

The Role of Household and Individual Income in Shaping Mortality Inequalities in the Elderly Population in Italy¹

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Theoretical focus

Income is a relevant predictor of adult mortality: several studies show that mortality decreases by increasing income level (Martikainen et al. 2001; Mortensen et al. 2016; Chetty et al. 2016; Kinge et al. 2019; Blakely et al. 2004; Bengtsson et al. 2020). This evidence is confirmed also in Italy, although studies usually rely on selected populations (Ardito et al., 2022; Zengarini et al. 2026). Noticeably, the definition of income has an important impact on the analysis of the relationship between economic resources and mortality (Shi et al., 2021). Income can be defined either at household or individual level. The former is a measure of the mean economic resources currently available for each household member, including those who do not perceive any personal income, under the income pooling assumption. The latter reflects both individual resources and standards of living over the life course. In this paper, we analyse economic inequality in mortality on the elderly population in Italy, comparing the effect of these two measures of income.

Data

The analyses are based on an innovative database, gathered by the integration of the Istat Population Register with a module of the Income Statistical Register, i.e., the Income Integrated Database. The Population Register provides demographic information (sex, date of birth, place of residence, marital status, educational attainment) for the resident population, as well as the household composition and the date of death. The Income Integrated Database provides information on taxable and non-taxable incomes, gathered by several administrative data sources (i.e., tax statements and social security data). The integration is carried out at individual level, through a unique pseudonymous individual identification code, centrally assigned by Istat.

The population aged 65 years or above, residing in a household at the end of 2018, is selected (about 13 million of individuals); deaths are observed in 2019, while the individual and household income reference period is the 2018 calendar year.

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Method

Mortality Rate Ratios (MRRs) are estimated by means of Negative Binomial regression models to account for over-dispersion in the data. All regression models adjust for age, marital status, place of residence, household size and educational level as covariates.

Firstly, we compare the relationship between household and individual income and mortality inequality. To this purpose, two independent models are estimated by sex: one includes household equivalised income and the other includes individual income. Household equivalised income is computed as the sum of all household members' individual income, divided by the modified OECD equivalence scale. It is then classified into five classes according to the quintiles of the individual distribution on the total population. Individual income is classified into six classes: five classes according to the quintiles of the individual distribution on the 65+ population, plus one class for individuals without personal income. Both income measures are net of health-related benefits, which are strongly associated with mortality and bias the relationship between income and mortality (Coppola et al., 2026).

Secondly, we investigate if individual income is associated with mortality inequality also within households with similar economic resources. Thus, populations are furtherly stratified into three groups of household income levels: individuals living in (i) low-income households (below the second quintile of the household equivalised income distribution), (ii) medium-income households (between the second and the third quintile of the distribution) and (iii) high-income households (above the third quintile of the distribution). Independent models are estimated for each gender and household income group.

Main results

Preliminary results show a clear gradient between income and mortality in the Italian elderly population, according to both income measures: the lower the income the higher the mortality for both sexes (Table 1). However, mortality inequalities are wider when considering individual income: the MRR of the poorest individuals, compared to the richest, is 1.65 and 1.43, for men and women respectively. When considering household income, the MRRs of the poorest compared to richest are 1.38 and 1.29, for men and women. Furthermore, the analysis on individual income shows that individuals without income experience lower mortality rates compared to those in the richest class (0.68 and 0.67 for men and women, respectively).

When models are furtherly stratified by household income levels, we observe that mortality inequality is still associated with individual income, especially for individuals living in high-income households (Table 2). Thus, individuals with low personal income experience higher mortality than those with high personal income, although they live in households with similar economic resources.

Discussion

In Italy, the elderly population is characterised by income inequalities in mortality, when either household or individual income is considered as a measure of economic condition. Individual income

is associated with wider disparities, possibly because representative of personal life course experiences and past labor market participation (that can also be affected by health-related issues). These individual factors are likely attenuated by the redistribution of income within the household. In fact, when considering household income, representative of current resources each member can rely on, inequalities are flattened, but still relevant. However, individuals living in households with similar economic resources are characterised by mortality inequality associated with the level of their individual income. This suggests that (i) besides economic resources, individual income in old age represents also individual life experiences (e.g., labour force participation, career and lifelong earning ability) that are associated with mortality, and (ii) household income may mask intra-household inequality.

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Table 1. Mortality rate ratios (MRR) with 95% confidence intervals (95% CI) estimated by gender using individual (model 1) and household (model 2) income, according to demographic and socio-economic characteristics. Age 65 years or above, Italy, 2019

Variable	Category	Men		Women	
		Model 1	Model 2	Model 1	Model 2
Age class	75-84	2.62 (2.58-2.67)	2.69 (2.64-2.74)	2.97 (2.92-3.03)	3.02 (2.97-3.08)
	85-94	7.13 (7-7.27)	7.38 (7.24-7.53)	9.8 (9.62-9.99)	10.02 (9.84-10.21)
	≥ 95	14.41 (14-14.84)	14.86 (14.42-15.31)	22.4 (21.86-22.95)	22.95 (22.41-23.51)
Marital status	65-74	1 (reference)	1 (reference)	1 (1-1)	1 (reference)
	Widowed	1.34 (1.31-1.36)	1.35 (1.33-1.38)	1.45 (1.42-1.47)	1.43 (1.4-1.45)
	Other	1.22 (1.2-1.25)	1.25 (1.22-1.27)	1.44 (1.41-1.47)	1.41 (1.39-1.44)
Educational level	Married/Partnership	1 (reference)	1 (reference)	1 (reference)	1 (reference)
	Primary school or none	1.16 (1.13-1.19)	1.22 (1.19-1.25)	1.14 (1.11-1.17)	1.19 (1.16-1.22)
	Lower secondary	1.06 (1.03-1.08)	1.09 (1.06-1.12)	1.04 (1.01-1.07)	1.06 (1.03-1.09)
	Higher secondary	1.03 (1-1.05)	1.04 (1.01-1.07)	1.04 (1.01-1.06)	1.05 (1.02-1.08)
Geographic area	Tertiary	1 (reference)	1 (reference)	1 (reference)	1 (reference)
	North-East	0.94 (0.92-0.96)	0.94 (0.92-0.96)	0.95 (0.93-0.97)	0.95 (0.93-0.97)
	Centre	0.99 (0.97-1.01)	0.99 (0.97-1.01)	1.01 (0.99-1.03)	1.01 (0.99-1.03)
	South	0.99 (0.97-1.01)	0.99 (0.97-1.01)	1.07 (1.05-1.09)	1.06 (1.04-1.08)
	Islands	1 (0.97-1.02)	1 (0.97-1.02)	1.07 (1.05-1.1)	1.06 (1.04-1.09)
Household size	North-West	1 (reference)	1 (reference)	1 (reference)	1 (reference)
	2	0.99 (0.97-1.01)	0.99 (0.98-1.01)	1.03 (1.01-1.05)	1.07 (1.05-1.09)
	3	1 (0.98-1.03)	1.02 (1-1.04)	1.12 (1.09-1.14)	1.16 (1.14-1.19)
	4	1.01 (0.98-1.03)	1 (0.98-1.03)	1.16 (1.14-1.19)	1.18 (1.15-1.2)
Individual income class	1	1 (reference)	1 (reference)	1 (reference)	1 (reference)
	No income	0.68 (0.65-0.72)		0.67 (0.64-0.69)	
	I	1.65 (1.61-1.69)		1.43 (1.4-1.47)	
	II	1.42 (1.39-1.45)		1.23 (1.21-1.26)	
	III	1.29 (1.26-1.32)		1.16 (1.13-1.19)	
	IV	1.18 (1.15-1.21)		1.1 (1.08-1.13)	
Household income class	V	1 (reference)	1 (reference)	1 (reference)	1 (reference)
	I		1.38 (1.34-1.41)		1.29 (1.26-1.32)
	II		1.35 (1.32-1.38)		1.23 (1.2-1.25)
	III		1.23 (1.2-1.25)		1.15 (1.13-1.18)
	IV		1.13 (1.1-1.15)		1.09 (1.07-1.11)
	V		1 (reference)		1 (reference)

Table 2. Mortality rate ratios (MRR) with 95% confidence intervals (95% CI) of the individual income estimated by gender and household income level. Age 65 years or above, Italy, 2019

Variable	Category	Men			Women		
		Low-income households	Medium-income households	High-income households	Low-income households	Medium-income households	High-income households
Individual	No income	0.53 (0.49-0.59)	0.80 (0.7-0.92)	0.89 (0.75-1.05)	0.51 (0.41-0.62)	0.70 (0.63-0.78)	0.73 (0.69-0.78)
	I	1.38 (1.27-1.51)	1.45 (1.38-1.52)	1.53 (1.45-1.61)	1.24 (1-1.53)	1.38 (1.26-1.52)	1.31 (1.27-1.35)
	II	1.22 (1.11-1.33)	1.24 (1.19-1.29)	1.34 (1.29-1.39)	1.11 (0.9-1.37)	1.24 (1.13-1.36)	1.16 (1.13-1.2)
	III	1.12 (1.02-1.22)	1.17 (1.12-1.21)	1.24 (1.2-1.27)	1.03 (0.83-1.27)	1.23 (1.12-1.35)	1.11 (1.08-1.15)
	IV	1.03 (0.94-1.12)	1.07 (1.03-1.11)	1.16 (1.14-1.19)	0.99 (0.79-1.22)	1.18 (1.07-1.3)	1.09 (1.07-1.11)
	V	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)

Note: models are adjusted for age, marital status, place of residence, household size and educational level.