Adverse employment histories, later health functioning and national labor market policies: European findings based on life history data from SHARE and ELSA

Morten Wahrendorf[1], Hanno Hoven[1], Christian Deindl[1], Thorsten Lunau[1], Paola Zaninotto[2]

[1] Centre for Health and Society, Institute of Medical Sociology, Medical Faculty, University of Düsseldorf, Germany

[2.] Department of Epidemiology and Public Health, UCL, London, United Kingdom

Corresponding author:

Dr. Morten Wahrendorf

Centre for Health and Society, Institute of Medical Sociology,

Medical Faculty, University of Düsseldorf

Universitätsstrasse 1

40225 Düsseldorf

Tel. : +49 (0)211 81 14729

Email: wahrendorf@uni-duesseldorf.de

Acknowledgements

The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org). Data from ELSA were made available through the UK Data Archive (UKDA). ELSA was developed by a team of researchers based at the National Centre for Social Research, University College London and the Institute for Fiscal Studies. The data were collected by the National Centre for Social Research. The funding is provided by the National Institute of Aging in the United States, and a consortium of UK government departments coordinated by the Office for National Statistics. The developers and funders of ELSA and the Archive do not bear any responsibility for the analyses or interpretations presented here.

Harmonized data from the Gateway to Global Aging Data were produced by the Program on Global Aging, Health & Policy, University of Southern California with funding from the National Institute on Aging (R01 AG030153).

This study was partly funded by the German research initiative “labour market participation at older ages” with support from the “fund for the future” of the Ministry of Innovation, Science and Research, North Rhine-Westphalia, Germany.

Abstract

Objectives: We investigate associations between adverse employment histories over an extended time period and health functioning in later life, and explore whether national labor market policies moderate the association.

Methods: We use harmonized life history data from the Gateway to Global Aging Data on two European studies (SHARE and ELSA) linked to health beyond age 50 (men= 11,621; women= 10,999). Adverse employment histories consist of precarious, discontinued and disadvantaged careers between age 25 and 50, and we use depressive symptoms, grip strength and verbal memory as outcomes.

Results: Adverse employment histories between age 25 and 50 are associated with poor health functioning later in life, particularly repeated periods of unemployment, involuntary job losses, weak labor market ties and disadvantaged occupational positions. Associations remain consistent after adjusting for age, partnership history, education and employment situation, and after excluding those with poor health prior to or during working life. We find no variations of the associations by national labor market policies.

Discussion: Our study calls for increased intervention efforts to improve working conditions at early career stages. Despite the importance in shaping employment histories, the role of national policies in modifying the impact of employment on health is less clear.

Keywords: Employment histories, work stress, life course, health functioning

Introduction

Research has established strong evidence on the impact of psychosocial stress at work on health (Rugulies, Aust, & Madsen, 2017; Steptoe & Kivimaki, 2012), as well as having developed theoretical models of work stress. These models help to delineate which conditions at work are most harmful for health, such as jobs characterized by high demands and limited opportunities of exercising control and autonomy (the demand control model (Karasek & Theorell, 1990)), or jobs where workers receive limited rewards and recognition for invested efforts (the effort-reward imbalance models (Siegrist, 1996)). Most empirical studies, though, assess working conditions at one time point only and investigate the risk of developing a disease thereafter. This has been criticized as too static, since it neither includes information on the chronicity of exposure nor on the cumulative and repeated experience of adverse conditions in different jobs. Studies report, however, that repeated exposure to stress throughout working life is more strongly related to health compared with single measures (Chandola, Brunner, & Marmot, 2006; Cuitún Coronado, Chandola, & Steptoe, 2018). In addition, current developments of labor markets and employment arrangements are characterized by increasing flexibility, recurrent insecurity, differentiation and fragmentation – all aspects that are not adequately reflected in existing approaches to assess stressful work (Brückner & Mayer, 2005; Kalleberg, 2009). Therefore, research investigating the consequence of work and employment conditions needs to be supplemented by a more dynamic approach which considers entire trajectories and their properties over an extended time period.

Extending research along these lines is concordant with the 'life course perspective' (Elder, Johnson, & Crosnoe, 2003; Kuh, Ben Shlomo, Lynch, Hallqvist, & Power, 2003), specifically, with the idea to adopt a holistic perspective on life courses without isolating single aspects from larger histories (Aisenbrey & Fasang, 2010; Sackmann & Wingens, 2003). With the increasing availability of detailed data on entire employment histories (either collected prospectively or retrospectively), recent studies started to explore histories in relation to health (Lacey et al., 2015; Sabbath, Guevara, Glymour, & Berkman, 2015; Wahrendorf, 2015; Wahrendorf, Blane, Bartley, Dragano, & Siegrist, 2013;

Wahrendorf, Hoven, Goldberg, Zins, & Siegrist, 2018), but the number of such studies remains small. Thereby, the following three types of histories appear particularly harmful for health: precarious careers (e.g. temporary contracts and frequent job changes), discontinuous careers (e.g. unemployment interruptions) and disadvantaged working careers (e.g. cumulative disadvantaged occupational positions or downward mobility). At the conceptual level, each of these adverse employment histories – albeit to a different degree - reflect core notions of the above-mentioned work stress models. Precarious work and temporary jobs, for example, involve limited control over one's employment situation. Similarly, people working in lower grade or unskilled occupations may have restricted opportunities to develop new skills and are more likely to be excluded from organizational participation, thus, restricting again the experience of control at work. Disadvantaged careers without opportunities for job promotion also mean that workers receive limited rewards for invested efforts, thus inducing stress according to the effort-reward imbalance model. Working under these conditions may therefore promote the initiation and progression of disease (Kuh, Karunananthan, Bergman, & Cooper, 2014) because of chronic stress and related psychobiological stress responses (or a state of "allostatic load" (Castagné et al., 2018; McEwen, 2012; Vineis et al., 2017)). Other pathways may include the impact of adverse employment histories on health behavior (e.g. physical inactivity, cigarette smoking, excessive alcohol use) or low income or wealth at older ages (e.g. low pension level due to discontinuous working careers). As such, adverse employment histories may be related to health functioning in older age, including physical capacity, mental health and cognitive functioning (see (Kuh, Cooper, Hardy, Richards, & Ben-Shlomo, 2014) for detailed discussions).

Despite the small number of studies that look at employment histories in relation to health, none of the above-mentioned studies investigated if national social and labor market policies modify the extent to which adverse employment histories and health are related. In fact, the way how social and labour market policies affect health may be twofold: Firstly, labor market policies may shape employment histories, and thus, the likelihood to experience adverse histories with health-related consequences (e.g. through developed rehabilitation policies that lead to more continuous histories (Bambra, 2011; Card, Kluve, & Weber, 2018). Secondly, it is also likely that these policies affect the

extent to which adverse histories and health are related, and thus, likely that social and labor market policies moderate associations between histories and health. For example, in the case of well-developed unemployment protections in a country (e.g. high levels of unemployment benefits) associations between discontinuous careers and poor health may be less pronounced, because of the financial security that employees can rely on (Lundberg et al., 2008). There are in fact some studies where associations between specific working conditions and health differed by national contexts, for example, the association between unemployment and self-reported health (Bambra & Eikemo, 2009), perceived employment insecurity and life satisfaction (Carr & Chung, 2014), or between work stress and depressive symptoms (Dragano, Siegrist, & Wahrendorf, 2010; Lunau, Wahrendorf, Dragano, & Siegrist, 2013). But none of these studies have investigated whether the relationship between adverse characteristics over the course of an extended time period and health is moderated by national policies. In terms of policies, it seems helpful to distinguish between two dimensions of labor market policies (rather than relying on typologies of welfare regimes), namely, protective and integrative policies. Integrative policies promote return to work in the case of unemployment or support job maintenance for those in precarious employment (e.g. through active labor market policies (ALMP) or workplace training). Protective (or compensation) policies, in contrast, refer to social provision through compensation of income loss following unemployment or precarious employment (e.g. generosity of unemployment benefits or investments into passive labor market policies (PLMP)). Scandinavian and Western European countries have traditionally more developed protective policies than Southern European countries or England. Similarly, integrative policies are generally more pronounced in Scandinavian countries. Although recent decades have been marked by a general tendency of a reduction of protective policies and an expansion of integration policies, these patterns between European countries remained stable until the early 2000s (Immervoll & Scarpetta, 2012). Therefore, European countries offer interesting opportunities to explore if these two types of policies moderate the association between previous employment histories and health.

Using European data from 13 countries with detailed information on employment histories between the ages of 25 and 50, and health functioning beyond age 50, the present paper aims at extending

existing research in two ways: First, in contrast to previous findings that are largely limited to one country or single health outcomes, we investigate the relationships between employment histories and three complementary measures of health functioning across 13 countries. In accordance with previous findings, we expect that adverse employment histories are linked to poorer health functioning. Second, building on the small number of studies that tested if associations between specific working conditions and health varied by national policies, we investigate whether the association between adverse employment histories and health functioning are moderated by specific policy indicators, in terms of protective and integrative policies. In both cases, we expect that associations are generally weaker in countries where policies were generally more developed.

Methods

Data source

We use harmonized life history data (Version A) from the Gateway to Global Aging Data platform (g2aging.org) with information on employment histories from two European studies, the 'English Longitudinal Study of Ageing' (ELSA 29th edition, England (Steptoe, Breeze, Banks, & Nazroo, 2013)) and the 'Survey of Health, Ageing and Retirement in Europe' (SHARE release 7.0.0, 14 countries (Börsch-Supan et al., 2013)). Both studies were developed in close coordination, with a focus on harmonizing research methods and study designs to allow for cross-national comparisons. The study samples consist of nationally representative samples of individuals aged 50 and older (based on probability household samples) that are interviewed in two-year intervals using Computer Assisted Personal Interviews (CAPI). ELSA began in 2002, and SHARE in 2004 (in 11 countries). New countries have joined SHARE since the onset of the study, while some countries skipped some waves (mostly due to financial reasons). In addition to the 'regular' interviews focusing on current circumstances (incl. health functioning), both studies also conducted life history interviews (in 2006-2007 in ELSA and 2008-2009 in SHARE) in which participants provide detailed retrospective information about their lives before entering the study. This includes histories for five key domains: children, partnership, housing, work, and health. To improve the quality of responses given, ELSA and SHARE collected life history data using 'calendar interviews', where recall and timing of information is supported by a graphical representation that is filled out during the interview (Belli, 1998). The Gateway to Global Aging Data Platform provides harmonized data for each of the five histories in a state sequence format with annual information from age 15 onwards (for details see: (Wahrendorf, Deindl, Beaumaster, Phillips, & Lee, 2019a, 2019b)). Harmonized life history data enables to link previous employment histories with data on health functioning from the regular waves across 15 European countries ranging from England, Ireland, Northern Europe (Sweden and Denmark), Western Europe (Germany, the Netherlands, Belgium, France, Switzerland and Austria), Southern Europe (Italy, Spain and Greece) to Central Europe (the Czech Republic and Poland).

Study sample

For the analyses, we restrict the sample to men and women between the ages of 50 and 85 who answered the life history interview and worked at least once between the age of 25 and 50. We also decided to exclude respondents from Poland and the Czech Republic because of historically different labor markets with generally guaranteed full-time employment (Commander & Coricelli, 1995). For similar reasons, respondents who lived in East Germany prior 1990 were excluded. This sub-sample of 26,497 respondents meets our study aim because these participants had employment histories with potential change or stability. Furthermore, early signs of reduced health functioning usually become manifest above age 50, thus enabling us to study their variations (Kuh, Karunananthan, et al., 2014). Excluding people beyond the age of 85 helps to avoid a biased sample due to selective mortality (with probably more favorable employment histories as well). Similarly, to minimize the effect of poor health causing adverse employment histories (e.g. periods of unemployment) and the report of poor health at older ages, we additionally excluded participants with poor health prior to or between 25 and 50 (the observation period of employment histories; 3877 out of 26,497 participants). Specifically, we excluded participants who (1) reported poor self-rated health during childhood, (2) who had mental health problems during childhood, (3) who reported a period of ill health or disability prior to age 25, and (4) who had a health-related career interruption between age 25 and 50. This resulted in a study sample of 22,620 respondents (10,999 women and 11,621 men) born between 1921 and 1960.

Measures

Health functioning

The analyses use three measures of health functioning that cover the domains of affective, physical and cognitive functioning and are considered to be important measures of healthy aging (Kuh, Karunananthan, et al., 2014). We use available health information from two waves before and three waves after the collection of life history data (wave 1-6 in both surveys). Affective functioning is measured by the increased number of depressive symptoms. For ELSA this is based on a short form of the Centre for Epidemiologic Studies Depression scale (CES-D, 8 items) (Turvey, Wallace, & Herzog, 1999), and for SHARE on the EURO-D depression scale (12 items) (Prince et al., 1999).

Albeit direct comparisons of levels of depressive symptoms between countries should be avoided when using these two scales, studies demonstrated that associations between risk factors and depressive symptoms are comparable (Courtin, Knapp, Grundy, & Avendano- Pabon, 2015). To define "caseness" we either used a score of 3 or more for the CES-D or of 4 or more for the EURO-D scale - thresholds that have both been validated against standardized psychiatric interviews in older populations (Castro- Costa et al., 2008; White et al., 2015). Then, respondents were classified as depressed if they had increased levels of depressive symptoms for at least half of the available measurement points. This strategy fully exploits available information from several waves while accounting for fewer waves of data collections in some countries (because of a later study onset or skipped data collection in SHARE). Also, because data on depressive symptoms was available for at least three waves for most respondents (more than 88%), our strategy increases the classification accuracy of depressive symptoms. As an objective indicator of physical functioning we used hand grip strength (kg) measured by a hand held dynamometer. Grip strength was measured at each wave in the case of SHARE (resulting in six measurement points) and at 4-year intervals in ELSA (resulting in 3 measurement points in ELSA). The highest value of the dominant hand was used and we ascertained the mean score across waves for the analyses. Finally, cognitive functioning was measured in terms of verbal memory using a word-recall test. Thereby, respondents have to memorize and report a list with ten words twice in the frame of the interview (once immediately after reading the list and once a few minutes later). On this basis, we calculated a score by counting the number of words recalled by the respondent (scores ranging from 0 to 20), and again used the mean score across all waves. A correlation matrix of all health measures is presented in Supplemental Table S1, indicating that each measure covers a distinct dimension of health functioning.

Adverse employment histories

As part of the life history interview each respondent provides detailed information on each single job they had that lasted 6 months or longer (starting with the first job until the moment of the interview), together with details on periods when the respondent was not working. Information on jobs includes the starting and ending date and a measure of occupational position (for SHARE only, 12 out of 13

countries). When the respondent was not in paid employment (at least 6 months in SHARE and 3 months in ELSA), data again includes information on the starting and ending data and of the situation (e.g. sickness absence, unemployment, home or family work, retirement), as well the reason for leaving the job (e.g. being laid off or plant/company closure; for SHARE only). By combining this data, we can provide a detailed description of whole employment histories for each individual in terms of an annual description of the employment situation between the ages of 25 and 50 (an employment sequence covering 26 years) and ascertain the following six career characteristics: (1) number of unemployment interruptions, and (2) years out of work as available indicators of 'discontinuous histories'; and (3) number of involuntary job losses and (4) number of job changes as available indicators of 'precarious careers'; and (5) the mode occupational position between the ages of 25 and 50, and (6) experienced downward mobility as indicators of 'cumulative disadvantages'.

Unemployment interruption measures the number of interruptions due to unemployment (3 categories). By years out of work we count the number of years without paid work (3 categories). The number of involuntary job losses ascertains the number of job losses due to "being laid off", "plant or office closure", or because "a temporary job had been completed" (3 categories). The number of job changes is divided into 3 categories and measures how often respondents changed jobs. The mode occupational position is based on the longest held position between 25 and 50 and based on the 10 major groups of the International Standard Classification of Occupations (ISCO-88) that we regrouped into the following four categories: (1) "Legislators and Professionals" (ISCO groups 1 & 2, e.g. Director, chief executive, or health professional), (2) "Associate Professionals and Clerks" (ISCO groups 3 & 4, e.g. health associate professional or customer service), (3) "Skilled Workers" (ISCO groups 5 to 8 & 10, e.g. cook or machine operator), and (4) "Elementary Occupations" (ISCO groups 9, e.g. cleaner, watchman or street vendor). In the infrequent case that participants had two or more mode positions (0.8 % of all cases), we prioritized the most recent one. Based on available information on occupational positions, we also ascertained whether the respondent had a downward mobility or not between 25 and 50. Details on each variable, including categories and their distributions for men and women are shown in Table 1.

Policy indicators

We use four policy indicators provided and harmonized from official sources, two referring to integrative and two to protective policies. The first measure is the replacement rate which expresses the expected net income after job loss as a percentage of the net income before job loss (for an average production worker in a one earner couple with two children) (Van Vliet & Caminada, 2012). The second measure comes from the OECD and summarizes the expenditures of a country (as % of GDP) into passive labor market policies (PLMP). This incorporates investments into income replacement for the unemployed and expenditures that compensate for early retirement. As measures of integrative policies (again from OECD), we first use the overall investments into active labor market policies (ALMP, as % of GDP). It summarizes 6 different types of actions, interventions that aim to promote labor market integration for disadvantaged groups in particular. Finally, we include investments into training programs as specific ALMP measures into the analyses (% of GDP). For each of these four indicators, we used available information between 1985 and 2005. Measures referring to prior years were not available from OECD, as well as some countries had missing information for single years. For the analyses, we decided to calculate average scores of the four macro indicator, as presented in Table 2. This was based on our observation that, albeit values of the indicators changed within countries between 1985 to 2005, the between country-differences were relatively stable (Immervoll & Scarpetta, 2012). Further details on country values between 1985 and 2005 and their trends (in terms of rank order) are presented in the supplementary material (Figure S1 – S4).

Additional Variables

Alongside age (when people responded to the life history interview) and education, we additionally included one measure summarizing respondents' partnership situation between the age of 25 and 50 (again based on harmonized life history data), the employment situation (in paid work or not when answering the life history interview). Education was measured according to the International Standard Classification of Educational Degrees (ISCED-97), regrouped into 'low education' (pre-primary,

primary or lower secondary education), 'medium education' (secondary or post-secondary education), and 'high education' (first and second stage of tertiary education). When values were missing (6% of the study sample), we decided to create an additional category for those with missing information. For partnership, we calculated the proportion of years spent in a cohabiting partnership between age 25 and 50 (regardless of marital status) that we regrouped into a binary indicator of whether the respondent spent the majority of time in a partnership or not (more than 75 %).

[Table 1 about here]

Analytical strategy

We first present a sample description by sex and explore how macro indicators vary by country. To answer our first research question (on the association between career characteristics and health functioning), we then estimate a series of multilevel regression models with random intercept for men and women separately. These models consider the hierarchical structure of the data, with individuals nested in countries and allows for accurate adjustment for country affiliation (because the constant is allowed to vary across countries). Since the number of countries is relatively small, multilevel models were also compared to conventional models (with country dummies) and revealed better model fits in all cases and showed identical findings. Each career characteristic is linked with each measure of health functioning, and we either use linear multilevel regressions for continuous outcomes (Rabe-Hesketh & Skrondal, 2005) or multilevel robust (modified) Poisson regression models with robust variance to estimate relative risks in case of the binary outcome (Zou, 2004). Poisson regressions are an alternative to logistic regression that enable the estimation of relative risks that are easier to interpret than Odds Ratios (Barros & Hirakata, 2003), and they are at least as flexible and powerful as negative binomial regression (without convergence problems) (Zou, 2004). All continuous outcomes were tested for normality and standardized to enable comparisons. Because of multiple outcomes we adopted a Bonferroni corrected p-value of <0.017 (o.o5 divided by 3 outcomes) indicating strong evidence for an association. All multivariable models were adjusted for age (linear and quadratic), partnership situation and education. The sample of the multivariable analysis varies according to the outcome and the career characteristic under study, because some career characteristics are only

available in SHARE (12 out of 13 countries), and because medical examination data (i.e. grip strength) is available for a lower proportion of participants than data from the questionnaire (depressive symptoms and verbal memory, see Table S1 for details). We applied weights for descriptive statistics to provide a sample description. These weights are study-specific sampling weights that are provided for all respondents of the life history interview (SHARE, 2019; Ward, Medina, Mo, & Cox, 2009). In addition, we account for complex survey design (by using stratum and cluster variables), and we also account for different sample sizes of each country (in case of descriptive statistics across countries). Because there is less consensus on whether weights should be routinely used in multivariate models (Winship & Radbill, 1994), and because our multilevel models accounted for country and controlled for similar variables that were used to create the weights (e.g.: gender, age), weights were not applied in case of multivariate analysis.

For the second research question (effect-modification by macro indicators), we first investigated the associations between career characteristics and health functioning in models that were stratified by the macro indicators. For this purpose, countries were regrouped into two groups based on the respective rank orders of the macro indicators, where countries above the median were labelled as 'high' and those at or below as "low". Detailed results are presented in the supplementary Material (Tables S3a and S3b), where we present associations between the career characteristics and each health measures for both macro-groups separately. We then pooled the country groups and formally tested for significant interactions between each career characteristic (broken down into dummies for each category) and each macro indicator separately (resulting in 72 tests of interactions). As recommended by Heisig and Schaeffer (2019), these models also include a random slope component for the lower level part of the interaction (career characteristic). Rather than relying on the significance of the individual interaction coefficients, we tested the joint significance of the interaction terms. To this end, we compared models with and without interaction terms, either on the basis of likelihood-ratio tests (LR-test) for linear models, or on the basis of Wald tests for binary outcomes (since LR-tests are not recommended in Poisson models with robust variance, see (Cameron & Trivedi, 2009) for a discussion). Results of the significant tests are summarized in Table 4, where we present degrees of

freedom (depending on the number of interaction terms), the test statistics for the joint significance of all interaction terms (Chi2) and corresponding p-values.

We conducted three types of sensitivity analyses: To further address potential health selections (with ill health both causing adverse histories and poor health functioning at older ages), we investigated the association between career characteristics and an indicator on whether the respondent first suffered from depression at age 50 or later for the SHARE subsample (supplementary Tables S4). In addition, to address potential social causations by childhood conditions (where parts of the effect of adverse histories include an indirect effect of disadvantage at childhood) all models were recalculated with further adjustments for two indicators of socioeconomic position at childhood, available both in SHARE and ELSA (number of books and housing quality at age ten, supplementary Tables S5). Finally, instead of regrouping countries into two groups, we additionally tested the interactions with linear macro-level factors. All calculations were produced with Stata (Version 15.1).

Results

Table 1 presents a sample description based on weighted data, as well as unweighted estimates are presented in the supplementary material (Table S2). The sample includes slightly more men than women (11,621 vs. 10,999), with an average age of 65. The average number of observations across countries is 1740, with the smallest number in Ireland (628) and largest number in England (5584) (not shown in the tables). For both men and women less than 10 percent have had at least one episode of unemployment or experienced downward mobility, and around 15 percent have had an involuntary job loss. Most respondents had been skilled workers or had continuous employment histories (especially men). Women are more likely to have elevated depressive symptoms than men, and men generally have better physical functioning (grip strength) but slightly worse cognitive functioning (verbal memory). Correlations between measures of health functioning are rather low in all cases, with highest values between grip strength and verbal memory (r=0.360 for men; r=0.346 for women, see supplemental Table S1 for details). Table 2 shows that integrative policies (ALMP and training) were more developed in Scandinavian and Western European countries compared with Southern European countries or England. Protective policies (replacement rate and PLMP) follow a similar pattern. Further details on country values between 1985 and 2005 and their trends are shown in the supplementary material (Figure S1 – S4), together with frequencies of career characteristics in each single country (Table S3).

[Tables 2 & 3 about here]

Results testing the associations between career characteristics and health are presented in Table 3, with three observations worth noting: First, findings suggest that those who experienced repeated periods of unemployment, who had weak ties to the labor market or who worked in a disadvantaged occupational position between the ages of 25 and 50 (especially elementary occupations) had poorer health functioning later on. This holds true for each measure of health functioning, with two exceptions for women in the case of grip strength (no associations for unemployment periods and years out of work) and for verbal memory (no association for unemployment periods). Second,

turning to involuntary job losses, associations are observed for each measure of health functioning for men, but only with grip strength for women. Third, turning to downward mobility and number of job changes, we find that frequent job changes are related to higher verbal memory (men and women), but that downward mobility was only linked to lower grip strength for women. Sensitivity analyses that additionally adjusted for childhood adversity (number of books and housing quality at age 10) generally confirmed our findings (Table S5). The findings are also similar (with the exception of occupational position) when the analyses use first symptoms of depression at age 50 or later as an alternative outcome for depressive symptoms (Table S6).

[Tables 4 about here]

Stratified analyses by the four macro indicators, each regrouped into "high" and "low", are presented in the supplementary material (Tables S4a and S4b). Overall, results are similar in the two groups and do not support the assumption that associations are weaker in countries with developed policies, neither in the case of integrative policies (Table S4a) nor in the case of protective policies (Table S4b). This is further supported in Table 4, where none of the interactions between career characteristics and macro indicators appear significant, suggesting that associations between career characteristics and health functioning do not differ by labor market policies. The same is true for sensitivity analyses where interactions are tested with linear macro-level factors (results available on request).

Discussion

This study investigated the associations between adverse employment histories and three measures of health functioning after the age of 50 across 13 European countries, and explored if labor market policies moderated these associations. Two major findings result from our analyses. First, adverse employment histories at early career stages (between 25 and 50) are associated with poor health functioning in later life, particularly repeated periods of unemployment, involuntary job losses, weak labor market ties and disadvantaged occupational positions. Associations were observed for all three measures of health functioning that cover the domains of affective, physical and cognitive functioning (measured by depressive symptoms, grip strength and verbal memory respectively), with somewhat more consistent associations in the case of men for depressive symptoms. Findings were stable after adjusting for partnership history, education and employment situation and were based on a sample that excluded respondents with poor self-rated health or mental health problems during childhood, who reported a period of ill health or disability prior to age 25, or had a health-related career interruption before age 50. Furthermore, with exception of occupational position, we found similar results in sensitivity analyses that use first symptoms of depression at age 50 or later as an alternative outcome for depressive symptoms. The second main finding is that the associations between career characteristics and health was not moderated by labor market policies, neither in the case of protective policies (generosity of replacement rates and investments into PLMP) nor in the case of integrative policies (investments into ALMP and training programs). To our knowledge this is the first study analyzing associations of adverse employment histories over the course of an extended time period (between age 25 and 50) with a comprehensive set of indicators of health functioning at later age among men and women across Europe. We hereby used both objective and subjective measures of health functioning that meet the WHO-recommendation (WHO, 2015): to focus on the maintenance of physical and mental functioning among older people as opposed to a disease oriented definition of health (Kuh, Karunananthan, et al., 2014). With the second finding, we also for the first time explored potential differences of associations by two types of national labor market policies.

The first finding is consistent with previous research which has shown that discontinuous working careers, repeated exposure to stress at work, unemployment or job insecurity are associated with a wide-range of health outcomes, including poor mental health, metabolic syndrome, cardiovascular diseases and disability (Bartley, 2005; Chandola et al., 2006; Wahrendorf & Chandola, 2016; Wahrendorf, Hoven, et al., 2018). Our study therefore provides further evidence for a potential psychobiological stress response linking adverse work with health. To substantiate this assumption, future studies will need to include markers that allow the investigation of psychobiological stress responses in more detail, including inflammatory, neuroendocrine or autonomic markers (Castagné et al., 2018; Chandola, Heraclides, & Kumari, 2010). Similarly, our results support previous studies that suggest that the impact of work stress on mental health is more consistent for men – a result that may be attributed to a higher significance of the work role for men or the increased availability of coping resources among women in the studied cohort. It is also interesting to note that we found no association for occupational position when using first symptoms of depression as an alternative outcome in sensitivity analyses. Although these latter findings deserve a more detailed investigation, it could be due to depression being under-recognized, especially among people in lower occupational positions who are less likely to recognize their symptoms as depression and to be diagnosed for depression by primary care physicians (Bell et al., 2011; Lecrubier, 2007). But when explaining links between careers and health we clearly need to keep in mind that - beside psychobiological stress response - other pathways are likely to be equally relevant, including income or wealth at older ages (e.g. low pension level due to discontinuous working careers) or unhealthy behavior due to adverse conditions (e.g. smoking or drinking or both). Yet, in additional analyses (not shown) estimates of career characteristics are generally attenuated, but remain statistically significant even after including smoking and high alcohol use or wealth at older ages as potential mediators, suggesting that the reported associations can only partly be explained by unhealthy behavior or wealth.

Finally, we again need to consider potential selections into adverse employment histories, where people with poor health are more likely to have discontinuous careers. Albeit we addressed this issue by excluding people with poor health before and during the observation period of employment

histories and by conducting sensitivity analyses with an additional indicator of depressive symptoms (first symptoms of depression at age 50 or later), we still cannot fully exclude this selection.

The second finding is harder to explain. Contrary to what we expected, the associations between adverse employment histories and health functioning did not vary by labor market policies. More generous policies were not related to weaker associations. Albeit this may be unexpected at first glance, a closer look at the literature reveals some points that may explain our findings. Specifically, our findings resemble existing findings of comparative studies that found that socioeconomic inequalities in mortality and morbidity are not necessarily smaller in countries with more generous welfare policies (Eikemo, Huisman, Bambra, & Kunst, 2008; Mackenbach, 2012). One potential explanation, hereby, is that people in lower socioeconomic positions – especially in countries with more generous policies - are a selective group of individuals with an increased risk of disease (Mackenbach, 2017). Or, it could be that living under disadvantaged socioeconomic circumstances – in a country where the majority of the population profits from generous welfare policies - even leads to greater differences (due to more pronounced "relative" deprivation) (Eikemo et al., 2008). Along these lines, we may speculate that our findings are related to the fact that people who had adverse employment histories in countries with more generous policies are a selective group as well. For example, people who had discontinuous careers (e.g. repeated unemployment interruptions) in a country with extended active labor market policies may probably be more likely to be socially disadvantaged. Importantly, however, this does not preclude that policies affect the overall prevalence of adverse histories and lead to smaller groups of people with adverse histories (Card et al., 2018; Wahrendorf & Siegrist, 2014). It only suggests that these smaller groups are selective and potentially have a more unfavourable composition with increased health-risks. Therefore, the way how policies moderate the association between employment histories and health functioning is not as straightforward as we expected. More detailed studies are mandatory to draw far-reaching conclusions at this point where the assessment of macro measures needs to be refined with a focus on both specific career characteristics and policy indicators. Our policy measures must also be considered as rather crude, and instead of using the average score of macro indicators between 1985 and 2005, the

exposure to adverse conditions in a given year may be directly linked to respective labor market policies of the same year. However, with the data we have access to from OECD (restricted to 1985 onwards), these kind of analyses remain difficult. Similarly, some of our macro measures may also be assessed in more detail, for example, by considering the unemployment rate when ascertaining expenditure into PLMP, as well as other indicators which may be of interest (e.g. family policies affecting the importance of work as income source). Furthermore, instead of regrouping countries into country groups, studies may elaborate more precisely on single countries. But the number of observations in single countries was simply not large enough in our case to allow for such analyses, particular for meaningful comparisons of histories and country-stratified analyses of their association with health.

Our study has several strengths, including a large sample, quality standards of data collection, detailed data on employment histories, and a comprehensive assessment of health functioning for population based studies (Kuh, Karunananthan, et al., 2014). But several limitations need to be considered. Beside potential health selections, the necessity to incorporate additional variables in order to explore potential pathways in more detail and a refined link between career characteristics and national policies (all aspects discussed above), we need to consider a potential recall bias in the case of the retrospective data on employment histories. This includes the tendency to reduce complexity (Rubin & Baddeley, 1989) or to report more favorable histories (Krinsley, Gallagher, Weathers, Kutter, & Kaloupek, 2003; Manzoni, Vermunt, Luijkx, & Muffels, 2010). But there is also support that retrospective data provide reliable and valid information (Berney & Blane, 1997; Jivraj, Goodman, Ploubidis, & de Oliveira, 2017), including information on previous employment histories (Bourbonnais, Meyer, & Theriault, 1988; Wahrendorf, Marr, et al., 2018). Secondly, albeit the career characteristics reflected core notions of theoretical models of work stress and consider an extended time period, we may ask if some of the derived measures could be elaborated more extensively. For example, in the case of downward mobility (available for SHARE only), the used categories must be seen as rather broad, thus neglecting possible mobility within the categories. Also, our measure of mobility did not consider information on the class of origin and of destination – an aspect that may be

of interest too (Hoven et al., 2019). Likewise, because employment spells and periods of non-employment were only recorded if they lasted 6 months or longer (in ELSA 3 months for periods of non-employment), we may have bypassed some short spells of unemployment and underestimated the number of job changes. Future studies could also apply more refined methods of sequence analysis to summarize and regroup employment sequences with similar patterns (Lacey et al., 2015; Sabbath et al., 2015; Wahrendorf et al., 2013). From a social-epidemiological perspective, however, it seems more important to have clearly defined properties of sequences than overall patterns, facilitating the development of targeted health interventions.

In conclusion, our study indicates that exposure to adverse work and employment conditions over an extended time period is related to reduced health functioning and suggests that this association is not modified by the national contexts. While national polices may be important in shaping employment histories, their role in moderating the associations between working conditions and health is less clear. Our study also illustrates the importance of extending the rather static concepts of stressful work to approaches that considers adverse characteristics over the course of an extended time period (Kuh, Karunananthan, et al., 2014; Wahrendorf & Chandola, 2016). If confirmed by further results, these findings call for increased intervention efforts among more disadvantaged groups of the labor market in early stages of labor market participation to prevent ill health in later life.

Conflict of interest

The authors declare that they have no conflict of interest.

References

Aisenbrey, S., & Fasang, A. E. (2010). New Life for Old Ideas: The 'Second Wave' of Sequence Analysis Bringing the 'Course' Back Into the Life Course. *Sociological Methods & Research, 38*(4), 652-654. doi:10.1177/0049124110373134

Bambra, C. (2011). *Work, worklessness, and the political economy of health*. Oxford: Oxford University Press.

Bambra, C., & Eikemo, T. A. (2009). Welfare state regimes, unemployment and health: a comparative study of the relationship between unemployment and self-reported health in 23 European countries. *Journal of Epidemiology and Community Health, 63*(2), 92-98. doi:10.1136/jech.2008.077354

Barros, A. J., & Hirakata, V. N. (2003). Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC medical research methodology, 3*(1), 21. doi:10.1186/1471-2288-3-21

Bartley, M. (2005). Job insecurity and its effect on health. *Journal of Epidemiology & Community Health, 59*(9), 718-719. doi:10.1136/jech.2004.032235

Bell, R. A., Franks, P., Duberstein, P. R., Epstein, R. M., Feldman, M. D., y Garcia, E. F., & Kravitz, R. L. (2011). Suffering in silence: reasons for not disclosing depression in primary care. *The Annals of Family Medicine, 9*(5), 439-446. doi:10.1370/afm.1277

Berney, L. R., & Blane, D. B. (1997). Collecting retrospective data: Accuracy of recall after 50 years judged against historical records. *Social Science & Medicine, 45*(10), 1519-1525. doi:10.1016/S0277-9536(97)00088-9

Börsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., . . . Team, o. b. o. t. S. C. C. (2013). Data Resource Profile: The Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology, 42*(4), 992-1001. doi:10.1093/ije/dyt088

Bourbonnais, R., Meyer, F., & Theriault, G. (1988). Validity of Self Reported Work History. *British Journal of Industrial Medicine, 45*(1), 29-32. doi:10.1136/oem.45.1.29

Brückner, H., & Mayer, K. U. (2005). De-Standardization of the Life Course: What it Might Mean? And if it Means Anything, Whether it Actually Took Place? *Advances in Life Course Research, 9*, 27-53. doi:10.1016/S1040-2608(04)09002-1

Cameron, A. C., & Trivedi, P. K. (2009). Microeconometrics using stata. *Indicator, 2*, 47.

Card, D., Kluve, J., & Weber, A. (2018). What works? A meta analysis of recent active labor market program evaluations. *Journal of the European Economic Association, 16*(3), 894-931.

Carr, E., & Chung, H. (2014). Employment insecurity and life satisfaction: The moderating influence of labour market policies across Europe. *Journal of European Social Policy, 24*(4), 383-399. doi:10.1177/0958928714538219

Castagné, R., Garès, V., Karimi, M., Chadeau-Hyam, M., Vineis, P., Delpierre, C., & Kelly-Irving, M. (2018). Allostatic load and subsequent all-cause mortality: which biological markers drive the relationship? Findings from a UK birth cohort. *European journal of epidemiology, 33*, 441-458. doi:10.1007/s10654-018-0364-1

Castro□Costa, E., Dewey, M., Stewart, R., Banerjee, S., Huppert, F., Mendonca□Lima, C., . . . Ritchie, K. (2008). Ascertaining late□life depressive symptoms in Europe: an evaluation of the survey version of the EURO□D scale in 10 nations. The SHARE project. *International Journal of Methods in Psychiatric Research, 17*(1), 12-29. doi:10.1002/mpr.236

Chandola, Brunner, & Marmot. (2006). Chronic stress at work and the metabolic syndrome: Prospective study. *British Medical Journal, 332*(7540), 521-524. doi:10.1136/bmj.38693.435301.80

Chandola, T., Heraclides, A., & Kumari, M. (2010). Psychophysiological biomarkers of workplace stressors. *Neuroscience & Biobehavioral Reviews, 35*(1), 51-57. doi:10.1016/j.neubiorev.2009.11.005

Commander, S., & Coricelli, F. (1995). *Unemployment, restructuring, and the labor market in Eastern Europe and Russia*: The World Bank.

Courtin, E., Knapp, M., Grundy, E., & Avendano□Pabon, M. (2015). Are different measures of depressive symptoms in old age comparable? An analysis of the CES□D and Euro□D scales in 13 countries. *International journal of methods in psychiatric research, 24*(4), 287-304. doi:10.1002/mpr.1489

Cuitún Coronado, J., Chandola, T., & Steptoe, A. (2018). Allostatic Load and Effort-Reward Imbalance: Associations over the Working-Career. *International Journal of Environmental Research and Public Health, 15*(2), 191. doi:10.3390/ijerph15020191

Dragano, N., Siegrist, J., & Wahrendorf, M. (2010). Welfare regimes, labour policies and unhealthy psychosocial working conditions: a comparative study with 9917 older employees from 12 European countries. *Journal of Epidemiology and Community Health, 65*(9), 793-799. doi:10.1136/jech.2009.098541

Eikemo, T. A., Huisman, M., Bambra, C., & Kunst, A. E. (2008). Health inequalities according to educational level in different welfare regimes: a comparison of 23 European countries. *Sociol Health Illn, 30*(4), 565-582.

Elder, G. H., Johnson, M. K., & Crosnoe, R. (2003). The emergence and development of life course theory. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 3-19). New York: Kluwer Academic.

Heisig, J. P., & Schaeffer, M. (2019). Why You Should Always Include a Random Slope for the Lower-Level Variable Involved in a Cross-Level Interaction. *European Sociological Review, 35*(2), 258-279. doi:10.1093/esr/jcy053

Hoven, H., Siegrist, J., Goldberg, M., Ribet, C., Zins, M., & Wahrendorf, M. (2019). Intragenerational social mobility and depressive symptoms. Results from the French CONSTANCES cohort study. *SSM - Population Health*, 100351. doi:10.1016/j.ssmph.2019.100351

Immervoll, H., & Scarpetta, S. (2012). Activation and employment support policies in OECD countries. An overview of current approaches. *IZA Journal of Labor Policy, 1*(1), 9.

Jivraj, S., Goodman, A., Ploubidis, G. B., & de Oliveira, C. (2017). Testing comparability between retrospective life history data and prospective birth cohort study data. *The Journals of Gerontology: Series B*. doi:10.1093/geronb/gbx042

Kalleberg, A. L. (2009). Precarious Work, Insecure Workers: Employment Relations in Transition. *American Sociological Review, 74*(1), 1-22. doi:10.1177/000312240907400101

Karasek, R., & Theorell, T. (1990). *Healthy Work*. New York: Basic Books.

Krinsley, K. E., Gallagher, J. G., Weathers, F. W., Kutter, C. J., & Kaloupek, D. G. (2003). Consistency of retrospective reporting about exposure to traumatic events. *Journal of Traumatic Stress, 16*(4), 399-409. doi:10.1023/A:1024474204233

Kuh, D., Ben Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C. (2003). Life course epidemiology. *Journal of Epidemiology & Community Health, 57*(10), 778-783. doi:10.1136/jech.57.10.778

Kuh, D., Cooper, R., Hardy, R., Richards, M., & Ben-Shlomo, Y. (2014). *A life course approach to healthy ageing* (First edition. ed.). Oxford, United Kingdom ; New York, NY, United States of America: Oxford University Press.

Kuh, D., Karunananthan, S., Bergman, H., & Cooper, R. (2014). A life-course approach to healthy ageing: maintaining physical capability. *Proceedings of the Nutrition Society, 73*(2), 237-248. doi:10.1017/S0029665113003923

Lacey, R. E., Sacker, A., Kumari, M., Worts, D., McDonough, P., Booker, C., & McMunn, A. (2015). Work-family life courses and markers of stress and inflammation in mid-life: evidence from the National Child Development Study. *International Journal of Epidemiology, 45*(4), 1247-1259. doi:10.1093/ije/dyv205

Lecrubier, Y. (2007). Widespread underrecognition and undertreatment of anxiety and mood disorders: results from 3 European studies. *The Journal of clinical psychiatry*.

Lunau, T., Wahrendorf, M., Dragano, N., & Siegrist, J. (2013). Work stress and depressive symptoms in older employees: impact of national labour and social policies. *BMC Public Health, 13*(1), 1086-1096. doi:10.1186/1471-2458-13-1086

Lundberg, O., Yngwe, M. A., rne, M. K., Elstad, J. I., Ferrarini, T., Kangas, O., . . . Fritzell, J. (2008). The role of welfare state principles and generosity in social policy programmes for public health: an international comparative study. *The Lancet, 372*(9650), 1633-1640. doi:10.1016/S0140-6736(08)61686-4

Mackenbach, J. P. (2012). The persistence of health inequalities in modern welfare states: the explanation of a paradox. *Social Science & Medicine, 75*(4), 761-769. doi:10.1016/j.socscimed.2012.02.031

Mackenbach, J. P. (2017). Nordic paradox, Southern miracle, Eastern disaster: persistence of inequalities in mortality in Europe. *European journal of public health, 27*(suppl_4), 14-17. doi:10.1093/eurpub/ckx160

Manzoni, A., Vermunt, J. K., Luijkx, R., & Muffels, R. (2010). Memory Bias in Retrospectively Collected Employment Careers: A Model-Based Approach to Correct for Measurement Error. *Sociological Methodology, Vol 40, 40*, 39-73. doi:10.1111/j.1467-9531.2010.01230.x

McEwen, B. S. (2012). Brain on stress: How the social environment gets under the skin. *Proceedings of the National Academy of Sciences, 109*(Supplement 2), 17180-17185. doi:10.1073/pnas.1121254109

Prince, M. J., Reischies, F., Beekman, A. T., Fuhrer, R., Jonker, C., Kivela, S. L., . . . Copeland, J. R. (1999). Development of the EURO-D scale--a European, Union initiative to compare symptoms of depression in 14 European centres. *British Journal of Psychiatry, 174*, 330-338. doi:10.1192/bjp.174.4.330

Rabe-Hesketh, S., & Skrondal, A. (2005). *Multilevel and Longitudinal Modeling using Stata*. College Station, Texas: Stata Press.

Rubin, D. C., & Baddeley, A. D. (1989). Telescoping Is Not Time Compression - a Model of the Dating of Autobiographical Events. *Memory & Cognition, 17*(6), 653-661. doi:10.3758/Bf03202626

Rugulies, R., Aust, B., & Madsen, I. E. (2017). Effort–reward imbalance at work and risk of depressive disorders. A systematic review and meta-analysis of prospective cohort studies. *Scandinavian Journal of Work, Environment & Health, 43*(4), 294-306. doi:10.5271/sjweh.3632

Sabbath, E. L., Guevara, I. M., Glymour, M. M., & Berkman, L. F. (2015). Use of life course work-family profiles to predict mortality risk among US women. *American Journal of Public Health, 105*(4), e96-e102. doi:10.2105/ajph.2014.302471

Sackmann, R., & Wingens, M. (2003). From Transitions to trajectories. Sequence types. In W. R. Heinz & V. W. Marshall (Eds.), *Social Dynamics of the Life Course. Transitions, Institutions, and Interrelations* (pp. 93-115). New York: Aldine de Gruyter.

SHARE. (2019). *SHARE Release Guide 7.0.0*. Munich: The Munich Center for the Economics of Aging.

Siegrist. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology, 1*, 27-41. doi:10.1037//1076-8998.1.1.27

Steptoe, & Kivimaki. (2012). Stress and cardiovascular disease. *Nat Rev Cardiol, 9*(6), 360-370. doi:10.1038/nrcardio.2012.45

Steptoe, A., Breeze, E., Banks, J., & Nazroo, J. (2013). Cohort Profile: The English Longitudinal Study of Ageing. *International Journal of Epidemiology*, 1640-1648. doi:10.1093/ije/dys168

Turvey, C. L., Wallace, R. B., & Herzog, R. (1999). A revised CES-D measure of depressive symptoms and a DSM-based measure of major depressive episodes in the elderly. *International Psychogeriatrics, 11*(2), 139-148. doi:10.1017/s1041610299005694

Van Vliet, O., & Caminada, K. (2012). Unemployment replacement rates dataset among 34 welfare states, 1971-2009: an update, extension and modification of the Scruggs' welfare state entitlements data set.

Vineis, P., Avendano-Pabon, M., Barros, H., Chadeau-Hyam, M., Costa, G., Dijmarescu, M., . . . Giles, G. (2017). The biology of inequalities in health: the LIFEPATH project. *Longitudinal and Life Course Studies, 8*(4), 417-449. doi:10.14301/llcs.v8i4.448

Wahrendorf, M. (2015). Previous employment histories and quality of life in older ages: sequence analyses using SHARELIFE. *Ageing & Society, 35*(09), 1928-1959. doi:10.1017/S0144686X14000713

Wahrendorf, M., Blane, D., Bartley, M., Dragano, N., & Siegrist, J. (2013). Working conditions in mid-life and mental health in older ages. *Advances in Life Course Research, 18*(1), 16-25. doi:10.1016/j.alcr.2012.10.004

Wahrendorf, M., & Chandola, T. (2016). A life course perspective on work stress and health. In J. Siegrist & M. Wahrendorf (Eds.), *Work Stress and Health in a Globalized Economy: The Model of Effort-Reward Imbalance* (pp. 46-66). Heidelberg: Springer.

Wahrendorf, M., Deindl, C., Beaumaster, S., Phillips, D., & Lee, J. (2019a). *Harmonized ELSA Life History Documentation , Version A*. Los Angeles, CA: Center for Economic and Social Research, University of Southern California.

Wahrendorf, M., Deindl, C., Beaumaster, S., Phillips, D., & Lee, J. (2019b). *Harmonized SHARE Life History Documentation , Version A*. Los Angeles, CA: Center for Economic and Social Research, University of Southern California.

Wahrendorf, M., Hoven, H., Goldberg, M., Zins, M., & Siegrist, J. (2018). Adverse employment histories and health functioning: the CONSTANCES study. *International Journal of Epidemiology*. doi:10.1093/ije/dyy235

Wahrendorf, M., Marr, A., Antoni, M., Pesch, B., Jöckel, K.-H., Lunau, T., . . . Dragano, N. (2018). Agreement of self-reported and administrative data on employment histories in a German cohort study: a sequence analysis. *European Journal of Population*. doi:10.1007/s10680-018-9476-2

Wahrendorf, M., & Siegrist, J. (2014). Proximal and distal determinants of stressful work: framework and analysis of retrospective European data. *BMC Public Health, 14*(1), 849-861. doi:10.1186/1471-2458-14-849

Ward, K., Medina, J., Mo, M., & Cox, K. (2009). *ELSA Wave Three: Life History Interview: A user guide to the data.* London: NatCen Social Research.

White, J., Zaninotto, P., Walters, K., Kivimäki, M., Demakakos, P., Shankar, A., . . . Batty, G. D. (2015). Severity of depressive symptoms as a predictor of mortality: the English longitudinal study of ageing. *Psychological medicine, 45*(13), 2771-2779. doi:10.1017/S0033291715000732

WHO. (2015). *World report on ageing and health*. Geneva: World Health Organization.

Winship, C., & Radbill, L. (1994). Sampling weights and regression analysis. *Sociological Methods & Research, 23*(2), 230-257. doi:10.1177/0049124194023002004

Zou, G. (2004). A modified poisson regression approach to prospective studies with binary data. *American journal of epidemiology, 159*(7), 702-706. doi:10.1093/aje/kwh090

Tables

Table 1. Sample description (based on weighted data): percentage (Col. %) or mean and standard deviation (SD), by sex.

	Categories or range	Men	Women
		Col % or mean (SD)	Col % or mean (SD)
Age	50-85	64.7 (9.0)	64.9 (9.5)
Partnership	Living mostly as single	21.1	20.8
	Living mostly with partner	78.9	79.2
Education	Low	33.6	38.8
	Medium	29.6	31.9
	High	31.0	21.6
	No information	5.8	7.7
Current empl. situation	In paid work	41.0	34.6
	Not in paid work	59.0	65.4
Number of unempl. periods	No unemployment period	91.1	92.9
	1 unemployment period	7.5	6.0
	2+ unemployment periods	1.4	1.1
Years out of work	No years out of work	90.6	52.7
	1-5 years out of work	6.5	10.6
	6+ years out of work	2.9	36.8
Involuntary job loss [a]	No job loss	84.8	85.6
	1 job loss	11.5	11.4
	2+ job losses	3.7	3.0
Number of job changes	No job change	30.5	34.9
	1 or 2 job changes	44.6	42.4
	3 + job changes	24.9	22.6
Mode occupational position [a]	Legislators and Professionals	16.3	12.6
	Ass. Professionals and Clerks	23.8	29.3
	Skilled Workers	46.0	36.5
	Elementary Occupations	13.9	21.5
Downward mobility [a]	No downward mobility	94.2	93.8
	Downward mobility	5.8	6.2
Depressive symptoms	Not elevated	85.0	73.0
	Elevated	15.0	27.0
Grip-Strength	2 – 95	42.0 (9.2)	25.5 (6.1)
Verbal memory	0 – 20	9.3 (3.0)	10.0 (3.1)

Note. [a] not collected in ELSA

Table 2. Policy indicators by country (rank order).

	ALMP [a]	Training [b]	PLMP [c]	Replacement rate [d]
Sweden (SE)	**1.58 (1)**	**0.57 (1)**	1.38 (8)	**0.81 (2)**
Denmark (DK)	**1.33 (2)**	**0.53 (2)**	**3.53 (1)**	**0.69 (7)**
Germany (DE)	**0.86 (3)**	**0.43 (3)**	**1.83 (6)**	**0.70 (6)**
Netherlands (NL)	**0.85 (4)**	0.14 (11)	**2.30 (3)**	**0.78 (3)**
Belgium (BE)	**0.70 (7)**	0.14 (9)	**2.59 (2)**	0.62 (9)
France (FR)	**0.80 (5)**	**0.37 (5)**	**1.65 (7)**	0.66 (8)
Switzerland (CH)	0.33 (11)	0.14 (10)	0.69 (12)	**0.83 (1)**
Austria (AT)	0.29 (12)	**0.20 (7)**	1.27 (9)	**0.71 (5)**
Italy (IT)	0.42 (9)	**0.22 (6)**	0.76 (11)	0.41 (13)
Spain (ES)	0.52 (8)	0.15 (8)	**2.14 (4)**	**0.75 (4)**
Greece (GR)	0.15 (14)	0.07 (14)	0.36 (14)	0.40 (14)
Ireland (IR)	**0.79 (6)**	**0.38 (4)**	**2.01 (5)**	0.61 (10)
England (EN)	0.19 (13)	0.10 (13)	0.65 (13)	0.45 (12)

Note. [a] ALMP: expenditure in % of GDP invested into active labor market programs (average score between 1985 and 2005)
[b] expenditure in % of GDP invested into life-long learning programs (average score between 1985 and 2005)
[c] PLMP: expenditure in % of GDP invested into passive labor market programs (average score between 1985 and 2005)
[d] replacement rate for a one earner production worker with two children (average score between 1985 and 2005)
For subsequent analyses, values in bold are considered as countries with extended policies (labelled as "high").

Table 3. Association between career characteristics and health functioning by sex: relative risks (RR) or unstandardized coefficients (b), confidence intervals and p-values (p).

	Depressive symptoms						Grip-strength						Verbal memory					
	Men			Women			Men			Women			Men			Women		
	RR	CI (95%)	p	RR	CI (95%)	p	b	CI (95%)	p	b	CI (95%)	p	b	CI (95%)	p	b	CI (95%)	p
No unemployment period (ref.)	–			–			–			–			–			–		
1 unemployment period	1.29	(1.14,1.47)	<0.001	1.18	(1.06,1.31)	0.002	-0.08	(-0.13,-0.03)	0.001	-0.02	(-0.06,0.01)	0.168	-0.05	(-0.11,0.00)	0.062	-0.03	(-0.02,0.09)	0.236
2+ unemployment periods	1.71	(1.24,2.35)	0.001	1.71	(1.31,2.25)	<0.001	-0.23	(-0.35,-0.11)	<0.001	-0.04	(-0.12,0.04)	0.328	-0.08	(-0.22,0.06)	0.275	-0.14	(-0.27,-0.00)	0.045
No years out of work (ref.)	–			–			–			–			–			–		
1-5 years out of work	1.18	(1.05,1.33)	0.006	1.07	(1.00,1.15)	0.059	-0.00	(-0.04,0.05)	0.944	-0.03	(-0.06,0.00)	0.066	-0.04	(-0.01,0.10)	0.132	-0.03	(-0.03,0.08)	0.317
6+ years out of work	1.39	(1.13,1.70)	0.002	1.15	(1.08,1.23)	<0.001	-0.20	(-0.27,-0.13)	<0.001	-0.01	(-0.03,0.01)	0.437	-0.12	(-0.21,-0.04)	0.003	-0.04	(0.00,0.08)	0.027
No job loss (ref.)	–			–			–			–			–			–		
1 job loss	1.07	(0.87,1.32)	0.521	1.12	(0.99,1.26)	0.065	-0.01	(-0.05,0.03)	0.605	-0.04	(-0.07,-0.01)	0.007	-0.01	(-0.06,0.04)	0.805	-0.01	(-0.07,0.04)	0.623
2+ job losses	1.33	(0.98,1.80)	0.066	1.08	(0.87,1.35)	0.490	-0.07	(-0.15,-0.00)	0.042	-0.00	(-0.06,0.06)	0.987	-0.07	(-0.16,0.01)	0.102	-0.03	(-0.07,0.13)	0.558
No job change (ref.)	–			–			–			–			–			–		
1 or 2 job changes	1.12	(1.01,1.24)	0.029	1.00	(0.92,1.10)	0.924	-0.00	(-0.03,0.03)	0.998	-0.01	(-0.03,0.01)	0.364	-0.01	(-0.04,0.02)	0.425	-0.03	(0.00,0.07)	0.043
3 + job changes	1.06	(0.91,1.24)	0.450	1.06	(0.96,1.17)	0.227	-0.01	(-0.03,0.04)	0.735	-0.02	(-0.05,0.01)	0.165	-0.06	(0.02,0.10)	0.005	-0.11	(0.07,0.16)	<0.001
Legislators and Professionals (ref.)	–			–			–			–			–			–		
Ass. Professionals and	1.02	(0.80,1.29)	0.878	0.97	(0.85,1.12)	0.727	-0.01	(-0.03,0.06)	0.515	-0.05	(-0.08,-0.02)	0.003	-0.05	(-0.10,0.00)	0.061	-0.04	(-0.10,0.02)	0.158

Clerks																		
Skilled Workers	1.06	(0.91,1.23)	0.472	1.10	(0.92,1.32)	0.275	-0.03	(-0.08,0.01)	0.100	-0.04	(-0.08,-0.01)	0.011	-0.20	(-0.25,-0.15)	<0.001	-0.22	(-0.28,-0.16)	<0.001
Elementary Occupations	1.31	(1.09,1.58)	0.003	1.30	(1.02,1.65)	0.031	-0.10	(-0.15,-0.05)	<0.001	-0.10	(-0.13,-0.06)	<0.001	-0.39	(-0.45,-0.32)	<0.001	-0.36	(-0.43,-0.29)	<0.001
No downward mobility (ref.)	–			–			–			–			–			–		
Downward mobility	1.19	(0.92,1.53)	0.177	1.04	(0.91,1.18)	0.584	-0.05	(-0.10,0.01)	0.097	-0.05	(-0.09,-0.01)	0.009	-0.05	(-0.12,0.01)	0.122	-0.07	(-0.00,0.14)	0.045

Note. Models are based on multilevel models (individuals nested in countries) and calculated separately for each career characteristic, adjusted for age (linear and quadratic), partnership situation, education, and employment situation. Respondents who reported poor self-rated health or mental health problems at childhood, who reported a period of ill health or disability prior age 25, or had a health-related career interruption prior age 50 are excluded from the analyses.

Table 4. Interactions between career characteristics and macro indicators on health functioning. Results of tests of significance based on multilevel regressions
(Poisson or linear models): degrees of freedom (df), Chi² and p-values.

		(df)	Depressive symptoms Chi2 (p-value)	Grip-Strength Chi2 (p-value)	Verbal memory Chi2 (p-value)
Number of unempl. periods	ALMP	2	0.58 (0.747)	0.28 (0.868)	0.16 (0.923)
	Training	2	1.65 (0.439)	0.15 (0.930)	0.29 (0.865)
	PLMP	2	0.16 (0.924)	0.62 (0.733)	0.31 (0.858)
	Replacement rate	2	1.73 (0.422)	0.13 (0.936)	0.67 (0.716)
Years out of work	ALMP	2	0.21 (0.903)	0.08 (0.959)	0.23 (0.892)
	Training	2	0.09 (0.958)	0.48 (0.786)	0.24 (0.886)
	PLMP	2	0.07 (0.967)	0.08 (0.961)	0.01 (0.997)
	Replacement rate	2	0.21 (0.902)	0.13 (0.937)	0.42 (0.810)
Involuntary job loss	ALMP	2	2.34 (0.311)	0.35 (0.838)	0.50 (0.778)
	Training	2	0.48 (0.785)	0.11 (0.946)	0.21 (0.898)
	PLMP	2	1.15 (0.563)	0.24 (0.889)	0.09 (0.955)
	Replacement rate	2	0.09 (0.955)	0.09 (0.956)	0.63 (0.729)
Number of job changes	ALMP	2	1.15 (0.564)	0.34 (0.846)	0.14 (0.933)
	Training	2	0.67 (0.717)	0.19 (0.909)	0.16 (0.924)
	PLMP	2	0.06 (0.972)	0.37 (0.832)	0.14 (0.931)
	Replacement rate	2	0.11 (0.946)	0.18 (0.912)	0.29 (0.867)
Mode occupational position	ALMP	3	0.56 (0.906)	0.13 (0.988)	0.90 (0.826)
	Training	3	0.20 (0.977)	0.22 (0.974)	0.47 (0.925)
	PLMP	3	0.17 (0.983)	0.12 (0.989)	0.27 (0.966)
	Replacement rate	3	1.92 (0.589)	0.25 (0.969)	0.05 (0.997)
Downward mobility	ALMP	1	0.01 (0.929)	0.14 (0.709)	0.35 (0.551)
	Training	1	0.00 (0.993)	0.23 (0.628)	0.72 (0.398)
	PLMP	1	0.24 (0.627)	0.06 (0.812)	0.18 (0.673)
	Replacement rate	1	0.02 (0.881)	0.06 (0.808)	0.03 (0.866)

Note. Models are based on multilevel models (individuals nested in countries) and calculated separately for each career characteristic (included as random slope), adjusted for sex, age (linear and quadratic), partnership situation, education, and employment situation. Respondents who reported poor self-rated health or mental health problems at childhood, who reported a period of ill health or disability prior age 25, or had a health-related career interruption prior age 50 are excluded from the analyses.