Socioeconomic determinants of inequality in life expectancy of people over 60 after retirement in Italy, estimates from AD-SILC dataset.

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Abstract

Objectives: To verify the persistence and estimate the magnitude of the differences in life expectancy of over-60 after retirement in Italy according to socioeconomic position.

Data: IT-SILC sample at baseline data collection in 2005 counts 11281 individuals over-60, 5752 females and 5529 males. Individuals are followed up for 4 years, until 31st December 2009, by a linkage with administrative data from the Italian National Social Insurance Agency (INPS).

Design: Survival analysis based on a Cox proportional risk model and Kaplan-Meier simulations of hypothetical individuals adjusted by a Brass relational model. According with Goldthorpe scheme of working relations and Brunner&Marmot accumulation risk theory, socioeconomic position index is derived by different available proxy variables on IT-SILC data and on INPS data.

Main outcome measure: Time at death or censored data. Entry time is derived by age of individuals in 2005 at baseline, exit time is derived by age at death officially registered by INPS. All individuals still alive at 31st December 2009 are considered censored.

Results: Italians present a significant inequality in life expectancy after retirement. Cox model estimates show that previous kind of job has a significant and relevant impact, even controlling by household wealth condition, education, marital status, sex and age, according with the Goldthorpe social class scheme based on the "working relations". Kaplan-Meier simulations adjusted by a Brass relational model show a difference of almost 5 years between the life expectancy of low-paid workers and the life expectancy of wealthy business owners.

Conclusion: Socioeconomic inequalities in life expectancies due to working relations persist in old age and specifically after retirement in Italy. Because the Italian social insurance system establish an age at retirement that is the same for all, this implies a substantial degree of redistribution of lifetime and wealth from working class to professionals and owners class.

Introduction

Life expectancy has increased around the western world during nineteenth and early twentieth centuries, but, at the same time, inequalities have increased between and inside countries (*Ziglio E. 2012, Crimmins et al. 2011, Marmot M. 2006, Mackenbach JP et al . 2003, Shaw et al. 2000, Bobak M. & M. Marmot 1996*), with the consequence to show, at the beginning of the twenty-first century, a significant unequal situation. The territory of European Union, for example, presented in 2012 average differences between countries of the order of about 4 years, and peaks of over 13 years .

Moreover, the significant general decrease of mortality in recent decades has not distributed equally among the population, and those countries where these inequalities were wider, had after a slower increase or a stagnation of life expectancy, also in presence of economic growth (*R. Wilkinson & Pickett K. 2009, R. Wilkinson & Pickett K. 2006, Wilkinson 2006, De Vogli et. al. 2005, Ross et. al. 2005*). The

social gradient in health is a remarkably widespread phenomenon, but this social gradient in health is not confined to those in poverty. It involve the whole society, from the top to the bottom, with less good standards of health at every step down the social hierarchy. Many studies investigated the existence and the magnitude of this social gradient, using different ways to identify the "social position": education, wealth, employment type and grade.

Both major international organizations such as the WHO (*World Health Organization - Commission on Social Determinants of Health from 2005 to 2008, WHO Europe 2003*), and numerous socio-demographic studies have indeed identified in the social determinants of health and survival the "cause of causes" of the growing inequalities in the health of populations among the most advanced nations of our century (*R. Wilkinson & Marmot M. 2006, Whitehead M. 1998*).

Dangerous behaviors for health, such as alcoholism, smoking or obesity, are not in fact randomly distributed among the population but tend to concentrate in certain social classes and in the most unequal society (*Maynard M. et al. 2005, WHO 2004 , Langenberg C. et al., 2003, Bobak et al., 2000, J. Wardle et al. 1999 Erens, H & Primatesta P. 1999 M. Nelson 1999 B. Gill et al. 1996 Bridgwood A. et al . 1995*). At the same time the effects of these dangerous behaviors have a different impact on health: stronger for lower social classes, such as workers and employees, fewer for others, such as managers and highest social classes (*Hallqvist J. et al. 2004, Holland P. et al. 2004, Marmot et al. 1997, Bartley M. & C. Owen in 1996, Sinfield RA 1981*). This determines that those individuals who have suffered a disadvantage in the past (economic, social or physical) are much more at risk of further damage of greater intensity in the future than any other: a phenomenon that goes by the name of "chain disadvantages "(*Blane D. et al. 1997, Davey S. 1997*)

However, despite the importance of the studies on mortality differences by socio-economic status (Valkonen 2006) and several efforts to study it in Italy (*Caselli G. et al. 2003, 2011, Maccheroni C. 2006, 2009, Lipsi R.M. & Tomassini C. 2009, Costa G.& d´Errico 2005, Leombruni et al. 2010*) , it is still far away to reach a complete knowledge on such themes in Italy today, especially for retired people.

This argument has become even more important in Italy after the pension reforms of the ´90ies that progressively extended the legal age at pension, linking this with the Italian life expectancy, without taking barely into account the effects of differential mortality and on the design of the system of public pension (*Maccheroni 2006*). This has lied to create a public retirement system with serious risk of inequity deriving from a "substantial degree of redistribution from high-mortality groups (typically characterized by low income and low wealth) to low-mortality groups (typically characterized by high income and high wealth)" (*Caselli G. et al. 2003*).

Indeed, until 1991 existed a dataset based on the linkage of deaths and the italian census data, elaborated by Istat (Italian National Statistical Institute) but, since Istat stopped linking census data with the deaths that occurred in successive months by education and occupation after the census of 1991, it become necessary to find other ways to estimate mortality by social class for the Italian retired population.

One way (*Costa & d´Errico 2005, Belloni et al. 2013*), is to use the public pension and retirement registers, but, because of lack of information about complete work histories and other important socio-economic as education level or marital status, the study presented serious weaknesses. In order to overcome these shortcomings it was further realized a dataset to merge by record-linkage census and retirement registers data, although limited to the city of Turin (*Rosso et al 1997*) and to the Piedmont region (*Mamo et al. 2005*), with the evident weakness of results referred only to local populations.

Another way to attempt to bridge this gap of knowledge from a macro perspective is just to correlate the deaths rates of Italian or local population with socio-economic and other variables (*Caselli G. & Egidi V. 1981, Michelozzi P. et al 1999, Caselli G. & Reale A. 1999, Materia E. et al. 2005, Maccheroni 2006*). The main weak point of these macro methods is the so-called "ecological fallacy", that is the aggregate-level relationship between socio-economic status and the mortality of populations in specific areas may be quite different from the individual-level association between such variables.

At least another way is to use indirect estimate methods, a classical solution to solve the main problem of lack of specific information (*Luy et al. 2011*)

The present study tried to overcome some of the described limitations in measuring the significance and the magnitude of socio-economic determinants of mortality in Italy. We provided on this argument specific information for the Italian retired population confirming the persistence of a social gradient of health even after retirement, as expected in according with the chain of disadvantage theory. Using an innovative dataset ("*AD-SILC", elaborated under the supervision of prof. Raitano M. 2013*) derived by a record linkage between the IT-SILC sample at 2005 and administrative data from the Italian National Social Insurance Agency (INPS) it has been possible to apply a survival analysis on a sample of Italian over 60 followed for 4 years, from 2005 to the 31st December of 2009, last time available.

Further analysis, using Kaplan-Meier simulations of a hypothetical individual, adjusted by a Brass relational model, allowed estimating the difference in life expectancy after 60 according to different socioeconomic position.

Data and methods

AD-SILC dataset has been built to follow up working histories of Italian people as registered by the archives of INPS and link them with the variables of IT-SILC survey, using a deterministic record-linkage via tax code. AD-SILC is a fruit of the cooperation between University of Rome "La Sapienza", the Italian Ministry of Treasury and the statistical office of INPS. It has been elaborated under the supervision of Prof. Michele Raitano.

AD-SILC links participants at IT-SILC survey at 2005 with individuals present in INPS archives at the same year. In this way is possible both to know the working history of an individual before 2005 and follow up them until 31st December 2009. INPS archives records, every year, change in job status, retirement status and, potentially, death.

Working histories provide information on type of job, redundancy fund periods, unemployment periods, type of pension, and amount of pension. However, this last information has been not taken in consideration because of some data inconsistencies due to different administrative rules relatives to different kinds of jobs.

INPS manages different retirement funds. Each fund is reserved to some kind of people. For example the oldest fund is the "Retirement Fund for Workers and Employee" that collects every months a share of worker salaries and provide a pension to them when legal pension age has reached. Similarly, professionals, business owners, farmers, self-employed, artisans, have their own funds, but payment of shares follows a different way, and the shares are even lower. Thanks to these monthly payments and of these administrative divisions inside INPS, it is possible to follow the individual working history and its changes.

People linked at 31st December 2005 between IT-SILC and INPS registers, aged 60 or more are 11281, 5529 males and 5752 females.

In addition to basic variables such as sex, age and potentially age at death, information provided by INPS working histories are combined following the accumulation risk theory, summarizing at the baseline the working longitudinal information registered before 2005, for example the years "exposed" to a specific retirement fund are used to identify the prevalent job position on the whole life-course.

On the other hand, IT-SILC provided information on household wealth condition, marital status, and education level.

Applying a Cox proportional hazard model it has been possible to estimate significance and magnitude of the effects of different variables on differential mortality in retired people aged 60 or more. Main outcome measure of the model is the time at death or censored data. Entry time is derived by age of individuals in 2005 at baseline, exit time is derived by age at death officially registered by INPS. All individuals still alive at 31st December 2009 are considered censored.

In order to allow easier comparisons, the study provide also differences in life expectancy of different hypothetical individuals with defined socioeconomic characteristics, according with Cox model results. A Kaplan-Meier survival curve, adjusted with a Brass relational model, has computed using the Kalbfleish-Prentice method and the Cox hazard coefficients, in order to simulate the survival curve of the hypothetical person.

Results

Estimates from Cox model show significant and sizable coefficients for socioeconomic position variables and prove the persistence of a social gradient in life expectancy for retired aged 60 or more (Table 1). Moreover, former type of job keep a relevant and significant impact on differential mortality, even controlling by household wealth condition and education level, according with Goldthorpe scheme of social classes based on the working relations.

Had had a working history prevalently inside the Working Fund imply mortality risks that are 30% higher with respect to the Business owner and Owner Fund ($p<0.01$), and 20% higher with respect to the Artisans and Farmers Fund ($p<0.05$). This confirm also the Goldthorpe social class scheme, where more subordinate are the working condition of a person, lower are health conditions and higher the mortality risks.

Finally, survival curve of some hypothetical individuals are simulated, and then computed the relative life expectancies (Table 2).

At the extreme ends of the picture in table 2, are the hypothetical manual low-paid worker, with a life expectancy at 60 of 18.75 years, and the hypothetical rich owner or business owner, with a life expectancy at 60 of 26.01 years. A difference between the two extremes of almost 5 year.

Reference variable	Variable	Coefficient	Exp(coef)	Se(coef)	z	Pr(>|z|)	significance
Male	Female	-0.68714	0.50301	0.0765	-8.986	< 2e-16	***
Primary school or none	Secondary school	-0.15406	0.85722	0.1046	-1.735	0.0828	.
Married	Divorced	0.47489	1.60784	0.2553	1.86	0.06288	.
Retirement Fund for Workers and Employee	Agricultural workers	-0.20566	0.81411	0.123	-1.672	0.09452	.
	Artisans	-0.22975	0.79474	0.1164	-1.973	0.04844	*
	Owners and Business owners	-0.36241	0.696	0.132	-2.746	0.00603	**
	Farmers	-0.22439	0.799	0.0946	-2.371	0.01774	*
Household ability to make ends meet: "With great difficulty"	"With some difficulty"	-0.27285	0.7612	0.0968	-2.819	0.00481	**
	"Fairly easy"	-0.2528	0.77662	0.1114	-2.269	0.02329	*
	"Easily"	-0.49988	0.60661	0.1876	-2.665	0.00771	**
	"Very easily"	-0.86191	0.42236	0.5082	-1.696	0.08985	.
Retirement pension	Disability pension (due to work injuries)	0.40464	1.49877	0.0994	4.069	4.72E-05	***
	Disability pension	1.24969	3.48925	0.1212	10.315	< 2e-16	***
	Unemployment benefits/ pension	0.34768	1.41578	0.2002	1.736	0.08251	.

Table 1. Coefficients estimated from Cox proportional hazard model.

Life expectancy at 60

Household wealth	INPS Retirement Fund				Italy
	Workers	**Farmers**	**Artisans**	**Business owner**	**-**
poor'	18.76	20.23	20.27	21.11	21.4
average'	20.54	21.94	21.97	22.77	21.4
rich'	24.07	25.29	25.32	26.01	21.4

Controlling by: Sex= male; Education level = Primary or none; Marital status= Married; Type of pension = Retirement pension

Table 2. Results from simulated survival curve of some hypothetical individuals defined by different socioeconomic positions.

Conclusions

Socioeconomic inequalities in life expectancies due to working relations persist in old age and specifically after retirement in Italy. Main result of this study is that Cox coefficients of former type of job, based on INPS working history, keep significance and sizable impact on mortality risk of over 60, even controlling for education and household wealth. This confirm the persistence of the Goldthorpe scheme of social classes based on working relations even after retirement.

Life expectancies of Italian retired present remarkable differences up to 5 years between a hypothetical low-paid worker and a wealthy business owner.

Moreover, the present study has not considered people positioned at the top of the Goldthorpe scheme, as managers and big businessman, because most of them are out of the INPS system. At same time is important to take in mind that long run unemployed and disable (due to work injuries) present mortality risk even higher, as shown in table 1.

Because the Italian social insurance system establish an age at retirement that is the same for all, this implies a substantial degree of redistribution of lifetime and wealth from working class to professionals and owners class.

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