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Descriptive Finding

Gender and educational inequalities in disability-free life expectancy among older adults living in Italian regions

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Abstract

BACKGROUND
Italy's life expectancy at age 65 is one of the highest in Europe, but its disability-free life expectancy (DFLE) is not so high. To understand this diverging pattern of longevity and health it is essential to consider indicators accounting for both mortality and morbidity, and to analyse the gender, social, and geographical inequities characterising them.

OBJECTIVE
The aim is to quantify the gender, social, and geographical inequalities in DFLE among Italian older adults and analyse the age-specific contribution of mortality and morbidity to those inequalities.

METHODS
This study draws on census-linked mortality data and disability prevalence for the years 2012–2014. DFLE at age 65 in Italian regions is computed by gender and educational attainment using the Sullivan method. Age-specific mortality–morbidity contributions to the gender and educational gaps in DFLE are calculated using the stepwise decomposition method.

RESULTS
Although at the national level older women and men share similar DFLE, these estimates hide important geographical and social inequalities. Women's health disadvantage completely outweighs their life expectancy advantage, resulting in lower DFLE. Educational inequalities in health are far more dramatic than those in mortality and the disadvantage in DFLE accumulates over education and region of residence.

CONCLUSIONS
In Italy notable differences in DFLE are found between genders and between educational groups, suggesting the need for better health policies aimed at reducing inequalities.

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CONTRIBUTION

This study provides novel empirical findings on gender, educational, and geographical inequalities in DFLE for Italian older adults and explains how age-specific mortality and morbidity contribute to shaping these inequalities.

1. Introduction

Steady increases in life expectancy and longevity have been predominant features of the demographic change worldwide (Oeppen and Vaupel 2002). In this context, Italy ranks among the European countries with the highest life expectancy at both birth and at age 65. In 2019 Italian women placed fourth, behind Spain, France, and Switzerland, with a life expectancy of 22.9 years at age 65. Italian men ranked sixth, only a half-year gap from Switzerland, which ranked first (20.3 and 19.7 years of life expectancy at age 65 in 2019 respectively) (Eurostat 2022). There is an ongoing debate on the consequences of (population) ageing for population health (Fries 1980; Gruenberg 1977; Manton 1982). Understanding whether increased life expectancy is complemented by the improvement in the health conditions of those who reach older ages is crucial. Disability resulting from functional limitations is one of the most important dimensions of morbidity to consider in ageing populations such as the Italian one. It determines whether people at older ages can actively engage in daily activities within the family, society, and the economic context. In societies with an older population–age structure it is essential to go beyond life expectancy and consider indicators that simultaneously account for mortality and morbidity. For this reason, health expectancy indicators, such as disability-free life expectancy (DFLE), were introduced in the second half of the 20th century (Sanders 1964; Sullivan 1971). When considering DFLE, Italy loses its advantage in terms of life expectancy at age 65 (Eurostat 2022). Italian women rank thirteenth in Europe, 6.4 years behind the frontrunner, Sweden (10.2 and 16.6 years of DFLE at age 65 respectively). Italian men rank ninth, 5.3 years behind Swedish men (10.6 and 15.9 years of DFLE at age 65 respectively). Studies on inequalities in DFLE are essential to deepen knowledge on the diverging patterns of longevity and healthy longevity in Italy.

It is well known that longevity and health are characterised by gender inequalities: women outperform men in terms of survival, while men have better health at older ages than women, the so-called "health–survival paradox" (Case and Paxson 2005). This paradox can be explained by the different disease patterns of the two genders, by differences in health reporting, and also by the association between health and mortality: as women live longer they are more likely to be exposed to poor health conditions than men (Di Lego, Di Giulio, and Luy 2020). A study by Frova, Burgio, and Battisti (2010)

shows that (until 2005) gender inequalities in DFLE at birth in Italy were declining, mainly due to mortality improvement among men, but still favoured women. However, focusing on older Italians (DFLE at age 65), nowadays men expect to live more healthy years than women (Caselli, Egidi, and Strozza 2021). Moreover, it is also well known that health (both in terms of both expected length of life and its quality) is not equally distributed within a country (Caselli, Egidi, and Strozza 2021; Zueras and Rentería 2020) or among social groups, regardless of which indicator of socioeconomic status is used (Cambois et al. 2020). It is important to consider the region of residence in Italy due to the high regional variation in, for instance, general health (Istat 2021) and socioeconomic status (Franzini and Giannoni 2010). This regional heterogeneity is also related to the decentralised national health system, possibly introducing local differences in healthcare provision and quality. As detailed in studies focusing on DFLE in Italy, it is important to go beyond the conventional north–south divide and investigate spatial health clusters at the regional level (Gruppo di Coordinamento per la Demografia 2009; Minicuci and Noale 2005). Also, inequalities in DFLE and in life expectancy have not been declining at the same pace, suggesting further investigation of gender and social inequalities is needed within regions (Caselli, Egidi, and Strozza 2021). This is relevant to health policymakers, since geographical inequalities in health reflect the need for policies aimed at reducing them to improve the health conditions in the whole country. Socioeconomic inequalities in DFLE have been investigated in Torino and Toscana, in the context of a European comparison. The study by Mäki et al. (2013) shows a gap of 2 years in DFLE at age 30 between low and high educated women, and 4 among men. The gap is 3.1 years and 2.7 years respectively when considering DFLE at age 65 in Italy (Caselli, Egidi, and Strozza 2021). Health inequalities constitute a major threat which deserves appropriate consideration, since ensuring long and healthy lives for everyone is a fundamental human goal, one of the pillars of the 2030 Agenda for Sustainable Development Goals (United Nations 2015), and one of the objectives of the Decade of Healthy Ageing (World Health Organization 2021). While some studies have investigated inequalities in DFLE separately by gender, education, and region of residence, no prior study has considered these three elements at the same time.

The aim of this study is twofold: first, to shed light on gender, social, and geographical inequalities in DFLE among older adults living in Italy, and second, to complement measures of inequality with an analysis of the age-specific morbidity and mortality contributions that explain them.

2. Data and methods

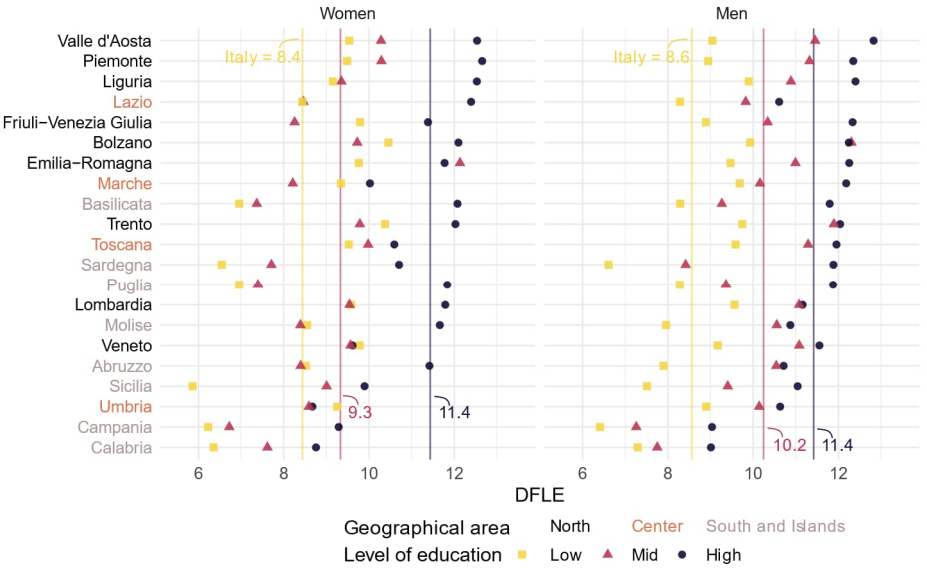
This study draws on census-linked mortality data for 2011 by 5-year age class, gender, educational attainment, and region of residence, including mortality records for the following three years (2012–2014). This represents the most recent available Italian data with this level of detail. At the same level of detail, disability prevalence is computed based on data from the Italian survey 'Aspects of Daily Living'. Robust prevalence estimates are obtained by averaging over the 3-year period 2012–2014 and applying sample weights. The study sample comprises 30,738 individuals aged 65 years and older and living in households, pooled over the 3 years. They each completed a paper-and-pencil-interview, providing information on their gender, region of residence, level of education, and disability status. The latter is based on the Global Activity Limitation Indicator (GALI), expressing self-reported long-term limitations on activities people usually do, and differentiates individuals without disability from those with mild or severe disability (Robine, Jagger, and Euro-REVES Group 2003).

DFLE is calculated using the Sullivan method (Imai and Soneji 2007; Sullivan 1971), based on health prevalence data, and is computed at age 65 to focus on the health conditions of life years at older ages. Confidence intervals for DFLE are computed to acknowledge the variability in the health measure arising from the sample size used to compute disability prevalence (Villavicencio, Bergeron-Boucher, and Vaupel 2021). As this study focuses on inequalities in DFLE, gender and educational gaps in DFLE are computed for each Italian region. The step-wise decomposition method (Andreev, Shkolnikov, and Begun 2002) is used to understand the age-specific contribution of mortality and morbidity to the gaps in DFLE between genders or educational groups, allowing to quantify the effect of the observed differences between groups on the indicator as a non-linear function of its parameters (prevalence and rates). The analysis is performed in R version 4.1.3 (R Core Team 2022), and the decomposition is implemented with the Demodecomp R-package (Riffe 2018). An interactive online application (Shinyapp) was developed to provide supplementary figures (i.e., DFLE at age 65 with confidence intervals, life expectancy at age 65, and the ratio of DFLE to total life expectancy at age 65) and detailed information on data and methods [margmoretti.shinyapps.io/IneqDFLEItaly]. As an additional support, the code to replicate the analysis and to reproduce the Shinyapp is available in the GitHub repository [github.com/MMargherita/IneqDFLEItaly].

3. Results

Figure 1 shows DFLE at age 65 by gender and level of education for the Italian regions and autonomous provinces. At the national level, DFLE at age 65 is around 10 years for both women and men (total life expectancy at age 65 is 22.3 years and 18.8 respectively). This value varies between 11.4 and 8.4 (8.6 for men) for the high- and low-educated, respectively. When analysing regions individually the differences between them should be interpreted carefully, given the small size of some populations (for more details, DFLE with confidence intervals is provided in the Shinyapp [margmoretti.shinyapps.io/IneqDFLEItaly]). In Figure 1, regions are ordered from the highest to the lowest DFLE and classified according to their geographical area. The high-educated living in some northern regions (i.e., men in Valle d'Aosta, women in Piemonte) have the highest DFLE in the country of almost 13 years, while the low-educated living in the south (i.e., women in Sicily and Campania) have the lowest of around 6 years; most of the regions with DFLE below the Italian average (vertical lines in the figure) are located in the south of the country. Lazio is a peculiar case, with highly educated women having one of the highest DFLE and highly educated men one of the lowest. The regions with the lowest DFLE are Campania and Calabria, regardless of the level of education and for both genders, with notable differences from all the other regions, even their neighbours. The figure shows a gender-specific peculiarity in DFLE by educational attainment for all the regions: the higher the educational attainment the higher the DFLE. What changes between men and women is how mid-educated individuals perform: the DFLE for mid-educated men is close to that of high-educated men, but mid-educated women experience mortality–morbidity levels similar to those of low-educated women. This is more evident in northern and central regions, while in the south men and women present more similar values.

Figure 1: Disability-free life expectancy (DFLE) at age 65 by gender and level of education for the 21 Italian regions and autonomous provinces, 2012–2014

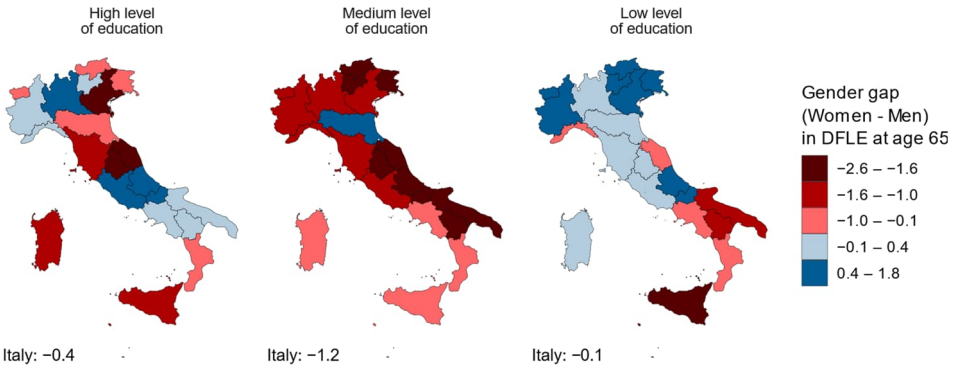


Note: Regions are classified by geographical area according to a grouping of NUTS-1: North (North-East and North-West), Centre, and South and Islands. Mortality data by level of education, used to compute DFLE, are released by the Italian National Institute of Statistics. Disability data come from the survey 'Aspects of Daily Living'. Disability status is defined according to the question in the Global Activity Limitation Indicator (GALI): "For at least the past 6 months, to what extent have you been limited because of health problems in activities people usually do? Would you say you have been: severely limited; limited but not severely; not limited at all". Level of education measures the highest educational attainment achieved: considering the age groups in the analysis, we defined low-educated as those with primary school diploma or less, mid-educated as those with lower secondary school diploma, and high-educated as those with upper secondary school diploma or higher. Due to the high level of detail in our analysis, some assumptions to deal with missing strata are made: the Piemonte and Valle d'Aosta, Molise and Abruzzo, and Basilicata and Puglia regions, and Trento and Bolzano autonomous provinces, are assumed to have, in pairs, the same health prevalence.

Figure 2 illustrates the gender gap in DFLE at age 65 in Italian regions, namely the difference between women's and men's DFLE, for the three levels of education. At the national level, women and men show a similar life expectancy free from disability, although gender differences in DFLE assume a specific picture when stratifying the Italian population by educational attainment: low-educated women and men and high-educated women and men have similar DFLE, while the gap is largest for the mid-educated, where women have the greatest disadvantage, equal to more than one year at the national level. At the regional level, for the mid-educated the highest gaps are mainly found on the east coast and in the north-east of the country, with values ranging between 1.5 and 2.6 years of difference, favouring men. There are only a few regions where men

are disadvantaged compared to women, mostly located in the centre-south and north or north-west for the high-educated and in the north for the low-educated.

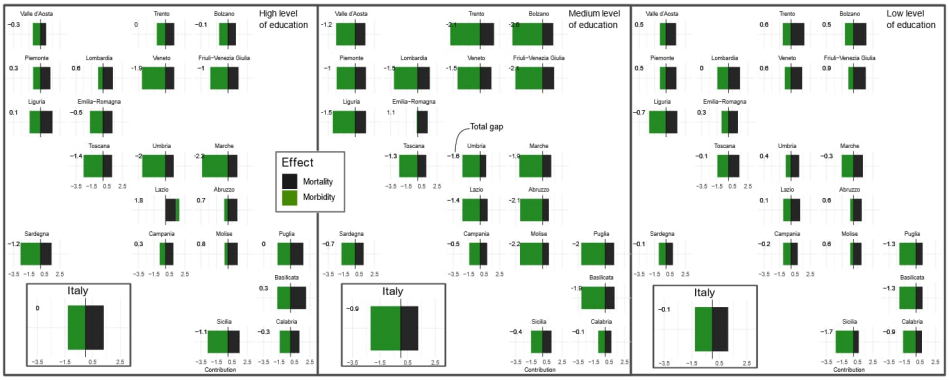
Figure 2: Gender gap (women – men) in disability-free life expectancy (DFLE) at age 65 by educational attainment for the 21 Italian regions and autonomous provinces, 2012–2014



Note: For each level of education, Italian regions are classified based on the quintile distribution of their gender gap in DFLE (calculated as the difference between DFLE for women and men).

Figure 3 shows mortality and morbidity contributions to the gender gap, resulting from the decomposition, for each region. The figure reveals that mortality contributions are always greater than zero, implying that mortality differences drive the gap toward positive values (the well-known female survival advantage) and this advantage is greater among the highly educated. Morbidity contributions are always greater than mortality contributions, and almost always negative, meaning that health disparities contribute to negative values of the gender gap, favouring men. We observe reduced health differences between low-educated men and women living in the north and centre, and between high-educated men and women in the central-southern regions, where mortality plays a more pronounced role in determining the gaps.

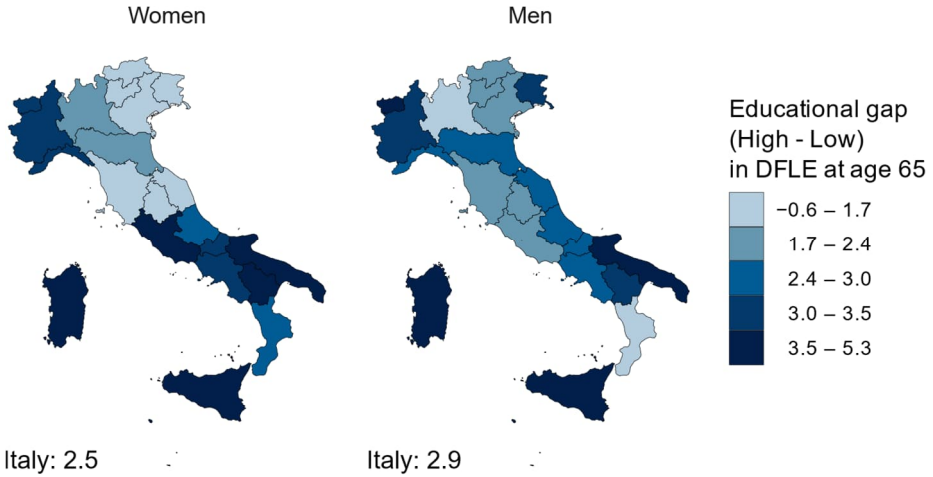
Figure 3: Mortality and morbidity contributions to the gender gap in disability-free life expectancy (DFLE) at age 65, by educational attainment, for the 21 Italian regions and autonomous provinces, 2012–2014



Note: The positioning of regions and autonomous provinces represents the geographical shape of Italy (Geofaceting, see Kashnitsky and Aburto 2019). The value of the gender gap, by level of education, is annotated for each region and autonomous province. The bars show the contributions, expressed in years, of the differences in mortality (rates) and morbidity (disability-free prevalence) between the two genders. Positive (negative) values of the contributions indicate women's advantage (disadvantage). Since there seems to be no clear age-specific pattern, this figure only shows the total contribution, i.e., the sum of the age-specific contributions for each region. The figure including the age-specific contributions is available in the Shinyapp: [margmoretti.shinyapps.io/IneqDFLEItaly].

Figure 4 shows the educational gap in DFLE at age 65 in the Italian regions, namely the difference in DFLE between the most- and least-educated. This difference is especially pronounced for both genders, with the gap for men reaching 2.8 disability-free years at the national level. At the regional level, almost all gaps for men are greater than 1.5 years, with most values above 2.5 years. The picture for women is more diverse, with an educational gap of 2.5 years at the national level, slightly lower than for men. The largest gaps for women are found in the southern and central-southern regions, whilst the smallest are in some central-northern regions and the north-east.

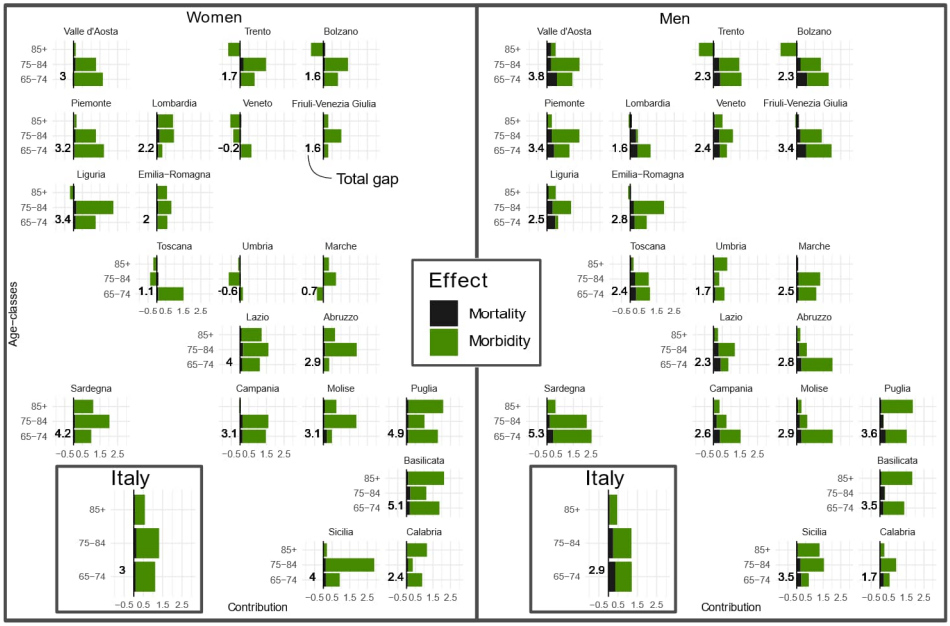
Figure 4: Educational gap (high – low) in disability-free life expectancy (DFLE) at age 65, by gender, for the 21 Italian regions and autonomous provinces, 2012–2014



Note: For both genders, Italian regions are classified based on the quintile distribution of their educational gap in DFLE (calculated as the difference in DFLE for those with high and low level of education).

Figure 5 displays the results of the decomposition of the educational gap into mortality and morbidity contributions, for each Italian region and age-class, by gender. Men's mortality contributions decline with age, nearly disappearing and giving way to health contributions, which are overall the most important factor in determining the educational gaps. This is especially true among women, for whom different levels of education do not necessarily reflect larger differences in mortality; however, inequalities in health and, as a result, in DFLE, are noticeable. The picture for morbidity contributions among women is quite diverse, making it difficult to find a general pattern. Among men, morbidity contributions also reduce at higher ages in most of the regions except the south-east, as was observed for mortality. However, even though morbidity contributions at older ages (85+) are limited, their intensity is higher than that of mortality contributions.

Figure 5: Mortality and morbidity contributions to the educational gap in disability-free life expectancy (DFLE) at age 65, by gender, for the 21 Italian regions and autonomous provinces, 2012–2014



Note: The positioning of regions and autonomous provinces represents the geographical shape of Italy (Geofaceting, see Kashnitsky and Aburto 2019). The value of the educational gap, by gender, is annotated for each region and autonomous province. The bars show the contributions, expressed in years, of the differences in mortality (rates) and morbidity (disability-free prevalence) between the high- and low-educated. Positive (negative) values of the contributions indicate high-educated advantage (disadvantage). Contributions are calculated by 5-year age groups but showed by 10 years for better visualization.

4. Discussion

In international comparisons, Italy has one of the highest life expectancies at age 65, but not-so-high DFLE. This makes Italy a very interesting case for understanding the diverging patterns of longevity and health by analysing inequalities within its population. A few studies focus on inequalities in DFLE in Italy by gender (Frova, Burgio, and Battisti 2010), socioeconomic status (Mäki et al. 2013), and region (Minicuci and Noale 2005). However, only two studies consider more than one dimension at the same time in this context (Caselli, Egidi, and Strozza 2021; Gruppo di coordinamento per la demografia 2009). To our knowledge, no prior study has investigated analytically gender, socioeconomic, and regional inequalities in DFLE in Italy simultaneously. This study

presents novel evidence of gender and educational inequalities in DFLE at the regional level for Italian older adults, as well as investigating the contribution of mortality and morbidity to the exploration of gender and educational inequalities.

In terms of gender gaps, this study shows that while older women and men share similar DFLE at the national level, these estimates hide important heterogeneities between regions and social groups. In fact, the highest gender gap (female disadvantage) among the mid-educated is more than 2.5 years in some eastern regions. Women's (functional) health disadvantage at older ages completely outweighs their advantage in mortality and life expectancy, which, however, has been declining in recent years (Frova, Burgio, and Battisti 2010). This results in a disadvantage in DFLE for women. In the context of the well-known excess mortality of men over women at all ages, it might be surprising that women do not experience a similar advantage in DFLE. Besides gender differences in health perception and reporting, this phenomenon has two explanations: women suffer from fewer fatal ill health conditions than men, which are less likely to lead to death but often lead to disability; and as women live longer than men, the excess years at older ages are more exposed to higher risk of poor health (Di Lego, Di Giulio, and Luy 2020).

Mäki et al. (2013) consider inequalities in DFLE in Italy to be relatively low when compared to other European countries. However, they analyse data from Toscana and Torino only, limiting the generalization of their results. We instead found important social differences in DFLE for both genders at age 65, similar to Caselli, Egidi, and Strozza (2021). Highly educated men's advantage is almost 3 years at the national level and almost always more than 1.5 years at the regional level. Women show a slightly lower gap at the national level and the regional picture is more diverse. The educational gaps in DFLE are mostly driven by differences in morbidity, which is the predominant factor explaining differences for older men and, most of all, for women. The literature on social inequalities at the regional level in Italy is limited to studies on mortality and life expectancy (e.g., Lallo and Raitano 2018, Caselli, Egidi, and Strozza 2021), while the present study shows that social inequalities in health indicators are far more dramatic than those found in mortality (as also highlighted in Cambois et al. 2020), resulting in large differences in the quality of older Italians' life expectancy. Moreover, the extent of the gap translates into a double disadvantage for the least educated and those living in southern regions of the country, as they can expect to live fewer years and in worse health than, respectively, the highly educated and those living in northern regions. The disadvantage in DFLE also cumulates over the different dimensions of education and region of residence, so that the difference between the highest DFLE at 65 (more than 12 years, for the highly educated in the north) is more than double that of the lowest (about 6 years, for the low-educated in the south).

There are some considerations that can be discussed regarding the different extent of the gender and educational gaps and the heterogeneity at the regional level. First, the structure of the Italian population in terms of educational attainment differs among regions and between genders. The share of low-educated individuals is higher in the south than in the north. The geographical distribution is more homogeneous among men than women, who show a higher prevalence of the low-educated. The highest educational attainment achieved may represent differing socioeconomic status (SES) for men and women. Educational attainment might be less accurate in capturing the SES of older Italian women, whose actual SES might be represented by that of their partner. Furthermore, educational background and health-related behaviours are strongly related, with low-educated individuals being more likely to engage in risky behaviours. This might explain the double disadvantage (mortality and health) experienced by those with a low level of education. However, there may be differences in the way men's and women's risky behaviour (e.g., smoking) relates to education (Luy, Di Giulio, and Caselli 2011), leading to different educational gaps between genders. The underlying differences between areas within the country are key factors that explain regional health and mortality heterogeneity. Italy is characterized by strong regional, cultural, behavioural, and economic differences. In particular, the regionalisation of the national healthcare system strongly affects its quality, particularly disadvantaging the south. This aspect plays a fundamental role in determining the observed regional heterogeneity.

This study has limitations that need to be acknowledged. First, the data only include individuals living in households; excluding those living in institutions might bias the results as institutionalised individuals are also more likely to be in poor health. It is also reasonable to assume that those living in institutions might have a specific SES composition and be more prevalent in certain regions. However, in 2013, older adults living in institutions represented only 2% of the population over 65 in Italy (Istat 2015). Second, since DFLE estimates are based on observed prevalence of disability, all the limitations pertaining to prevalence-based measures are embedded. Specifically, the Sullivan method has some strong assumptions that need to be acknowledged: stationarity of the population and its age-specific disability prevalence. In particular, the assumption that the disability rates do not change – until the synthetic cohorts under analysis are extinct – is very strong. If the underlying disability rates change over time, this may result in biased estimates (lower/higher DFLE). Finally, in this study we use a self-reported indicator of disability (GALI) that is only a proxy for individuals' objective functional health status. This study shows the need for more years of detailed mortality data by level of education that provides evidence for years more recent than 2013, with a temporal trend to understand whether the country has been experiencing an expansion or compression of morbidity, with finer estimates than those at the national level.

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