SIS | 2022

51st Scientific Meeting
of the Italian Statistical Society

Caserta, 22-24 June

Università degli Studi della Campania *Luigi Vanvitelli*

Società Italiana di Statistica

www.unicampania.it

Book of the Short Papers

Editors: Antonio Balzanella, Matilde Bini, Carlo Cavicchia, Rosanna Verde

Città di Caserta

1222-2022 800 ANNI

UNIVERSITÀ DEGLI STUDI DI PADOVA

DIPARTIMENTO DI SCIENZE STATISTICHE

STATA

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Pearson

PUBLISHED BY PEARSON

WWW.PEARSON.COM

ISBN 9788891932310

Increasing Inequalities in Mortality by Socioeconomic Position in Italy

Aumento delle diseguaglianze di mortalità per posizione socioeconomia in Italia

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Abstract This article assesses the evolution of socioeconomic inequality in life expectancy and mortality in Italy adopting measures of individual socioeconomic position based on income and occupational social class.
The analysis uses a large social security administrative dataset covering the population of private sector employees in Italy for the years 1990-2019 and the population of private and public sector workers from the census of the city of Turin (Italy) for the years 1981-2019. Life table techniques are used to estimate life expectancy at 65 years by different income quantiles and occupational classes. Cox regression analyses are performed to calculate the effect of socio-economic position on mortality controlling for several individual and contextual factors.
We find that inequalities in longevity have increased in recent decades. The redistributive implications are considerable since pension rules based on the average life expectancy in the population implicitly induce a regressive redistribution of pension resources.
Abstract *L'articolo stima l'evoluzione nel tempo delle disuguaglianze sociali nella longevità in Italia adottando misure di posizione socioeconomica basate su reddito e classe sociale professionale.*
L'analisi utilizza dati amministrativi relativi alla popolazione dei dipendenti del settore privato per gli anni 1990-2019 e alla popolazione dei lavoratori del settore

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privato e pubblico dal censimento della città di Torino (Italia) per gli anni 1981-2019. L'aspettativa di vita a 65 anni per diversi quartili di reddito e classi occupazionali è stimata tramite le tavole di mortalità. Analisi di regressione di Cox vengono eseguite per calcolare l'effetto della posizione socioeconomica sulla mortalità controllando per numerosi fattori individuali e contestuali.
Troviamo che negli ultimi decenni le disuguaglianze di longevità sono aumentate. Le implicazioni redistributive sono rilevanti in quanto la presenza di regole pensionistiche basate sull'aspettativa di vita media nella popolazione induce implicitamente una redistribuzione regressiva delle risorse pensionistiche.

Key words: Mortality, Inequality, Socio-economic position, Income, Occupational class, Pension system.

1 Introduction

Life expectancy inequalities do not only rise public health concerns, but they also have important consequences in terms of redistribution and equity of pension systems (e.g. [1,2,3,4,5]). Life expectancy deterministically translates in the number of years of retirement, and it is a key parameter used in pension rules. In countries adopting automatic adjustment mechanisms, life expectancy determines the pension benefits as in notional defined contributions-based systems, or the eligibility conditions, in countries like Italy, where raises in average life expectancy automatically translate into equal rises in the eligibility conditions. However, while pension rules focus on the average life expectancy in the population, important differences exist between social groups as more disadvantages categories display systematically lower life expectancy. Hence, pension systems may induce a regressive redistributive mechanism by ignoring the longevity differences across socio-economic groups.

In this work, we present updated evidence on the evolution over the last 30 years of socio-economic differentials in mortality inequality and in life expectancy at 65 in Italy, controlling for individual and contextual factors. Moreover, we exploit comprehensive administrative data from INPS, the Italian National Institute of Social Security, which covers the population of private sector employees, offering highly precise and nationally representative estimates based on the entire population rather than on samples limited to specific subpopulation or geographical areas. Our estimates are based on individual rather than aggregated data, providing very accurate measurements of socio-economic position (SEP) whereas most of previous studies on the evolution of longevity inequalities adopted measures of deprivation based on aggregated indicators at the level of areas. These are important for delivering evaluations on the longevity divide that can inform policy makers around the revision of retirement eligibility conditions for more disadvantaged categories.

2 Data and Methods

2.1 Data and variables

The empirical analysis exploits the administrative archives of the INPS. This data represents the most complete and up-to-date statistical source of information to study socio-economic longevity differentials among workers. We analyse data on the population of private sector employees registered in the INPS archives for the years 1990-2019. Furthermore, the analysis is replicated and tested on an independent information source, the Turin Longitudinal Study (TLS), a census-based database built on the censuses of the municipality of Turin, one of the four largest cities for population in Italy. For both data sources, it is possible to conduct mortality follow-up by linking administrative records with administrative mortality records up to very recent years, i.e., up to 2019. It should be noted that while INPS data allow obtaining results valid for private sector employees in Italy, the TLS database includes all workers residents in the municipality of Turin, thus offering the opportunity to extend the analysis to autonomous work and public sector too, at the cost of lower national representativeness.

For the analysis on INPS, we observe and select private sector employees in three distinct 5-year periods: 1990-1994; 1995-1999 and 2000-2004 (henceforth, we will refer to them as the "1990", "1995" and "2000" cohorts). For each cohort, we selected only individuals born in Italy, aged 15-95 at the start of the period and with at least one job spell lasting for one month or more. Then, individuals were followed until death or end of the follow-up (after 20 years from the start). By piling up all job spells observed during the 5-year periods, for each separate cohort of workers we were able to construct variables describing their work such as: average weekly wage, prevalent geographical area of work, main sector of activity, main occupational class, main firm size, average labour market attachment (% of weeks worked over the period). For TLS data we sample workers from three different censuses, i.e., 1981, 1991 and 2001.

We use two different SEP indicators. The first is occupational social class, categorized according to the European Socio-economic Classification (ESeC) into three categories: executives, white collars, and blue collars. The second is based on average weekly wage and ranks individuals according to income quartile, calculated separately for men and women. To define weekly wage, we took the sum of reported employment inflation-adjusted earnings divided by the total number of weeks worked and constructed an average weekly wage over the 5-year window for every given cohort.

2.2 Methods

Specific mortality rates were calculated for five-year age classes, sex, income, occupational class, and cohort as the ratio between the number of individuals who died in the age interval and the total population-years at risk in that age interval. Subsequently, we constructed abridged life tables using 5-year age intervals with a final age interval of 85+ to estimate life expectancy and confidence intervals (CIs) using the method described by [6], with standard errors formulas proposed in [7]. In the analysis, we focus on life expectancy at an age approaching statutory retirement age, i.e., at 65 years. The differential is computed as the difference in life expectancy between the highest-SEP and lowest-SEP group.

We complement the life expectancy analysis by estimating a set of Cox regression models on the INPS data to assess how the hazard rate (HR) of mortality for the lowest-SEP compared to the highest-SEP group changed over time controlling for work and individual characteristics. The models include two separate measures of socio-economic position simultaneously (occupational class and income quartiles) while adjusting for the following covariates: age (linear and transformed in logarithmic), macro-region of birth (5 categories), macro-region of work (5 categories), economic activity (4 ISIC categories), an indicator of work intensity constructed as the proportion of weeks worked over the 5-year window (divided in tertiles) and firm size (3 categories).

3 Results

3.1 Life expectancy in Italy by socio-economic position

Figure 1 plots the gap in life expectancy at 65 measured between the top and bottom SEP categories in the three cohorts of 1990, 1995 and 2000 using two measures of SEP: occupational social class (panel A) and income quartiles (panel B). The results show that the advantage of life expectancy in favor of workers in high socio-economic groups has increased significantly with time, regardless the indicator adopted, in both genders, although with more pronounced life expectancy gaps found among men. Being more precise, comparing individuals of different occupational class (panel A), we observe that 65-years old male executives could expect to live 1.33 years more than blue collars in 1990 (95% CI 1.23, 1.43) and this gap raised to 2.0 years in 2000 (95% CI 1.90, 2.11). Among women too it is possible to detect a significant increase with time, as the gap was null in the 1990 cohort but positive and significant in the 2000 cohort.

The divide in life expectancy at 65 widened also among individuals of different income levels. Focusing on income quartile (panel B), among men in the lowest 25% of the income distribution, the life expectancy disadvantage increased over the last 30 years, raising from 1.09 years in 1990 to 1.79 years in 2000. Women of different income groups had equal life expectancy at 65 in 1990 while a small but significant advantage of about 2 and 4 months for the richest quartile emerged in the 1995 and in 2000 cohort, respectively.

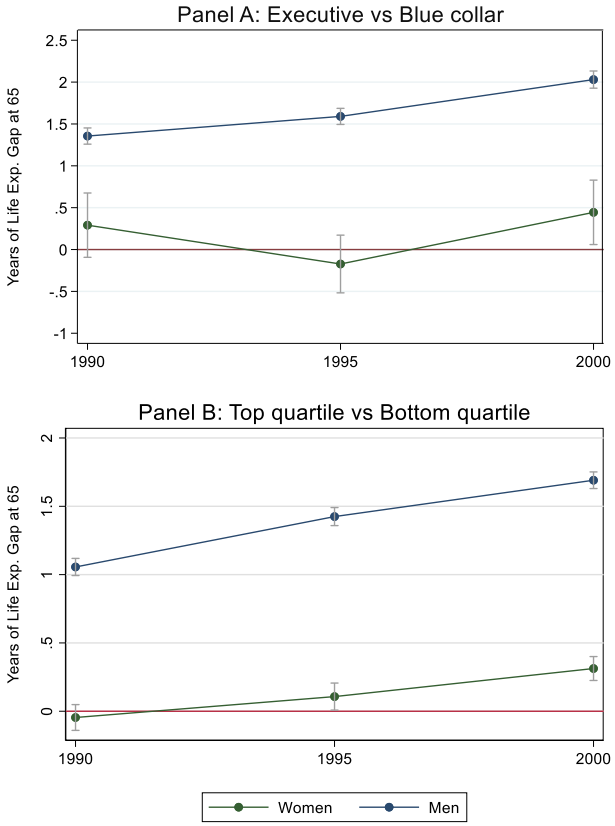

Figure 1: Evolution of the difference in life expectancy at 65 by SEP (highest SEP - lowest SEP), by sex and different SEP measures. Source: INPS data

3.2 Regression analyses on mortality

Regression results are substantially consistent with the findings from the life expectancy analyses, indicating that the socio-economic gradient in mortality

became stronger in the most recent cohorts also when adjusted for several individual and work-related characteristics. Table 1 presents gender-specific HRs and 95% CIs from Cox regression models predicting mortality by SEP in the 1990, 1995 and 2000 cohorts separately, controlling for age, region of birth and several work characteristics. The analysis is mutually adjusted for the two SEP indicators used in the previous section, i.e., occupational social class and income quartile. Mortality follow up is 20 years for all the cohorts.

Focusing on occupational social class, results show a clear time trend in inequality in mortality for both men and women: the HR of mortality for blue collars compared to executives, increased with time, raising from 1.128 (n.s.) to 1.663 ($p<.001$) for men (panel A) and from 1.051 (n.s.) to 1.175 ($p<.001$) for women (panel B). Income inequality seems to widen mortality inequality too, as the HR for the lowest income quartile raised for both men and women comparing the 1990 and 2000 cohorts.

Table 1: Cox model of hazard of death in relation to SEP and other individual characteristics, stratified by sex and cohort

	Panel A: Men		
	1990	***1995***	***2000***
	HR/ci95	*HR/ci95*	*HR/ci95*
Occupational Class:			
Blue collars	1.128	1.307*	1.663***
	[0.880,1.447]	[0.993,1.720]	[1.203,2.298]
White collars	1.069	1.147	1.327*
	[0.839,1.363]	[0.879,1.498]	[0.967,1.821]
Executives (ref.)	1	1	1
	[1.000,1.000]	[1.000,1.000]	[1.000,1.000]
Income Quartile:			
First	1.806***	2.040***	1.984***
	[1.545,2.110]	[1.740,2.392]	[1.691,2.328]
Second	1.343***	1.488***	1.471***
	[1.162,1.552]	[1.275,1.737]	[1.261,1.716]
Third	1.180***	1.297***	1.159**
	[1.042,1.336]	[1.132,1.485]	[1.007,1.335]
Fourth (ref.)	1	1	1
	[1.000,1.000]	[1.000,1.000]	[1.000,1.000]
Age	0.963**	0.954***	0.927***
	[0.932,0.996]	[0.924,0.985]	[0.898,0.958]
Ln (Age)	4.178**	7.561***	21.174***
	[1.066,16.373]	[2.059,27.770]	[5.788,77.464]
Work Intensity:			
Low	1.593***	1.734***	1.626***
	[1.403,1.810]	[1.523,1.974]	[1.425,1.855]
Mid	1.422***	1.464***	1.384***
	[1.295,1.560]	[1.324,1.620]	[1.249,1.534]
High (ref.)	1	1	1
	[1.000,1.000]	[1.000,1.000]	[1.000,1.000]
N subjects	3,987,425	4,050,416	4,294,761
N fails	321,452	269,094	238,787
N persons years	77,356,993	78,973,444	84,111,693

(Cont.)

(Cont.)

	Panel B: Women		
	1990	***1995***	***2000***
	HR/ci95	*HR/ci95*	*HR/ci95*
Occupational Class:			
Blue collars	1.051	1.174***	1.175***
	[0.967,1.143]	[1.099,1.253]	[1.086,1.271]
White collars	1.028	1.104***	1.085**
	[0.946,1.117]	[1.035,1.178]	[1.003,1.173]
Executives (ref.)	1	1	1
	[1.000,1.000]	[1.000,1.000]	[1.000,1.000]
Income Quartile:			
First	1.095***	1.156***	1.203***
	[1.071,1.119]	[1.131,1.180]	[1.181,1.226]
Second	1.022*	1.019*	1.039***
	[1.000,1.044]	[0.998,1.039]	[1.021,1.058]
Third	0.999	0.996	0.984*
	[0.980,1.019]	[0.977,1.014]	[0.968,1.000]
Fourth (ref.)	1	1	1
	[1.000,1.000]	[1.000,1.000]	[1.000,1.000]
Age	0.951***	0.960***	0.965***
	[0.946,0.955]	[0.956,0.965]	[0.961,0.969]
Ln (Age)	4.346***	3.455***	3.349***
	[3.633,5.198]	[2.896,4.122]	[2.822,3.975]
Work Intensity:			
Low	1.324***	1.342***	1.415***
	[1.300,1.350]	[1.318,1.366]	[1.392,1.438]
Mid	1.246***	1.216***	1.234***
	[1.227,1.265]	[1.199,1.234]	[1.218,1.250]
High (ref.)	1	1	1
	[1.000,1.000]	[1.000,1.000]	[1.000,1.000]
N subjects	1,984,973	2,406,683	2,808,114
N fails	45,543	52,683	66,317
N persons years	39,378,389	47,760,857	55,700,000

Notes: The table displays HR separately for gender and cohort, adjusted for the displayed covariates. Additional controls not displayed are macro region of birth; prevalent sector of activity; firm size and area of work as described in section 2.2. Source: INPS data. *p < .05; **p < .01; ***p < .001

4 Robustness

To test the robustness of results we performed several checks. First, we replicated the life expectancy analysis on a different administrative dataset, i.e., the Turin Longitudinal Study (TLS). TLS is a prospective study of mortality among persons residents in Turin (the fourth largest city of Italy) censused at the 1981, 1991 and 2001 national population censuses. The results from the analysis of the social differential in life expectancy at 65 on TLS confirm that social inequalities increased substantially among men, where the gap in life expectancy at 65 more than doubled from the 1981 census to the 2001 one. For women, no significant difference in life expectancy emerges in TLS data in all the census cohorts, suggesting that when the reference population encompasses the public sector too, longevity inequality among female workers vanishes.

Furthermore, we assessed the robustness of our life expectancy analysis by modifying the follow up duration, using more cohorts, and adopting a dynamic definition of income quartile. All these robustness tests have confirmed our main analysis showing that longevity inequalities are increasing in Italy (more details are available in [8]).

5 Conclusions

This work revealed that inequalities in life expectancy at 65 and mortality rates between income quartiles and occupational classes are widening among Italian workers.

These results have distributional implications for the pension system, too. As several studies have documented, life expectancy inequality translates into inequality of pension entitlements. In fact, individuals with a lower life expectancy spend less time in retirement and receive less than actuarially fair pension treatments. Hence, it is important for pension policy to establish compensating mechanisms that explicitly consider differential longevity. This is especially important in a pension system in which, as the Italian one, there is an automatic link of pension eligibility to the average life expectancy, an adjustment that in this moment applies also to social groups whose life expectancy is potentially stagnating.

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