LIVING CONDITIONS, LIFESTYLES AND SELF-RATED HEALTH IN ITALY[1]

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Abstract. We study the association between living conditions, lifestyles and self-rated health in Italy, using the module on lifestyles and health difficulties included in the 2022 edition of the European Survey on Income and Living Conditions (EU-SILC). In particular, we use logistic regression to estimate the association between three EU-SILC indicators of poverty or social exclusion (risk of poverty, material deprivation and severe housing deprivation), covering different aspects of socio-economic disadvantage, and self-rated health, controlling for a full set of individual covariates and for many lifestyle risk factors (body mass index, smoking, alcohol consumption, healthy diet, physical activity and social participation). We document the existence of a strong association between socio-economic deprivation and the risk of poor self-rated health. Moreover, we find a significant impact of lifestyles on this association, showing how observed inequalities in subjective health depend on the complex interactions between socio-economic deprivation and the adoption of healthy habits.

1. Introduction

Low socio-economic status (SES), as measured by income, education, occupational condition or a combination of such factors, is consistently found to be associated with higher morbidity, mortality and with a number of other adverse health outcomes, even in advanced countries with generous welfare programs and large public health infrastructure (Stringhini *et al.* (2017) and Vineis *et al.* (2020) for a general discussion; Chetty *et al.* (2016) for USA; Kinge *et al.* (2019) for Norway; Petrelli *et al.* (2024) for Italy). On the other hand, unhealthy lifestyles are found to be among the main risk factors for non-communicable diseases and for a large share of premature mortality and total years of life lost and disability-adjusted life years at the global level (GBD 2021 Causes of Death Collaborators (2024), GBD 2021 Risk Factors Collaborators (2024)). However, the interaction between socio-economic deprivation and lifestyles choice is still poorly understood (Foster *et al.* (2021)).

Lifestyles are often considered as mediators between SES and health outcomes, even if some recent studies found that unhealthy habits mediate only a small fraction

[1] The article exclusively expresses the authors' opinions. Although the paper is the result of joint work, sections are attributed as follows: paragraphs 1 and 5 to S. Gerosa, paragraph 2 to F. Lariccia, paragraph 3 to D. Lo Castro, paragraph 4 to C. Delle Fratte.

of the observed association between socio-economic deprivation and health (Zhang *et al.* (2021), Fang *et al.* (2023)). Moreover, not only unhealthy lifestyles are more prevalent among low SES populations, but also there is some evidence that the adverse health effect of such behaviours is amplified among socio-economic deprived individuals, coherently with the "differential vulnerability" hypothesis (Foster *et al.* (2018)). Finally, risk behaviours appear to cluster and interact among specific subpopulations (Meader *et al.* (2017)), suggesting the need for a careful evaluation of the impact not only of single risk factors, but also of extensive combination of lifestyles, in order to uncover what has been called the "behavioural constellation of deprivation" (Pepper and Nettle (2017)).

Our aim is to examine the joint relations between socio-economic deprivation, lifestyles and self-rated health in Italy, using cross-sectional sample data from the 2022 edition of European Survey on Income and Living Conditions (EU-SILC). Our chosen health outcome variable, self-rated health (SRH), despite being a subjective indicator, has been repeatedly shown to be a robust and independent predictor of objective health outcomes, and in particular of mortality (Idler and Benyamini (1997), Jylhä (2009)).

We assess socio-economic deprivation (SED) using three EU-SILC indicators (risk of poverty, material deprivation and severe housing deprivation), covering different and only partially overlapping aspects of the social disadvantage spectrum, and we build an extensive healthy lifestyle score index, combining information on multiple individual behaviours (body mass index, smoking, alcohol consumption, healthy diet, physical activity and social participation). We then evaluate the association between the risk of poor SRH, SED and lifestyles first in the whole sample, and then performing stratified and joint analyses among the subpopulations identified by our main SES and behavioural indicators, to evaluate the combined impact of living conditions and lifestyles.

2. Data and variables

We use data from the Istat EU-SILC (European Survey on Income and Living Conditions) conducted in 2022. The survey's priority is to produce annual comparable data, both cross-sectional and longitudinal, using harmonized definitions and methods, for the analysis of income distribution, social exclusion, living conditions and quality of life of households, as well as of economic and social policies adopted at the national and European levels (Eurostat (2022)).

The survey is conducted on a nationally representative sample of Italian population. The reference population includes households and their current members residing in the territory of the country at the time of data collection. All household members are surveyed, but only those aged 16 and more are interviewed.

Information on social exclusion and housing conditions is collected mainly at household level, while labour, education and health information is obtained for persons aged 16 and over (Istat (2021)). According to the Commission Regulation, the 2022 edition includes a rolling module on health and lifestyles[2], considered in this study.

We assess socio-economic deprivation (SED) using three EU-SILC indicators of poverty or social exclusion, considering both monetary and non-monetary aspects. In particular, people at risk of poverty are those living in households with a net equivalent income below the at-risk-of-poverty threshold[3]. An individual is in condition of material deprivation if he lives in a household experiencing at least three out of nine symptoms of deprivation[4]. Finally, severe housing deprivation is defined as the condition of those living in an overcrowded dwelling and exhibiting at least one of the housing deprivation measures[5].

In order to evaluate the associations of lifestyles with SRH we consider many lifestyle risk factors: body mass index, smoking, alcohol consumption, healthy diet, physical activity and social participation. We use body mass index (BMI) to measure healthy weight. According to the World Health Organization (WHO) definition, we calculate BMI as weight (kg) divided by height (m) squared. We then classify individuals as underweight (BMI<18.5), normal weight (18.5<=BMI< 25), overweight (25<= BMI< 30), obese BMI>=30). We define normal weight as the healthy category.

We evaluate smoking consumption distinguishing between never smoking in the last 12 months (which is considered to be a healthy lifestyle), and smoking at least once in the last 12 months. We are not able to distinguish former smokers using our survey questions. We estimate each individual's alcohol consumption distinguishing between drinking not daily in the last 12 months (i.e. healthy behaviour), and drinking daily in the last 12 months. We do not possess any information on the volume and frequency of alcoholic beverages drank.

[2] 2022 module on health: Commission Regulation (EU) N° 2020/1721 of 17 November 2020.

[3] At-risk-of-poverty rate: percentage of people living in households with a net equivalent income below an at-risk-of-poverty threshold, set at 60% of the median of the individual distribution of net equivalent income. The net income considered for this indicator complies with the European definition. The income reference year is the calendar year preceding the survey.

[4] Material deprivation rate: percentage of the population that cannot afford at least three of the following nine items: 1) to pay their rent, mortgage or utility bills; 2) to keep their home adequately warm; 3) to face unexpected expenses; 4) to eat meat or proteins regularly; 5) to go on holiday; 6) a television set; 7) a washing machine; 8) a car; 9) a telephone.

[5] Severe housing deprivation rate: percentage of population living in a dwelling which is considered as overcrowded, while also exhibiting at least one of the housing deprivation measures. Housing deprivation is calculated by reference to households with a leaking roof, neither a bath, nor a shower, nor an indoor flushing toilet, or a dwelling considered too dark.

We identify healthy diet using two separate questions on the frequency of fruit consumption and the frequency of eating vegetables or salad during a typical week in a given season. A dummy variable is then obtained, taking the value of one if both are consumed at least once a day and zero otherwise. We define regular physical activity as engaging at least 4 times a week in sports, fitness or recreational activities that cause at least a small increase in breathing or heart rate for a continuous period of at least 10 minutes.

Finally, we create a social participation score as a combination of four questions about the frequency of getting together or of contacts with family (relatives) or friends. From its distribution, we identify those respondents who exceed the first quartile as socially participants, obtaining a dummy variable that takes the value of one if there is social participation (i.e. active social participation), zero otherwise (i.e. low social participation)[6].

We include in this study also the following other covariates: sex (male, female); age in 10-year classes (16-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+); citizenship (Italian, foreign); education level (lower secondary education or below, high school, university degree and above); employment status (employed, unemployed, inactive); region of residence (North, Centre, South/Islands). Moreover, we consider the covariate chronic diseases (absence, presence) by considering the individuals interviewed self-reported information about chronic diseases or long-standing (lasted or expected to last at least 6 months) health problems.

Our chosen health outcome variable is self-rated health (SRH). According to WHO's definition of health, in the EU-SILC the variable is collected by using the internationally standardized question "How is your health in general?" and asking respondents to assess their health status on a 5-point scale from very good to very bad. The dependent variable has been obtained dichotomizing respondents' assessment of their health status: the dummy variable is equal to one in the case of a respondent answering bad or very bad (i.e. poor SRH), zero otherwise.

3. Methods

Our statistical analysis is based on a sample of 38,808 individuals aged 16 years and above, obtained from an initial sample of 39,814 individuals, after excluding those refusing to respond to health related questions (i.e. SRH and presence of chronic diseases).

We start by evaluating the association between the risk of poor SRH, SED and lifestyles in the whole sample. Because of the outcome variable is binary, two

[6] Following the remark of a referee, we tested alternative cut-off values (10^{th} percentile and the median) for the dichotomization of the social participation variable: results are qualitatively robust to the choice of different thresholds.

logistic regression models[7] have been estimated in order to produce adjusted Odds Ratios (ORs[8]) relating living conditions and healthy lifestyle factors to SRH. Model 1 investigates the association of single indicators of SED with the response variable, adjusting for some control covariates. Model 2 additionally includes lifestyle items to correct for the effects of lifestyle.

Subsequently, composite score variables have been constructed from the single items of living conditions and lifestyles, so that stratified and joint analyses have been performed in order to examine how these scores modify their relations with SRH. The presence of SED is obtained as a sum of the single items of living conditions (risk of poverty, material deprivation and severe housing deprivation) and is grouped into two modalities: having at least one socio-economic distress signal, having none. To comprehensively assess the associations of multiple lifestyles with SRH, we build an extensive healthy lifestyle score (LS) index, combining information on multiple individual behaviours considered in the previous model. In particular we proceed by summing healthy lifestyles and we define three groups using the so calculated score: low LS (having up to 2 healthy lifestyles), medium (having 3 or 4), high (having 5 or 6).

We finally conduct stratified and joint analyses, to evaluate how lifestyles affect the risk of poor SRH across different socio-economic groups and how the same risk varies across subgroups defined by both lifestyles and SED signals. Stratified models are separately estimated on the at-risk-of-SED and not at-risk-of-SED subsamples (10,031 and 28,049 individuals respectively), with low LS as the reference category. The reference category for the joint model is the most disadvantaged group, i.e. participants showing both SED signals and low LS.

4. Results

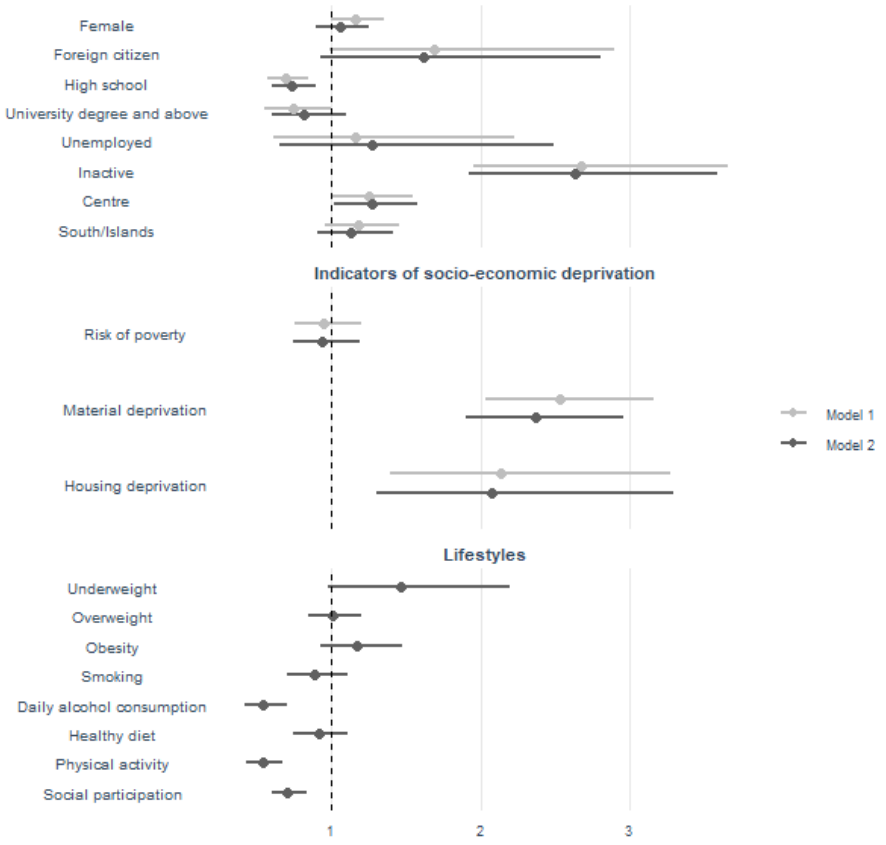
Figure 1 presents the results from the two logistic regression models. Controlling for age and chronic diseases, but not for lifestyles (Model 1), the characteristics associated with a higher risk of poor SRH at the 5% significance level are being inactive (OR=2.67, 95% CI=1.96-3.66; ref.: being employed) and living in the Centre (OR=1.25, 95% CI=1.01-1.54; ref.: North), while higher educational attainment is associated with a lower risk both for high school (OR=0.69, 95% CI=0.57-0.84; ref.: no high school degree) and for university degrees (OR=0.74,

[7] The package *survey* of the R software has been used to fit survey-weighted generalised linear models to data from a complex survey design.

[8] If the OR is equal to one, this means that there is no association between the exposure and the odds of a negative health perception (the odds of SRH given exposure and the odds of SRH given no exposure are the same). Values greater than one indicate positive association (the exposure is a risk factor), lower a negative one (the exposure is a protective factor).

95% CI=0.55-0.99; ref.: no high school degree). Being female (OR=1.16, 95% CI=0.99-1.35) and foreign citizenship (OR=1.69, 95% CI=0.98-2.89) are significant at the 10% significance level.

Figure 1 – *Logistic regression estimates of ORs and 95% confidence intervals without (Model 1) and with (Model 2) lifestyles.*



The dots provide a visual estimate of ORs, the lines represent the 95% confidence intervals. ORs with a confidence interval including 1 are not statistically significant at the 95% level. Age classes and chronic diseases have not been reported in this figure because of their high OR values.

Looking at indicators of SED, a remarkable difference appears between monetary and non-monetary ones: while individuals at relative risk of poverty do not show higher odds of poor SRH (OR=0.95, 95% CI=0.75-1.19), participants in condition

of material deprivation (OR=2.53, 95% CI=2.03-3.16) or experiencing severe housing deprivation (OR=2.14, 95% CI=1.39-3.27) display odds of poor SRH more than twice as high as those not presenting these SED signals.

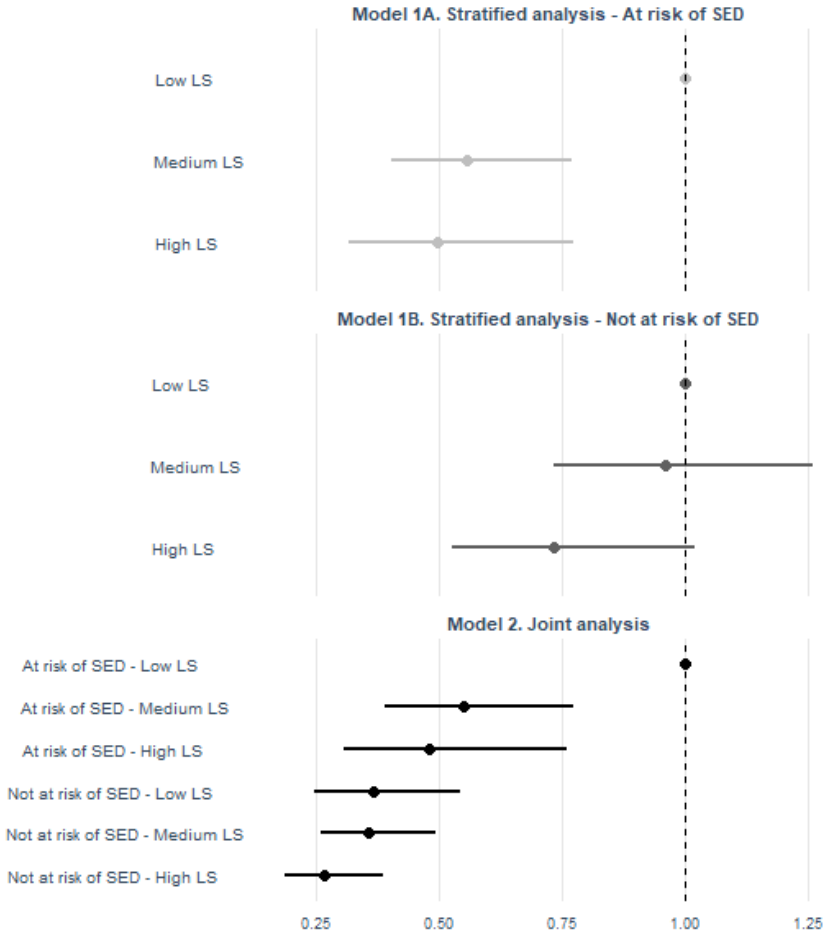
Adding lifestyle variables (Model 2) generally reduces the magnitude of the above-described associations and in some cases makes them lose statistical significance (e.g. female sex, foreign citizenship, university degree) while preserving the direction of the effects. Considering the impact of lifestyle variables, daily alcohol consumption (OR=0.54, 95% CI=0.41-0.70), regular physical activity (OR=0.54, 95% CI=0.43-0.67) and active social participation (OR=0.70, 95% CI=0.60-0.83) are all associated with lower odds of poor SRH. Being underweight is associated with a higher probability of being in poor SRH at the 10% significance level (OR=1.47, 95% CI=0.98-2.19; ref.: normal weight). Neither current smoking nor healthy diet habits seem to have significant effects on SRH[9].

Figure 2 and Tables 1 and 2 present the results from stratified and joint analyses. Stratified analysis (Table 1 and Figure 2 - Models 1A and 1B) show that healthier lifestyles are associated with lower odds of poor SRH both for the subgroup at risk of SED and for that not at risk, but the strength of the effect is much larger for the former. Moving from the low LS to the high LS category is associated with a 50% reduction in the odds of poor SRH for the socio-economically deprived population (OR=0.49, 95% CI=0.32-0.77), while the same improvement in the number of adopted healthy behaviours is linked with a 27% reduction for the not at-risk-of-SED subgroup (OR=0.73, 95% CI=0.53-1.02). These results support the hypothesis of differential vulnerability, for which SED amplifies the impact of unhealthy lifestyle behaviours.

Finally, the joint analysis (Table 2 and Figure 2 - Model 2) shows the combined effect of SED and lifestyles on the risk of poor SRH, using the most disadvantaged group as the reference point. The overall extent of observed inequalities in SRH is large, with the group with no SED signals and a high LS reducing by almost three-quarters the odds of poor SRH (OR=0.27, 95% CI=0.19-0.39) compared to the at-risk-of-SED and low LS group. Moreover, even the group with the most healthy behaviours among the at-risk-of-SED population has a smaller relative reduction in the risk of poor SRH (OR=0.48, 95% CI=0.31-0.76) than the group with the lowest LS but with no SED signals (OR=0.37, 95% CI=0.25-0.55), showing that socio-economic conditions play a bigger role than lifestyles in determining the risk of poor SRH.

[9] The unexpected results related to drinking and smoking behaviours are probably linked to our survey questionnaire, that does not allow us to distinguish former smokers and excessive drinking, as we discuss in Sections 2 and 5.

Figure 2 – *Logistic regression estimates of ORs and 95% confidence intervals of stratified (Models 1A and 1B) and joint (Model 2) analyses.*



Logistic models adjusted for sex, age, citizenship, education level, employment status, region of residence, chronic diseases.

Table 1 – *Association of lifestyle score with self-rated health stratified by presence of socio-economic deprivation (ORs, 95% confidence intervals, sample observations).*

Socio-economic deprivation	**Lifestyle score**		
	Low (0-2)	*Medium (3-4)*	*High (5-6)*
At risk of SED	1 (ref.) n=1,553	0.56 (0.40-0.77) n=5,954	0.49 (0.32-0.77) n=2,524
Not at risk of SED	1 (ref.) n=2,733	0.96 (0.73-1.26) n=15,884	0.73 (0.53-1.02) n=9,432

Table 2 – *Joint association of socio-economic deprivation and lifestyle score with self-rated health (ORs, 95% confidence intervals, sample observations).*

Socio-economic deprivation	**Lifestyle score**		
	Low (0-2)	*Medium (3-4)*	*High (5-6)*
At risk of SED	1 (ref.) n=1,553	0.55 (0.39-0.77) n=5,954	0.48 (0.30-0.76) n=2,524
Not at risk of SED	0.37 (0.25-0.54) n=2,733	0.36 (0.26-0.49) n=15,884	0.27 (0.19-0.39) n=9,432

5. Conclusions

We study the association between living conditions, lifestyles and the risk of self-rated poor health using EU-SILC, a cross-sectional nationally representative sample of the Italian population in 2022. Controlling for a large number of socio-demographic characteristics, we find that being at risk of poverty is not significantly associated with an increased risk of poor SRH, while both material deprivation and severe housing deprivation are associated with a more than doubled risk. Therefore, it seems that it is not low income *per se*, but weak access to material possibilities (presence of arrears on due household payments, incapacity to face unexpected expenses or to pay for holidays) and the distress due to overcrowded and low-quality housing that are associated with poor subjective health. Including lifestyles in our model only slightly reduces the magnitude of this association.

Looking at lifestyles, daily alcohol consumption, physical activity and social participation are found to be associated with significant reduction of the risk of being in poor SRH, while being underweight is weakly associated with an increased risk.

Our stratified and joint analyses uncover a complex picture of the risk of poor SRH across subgroups identified by the socio-economic deprivation index and the lifestyle score built aggregating healthy behaviours. Healthier lifestyles are associated with a reduced risk of poor SRH both within the socio-economic deprived and not socio-economic deprived subgroup, but the risk reduction associated with moving from the least healthy to the most healthy lifestyle group is much larger for the at-risk-of-SED population, pointing to the possibility of "differential vulnerability" of unhealthy behaviours across different populations. The joint analysis shows how lifestyles and socio-economic deprivation mutually reinforce each other in relation to the observed risk of poor subjective health. While the non-deprived population has a lower risk of poor SRH relative to the deprived population within each lifestyle score group, the combined effect of behaviours and socio-economic deprivation is very large: the subgroup of the non-deprived with at least 5 healthy lifestyles has a 73% lower risk of being in poor health relative to the subgroup with at least one signal of SED and less than 3 healthy behaviours.

These findings have direct policy implications, suggesting that a public health policy aimed at reducing the social and economic costs associated with poor health should concentrate on specific material aspects such as improving housing access and quality, and in identifying and supporting households facing multiple material risks related to debt, unpredictable economic shocks, low access to services.

Moreover, public health campaigns aiming at promoting healthy lifestyles should be specifically addressed to the most deprived segment of the population, because both risks and gains from behavioural changes are larger for this group. Our results show the urgent need for an explicit coordination of economic and health policies, with the objective of designing integrated interventions for the socially most vulnerable part of the population.

We acknowledge some limitations in our analysis. Being a cross-sectional study, we cannot claim to have identified any causal effect of socio-economic conditions and of personal behaviours on subjective health: there can be unobserved characteristics linked to the co-occurrence of low socio-economic and poor health conditions. Our chosen health outcome is self-reported, and not objective: as with any self-assessment, this can lead to measurement errors influenced by unobserved factors. The same caveat applies for our measurement of lifestyles: many of them are roughly measured, and in particular we do not have quantitative assessment of smoking and drinking behaviour and we do not possess information on objective health conditions.

Our study at the same time has multiple strengths and we consider it as a valuable reference point for further investigations. It is based on a nationally representative sample, and is part of a coordinated European survey using harmonized techniques, definitions and socio-economic indicators, making it possible to envisage

comparisons of the relationship between living conditions, lifestyles and health across European countries. It is a longitudinal survey, allowing for a future extension of our analysis considering changes over time in socio-economic conditions, lifestyles and health outcomes.

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