

Socio-economic Inequality in Mortality in Italy

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Socioeconomic factors are well-recognized determinants of health. A high prevalence of risk factors for non-communicable diseases along with reduced access to early diagnosis and effective treatment have historically been thought to be the main mechanisms linking the low socio-economic status (SES) to poor health. However, the phenomenon is more complex and involves also psychosocial factors, such as stress, depression, hopelessness, financial difficulties, lack of social support, and low job control, all risk factor for poor health [1]. A meta-analysis of 48 independent prospective cohort studies [2], including 1.7 million individuals, showed that low SES is an independent risk factor for mortality and has a comparable health impact to that of the seven risk factors identified in the World Health Organization (WHO) Global Action Plan for the Prevention and Control of Non-Communicable Diseases (including high alcohol intake, physical inactivity, current smoking, hypertension, diabetes, salt intake and obesity). The study estimated a hazard ratio of 1.26 (95% CI: 1.21–1.32) for low socioeconomic status after mutually adjusting for the above-mentioned risk factors.

However, reverse causation partly contributes to socioeconomic inequality (3). In fact, subjects with physical or psychologic/psychiatric diseases are likely to have a lower SES and a high mortality rate due to their underlying conditions. The amount of inequality explained by reverse causation is difficult to quantify, but it may be more relevant in egalitarian societies, which offer similar opportunities to their populations.

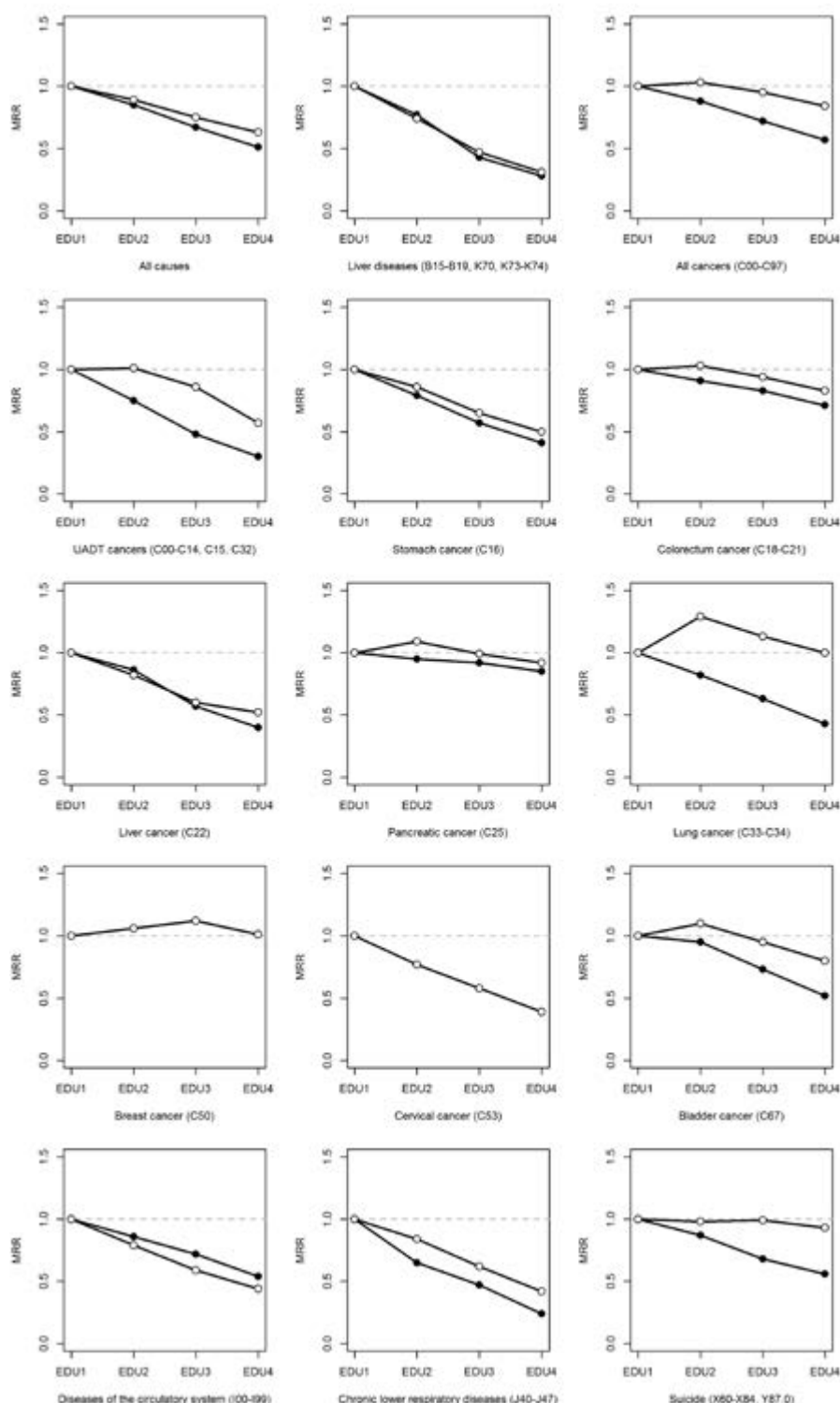
During economic recessions the interest in measuring socio-economic inequalities in health increases, considering the negative effects that financial crisis may cause to people in the lower socio-economic status. Unemployment and financial problems that arise during economic recession is expected to affect more people with a middle to lower SES. However, results on the impact of macroeconomic changes on socioeconomic inequality have been mixed [4]. In fact, previous studies carried out during economic recessions suggest that the effects of the financial crisis on health inequality vary between countries, likely as a consequence of the different fiscal and social policies each country has adopted to deal with the crisis.

The 2008 financial crisis has caused long-term damages to the economics of many European countries, including Italy, with deleterious socio-economic consequences, increasing unemployment and poverty rates and decreasing household's (health and nutrition) expenditure [5]. All these changes have had a more severe impact among the most disadvantages individuals who have limited intellectual and material resources to face financial difficulties. Therefore, quantifying and monitoring social inequality in health are becoming top priorities, and ad hoc projects should be planned to find out potential areas of intervention.

Studies from several European countries showed that poorly educated people and/or those in less prestigious jobs have higher risk of overall mortality compared to highly educated individuals or those who have a better job [6]. However, the magnitude of socio-economic inequality in mortality appreciably varies across European countries, with higher inequality detected in Eastern and Northern Europe as compared to Southern European countries. Most of this evidence comes from census data (including socio-economic variables) linked to archives of mortality. In Italy, there were no census-based database to investigate socio-economic inequality in mortality and, most of the findings came from local studies carried out in some municipalities or studies based on a sample of the Italian population [7-10].

In 2015, we laid the basis of a large cohort study based on the 2011 census with the aim to investigate socioeconomic differences in mortality in Italy. Besides the census, we used the archives of mortality and the list of residents in all Italian municipalities to track people who moved abroad. The databases have been linked using the tax code as matching key. To

FIGURE 1. Mortality rate ratios from selected causes according to level of education.



Abbreviations: EDU1 - No education or primary school; EDU2 - Middle school; EDU3 - High school; EDU4 - University; UADT - Upper Aero Digestive Tract.

minimize false match rate, the tax code reported on the death certificate was checked for consistency with personal details of the deceased before matching and, in case of inconsistency, a new tax code was recalculated from the personal details and used for the matching. The percentage of deaths successfully linked with the 2011 census was 95%.

The first results of this study provided the life expectancy by level of education using the 2012 mortality data [11]. Life expectancy at birth was 3.8 years shorter in men having less than high school compared to university graduates (78.6 vs. 82.4 years), while the gap was smaller in women (-1.9 years, 84.0 vs. 85.9 years).

In a further analysis, we used the 2012 and 2013 archives of mortality to quantify overall mortality and mortality from specific causes. The archives of mortality contain the underlying cause of death that has been coded according to International Classification of Diseases (ICD), 10th Revision. The 4-digit code of the underlying cause of death has been grouped according to the European Short List of Causes of Death. The age-standardized mortality rates (ASMRs) showed a remarkable gradient in overall mortality by level of education both in men (the ASMRs for less than middle school, middle school, high school and university were: 77.24, 58.32, 48.15 and 37.52 per 10,000 person-years respectively) and in women (the ASMRs for less than middle school, middle school, high school and university were: 38.34, 31.13, 27.60 and 24.05 respectively) [12].

Moreover, to compare the effect of education on cause-specific mortality between sexes we estimated the relative inequality by computing the mortality rate ratio (MRR), setting the lowest level of education (less than middle school) as reference. Figure 1 summarizes the relationship between education and mortality from any causes and from some selected diseases, with a special focus on cancer mortality. A detailed description of the methods and the results of the study can be found elsewhere [12,13].

A remarkable gradient by level of education was found for mortality from diseases of the circulatory system, chronic liver diseases, chronic respiratory diseases, stomach and liver cancers in both sexes. A weaker association was found for cancer of colorectum and pancreas, while a sex-dependent pattern was found for all cancers, cancer of upper aero-digestive tract (UADT) and bladder cancers (weaker association in women), lung cancer (no risk reduction by level of education in women) and for suicide (no association in women). The gradient by level of education was also observed for cervical cancer, whereas there was no association between education and breast cancer.

An extended project will provide the first comprehensive analysis of inequality in mortality in Italy, and whose results will help policy makers to plan future intervention aiming to reduce socio-economic inequality in the country.

The record linkage of the archives of mortalities with the census is an effective way to measure inequality in mortality in the whole of Italy. In fact, it allows the collection of a considerable number of events even for the less common diseases, requiring limited additional resources.

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Conflict of interests

The authors declare no conflict of interest linked to the content of this manuscript.

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