Social Science & Medicine 410 (2026) 119874



Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed



Unequal returns to effort? Gender differences in health status and lifestyle

Alexia Bigorne [a,*], Sandy Tubeuf [a,b]

[a] Institute of Health and Society Research, Université catholique de Louvain, Clos Chapelle-aux-champs 30/B1.30.15, Woluwe-Saint-Lambert, 1200, Belgium
[b] Institute of Economic and Social Research, Université catholique de Louvain, Place Montesquieu 3/L2.06.01, Louvain-la-Neuve, 1348, Belgium

ARTICLE INFO

Handling Editor: Joanna Coast

ABSTRACT

Equality of opportunity suggests that observed differences in an outcome of interest should only reflect factors within individuals' control, namely effort, and not circumstances beyond their control, such as their parent's level of education or longevity. In the health field, lifestyles are typically considered as individual effort and are viewed as legitimate sources of health inequality. However, it remains unclear to what extent these effort-related factors contribute to gender differences in health status. Using data from the Survey on Health Ageing and Retirement, we examine differences in health and lifestyles related to physical exercise and fruits and vegetables intake between men and women. We use a Shapley decomposition and generate a multidimensional health score based on a set of health-related outcomes. Interaction terms between gender and lifestyles suggest that insufficient physical activity is more strongly associated with poorer health in men than in women, whereas infrequent consumption of fruits and vegetables is more strongly associated with poorer health in women than in men. Finally, the decomposition shows that family socio-economic background is the main contribution of heath inequalities among women, while the frequency of physical exercise is the main contribution of health inequalities among men. Our results encourage gender-specific prevention policies to improve population health.

1. Introduction

According to Dworkin (1981), equality-of-opportunity (EOP) implies that individuals should strictly be held responsible for the consequences of voluntary lifestyles, referred to as effort, which are within their control. Conversely, individuals should not be held responsible for factors beyond their control, such as their place of birth or their parents' characteristics (Roemer, 1998). These factors, commonly referred to as circumstances, are regarded as illegitimate sources of inequality under the EOP framework of Roemer (1998). The policy principles underlying the concept of EOP aim to compensate individuals for disadvantaged outcomes stemming from illegitimate sources of inequality (circumstances) while recognizing and preserving the observed outcome that results from effort, which is considered as legitimate sources of inequality. These two principles are respectively known as the principle of compensation and the principle of reward; they are essential for achieving EOP, an ideal state in which illegitimate sources of inequality in outcomes have been eliminated.

The study of EOP in the health field has become a prolific line of research in recent years (Jusot and Tubeuf, 2019). Although gender is often included as a control variable in models measuring EOP (Aran and Ersado, 2013; Hederos et al., 2017; Awad and Hussain, 2021; Berthung et al., 2022), the gender dimension itself is rarely the main focus of analyses. Some studies highlight that gender is a key source of disparities in EOP in areas such as nutrition and income where EOP tends to be higher among women than among men (Aran and Ersado, 2013; Hederos et al., 2017). It has also been shown that mothers' health is more strongly associated with their daughters' health, while fathers' health is more strongly associated with their sons' health (Berthung et al., 2022; Bigorne et al., 2023). In this paper, we adopt an *ex-post* approach to measuring inequalities of opportunity in health (Fleurbaey et al., 2017), which means that we assume that individuals exerting the same level of effort should achieve similar health outcomes and we investigate gender differences in health outcomes and health-related lifestyles.

While women generally have a higher life expectancy than men, they also tend to experience poorer health outcomes and live more years in degraded health conditions (Case and Paxson, 2005). Gender differences are also observed in health-related behaviours. As noted by Casal, unhealthy habits such as alcohol consumption, smoking, drug use, and engagement in risky activities such as speeding, drunk driving and extreme sports are more commonly observed among men, especially in developed countries (Casal, 2015). Recent evidence suggests that

* Corresponding author.
E-mail addresses: alexia.bigorne@uclouvain.be (A. Bigorne), sandy.tubeuf@uclouvain.be (S. Tubeuf).

https://doi.org/10.1016/j.socscimed.2026.119874
Received 10 February 2026; Received in revised form 21 September 2026; Accepted 24 September 2026
Available online 7 October 2026
0277-9536/© 2026 Elsevier Ltd. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

physical activity does not benefit women and men to the same extent. Chen et al. (2025) used data from accelerometers used on 85 000 UK-Biobank participants to examine sex differences in the association between physical activity and coronary heart disease (CVD). Their results show that while women require 250 min of moderate to vigorous physical activity per week to achieve a 30% reduction in CVD risk, men require 530 min to reach the same reduction.

The current study investigates whether men and women engage differently in risky behaviours and whether those differences in lifestyles help explain observed differences in general health status. Specifically, we investigate whether and to what extent, current health-related lifestyles, considered as efforts, affect health outcomes differently for men and women. By examining differences in health-related lifestyles, we assess whether the returns of effort on health vary by gender, while controlling for individual circumstances, age and country of residence. Finally, we measure and decompose the gender gap in inequality of opportunity in health between men and women.

In order to address gender appropriately in quantitative methods we follow four deliberate methodological guidelines that align with recent developments in feminist economics (Small, 2024). First, rather than splitting the sample into two separate groups and conducting a stratified analysis by gender, we include interaction terms between gender and key explanatory variables. Unlike a stratified analysis, our approach preserves the full sample size, thereby increasing statistical power. Second, we refer to "gender" rather than "sex" throughout the paper. As Small notes, social scientists should rarely make claims purely on biological sex but rather on socially constructed gender roles and experiences (Small, 2024). Although the survey data used in this study collect self-reported sex, we treat this variable as a proxy for gender, acknowledging the socialization processes that underlie differences in childhood circumstances, lifestyles and health. Third, we intentionally consider women as the reference group in our regression analyses. Cokley and Awad (2013) argue that comparisons between groups should not be used to reinforce hierarchies or imply the superiority of one group over another. Similarly, Sprague warns against framing social problems in ways that focus on responsibility and blame on disadvantaged groups while leaving advantaged individuals unexamined (Sprague, 2016). Finally, we follow recommendations from Miller and Rodgers (2008) when interpreting the regression results and distinguish between economic importance and statistical significance, ensuring that our discussion does not conflate statistical findings with substantive meaning.

This paper contributes to the literature on health inequalities in four main ways. First, it bridges a gap in the literature by integrating gender-aware principles into an *ex-post* EOP analysis. Second, it uses a decomposition method which allows us to assess the relative contribution of all independent variables of our model (circumstances, effort, age, gender and country of residence) in health inequalities. Third, while previous studies commonly used tobacco or alcohol consumption to proxy individual investments in health, this study focused on two positive health-related behaviours: physical exercise and fruits and vegetables intake. These behaviours are socially patterned and show gendered differences. Finally, it is the first study to apply an *ex-post* approach in EOP in health to assess whether the health returns of lifestyles differ between men and women.

2. The model

2.1. General health production function

We consider a health capital model *à la* Grossman (1972) where health is framed as a capital that individuals can consume and invest in. Health is conceptualised as a durable capital stock that produces healthy days, which are valued both intrinsically and for their contribution to productivity. Over time, this capital depreciates due to ageing and the onset of illness, and must be maintained or enhanced through investment. Individuals can invest in their health capital through medical care, healthy behaviours and education, which are expected to improve the efficiency of health production.

We will use data from waves 4, 5 and 6 of the Survey on Health, Ageing and Retirement in Europe (SHARE), which were respectively collected in 2010, 2013 and 2015. Our analysis is across 12 European countries, namely Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Italy, Luxembourg, Slovenia, Spain and Sweden. During the SHARE study, the relevant research ethics committees in the participating countries approved the research design, and all participants provided written informed consent. For further use and analysis of SHARE data, no ethical approval is needed.

Let us assume that (H_i) represents the health outcome of individual i as follows:

$$\boldsymbol{H}_i = \alpha \boldsymbol{E}_i + \beta \boldsymbol{C}_i + \delta \boldsymbol{Age}_i + \gamma \boldsymbol{Country}_i + u_i \quad \text{(Eq. 1)}$$

where health-related behaviours are represented by (E_i) and childhood circumstances are represented by (C_i). The depreciation of the health stock (H_i) over the lifecycle is accounted for by controlling for (Age_i) and the country of residence of the respondents ($Country_i$). Finally, (u_i) is an error term normally distributed tending towards 0.

Extensions of Grossman's model have been proposed to better understand factors such as the effects of education or the gender pay gap on health. Mazzonna (2014) showed that an additional year of schooling improved men's self-reported health but not women's. Averett et al. (2024) suggested that eliminating the gender wage gap would result in a 1.2% reduction in women's poor or fair self-reported health. Other studies showed that health deterioration varies across socioeconomic groups with the ageing process occurring more rapidly for individuals with lower socioeconomic status (Case and Deaton, 2005) and social inequalities in health-related lifestyles and medical care (Galama, 2009). Several studies have shown that women and men do not age at the same pace (Gale et al., 2013; Merz and Cheng, 2016; Cunningham et al., 2021). Gale et al. (2013) showed that, in older adults, higher concentrations of inflammatory markers, CRP and fibrinogen, explain more of the risk of incident frailty in women than in men. Merz and Cheng (2016) highlighted sex differences in cardiovascular ageing attributable to both hormonal and non-hormonal factors, generally to the advantage of men. Cunningham et al. (2021) reported a higher prevalence of obstructive sleep apnea in middle-aged men than in middle-aged women, along with differences in comorbidities.

Empirical applications of the Grossman model (1972) rarely explicitly distinguished between men and women, we propose to consider gendered differences in the depreciation of health and the differential effect of lifestyle behaviours over the life course. This explicit consideration leads us to develop (Eq. (1)) as follows:

$$\boldsymbol{H}_i = \theta \boldsymbol{G}_i + \alpha_g \boldsymbol{E}_i + \vartheta \boldsymbol{E} \times \boldsymbol{G}_i + \beta_g \boldsymbol{C}_i + \delta_g \boldsymbol{Age}_i + \gamma_g \boldsymbol{Country}_i + u_i \quad \text{(Eq. 2)}$$

where gender (G_i) represents a binary variable of whether the individual reports being a man or a woman in the survey and ($E_i \times G_i$) is an interaction term measuring the gendered effect of lifestyle behaviours on health. We propose to consider α_g a gender-specific estimator measuring the gendered returns of health-related behaviours on health, β_g a gender-specific estimator measuring the social structure constraints related to gender from family and social background and δ_g, a gender-specific age depreciation estimator with the subscript $g = \{w, m\}$.

Despite that our model will not be stratified by gender, we want to underline that estimators could be gender-specific in (Eq. (2)) to emphasise the different channels through which gender can affect the correlation between the health status and some regressors. Our model tests the following three conditions: (1) equality of lifestyles returns across gender: $\alpha_g = \alpha_w = \alpha_m$; (2) equality of opportunity across gender: $\beta_g = \beta_w = \beta_m = 0$ and (3) equality of age depreciation across gender: $\delta_g = \delta_w = \delta_m$.

The empirical investigation considers seven alternative models based

on (Eq. (2)). Model 1 includes the full set of control variables, including the vector of circumstances, age and country of residence. Model 2 additionally considers physical exercise. Model 3 includes fruits and vegetables intake without physical exercise. Interaction terms between health-related behaviours and gender with physical activity are considered in Model 4, while interaction terms of gender with fruits and vegetables intake are included in Model 5. In Model 6, the two health-related behaviours and respective interaction terms are jointly included. Finally, Model 7 introduces interacted terms between the vector of childhood circumstances and gender.

2.2. EOP decomposition

We then quantify how each explanatory variable explains the R-squared of the previous regression model (Eq. (2)) through a Shapley decomposition. Each explanatory variable is a contribution of the variance of the dependent variable measuring health (Israeli, 2007). Specifically, health inequality measures are estimated for all possible permutations of the independent variables, which allows the average marginal contribution of each variable to total health inequality to be calculated. The Shapley decomposition has two advantages. First, if we add the different components, we get the total value of the variance and second, it is order independent (Juárez and Soloaga, 2014). This method has been previously used to quantify inequality of opportunity in health *ex-ante* (Davillas and Jones, 2020; Berthung et al., 2022). We consider three sequential decompositions: a total sample decomposition (including gender) and a separate decomposition for women and for men. Interaction terms are excluded from the model to run the decomposition.

2.3. Robustness checks

We performed 4 robustness checks to strengthen our findings. First, we computed the analysis using only physical exercise prior to the measurement of the outcome variable. Second, we included more commonly used effort variables in the litterature, smoking and BMI. Third, we did the analysis using purged effort from its correlation with circumstances. Fourth, we clustered countries according to the Gender Equality Index, accounting for gender inequalities across countries.

3. Data

Data come from waves 4, 5 and 6 of the Survey on Health, Ageing and Retirement in Europe (SHARE), which were respectively collected in 2010, 2013 and 2015. We have information on respondents' current health-related habits as well as information regarding their socio-economic background during childhood as collected in SHARELIFE survey. We consider a sample of 25 210 individuals, 14 425 women and 10 785 men aged from 50 years old and above across 12 European countries, namely Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Italy, Luxembourg, Slovenia, Spain and Sweden. Our analysis considers pooled data over Europe.

3.1. Health outcome

Although self-assessed health (SAH) is a well-established predictor of mortality (Benyamini, 2011; Idler and Benyamini, 1997), research indicates that it may not consistently capture overall health status due to age-related differences in health determinants and reporting standards. For example, research points to a lack of measurement invariance across groups and to persistent effects of non-health characteristics even after extensive adjustment for health, indicating non-health-related biases in SAH (Layes et al., 2012; Oksuzyan et al., 2019; Lazarevič and Brandt, 2020). To address these biases, Lazarevič (2023) adopted a multidimensional approach to measure health and developed a composite health score based on the three questions of the Minimum European Health Module, capturing general, medical and physical health. General health status is measured with self-assessed health with five response categories ranging from excellent to poor. Medical health is measured through self-reported chronic conditions based on a list of 15 diseases. Physical health is measured using the Global Activity Limitation Indicator (GALI) with three severity levels. The distributions of these three indicators, along with the newly generated score, are presented in Table 1. Women report poorer general health than men. Nearly half of the sample reports having two or more chronic diseases and this is significantly more marked in women. Finally, women are significantly more likely than men to report limitations, whether moderate or severe.

The score is generated using a generalized structural equation model where each of the health outcomes is modelized as an ordered logit and the health score is predicted as a latent variable in a post-estimation (Lazarevič, 2023). Regression results are available in Appendix A. Self-assessed health and GALI contribute equally to the score, while the prevalence of chronic disease contributes to a lower extent. The newly generated score is a continuous variable and has the advantage allowing the use of linear regressions model for the rest of the analysis. It has been standardized as a z-score, centered around 0 within a range spanning from −2.04 to +2.06, corresponding to a total scale width of 4.10 points. Positive values indicate poorer health than the sample average and negative values indicate better health than the sample average. Men have on average a score of −0.047, which means that they have a better health status than the total sample average whereas women have on average a score of 0.055, which is below the sample average. Observed differences in the health score between men and women are significant.

We graphically represented the distribution of the health score overall (Fig. 1), and in men and women samples respectively (Fig. 2). The distribution of the health score in men is more dispersed than in women. Because the average health score of women is lower than men, a larger proportion of women cluster around this lower average. In contrast, men exhibit greater variability with scores spread more widely across the range. Overall women have poorer health but demonstrate fewer extreme values.

Table 1
Distribution of self-assessed health, prevalence of chronic diseases and GALI in the pooled sample across Europe, and in the pooled sample of men and of women in Europe.

	Total	Women	Men	Difference between gender
	Proportion (SE)	Proportion (SE)	Proportion (SE)	
Self-assessed health				
Excellent	7% (0.255)	7% (0.248)	7% (0.263)	−0.009**
Very good	17% (0.374)	16% (0.369)	18% (0.381)	−0.015**
Good	36% (0.481)	35% (0.478)	38% (0.484)	−0.023***
Fair	30% (0.458)	31% (0.464)	28% (0.450)	0.032***
Poor	10% (0.298)	10% (0.306)	9% (0.287)	0.014***
Prevalence of chronic diseases				
No chronic diseases	23% (0.418)	22% (0.413)	24% (0.425)	−0.010***
1 chronic disease	29% (0.453)	28% (0.449)	30% (0.459)	−0.021***
2 or more chronic diseases	48% (0.500)	50% (0.500)	46% (0.499)	0.040***
Global Activity Limitation Indicator				
Not limited	52% (0.499)	50% (0.500)	55% (0.497)	−0.050***
Limited but not severely	32% (0.467)	33% (0.471)	30% (0.460)	0.029***
Severely limited	16% (0.363)	16% (0.371)	14% (0.351)	0.020***
Generated health score				
Average (SD)	0.011 (1.00)	0.055 (1.00)	−0.047 (0.98)	
(Min; Max)	(-2.04; 2.06)	(-2.04; 2.06)	(-2.04; 2.06)	

Standard errors in parentheses ***p < 0.001, **p < 0.01, *p < 0.05.

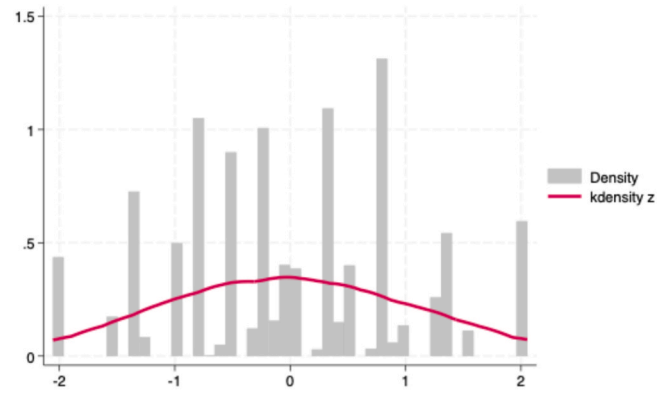


Fig. 1. Distribution of the health z-score in the pooled sample across Europe.

3.2. Health-related lifestyles

Effort is proxied with two health-related lifestyles collected as part of the survey: self-reported frequency of physical exercise and self-reported frequency of eating fruits and vegetables. While physical activities were collected across three consecutive waves of the survey waves 4, 5 and 6, fruits and vegetables intake was only collected at wave 5.

Individuals reported how often they engaged with sports and activities considered as vigorous using four possible answers: 'More than once a week', 'Once a week', 'One to three times a month' and 'Hardly ever, or never'. Accounting for repeated observations, we constructed a three-category ordered variable for physical activities: 'Exercising more than once a week for at least 2 waves', 'Hardly or ever exercising for at least 2 waves' and a middle category capturing all remaining patterns, which we labelled 'Mid-level exercising'. A majority of individuals engage in a mid-level exercising for at least 2 waves and this applies to both women and men (Table 2). However, a higher proportion of men exercise significantly more than once a week for at least 2 waves compared to women.

Individuals reported how often they had a serving of fruits and/or vegetables with the possible answers: 'Every day', '3-6 times a week', 'Twice a week', 'Once a week' and 'Less than once a week'. We collapsed the 5-categories variable into 3-categories as follows 'Every day', '3-6 times a week' and 'Almost never' which includes the following options: 'Twice a week', 'Once a week' and 'Less than once a week'. A majority of individuals (almost 4 individuals out of 5) report eating fruits and vegetables everyday; in women, the proportion reaches 82% against 72% in men; these differences are significant (Table 2).

Physical exercise and fruits and vegetables intake are inversely correlated (rho = −0.0268, $p < 0.001$). Individuals who tend to exercise more frequently, eat fruits and vegetables less frequently; still, the correlation is relatively small and negligible.

3.3. Family socio-economic background

Building upon prior empirical literature (Rosa Dias, 2009, 2010; Trannoy et al., 2010), we consider a large vector of variables to measure circumstances during childhood that are expected to be associated with the health status. This vector covers several socioeconomic and health dimensions. It is measured with self-reported information in the SHARELIFE survey collected in 2008-2009 and 2017 where respondents were asked to report information about their family conditions.

Social conditions include six different variables: mother's and father's education level, occupation of the household head, household's financial status and the number of books in the house. Parents' level of education is measured using the International Standard Classification of Education (ISCED), which allows for comparisons between countries using a uniform international classification. Education is classified into three levels: education at kindergarten level classified as 'no education', primary and lower secondary education classified as 'low education', and education from secondary to tertiary education classified as 'medium or high education'. We note a higher proportion of fathers with a medium or high level of education (37%) than mothers (22%), who predominantly had a low education (more than 50%) (Table 3). Occupation of the household heads follows the International Standard Classification of Occupations classification (ISCO-08), and divides occupations into six categories: 'senior managers and professionals', 'technicians and associate

Table 2
Distribution of self-reported frequency of engaging in physical activity and frequency of eating fruits and vegetables in the pooled sample across Europe, in the pooled sample of women and the pooled sample of men.

Frequency of vigorous physical exercise	Total	Women	Men	Difference between gender
	Proportion (SE)	Proportion (SE)	Proportion (SE)	
More than once a week for at least 2 waves	29% (0.451)	25% (0.430)	34% (0.473)	−0.093***
Mid-level exercising	38% (0.485)	38% (0.484)	38% (0.487)	−0.008
Hardly or ever exercising for at least 2 waves	34% (0.472)	38% (0.485)	28% (0.448)	0.102***
Frequency of fruits and vegetables intake				
Daily	78% (0.416)	82% (0.386)	72% (0.447)	0.094***
3-6 times a week	16% (0.365)	13% (0.341)	19% (0.393)	−0.057***
Almost never	6% (0.244)	5% (0.213)	8% (0.278)	−0.037***
Spearman correlation (rho)	−0.0278***	−0.0200*	−0.0476***	

Standard errors in parentheses ***p < 0.001, **p < 0.01, *p < 0.05.

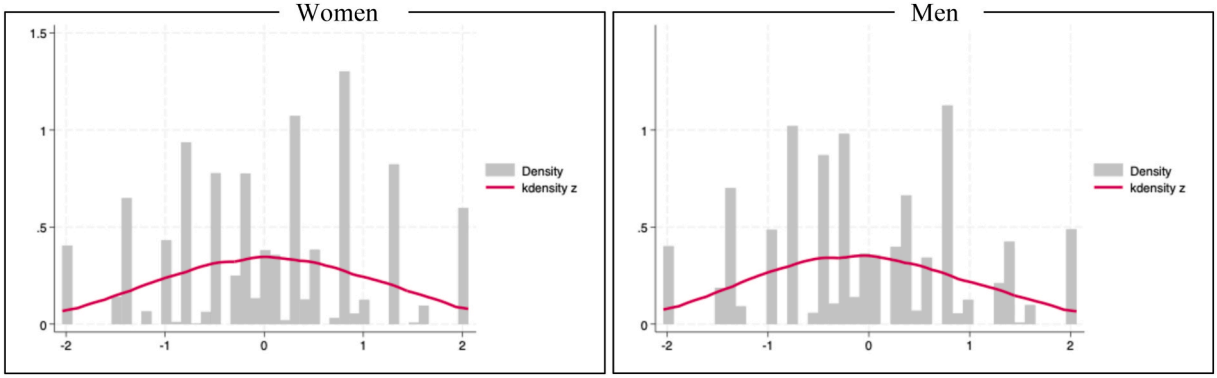


Fig. 2. Distribution of the health z-score in the pooled sample of women *(on the left)* and of men *(on the right)* in Europe.

Table 3
Distribution of the vector of circumstances in the pooled sample across Europe, in the sample of women and in the sample of men.

	Total sample % (SD)	Women % (SD)	Men % (SD)	Difference between gender
Mother's education				
High-medium education	22% (0.417)	23% (0.421)	21% (0.411)	0.016**
Low education	55% (0.497)	55% (0.497)	56% 0.497)	−0.006
No education	21% (0.406)	20% (0.404)	21% (0.409)	−0.008
Unknown	2% (0.122)	1% (0.118)	2% (0.126)	−0.002
Father's education				
High-medium education	37% (0.483)	37% (0.482)	37% (0.484)	−0.007
Low education	41% (0.492)	41% (0.492)	41% (0.491)	0.006
No education	18% (0.386)	18% (0.384)	19% (0.389)	−0.006
Unknown	4% (0.193)	4% (0.200)	3% (0.183)	0.006**
Household head				
Head - Managers and professionals	12% (0.320)	12% (0.320)	12% (0.320)	−0.001
Head - technicians, associate prof. armed forces	8% (0.264)	8% (0.266)	7% (0.262)	0.002
Head - office clerks, service and sales workers	10% (0.303)	10% (0.306)	10% (0.299)	0.005
Head - skilled agricultural and fishery workers	17% (0.373)	17% (0.372)	17% (0.374)	−0.002
Head - craftsmen and skilled workers	21% (0.404)	20% (0.400)	21% (0.409)	−0.12**
Head - elementary occup., unskilled workers	17% (0.373)	17% (0.378)	16% (0.367)	0.012**
Head – None	17% (0.373)	16% (0.371)	17% (0.375)	−0.005
Family's finance				
Pretty well-off family	11% (0.311)	11% (0.312)	11% (0.310)	0.002
About average family	60% (0.491)	59% (0.491)	60% (0.490)	−0.004
Poor or varied family	25% (0.432)	25% (0.434)	25% (0.431)	0.005
Unknown financial situation	5% (0.208)	4% (0.206)	5% (0.211)	−0.003
Number of books in the household during childhood				
2+ bookcases (101+ books)	17% (0.373)	17% (0.379)	16% (0.364)	0.016***
One bookcase (26-100 books)	25% (0.434)	25% (0.433)	25% (0.436)	−0.005
One shelf (11-25 books)	24% (0.426)	24% (0.426)	24% (0.427)	−0.002
None or very few (0-10 books)	33% (0.468)	32% (0.467)	33% (0.470)	−0.007
Unknown	2% (0.131)	2% (0.127)	2% (0.137)	−0.003
Mother harming				
Mother often or sometimes harming	17% (0.375)	17% (0.372)	17% (0.380)	−0.009*
Mother rarely harming	21% (0.408)	20% (0.399)	23% (0.420)	−0.030***
Mother never harming	59% (0.492)	61% (0.488)	56% (0.497)	0.051***
Unknown	3% (0.177)	3% (0.163)	4% (0.193)	−0.011***
Father harming				
Father often or sometimes harming	14% (0.344)	10% (0.306)	18% (0.386)	−0.078***
Father rarely harming	21% (0.408)	18% (0.382)	26% (0.436)	−0.079***
Father never harming	58% (0.493)	65% (0.476)	49% (0.500)	0.163***
Unknown	7% (0.251)	6% (0.246)	7% (0.257)	−0.007**
Mother's health				
Mother alive	17% (0.376)	18% (0.380)	16% (0.369)	0.012**
Mother: died normal age	44% (0.496)	43% (0.495)	45% (0.497)	−0.016**
Mother: premature death	39% (0.489)	40% (0.489)	39% (0.488)	0.004
Father's health				
Father alive	6% (0.241)	6% (0.243)	6% (0.239)	0.002
Father: died normal age	49% (0.500)	49% (0.500)	50% (0.500)	−0.012*
Father: premature death	45% (0.497)	45% (498)	44% (0.496)	0.010*
Child's health status				
Excellent childhood health	27% (0.446)	26% (0.439)	29% (0.454)	−0.031***
Very good childhood health	30% (0.459)	30% (0.458)	30% (0.459)	−0.002
Good childhood health	29% (0.453)	29% (0.456)	28% (0.449)	0.013**
Fair/Poor/Uncertain childhood health	13% (0.337)	14% (0.348)	12% (0.321)	0.024***
Unknown	<1% (0.084)	<1% (0.073)	<1% (0.096)	−0.004***

Standard errors in parentheses ***p < 0.001, **p < 0.01, *p < 0.05.

professionals and armed forces', 'clerical, service and sales workers', 'skilled agricultural and fishery workers', 'craftsmen and skilled workers', 'elementary occupations and unskilled workers'. One fifth of the household heads were craftsmen and skilled workers; 8% of the heads were then technicians, associate professionals and armed forces. For a large proportion of the sample (17%), the occupation of the household head is missing. Respondents were asked to report their family financial situation during childhood before the age of 16 years old on a 4-categories scale including: 'pretty well off financially', 'about average', 'poor' or 'it varied'. More than 60% of the respondents reported that their family's financial situation was about average. Finally, respondents were also asked about the number of books they had at home when they were 10 years old; four response categories were proposed ranging from 'none or very few (0-10 books)' to 'enough to fill two or more libraries (101+ books)'. One third of the respondents reported having 'none or very few books at home'. We consider access to books as a proxy of cultural capital. According to Bourdieu's theory, access to books in the household during childhood serves as a proxy for cultural capital. This reflects an intergenerational transmission of objectified cultural capital, which can enhance the likelihood of success later in life. (Bourdieu, 1986; Bourdieu and Passeron, 1990). This circumstance is not gender-specific; rather, it is a common factor alongside parents' education, the head of household's occupation, and the family's financial situation.

Relationship with parents is measured using the question 'Did your father/mother ever push, grab, shove, throw anything at you, slap or hit you?' with four possible answers 'often', 'sometimes', 'rarely', and 'never'. Individuals reported being more frequently harmed by their mother (17%) than their father (14%).

Parental health is measured using information on whether or not the parent is alive at the time of the survey; we considered reports at wave 6. If the parent is not alive, the respondent reported their age at death. Using a country-specific median age at death for mothers and fathers, respectively, we generated a discrete variable to assess whether the parent died at a premature age i.e, dying strictly younger than the

Table 4
Linear regression models results, outcome: score of health for Europe (with bootstrapped standard errors: 1000 replications).

VARIABLES	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Coeff.	(SE)	Coeff.	(SE)	Coeff.	(SE)	Coeff.	(SE)	Coeff.	(SE)	Coeff.	(SE)	Coeff.	(SE)
Women	**Ref**		**Ref**		**Ref**		**Ref**		**Ref**		**Ref**		**Ref**	
Men	−0.081***	(0.013)	−0.021*	(0.012)	−0.092***	(0.013)	−0.050***	(0.019)	−0.079***	(0.014)	−0.044**	(0.020)	0.049	(0.072)
Mid-level exercising			**Ref**				**Ref**				**Ref**		**Ref**	
Hardly or ever exercising			0.442***	(0.015)			0.419***	(0.019)			0.416***	(0.019)	0.402***	(0.019)
Exercise more than once a week			−0.185***	(0.015)			−0.202***	(0.020)			−0.198***	(0.020)	−0.193***	(0.020)
Daily fruits and vegetable intake:					**Ref**				**Ref**		**Ref**		**Ref**	
3-6 times a week					0.070***	(0.016)			0.106***	(0.023)	0.081***	(0.022)	0.077***	(0.022)
Almost never					0.183***	(0.027)			0.189***	(0.037)	0.131***	(0.037)	0.128***	(0.037)
Mid-level exercising x Women							**Ref**						**Ref**	
Hardly or ever exercising x Men							0.057*	(0.029)			0.059**	(0.029)	0.091***	(0.030)
Exercise more than once a week x men							0.039	(0.028)			0.037	(0.028)	0.026	(0.028)
Daily F&V intake x Women									**Ref**		**Ref**		**Ref**	
3-6 times a week x Men									−0.073**	(0.033)	−0.079**	(0.032)	−0.077**	(0.032)
Almost never x Men									−0.014	(0.051)	−0.016	(0.049)	−0.021	(0.049)
Age	***		***		***		***		***		***		***	
Family socio-economic background	***		***		***		***		***		***		***	
Family socio-ec background x women													***	
Country	***		***		***		***		***		***		***	
Constant	−0.862***	(0.047)	−0.873***	(0.046)	−0.865***	(0.047)	−0.881***	(0.044)	−0.962***	(0.044)	−0.897***	(0.044)	−0.929***	(0.054)
Observations	**21 012**													
R-squared	**0.211**		**0.268**		**0.213**		**0.268**		**0.213**		**0.269**		**0.272**	

Model 1: family socio-economic background, age, country; **Model 2**: Model 1 + physical exercise, **Model 3**: Model 1 + fruits and vegetables intake; **Model 4**: Model 2 + interaction term gender × physical exercise; **Model 5**: Model 3 + interaction term gender × fruits and vegetable intake; **Model 6**: Model 4 + Model 5; **Model 7**: Model 6 + gender × circumstances.
Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1.

national median age at death or not. When individuals reported that their mother or father died but could not remember their age of death or did not want to say, we imputed the missing value by the national median age at the death for fathers or mothers. We thus have a parental health status variable in three categories for both parents: being alive at the time of the survey, having died at a normal age, having died prematurely. The proportion of fathers who are still alive at the time of the survey is lower than the proportion of mothers (6% compared to 17%). There is also a higher proportion of fathers who died prematurely compared to mothers (45% compared to 39%).

Respondent's health status during childhood is measured using retrospective self-reported health status during their childhood up to the age of 15, using five categories: 'excellent', 'very good', 'good', 'fair, poor or it varied', 'unknown'. Regardless of gender, most individuals reported having a health status between good and excellent during their childhood.

While most circumstances were similar in the women and men samples, relationship with parents and parental health showed significant differences. These observed differences motivate the use of interacted terms for circumstances variables with gender in the regression (Model 7).

4. Results

4.1. Results of the general health production regressions

The results of the linear regression models of the health score are presented in Table 4. Seven different models are reported: Model 1 does not include any health-related lifestyles, Model 2 and 3 respectively consider physical activity and fruits and vegetables intake, Models 4 and 5 include interacted terms of each health-related lifestyles with gender and finally Model 6 includes both health-related lifestyles and their respective interacted terms with gender while Model 7 adds interaction terms between circumstances and gender. The health score is constructed so that the higher the score, the poorer the health.

Miller and Rodgers (2008) highlight the importance of distinguishing statistical significance from economic significance: a coefficient can be statistically significant yet too small to warrant attention from a policy or public health perspective. "*The underlying modes are intended to identify factors that could be used to influence outcomes such as employment, wages, economic growth, or health*" (Miller and Rodgers, 2008). Therefore, interpretation of results should consider not only statistical evidence but also the substantive size of the association in the context of the outcome's scale.

Across all model specifications, higher age categories are consistently associated with poorer health. As a summary, less favorable family socio-economic background (lower parental education, less skilled head of the household, less available books at home when 10 years old, lower family financial situation, more harmful parents, lower health status as a child and lower parents' health) are associated to a poorer adult health.

Focusing on the association between gender and health status, Model 1 shows that men report significantly better health than women, with a 0.08 point lower health score. In Model 2, incorporating physical activity, 'ever or hardly ever' exercising for at least two waves compared with exercising 'more than once a week', is associated with a substantially poorer health score ($\beta = 0.44$), with a clear gradient across physical activity categories. The association between health and being a man decreases in magnitude once physical activity is included, indicating that exercising accounts for part of the gender difference in health. Model 3 adds fruits and vegetables intake and shows that consuming fruits and vegetables less frequently than daily is associated with poorer health, again showing a graded pattern between health and fruits and vegetables intake. The gender coefficient remains significant and similar to Model 1, suggesting that healthy eating explains little of the observed gender gap relative to physical activity. In Model 2, hardly

or ever engaging in physical activity (compared to having a mid-level exercise frequency over two waves) is associated with an increase of 0.44 points in the health score. This corresponds to approximately 10,73% of the total health scale, indicating a substantial and practically meaningful association. Such a result suggests a notable deterioration of health associated with physical inactivity. In contrast, the coefficient for gender in Model 1 is −0.08, which, while statistically significant, represents less than 2% of the health scale range. The magnitude of the association is relatively small, raising questions about its relevance in terms of health disparities between men and women.

Models 4 and 5 include interaction terms to further assess whether health-related behaviours moderate the association between gender and health. In Model 4, the interaction between gender and physical activity is positive and statistically significant, although smaller in magnitude than the main association with physical exercise. This indicates that low levels of physical exercise are more strongly associated with poor health among men than among women. In other words, women's health appears to be less sensitive to the lack of physical activity compared to men. In Model 5, the interaction between gender and fruits and vegetables intake is negative and significant, with a magnitude comparable to that of the main association between fruits and vegetables intake on health. This suggests that men gain more health benefits from frequent consumption of fruits and vegetables than women. In Model 6, which simultaneously incorporates both lifestyle behaviours and childhood circumstances, the coefficient for being a man remains negative and significant, indicating that men have better health than women even after accounting for lifestyle differences.

Finally, Model 7 includes interaction terms between gender and circumstances. Once these interactions are included, the main association with gender is no longer significant, suggesting that this specification absorbs the remaining gender-related differences in health status.

Returning to our model hypotheses: (1) lifestyle factors yield different health returns for women and men ($\alpha_g \neq \alpha_w \neq \alpha_m$); (2) inequality of opportunity also differs across gender ($\beta_g \neq \beta_w \neq \beta_m \neq 0$) and (3) age-related health depreciation varies between women and men ($\delta_w \neq \delta_m$). The general health demand model therefore differs for women and men. Both the level of health capital transmitted at birth and the rate at which health declines over the life course vary by gender.

Concerning the R-squared of the different models, we reach an explanatory power of up to 27.2% of health differences across our sample in the final model where all variables and all interaction terms are included. The R-squared for Model 2 that includes physical exercise is 26.8%, and is higher than the one where fruits and vegetables intake is included. Physical exercise therefore appears to explain more health inequalities among individuals than fruits and vegetables intake does.

4.2. Results Shapley decomposition

The decomposition in Fig. 3 shows that the most significant contributions to health inequalities in our total sample are circumstances (31.8%), followed by frequency of physical activity (28.9%), country of residence (22.7%), age (15.0%), fruits and vegetables intake (1.2%), and finally, the smallest contribution is gender (0.5%).

For health inequalities among women in our sample, the most significant contributors are circumstances (35.2%), followed by frequency of physical activity (25.9%), country of residence (18.6%), age (18.4%) and, finally, fruits and vegetables intake (1.9%).

If we now look at health inequalities among men, the primary contribution is the frequency of physical activity (32.2%), followed by country of residence (28.7%), circumstances (27.9%), age (10.5%), and finally, fruits and vegetables intake (0.8%).

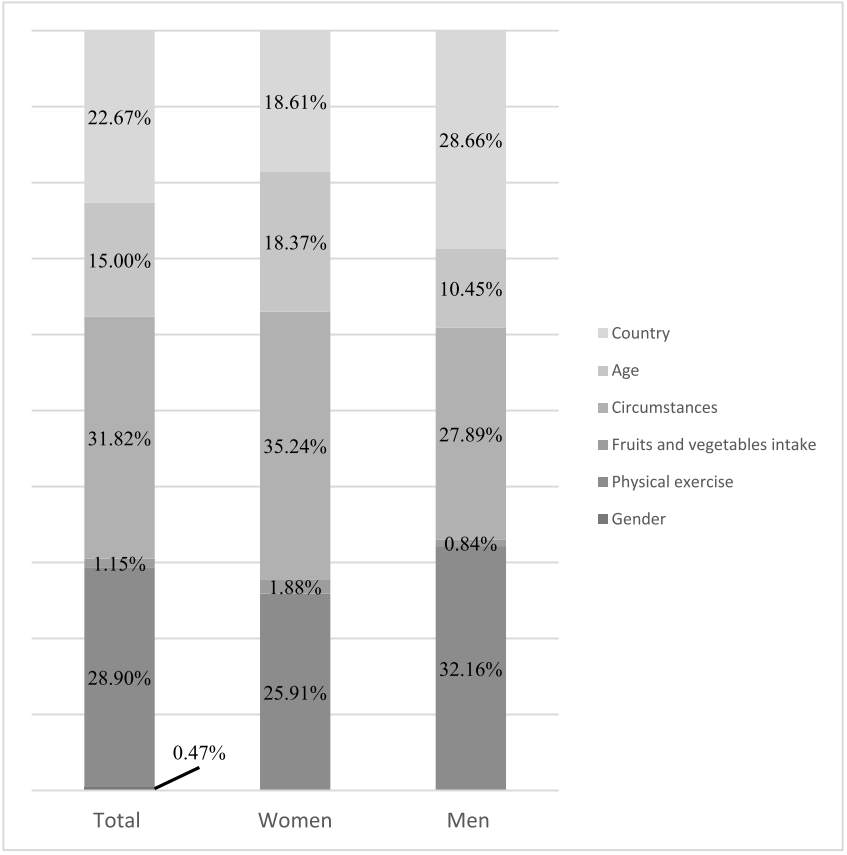


Fig. 3. – Shapley decomposition of health inequality by gender within Europe.

4.3. Robustness checks

We conducted four sets of robustness checks to further validate our results.

As a primary robustness check, we considered efforts observed only prior to the health outcome to prevent possible reverse causality. When physical activity data is limited to waves 4 and 5, results are consistent with the main findings: individuals who hardly or never exercised for at least two waves are associated to have poorer health compared to those with moderate exercise, and those who exercised more than once a week for two waves are associated to have better health. Examining interaction terms, being a man and exercising rarely for at least two waves is linked to poorer health than being a woman and exercising rarely for the same period. Additionally, the magnitude of these coefficients is also similar to the results including effort in wave 6.

As a secondary robustness check, we examined more commonly used effort variables in previous research including smoking prevalence and BMI as measured in wave 5. Findings show that smoking prevalence and having a BMI outside the healthy range of 18 to 25 are linked to poorer health. Interaction terms between smoking and gender are not statistically significant. Regarding BMI, being a man and having a BMI outside the healthy range is associated to a less poor health than for women with the same BMI. The Shapley decomposition reveals that smoking accounts for less than 1% of health differences both overall and within genders. BMI explains about 6% of health variation in the total sample and 9% within women. These figures are substantially lower than the contribution of physical exercise.

As a third robustness check, we accounted for the correlation between effort and circumstances (Roemer, 1998; Jusot et al., 2013), by regressing effort onto circumstances and using estimated residuals as measures of pure efforts. Models' coefficients and standard deviations remained similar. As expected, the Shapley decomposition displayed a higher contribution of circumstances and a lower contribution of efforts to health differences, however physical activity remained the second most important factor.

Finally, as a fourth robustness check, we accounted for the varying contexts of access to sports and nutrition across different countries dividing the 12 countries in the study into four groups using the Gender Equality Index following Bigorne et al. (2023). Since our focus is on gender differences, grouping countries by their level of gender inequality appeared relevant. Countries were divided into four groups; higher scores indicating lower gender inequalities. The 2025 index and the EU average of 63.4 were used. Group 1 includes Sweden (73.3), France (73.4), and Denmark (71.8). Group 2 features Spain (70.9), Belgium (68.5), and Luxembourg (63.9). Group 3 comprises Germany (63.2), Italy (61.9), and Austria (61.2). Group 4 contains Estonia (59.4), Slovenia (58), and Czech Republic (53.2). All results go in the same direction: exercising is linked to poorer health, while exercising more than once weekly over two waves correlates with better health compared to moderate exercise. Consuming fruits and vegetables less than daily is also associated with poorer health across all groups. Interaction terms exhibit a lower significance likely due to smaller sample sizes. Results remain consistent with our conclusions and the categorization of countries by political context does not alter the directions of our results.

5. Discussion

Our findings show that coming from a disadvantaged socio-economic background and being a woman are associated with poorer health status beyond the age of 50. Less healthy lifestyles, such as insufficient physical exercise and a lack of fruits and vegetables intake, are associated to poorer health status.

First, when taking into account the interacted terms between gender and circumstances, the results show the association between gender and health is no longer statistically significant. This suggests that disadvantaged circumstances remain a major determinant of health differences relative to lifestyle behaviours, gender, age and country of residence.

Second, interaction terms indicate that sedentary behaviours are associated with slightly poorer health among men than among women, whereas women who consume fruits and vegetables less frequently have slightly poorer health than men. These findings point to gender differences in the returns to health-related investments, suggesting that engaging in the same health behaviours does not yield equivalent health outcomes for women and men. From a normative perspective, women and men receive different health returns for identical lifestyles. Our results are in line with Chen et al. (2025), who found that women need to exercise less than men to achieve the same level of health benefits. Our results therefore confirm, using survey data and an empirical health economics approach, the findings of this epidemiological study. Lau (2025) discussed the results from Chen and colleagues and highlighted the importance of providing sex- and gender-specific physical activity recommendations. Such differentiated recommendations have already proved their relevance in cardiovascular diseases (CVD) research, where enhanced understanding of sex-specific pathophysiology in coronary atherosclerosis among women has been shown to reduce the risk of CVD in women by up to 30% (Aggarwal et al., 2018). As CVDs are the leading cause of death among women, the report from the Lancet Women and Cardiovascular Disease Commission raised awareness of the lack of sex- and gender-specific research on CVD and emphasized the importance of developing sex- and gender-specific policies to reduce global burden by 2030 (Vogel et al., 2021).

Finally, the inequality decomposition within the total sample relates to previous research on inequality of opportunity in health where circumstances were identified as the main contributor of health inequalities, representing up to 45% of the observed differences (Jusot et al., 2013). With regard to effort however, previous research found that its contribution was small (around 7%), whereas our findings show that physical exercise explains 29% of the variance in health. While Jusot et al. (2013) used BMI, fruits and vegetables intake and smoking as measures of effort, our results suggest physical exercise is a major contributor of health inequalities. This pattern holds for both women and men, and among men, physical activity appears to be an even more important contributor than circumstances. However, the large contribution of effort should be interpreted with caution, as we were unable to account for constraints imposed by the living environment. Access to safe spaces for exercise, sports facilities, or affordable sources of healthy food may vary substantially across individuals, meaning that similar levels of effort may not translate into the same opportunities to adopt healthy lifestyles. To the extent that health behaviours are conditioned by the local living environment, the estimated contribution of effort may partly capture unequal opportunities rather than purely individual choices. Nevertheless, such constraints are unlikely to differ systematically between men and women. Circumstances therefore remain a large contributor to health inequalities especially among women, which is consistent with previous research (Bigorne et al., 2023).

The greater contribution of age among women than in men may be explained by women living longer and experiencing poorer health status in their late life (Case and Paxson, 2005).

Our results support previous recommendations calling for sex- and gender-specific prevention policies to improve the health of the population. Such policies should encourage healthy behaviours differently according to gender. We also highlight the importance of incorporating sex and gender into further research on inequality of opportunity in health, in order to improve the relevance of findings and contribute to achieving health equality between women and men.

CRediT authorship contribution statement

Alexia Bigorne: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Sandy**

Tubeuf: Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization.

Ethical approval

This study used data provided by SHARE (Survey of Health, Ageing and Retirement in Europe). During the SHARE study, the relevant research ethics committees in the participating countries approved the research design, and all participants provided written informed consent. For further use and analysis of SHARE data, no ethical approval is needed.

Declaration of competing interest

I have nothing to declare.

Acknowledgements

Authors are greateful for the Université catholique de Louvain which is funding Alexia's PhD (FSR 2021). They would like to thank members of Alexia's PhD steering committee, Florence Degavre, Florence Jusot, Sophie Thunus and Alain Loute for their important insights and guidance throughout the making of the research. They are also grateful for comments from ECHIL members, namely Joséphine Aikpitanyi, Cossi Agbeto, Lisa Albert, Luigi Boggian, Lisa Quertinmont and Emilia Luyten. This paper was discussed in several conferences and we thank Thomas Martinez, Raf Van Gestel, and participants to the 45th edition of the JESF in Rennes in 2024 and Lola HESG conference in 2023.

Appendix

Appendix A
Generalized structural equation model

	Coefficient	Std. err.	z	P > z	[95% conf. interval]	
Self-assessed health	1	(constrained)				
GALI	1.026068	0.0375294	27.34	0	0.9525117	1.099624
Prevalence chronic disease	0.5750257	0.0160567	35.81	0	0.5435552	0.6064962
Self-assessed health						
cut1	−4.680627	0.0716803			−4.821117	−4.540136
cut2	−2.26837	0.0407259			−2.348192	−2.188549
cut3	0.7782335	0.0271257			0.7250681	0.8313988
cut4	4.095901	0.0649891			3.968524	4.223277
GALI						
cut1	0.1899962	0.0254917			0.1400333	0.239959
cut2	3.272124	0.0571389			3.160134	3.384114
Prevalence chronic disease						
cut1	−1.702951	0.0229571			−1.747946	−1.657955
cut2	0.1006792	0.0177504			0.065889	0.1354694
var(Health)	6.913691	0.2800914			6.385951	7.485044

Data availability

Data will be made available on request.

References

Aggarwal, N.R., Patel, H.N., Mehta, L.S., Sanghani, R.M., Lundberg, G.P., Lewis, S.J., Mendelson, M.A., Wood, M.J., Volgman, A.S., Mieres, J.H., 2018. Sex differences in ischemic heart disease. Circulation: Cardiovascular Quality and Outcomes 11 (2), e004437.
Aran, M.A., Ersado, L., 2013. Inequality of opportunity in access to basic services among egyptian children. Development Analytics Research Paper Series 1304, 1–28.
Averett, S.L., Biener, A., Ogrokhina, O., 2024. Equal Pay for Better Health: the Health Cost of the Gender Wage Gap. IZA Discussion Papers.
Awad, A., Hussain, M.A., 2021. The inequality of opportunity and youth employment in Sub-Saharan Africa. Labor Hist. 62 (1), 74–90.
Benyamini, Y., 2011. Why does self-rated health predict mortality? An update on current knowledge and a research agenda for psychologists. Psychol. health 26, 1407–1413.
Berthung, E., Gutacker, N., Abelsen, B., Olsen, J.A., 2022. Inequality of opportunity in a land of equal opportunities: the impact of parents' health and wealth on their offspring's quality of life in Norway. BMC Public Health 22 (1).
Bigorne, A., Boggian, L., Tubeuf, S., 2023. Inégalité des chances en santé chez les séniors: quelles différences selon le genre? Rev. Econ. Paris 74 (3), 373–397.
Bourdieu, P., 1986. The Forms of Capital.
Bourdieu, P., Passeron, J.-C., 1990. Reproduction in Education, Society and Culture. Sage.
Casal, P., 2015. Distributive Justice and Female Longevity. Law Ethics Philos. 90–106.
Case, A., Deaton, A.S., 2005. Broken down by work and sex: how our health declines. In: Analyses in the Economics of Aging. University of Chicago Press, pp. 185–212.
Case, A., Paxson, C., 2005. Sex differences in morbidity and mortality. Demography 42 (2), 189–214.
Chen, J., Wang, Y., Zhong, Z., Chen, X., Zhang, L., Jie, L., Zhang, Y., Wang, Y., 2025. Sex differences in the association of wearable accelerometer-derived physical activity with coronary heart disease incidence and mortality. Nat. Cardiovasc. Res. 4 (11), 1539–1549.
Cokley, K., Awad, G.H., 2013. In defense of quantitative methods: using the "Master's Tools" to promote social justice. Journal for Social Action in Counseling & Psychology 5 (2), 26–41.
Cunningham, J., Hunter, M., Budgeon, C., Murray, K., Knuiman, M., Hui, J., Hillman, D., Singh, B., James, A., 2021. The prevalence and comorbidities of obstructive sleep apnea in middle-aged men and women: the Busselton healthy ageing study. J. Clin. Sleep Med. 17 (10), 2029–2039.
Davillas, A., Jones, A.M., 2020. Ex ante inequality of opportunity in health, decomposition and distributional analysis of biomarkers. J. Health Econ. 69, 102251.
Dworkin, R., 1981. Part 1: equality of welfare. Philos. Publ. Aff. 10 (3), 185–246.
Fleurbaey, M., Peragine, V., Ramos, X., 2017. Ex post inequality of opportunity comparisons. Soc. Choice Welfare 49 (3), 577–603.
Galama, T.J., 2009. A Theory of Socioeconomic Disparities in Health.
Gale, C.R., Baylis, D., Cooper, C., Sayer, A.A., 2013. Inflammatory markers and incident frailty in men and women: the English longitudinal study of ageing. AGE 35 (6), 2493–2501.
Grossman, M., 1972. On the concept of health capital and the demand for health. J. Polit. Econ. 80 (2), 223–255.
Hederos, K., Jäntti, M., Lindahl, L., 2017. Gender and inequality of opportunity in Sweden. Soc. Choice Welfare 49 (3), 605–635.
Idler, E.L., Benyamini, Y., 1997. Self-rated health and mortality: a review of twenty-seven community studies. J. Health Soc. Behav. 21–37.
Israeli, O., 2007. A Shapley-based decomposition of the R-Square of a linear regression. J. Econ. Inequal. 5 (2), 199–212.

Juárez, F.W.C., Soloaga, I., 2014. Iop: estimating Ex-Ante inequality of opportunity. STATA J.: Promoting communications on statistics and Stata 14 (4), 830–846.
Jusot, F., Tubeuf, S., 2019. Equality of Opportunity in Health and Healthcare. Oxford Research Encyclopedia of Economics and Finance.
Jusot, F., Tubeuf, S., Trannoy, A., 2013. Effort or Circumstances: Does the Correlation Matter for Inequality of Opportunity in Health?.
Lau, E.S., 2025. Sex differences in the association of physical activity with coronary heart disease incidence and mortality. Nat. Cardiovasc. Res. 4 (11), 1457–1458.
Layes, A., Asada, Y., Kephart, G., 2012. Whiners and deniers – what does self-rated health measure? Soc. Sci. Med. 75 (1), 1–9.
Lazarevič, P., 2023. Measuring generic health using the minimum european health module: does it work and is it better than self-rated health? BMC Public Health 23 (1).
Lazarevič, P., Brandt, M., 2020. Diverging ideas of health? Comparing the basis of health ratings across gender, age, and country. Soc. Sci. Med. 267, 112913.
Mazzonna, F., 2014. The long lasting effects of education on old age health: evidence of gender differences. Soc. Sci. Med. 101, 129–138.
Merz, A.A., Cheng, S., 2016. Sex differences in cardiovascular ageing. Heart 102 (11), 825–831.
Miller, J.E., Rodgers, Y.V.D.M., 2008. Economic importance and statistical significance: guidelines for communicating empirical research. Fem. Econ. 14 (2), 117–149.
Oksuzyan, A., Dańko, M.J., Caputo, J., Jasilionis, D., Shkolnikov, V.M., 2019. Is the story about sensitive women and stoical men true? Gender differences in health after adjustment for reporting behavior. Soc. Sci. Med. 228, 41–50.
Roemer, J.E., 1998. Equality of Opportunity. Harvard University Press.
Rosa Dias, P., 2009. Inequality of opportunity in health: evidence from a UK cohort study. Health Econ. 18 (9), 1057–1074.
Rosa Dias, P., 2010. Modelling opportunity in health under partial observability of circumstances. Health Econ. 19 (3), 252–264.
Small, S.F., 2024. What is a feminist quantitative method? Opportunities for feminist econometrics. Fem. Econ. 1–22.
Sprague, J., 2016. Feminist methodologies for critical researchers: Bridging differences. Rowman & Littlefield.
Trannoy, A., Tubeuf, S., Jusot, F., Devaux, M., 2010. Inequality of opportunities in health in France: a first pass. Health Econ. 19 (8), 921–938.
Vogel, B., Acevedo, M., Appelman, Y., Bairey Merz, C.N., Chieffo, A., Figtree, G.A., Guerrero, M., Kunadian, V., Lam, C.S.P., Maas, A.H.E.M., Mihailidou, A.S., Olszanecka, A., Poole, J.E., Saldarriaga, C., Saw, J., Zühlke, L., Mehran, R., 2021. The lancet women and cardiovascular disease commission: reducing the global burden by 2030. Lancet 397 (10292), 2385–2438.