and Tables

Graph 1. Interrelationships among constructs in our conceptual scheme

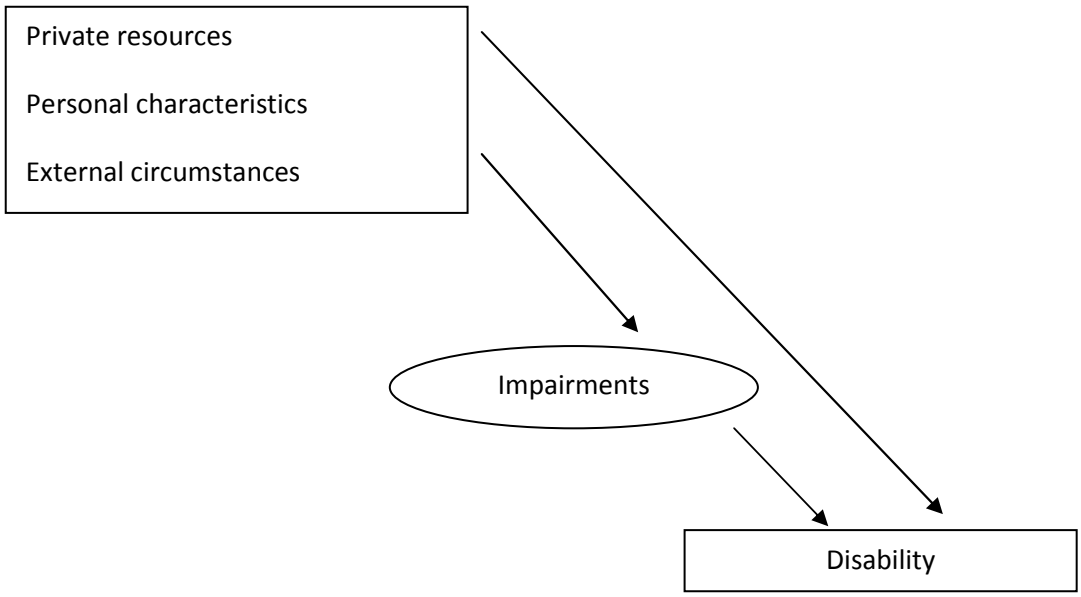

Table 1. Descriptive statistics: impairments

Impairments (continuos 0 -1)	Mean	Standard Deviation
Global health problems	0.30	0.20
Rresidual physical health problems	0.45	0.15
Residual cognitive health problems	0.30	0.16
Residual affective health problems	0.38	0.19
Residual motivational health problems	0.16	0.09

Table 2. Descriptive statistics: personal characteristics, external circumstances and private resources

Attribute	Percent	Number
Gender		
Men	45.1	1292
Women	54.9	1579
Household composition		
Living with the spouse or partner	74.7	2153
Single adult	25.3	718
Medical condition		
No condition	21.1	603
At least one mild chronic condition	56.4	1607
At least one severe chronic condition	22.5	661
Area of residence		
Urban area	62.2	1780
Rural Area	38.8	1091
Macro-region		
North-East	23.8	690
North-West	22.1	631
Centre	22.9	660
South	31.2	890
	Mean	Standard deviation
Age (continuous)	64.6	9.7
Loq wealth (continuous)	10.8	1.56

Table 3. Autonomy by exogenous variables

"How often do you think that you can do the things that you want to do?"

	Often	Sometimes	Rarely	Never
Total	32.19	25.67	27.45	13.69
Age				
Less than 64	39.77	28.91	23.92	7.41
65+	27.25	22.75	30.64	19.36
Gender				
Male	35.19	26.68	26.68	11.45
Female	29.56	24.84	28.07	17.53
Household Composition				
Living with others	34.73	26.57	27.08	11.62
Living alone	26.43	21.70	29.06	22.83
Area of Residence				
Urban area	37.66	23.87	25.82	12.66
Rural village	24.67	27.90	29.46	17.96
Wealth				
1° tertile	25.00	24.47	31.01	19.51
2° tertile	33.06	25.65	27.53	13.76
3° tertile	41.39	26.87	23.86	7.88

Table 4: Predictors of autonomy: ordered probit estimates (full sample)

impairment (continuos)	
Glob	0.45***
R_Phys	0.10**
R_Cogn	0.04
R_Affect	0.12***
R_Motiv	0.20***
Gender (ref = man)	0.09***
age (continuos)	0.11***
household composition (ref. = living with spouse/partner)	
Single-adult	0.09**
medical condition (ref. = No chronic conditions)	
at least one mild medical condition	0.03
at least one severe medical condition	0.05
wealth (continuos)	-0.07***
area of residence (ref. = urban area)	
rural village	0.12***
macro- region (ref. = North-East)	
North-West	0.04
Centre	0.03
South	0.11**
Constant	**1.14*** **
Observations	**2871**
R-Squared	**0.25**

Note: Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 5: Predictors of autonomy divided by four subgroups of population: ordered probit estimates

	Younger old men	Younger old women	Older old men	Older old womem
impairment (continuos)				
Glob	0.22***	0.39***	0.44***	0.56***
R_Phys	0.10***	0.12***	-0.02	-0.04
R_Cogn	0.02	0.03	0.01	0.01
R_Affect	0.12***	0.13**	0.15***	0.18***
R_Motiv	0.15***	0.19***	0.18**	0.21***
age (continuos)	0.01	0.04*	0.12***	0.06**
household composition (ref. = living with spouse/partner)				
Single-adult	0.03	-0.01	0.08**	0.10***
medical condition (ref. = No chronic conditions)				
at least one mild medical condition	0.03	0.04	0.03	0.02
at least one severe medical condition	0.04	0.01	0.05	0.01
wealth (continuos)	-0.09**	-0.06**	-0.03	-0.01
area of residence (ref. = urban area)				
rural village	0.04	0.03	0.10***	0.14***
macro- region (ref. = North-East)				
north-West	0.02	0.04	0.03	0.01
centre	0.02	0.03	0.01	0.03
south	0.07***	0.05***	0.19***	0.17***
Constant	2.38***	1.41***	0.44*	1.32***
Observations	**551**	**812**	**742**	**766**
R-Squared	**0.188**	**0.197**	**0.295**	**0.333**

Note: Significance levels: * p<0.1, ** p<0.05, *** p<0.01.