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Unemployment and mortality in a large Italian cohort

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ABSTRACT

Background Aim of this study was to examine the association between unemployment and mortality, taking into account potential confounders of this association. A secondary objective was to assess whether the association between unemployment and mortality was modified by lack of household economic resources.

Methods Prospective cohort composed of a representative sample of Italian subjects 30–55 years who participated in the Italian National Health Survey 1999–2000, followed up for mortality up to 2012 (15 656 men and 11 463 women). Data were analyzed using Cox regression models, stratified by gender and adjusted for health status, behavioral risk factors, socioeconomic position and position in the household. The modifying effect of the lack of economic resources was assessed by testing its interaction with unemployment on mortality.

Results Among women, unemployment was not associated with mortality, whereas among men, higher mortality was found from all causes (HR = 1.82), which was not modified by lack of economic resources, and from neoplasms (HR = 1.59), cardiovascular diseases (HR = 2.58) and suicides (HR = 5.01).

Conclusions Results for men were robust to the adjustment for main potential confounders, suggesting a causal relationship between unemployment and mortality. The lack of effect modification by economic resources supports the relevance of the loss of non-material benefits of work on mortality.

Keywords individual behavior, mortality, socioeconomic factors

Introduction

Work is a central element of persons' life because it is their main source of income and has a crucial role in shaping their socioeconomic position (SEP), which, in turn, is the main determinant of health and health inequalities.[1] During the last decades, unemployment has been found associated with increased morbidity[2–5] and mortality[6–11] in many studies, with consistent excess risks for overall mortality and for some specific causes of deaths, such as cardiovascular and respiratory diseases,[6,7] and suicides.[12] However, most of the available studies had little information on potential confounders of this association, making unclear whether unemployment has a direct causal effect of on health. In fact, it has been suggested that the increased mortality associated with unemployment may be attributable to socioeconomic confounding, due to the fact that most unemployed have low education and low professional skills, or to health selection into and out of unemployment.[13,14] Also, although the direction of the association between behavioral factors and unemployment is still controversial, especially for smoking and physical activity, for which both selection and causation

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effects have been observed,[15–20] it has been hypothesized that the increased mortality of the unemployed may be attributable to exposure to unhealthy lifestyles prior to unemployment, increasing both the likelihood of future unemployment and mortality.[21–23]

A meta-analysis of studies on unemployment and mortality concluded that increased mortality persisted even considering only risk estimates adjusted for health status, behavioral risk factors and SEP at baseline, at least among men.[24] However, this conclusion was based on only three studies adjusted for all these dimensions,[6,25,26] among which two conducted in the UK and one in Japan; therefore, rising problems of generalizability of the results to other countries. A subsequent Swedish study with accurate control for health-related and socioeconomic covariates also observed an increased risk, but lower than that reported in previous studies.[9]

Therefore, the main objective of this study was to assess the mortality risk associated with unemployment in a large Italian cohort after controlling for health status, lifestyles and SEP.

Since the relationship between unemployment and health may be influenced by the availability of economic resources, such as wealth, assets or partner's income, we also wanted to ascertain whether economic resources were an effect modifier of the association between unemployment and mortality.

Methods

Data collection

The study population was composed of participants in the 1999–2000 National Health Interview Survey (NHIS), carried out by the National Institute of Statistics (hereafter ISTAT) mostly every 5 years, at each occasion on independent samples, representative of the Italian population. The NHIS has a two-stage sampling design, with municipalities as primary sampling units and households as secondary units. Further details on the sampling methodology of the NHIS can be found elsewhere.[27] The survey provides detailed information on health conditions, including perceived health, long-term chronic diseases, disability, lifestyles, and use of health services, as well as information on socio-demographic characteristics. The 1999–2000 NHIS had a 87% response rate and collected information on 140 011 subjects, belonging to about 52 000 different households.

Outcome

The mortality follow-up of the cohort was conducted through individual record-linkage with the National Archive of Mortality 1999–2012, described in detail in a previous article on mortality of this cohort,[27] limited to 128 818 subjects with complete demographic information (about 92% of the sample) (Supplementary Fig. S1).

Start of follow-up was set at the first day of the month following the interview, and the end of follow-up at 31 December 2012, or, for the deceased, at the date of death. Only subjects 30–55 years old were included in the study, as older subjects who had been unemployed could have already been retired, while two-third of subjects younger than 30 years were living with their parents, which may imply a smaller effect of unemployment on health. Self-employed workers ($n = 9{,}093$) were excluded because of the small number of deceased subjects who reported to be unemployed in this group ($n = 11$). Other seven men and one woman who died before the start of follow-up were also excluded.

The final population was composed of 27 119 subjects (15 656 males and 11 463 females), contributing overall to 340 720 person-years.

Exposure

Information on employment status was collected through the questionnaire interview at baseline. Only subjects who were either employed or unemployed and in search of a new job were enrolled in the study.

Covariates

Covariates considered in the analyses consisted of behavioral risk factors, health status, SEP, and position in the household.

Behavioral risk factors included physical activity level (four classes: no physical activity, light, moderate and intense activity), body mass index (BMI) (four standard categories), smoking history (pack-years smoked in quartiles among current or former smokers, with non-smokers as the reference category).

Health status was assessed by means of the physical component summary (PCS) score, categorized in quartiles, computed from answers to the SF-12 questionnaire (Ware et al.[28]), and of a Chronic Morbidity Index (CMI), also divided in quartiles (quantization limited to those with an Index above zero), constructed through self-reported information on the presence of 22 chronic disorders diagnosed by a physician.

SEP was assessed using as proxy indicators educational level (four categories: university degree, high school diploma, low secondary, elementary or less) and perceived household economic resources in the last 12 months (two categories: excellent or adequate; scarce or absolutely insufficient), as a proxy for income. Good concordance between self-reported perceived economic resources and quintiles of income has been found in the Italian data of the European Health Interview Survey 2015, with two-third of 30–55 years subjects reporting scarce or insufficient resources concentrated in the two lowest quintiles of the income distribution

Table 1 Frequency distribution of covariates by employment status and gender. Baseline survey data. Italy, 1999–2000

COVARIATES	Employed men ($N = 14,883$)	Unemployed men ($N = 773$)	*P* value	Employed women ($N = 9,911$)	Unemployed women ($N = 1,552$)	*P* value
Education	**(%)**	**(%)**		**(%)**	**(%)**	
University	16.4	5.4	<0.001	21.7	5.6	<0.001
High school	39.8	23.8		46.1	33.3	
Low secondary	37.3	55.9		27.3	50.8	
Elementary or less	6.5	14.9		4.9	10.4	
Household position	**(%)**	**(%)**		**(%)**	**(%)**	
Single	9.3	12.8	<0.001	9.1	4.2	<0.001
Couple with children	10.2	6.6		10.6	7.7	
Couple without children	68.0	51.9		61.8	74.6	
Single parent	1.3	0.9		7.4	4.4	
Subject living with parents or other relatives	11.2	27.8		11.2	9.2	
Household economic resources	**(%)**	**(%)**		**(%)**	**(%)**	
Good or adequate	77.0	30.5	<0.001	81.3	64.2	<0.001
Scarce or insufficient	23.0	69.5		18.7	35.8	
Physical activity	**(%)**	**(%)**		**(%)**	**(%)**	
None	24.7	30.4	<0.001	27.4	25.5	<0.001
Light	28.6	34.7		34.5	38.2	
Moderate	30.6	24.6		26.3	27.8	
Intense	16.1	10.4		11.8	8.6	
Body mass index	**(%)**	**(%)**		**(%)**	**(%)**	
<18.5	0.5	0.7	0.01	4.1	3.7	<0.001
18.5–24.9	48.9	51.9		68.2	62.6	
25.0–29.9	42.0	36.6		21.5	24.7	
30+	8.6	10.9		6.3	9.0	
	Mean (sd)	**Mean (sd)**	***P* value**	**Mean (SD)**	**Mean (SD)**	***P* value**
Smoking (pack-years)	14.1 (17.1)	18.0 (20.9)	<0.0001	6.1 (10.1)	5.6 (9.5)	0.09
Physical Component Summary	53.2 (6.1)	51.8 (8.4)	<0.0001	52.4 (6.8)	51.6 (7.5)	<0.0001
Chronic Morbidity Index	1.5 (3.8)	2.6 (5.6)	<0.0001	1.9 (4.0)	2.4 (4.7)	<0.0001

(L Iannucci, personal communication, 2019). Among sociodemographics, position in the household was also considered (categorized as single, couple with children, couple without children, single parent, subject living with parents or other relatives), to take into account the family structure of the respondent and, in particular, the presence of dependent children.

Statistical analysis

The frequency distribution of covariates between employed and unemployed subjects was compared using chi-square statistics, for categorical variables, and t-test, for continuous ones.

Hazard Ratios (HRs) of mortality associated with unemployment were estimated through Cox regression models. In a first analysis (Model 1), results were adjusted only for age class (5-year categories), treated as a time-varying covariate, and geographical area of residence (three areas: North, Center and South and Islands). Afterward, behavioral risk factors, health status and socioeconomic covariates were added (Model 2).

Mortality from natural causes and for major groups of causes of death was also investigated, limited to those with at least five deaths observed in each sex, excluding from the analyses subjects who reported at baseline to suffer from a chronic disease belonging to the corresponding disease group.

To assess consistency with other studies on unemployment, mortality from suicides among men was investigated, in spite only three deaths occurred among the unemployed, after excluding subjects reporting anxiety or depression diagnosed by a physician at baseline.

Table 2 Frequency distribution of vital status and selected major groups of causes of death of the study population at the end of follow-up. Italy, 1999–2012

	Employed men ($N = 14,883$)	Unemployed men ($N = 773$)		Employed women ($N = 9,911$)	Unemployed women ($N = 1,552$)	
Cause of death	***N* (%)**	***N* (%)**	***P* value**	***N* (%)**	***N* (%)**	***P* value**
All causes	517 (3.5)	65 (8.4)	<0.001	166 (1.7)	32 (2.1)	0.28
Natural causes	460 (3.1)	59 (7.6)	<0.001	153 (1.5)	31 (2.0)	0.19
Neoplasms	262 (1.8)	25 (3.2)	0.003	111 (1.1)	21 (1.4)	0.42
Diseases of the circulatory system	124 (0.8)	15 (1.9)	0.001	19 (0.2)	1 (0.06)	0.26
Coronary heart disease	53 (0.4)	7 (0.9)	0.02	3 (0.03)	0 (0.0)	0.49
Diseases of the respiratory system	4 (0.03)	2 (0.3)	0.001	4 (0.04)	2 (0.1)	0.16
Diseases of the digestive system	24 (0.2)	8 (1.0)	<0.001	4 (0.04)	2 (0.1)	0.16
Other natural causes	46 (0.3)	9 (1.2)	<0.001	15 (0.2)	5 (0.3)	0.13
Natural causes not alcohol-related	373 (2.5)	46 (6.0)	<0.001	112 (1.1)	26 (1.7)	0.07
Violent causes	57 (0.4)	6 (0.8)	0.09	13 (0.1)	1 (0.06)	0.48
Suicides	9 (0.06)	3 (0.4)	0.001	1 (0.01)	0 (0.0)	0.69
Alive	**14 366 (96.5)**	**708 (91.6)**		**9745 (98.3)**	**1520 (97.9)**	
Total	**14 883 (100.0)**	**773 (100.0)**		**9911 (100.0)**	**1552 (100.0)**	

Given that no information on alcohol consumption was available, the risk of mortality from natural causes after excluding causes potentially attributable to alcohol was also estimated (tumors of oral cavity, pharynx, larynx, esophagus, liver and colorectum; liver cirrhosis, alcoholic liver disease and other or unspecified forms of liver disease).

The eventual modifying effect of availability of household economic resources was assessed by comparing the models with and without interaction term with unemployment through the likelihood ratio test, which tests interactions on the multiplicative scale.

To assess whether adjustment for PCS and CMI provided an accurate control for confounding by health status, a sensitivity analysis was conducted on overall mortality after excluding subjects reporting at baseline chronic diseases known to influence mortality (coronary heart disease, other heart diseases, cerebrovascular disorders, hypertension, diabetes, chronic bronchitis or emphysema, asthma, thyroid diseases, liver cirrhosis, chronic hepatitis, neoplasms, neurological diseases, anxiety or depression), also adjusting for the same covariates as in the main analysis.

All statistical analyses were performed using the software Stata (version 13).

Results

The proportion of unemployed subjects in the cohort at baseline was 4.9% among men and 13.5% among women. In both genders, the unemployed were less educated, had a higher CMI and were more likely to report scarce or insufficient economic resources (Table 1).

During follow-up, 780 deaths occurred in the cohort (2.9%), 582 among males (3.7%) and 198 among females (1.7%) (Table 2), with an average follow-up time to death of 7.6 years (sd: 3.5 years). Among unemployed men, the proportion of deceased subjects was more than the double of that of the employed (8.4% vs. 3.5%; $P < 0.001$), whereas among women the difference was much smaller (2.1% vs. 1.7%; $P = 0.28$). Kaplan–Meier survival analysis during follow-up by employment status at baseline showed significantly lower survival among the unemployed for men, but not for women (log rank test: $P < 0.0001$ for men, $P = 0.28$ for women) (Figure 1).

Risk of mortality associated with unemployment

Men

In the analysis adjusted for age and area of residence, the risk of death was increased among unemployed men (HR = 2.66, 95% CI: 2.05–3.46) (Table 3, Model 1). Adjusting the analysis for behavioral risk factors, health status, and socio-demographic characteristics, the mortality risk decreased, but remained significant (HR = 1.82, 95% CI: 1.37–2.41) (Table 3, Model 2). Area of residence practically did not change the risk of mortality associated with unemployment when adjusted for in the models (data not shown), nor

it exerted a modifying effect on the relationship between unemployment and mortality (test for interaction: $P = 0.16$ among men, $P = 0.15$ among women).

Similar results were obtained considering only deaths from natural causes, which represented about 90% of all deaths. Mortality from violent causes was non-significantly elevated among unemployed men, with a strong increase in risk for suicides (HR = 5.01, 95% CI: 1.13–22.2) in the fully adjusted model.

Examining major groups of causes of death, in the area- and age-adjusted analysis unemployment was associated with neoplasms (HR = 2.19, 95% CI: 1.44–3.32), and with diseases of the circulatory (HR = 3.27, 95% CI: 1.87–5.72) and the digestive systems (HR = 5.65, 95% CI: 2.36–13.5). Adjustment for behavioral risk factors, health and socio-demographics reduced the HRs for these causes of death, but, except for digestive disorders, they remained significantly elevated (HR = 1.59, 95% CI: 1.02–2.49 for neoplasms; HR = 2.58, 95% CI: 1.41–4.72 for circulatory).

Mortality was also increased for a residual category of natural causes of death not belonging to any of the four disease groups examined (HR = 2.84, 95% CI: 1.27–6.32 in the fully adjusted model).

The analysis performed excluding alcohol-related causes of deaths showed that the mortality risk was very similar to that computed for natural causes, suggesting that the association between unemployment and mortality was unlikely strongly confounded by alcohol drinking (Table 3).

Women

Among women, no association with unemployment was observed, neither for overall mortality nor for major groups of causes, partly because of the small number of deaths observed (Table 3). An association emerged for causes unrelated to alcohol consumption (HR = 1.55, 95% CI: 1.01–2.38), but it decreased and lost significance in the fully adjusted model (HR = 1.46, 95% CI: 0.93–2.29).

Interaction between unemployment and household economic resources

No significant interaction was found between unemployment and availability of household economic resources in neither gender (test for interaction: $P = 0.12$ among men; $P = 0.55$ among women); unexpectedly, in men the association between unemployment and mortality was stronger for subjects reporting good economic resources (HR = 2.55, 95% CI: 1.60–4.04 vs. HR = 1.70, 95% CI: 1.19–2.44). Similar results were obtained testing the interaction between unemployment and current/last occupation in manual or non-manual work, as a proxy indicator of income, on mortality (test for interaction: $P = 0.17$ among men; $P = 0.32$ among women).

Sensitivity analysis

The results of the sensitivity analysis on overall mortality, conducted after exclusion of the subjects reporting health conditions at baseline potentially associated with mortality, were very similar to those obtained in the whole sample from the fully adjusted model (men: HR = 1.78, 95% CI: 1.28–2.47; women: HR = 1.25, 95% CI: 0.76–2.06) (Table 3, Model 2).

Discussion

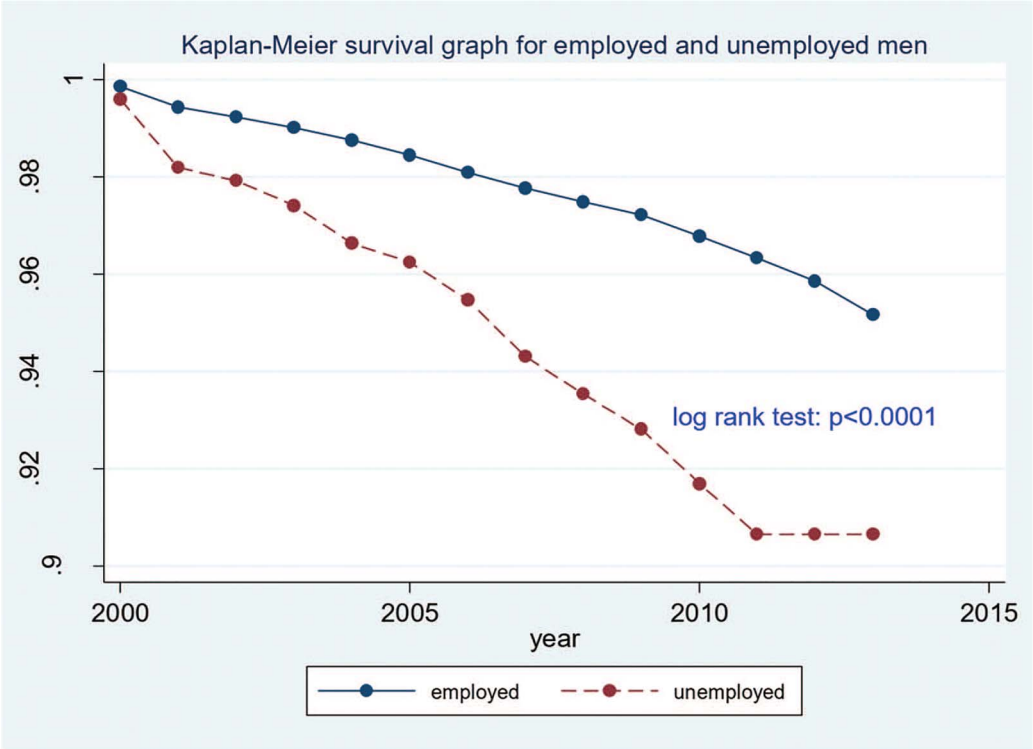
The main finding of this study

The present study found an age- and area-adjusted risk of overall mortality almost three times higher among unemployed men, compared to those employed, whereas among women the increase in risk was much smaller and not statistically significant. Although among men the strength of association practically halved from the model adjusted for age and area of residence to the fully adjusted model, the risk remained significantly elevated, suggesting a direct effect of unemployment on health. The sensitivity analysis confirmed the validity of our results, demonstrating that the increased risk of mortality among unemployed men in the fully adjusted model was not attributable to residual confounding by health.

What is already known on this topic

Our results for men are similar to those from the few studies conducted in Italy or in other Southern European countries,[8,11] showing mortality risks 2–3 times higher among unemployed men. A French study also reported a high age-adjusted mortality risk (RR = 2.79) associated with unemployment in a cohort of healthy volunteers,[10] but its results were not stratified by gender.

The lower mortality risk associated with unemployment among women appears also consistent with previous research. In the meta-analysis by Roelfs *et al.*,[24] the age-adjusted mortality among women was about half that observed among men and only slightly higher than that estimated in the present study. Among studies published afterward, most reported low and not significant excess risks for women,[29–32] although a few observed stronger associations.[33,34] The smaller risk among women may reflect the prevalent breadwinner role of men in high-income countries, especially in those societies characterized by more traditional family values and low participation of women in the labor market, like Italy.



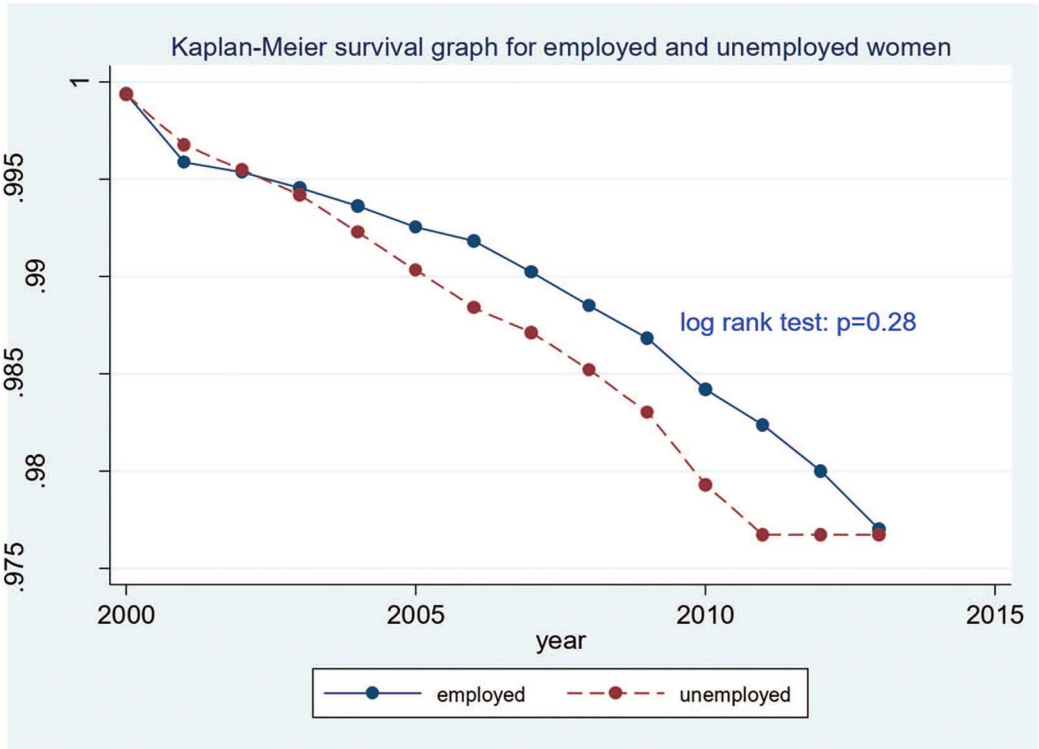


Fig. 1 Kaplan–Meier survival graphs 1999–2012 of the study population by employment status at baseline and gender.

Table 3 HRs of mortality from all causes and for major groups of causes of death associated with unemployment at baseline, by gender. Italy, 1999–2012

Causes of death	No. of exposed cases	Model 1[a] HR (95% CI)	Model 2[b] HR (95% CI)
MEN (ref: employed)		1	1
All deaths	65	**2.66 (2.05–3.46)**	**1.82 (1.37–2.41)**
Natural causes of death	59	**2.74 (2.08–3.61)**	**1.89 (1.41–2.55)**
Neoplasms	25	**2.19 (1.44–3.32)**	**1.59 (1.02–2.49)**
Circulatory system	15	**3.27 (1.87–5.72)**	**2.58 (1.41–4.72)**
Coronary heart disease	7	**3.32 (1.46–7.56)**	**2.58 (1.05–6.37)**
Digestive system	8	**5.65 (2.36–13.5)**	2.27 (0.85–6.03)
Other causes[c]	9	**3.72 (1.79–7.74)**	**2.84 (1.27–6.32)**
Natural causes not alcohol-related	46	**2.59 (1.90–3.54)**	**1.88 (1.35–2.64)**
Violent causes of death	6	2.01 (0.85–4.73)	1.67 (0.68–4.14)
Suicides	3	**5.23 (1.36–20.1)**	**5.01 (1.13–22.2)**
WOMEN (ref: employed)		1	1
All deaths	32	1.29 (0.88–1.88)	1.29 (0.87–1.92)
Natural causes of death	31	1.35 (0.92–1.99)	1.32 (0.88–2.00)
Neoplasms	21	1.23 (0.76–1.99)	1.21 (0.73–1.99)
Other causes[c]	5	2.12 (0.77–5.84)	2.10 (0.70–6.36)
Natural causes not alcohol-related	26	**1.55 (1.01–2.38)**	1.46 (0.93–2.29)

[a]Model 1: age and area of residence.

[b]Model 2: age and area of residence + smoking (pack-years), physical activity and BMI + health status + socioeconomic status (education, household economic resources) + position in the household.

[c]Deaths from neoplasms, and from cardiovascular, respiratory and digestive diseases are excluded.

What the study adds

Our study was one of the few, and the first one in Southern Europe, allowing to examine, in a sample representative of the general population, the association of unemployment with mortality after controlling for a large set of covariates collected at baseline, including the main potential confounders of this association in the literature.

It is possible that the strong reduction observed in the risk of mortality in the fully adjusted model was in part the result of an overadjustment, as the covariates used to adjust the risk estimates, in particular, behavioral factors, may be also mediators of the unemployment-mortality relationship. In fact, the direction of the relation between behavioral factors and unemployment appears uncertain in the literature, and several studies have reported an increase in risky lifestyles following unemployment,[16–18] which would then be intermediate factors on the causal chain from unemployment to mortality.

Various mechanisms have been proposed to explain the higher risk of mortality of the unemployed, including on one hand deprivation of aspects of identity and relationships linked to work,[35] on the other hand, financial strain, intended, rather than exposure to material poverty, as the difficulty in paying for daily life expenses needed to participate in social and family activities.[36] In both these theoretical models, the psychological stress associated with unemployment is considered a fundamental mechanism and this view is supported by studies showing an increase in cortisol levels related to job loss or unemployment, in particular, long-term unemployment.[37–39] This finding suggests that chronic activation of the Hypothalamus–Pituitary–Adrenal axis may be an important mechanism underlying the association between unemployment and mortality, possibly through a pathway leading to an increase in inflammatory markers,[40,41] which, in turn, would be responsible for the development of several different chronic disorders, such as neoplasms[42] and cardiovascular diseases.[43] The analysis of major groups of natural causes of death revealed that excess mortality among men was not concentrated in a specific group, but was spread across several outcomes, coherently with the proposed biological mechanism.

The high risk of mortality observed among the unemployed in Italy, compared to other countries, may be a consequence of the poor level of social welfare provided in this

country,[44] as during the years under investigation measures of income support for the unemployed were characterized by low salary replacement rate and strict requisites for accessing them. Nonetheless, the lack of effect modification by household economic resources would favor the hypothesis that unemployment increases mortality through psychological stress due to the loss of non-material benefits of work,[35] rather than through material poverty or financial strain.

Limitations

A limitation of the study is that the record-linkage with the National Archive of Mortality was incomplete, with a mortality underestimation by around 10%, as suggested by a comparison of the number of deaths in the cohort with the expected number of deaths at the national level, although it seems unlikely that vital status ascertainment had been differential by exposure status.

Also, as the present study focused on mortality, it cannot be excluded that the higher mortality among the unemployed would be actually attributable, at least in part, to a reduced seek or access to health care, compared to the employed population.[45,46] However, the national health care system in Italy has universalistic access since 1978, with exemption from payment for any kind of health care provided to people with low income, which makes unlikely strong differences in health care accessibility related to unemployment.

Another limitation is that unemployment was assessed only once, without information on unemployment before the survey, which has likely produced a certain degree of non-differential misclassification of ever unemployment, with a consequent attenuation of the associated mortality risk. Ascertainment of unemployment at a single time has also probably caused overrepresentation of long-term unemployed in the sample. However, the baseline survey was conducted in a period when the unemployment rate peaked in Italy, reaching 11% in the population of working age (8.5% among men and 15% among women), while steadily declining in the subsequent 5 years to only 6%. Both the large proportion of workers undergoing unemployment at the end of the '90s as well as the fact that many of them regained a job in the next few years have likely limited the selection of long-term unemployed in the cohort.

In conclusion, among men the association between unemployment and mortality was robust to adjustment for differences in health status, behavioral factors and socioeconomic conditions, giving support to the causal nature of this association. The smaller and non-significant risk observed among women may reflect the prevalent breadwinner role of men in Italy.

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Conflict of interest

None declared.

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