Routes to healthy ageing: the role of lifecourse patterns

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Abstract

Healthy ageing is a dynamic process, but only a few studies use a longitudinal perspective to investigate the routes to healthy ageing and rarely do so in comparative perspective. This study adopts a holistic multi-domain approach in order to investigate the importance of lifecourse patterns for healthy ageing in Europe, as measured by the Global Activity Limitation Indicator (GALI) and using seven waves of the Survey of Health, Ageing and Retirement in Europe (SHARE). Employment and family histories are identified through sequence analysis and used as predictors, together with childhood conditions, in multivariate ordered logistic models covering a sample of 15,952 participants aged 60–65 years. The results showed that 'non-standard' employment and family patterns hamper healthy ageing and that these negative effects tend to reinforce each other across the employment and family domains rather than compensating for each other – especially in women. Welfare states, however, moderate these associations. The findings promote the adoption of a lifecourse approach to healthy ageing that considers multiple domains simultaneously and addresses unfavourable life conditions as early as possible in an attempt to mitigate their effects.

Introduction

Health-care systems are currently facing the challenge of how to accommodate populations that are living longer – but not always healthier – lives (Eurostat, 2019). To address the issue of population ageing, the World Health Organization (WHO) recently proposed a new framework that considers *healthy ageing* to be a 'process' – starting at birth and developing throughout life – 'of developing and maintaining the functional ability that enables wellbeing in older age' (WHO, 2015). This holistic approach focuses on individuals' capacity to address their needs and preferences, such as actively participating in society (Papa *et al.*, 2019).

This framework departs from the emphasis on physical/mental functioning, recognising the heterogeneity in older individuals (Wiles and Jayasinha, 2013) and taking into account embeddedness and the fact that individuals' activity and inclusion in older age depends on their interactions with their environment, which can also change individuals' ageing trajectory. Access to services, living conditions and social relationships can mitigate deficits and promote resilience (McDonald *et al.*, in press).

In this study, we adopt this framework in order to identify conditions and lifecourse trajectories that favour healthy ageing. Health is a dynamic process that depends on individuals' behaviours and experiences (Jones *et al.*, 2019), characteristics, resources and living contexts, including macro factors like culture, labour markets, social protection and health-care provision (Beckfield *et al.*, 2015). These factors have the potential to cause health inequalities during the lifecourse through an accumulation mechanism that reinforces and compounds divergences in later-life patterns (Dannefer, 2003; Mayer, 2009; Elder *et al.*, 2015; Jones *et al.*, 2019). Although there is a growing interest in exploring how lifecourses shape health conditions in later life (O'Flaherty *et al.*, 2016), previous studies have often focused on single aspects or events in single domains of the lifecourse (*e.g.* childhood conditions, unemployment, marriage/co-habitation) and on specific health measures (*e.g.* functional limitations, mental health), providing only a partial perspective (Zella and Harper, 2018; Wickrama *et al.*, 2019; Iveson *et al.*, 2020). Only a few studies use a longitudinal perspective and those that do are often limited to just a few years of observations (Sarti and Zella, 2016), to a single country (Devillanova *et al.*, 2019; Lu *et al.*, 2019; Di Gessa *et al.*, 2020) and to a single dimension of lifecourses (usually employment).

This study adopts a holistic multi-domain lifecourse approach, including employment and family careers, to identify the main lifecourse trajectories and investigate how these patterns are associated with the subsequent achievement of healthy ageing in different macro-institutional contexts in Europe (Madero-Cabib *et al.*, in press). Whereas most of the previous literature has concentrated on health or wellbeing, we adopt an encompassing framework and utilise the Global Activity Limitation Indicator (GALI) to measure the healthy ageing of men and women. Based on seven waves of the Survey of Health, Ageing and Retirement in Europe (SHARE), we analyse how the realisation of healthy ageing varies in people aged 60–65 based on their previous life histories across 13 countries. We also take into account early-life conditions, multiple life-domains, and their dynamics and interdependencies (Mayer, 2009), as well as adopting a comparative approach to assess the role of the welfare state in accumulation mechanisms and thus in mitigating or reinforcing health inequalities.

Background

Measuring healthy ageing

The WHO's definition of healthy ageing integrates a functional definition of health with a social dimension to form a comprehensive multi-domain lifecourse concept (Liotta *et al.*, 2018). This approach moves from considering being free of diseases as a requirement for healthy ageing to a more global notion accounting for a person's

individual capacities and living environment, and the interactions between the two (WHO, 2015). This means that health represents only one aspect of a person's life and that one still has the potential to live a full, active life if supported by adequate resources, environments and social interactions (Young *et al.*, 2009). In addition, this framework focuses on the underlying dynamic processes that occur during the lifecourse.

There is no consensus on how to measure healthy ageing (Beard *et al.*, 2016; Michel and Sadana, 2017). A recent review (Lu *et al.*, 2019) found that there are a wide range of separate domains or comprehensive scales or indices in use, the most essential of which were physical capability, cognitive function, metabolic and physiological health, psychological wellbeing and social wellbeing.

The main limitations of the existing tools are the heterogeneity of the domains and variables used as well as the differences in response scales and population sub-groups considered (Michel and Sadana, 2017), which limits the comparability of data produced by different studies. The European Innovation Partnership on Active and Healthy Ageing attempted to address this issue by monitoring the strategy Europe 2020 (Lagiewka, 2012) through the widely used indicator 'healthy life years' (HLY) (Jagger *et al.*, 2010), *i.e.* how many years an individual can expect to live for without suffering long-term limitations on their activity. In Europe, people aged 65 are expected to live, on average, for approximately 22 more years if they are women and 18 if men, but these numbers are halved if HLY is the measure (Eurostat, 2019). HLY is calculated by combining life table data with survey data on the GALI (Robine, 2003), which assesses the extent of limitations in 'activities people usually do'. In this study, we measure the situation of healthy ageing using GALI. GALI differs from other scales because it considers diversity in individual needs and conditions, referring to any type of activity, long-term duration and severity of restriction instead of providing a predefined set of activities and impairments. Moreover, it follows the Disablement Process approach (Verbrugge and Jette, 1994), which includes functional limitations and restrictions in performing activities in the dynamic process towards disability. GALI is used as a health indicator for monitoring purposes by the European Commission (Bogaert *et al.*, 2018) and has proved to have high validity and reliability (Jagger *et al.*, 2010; Van Oyen *et al.*, 2018). Its use as an outcome helps to assess whether persons with different individual and environmental conditions are able to achieve their full potential (Johnsen *et al.*, 2018). Being also a strong determinant of health-care expenditures, GALI favours the adoption of multiple factors strategies in public health identifying the groups of citizens more in need of support.

Lifecourse and ageing

People develop different paths to healthy ageing, based on their (initial or developed) capacities (intrinsic, physical, mental), and the ability to recover from and adapt to (early) life conditions, lifecourse experiences and adversities (*i.e.* resilience) (Cosco *et al.*, 2017). The lifecourse approach improves our understanding of the ageing process because it takes into account the dynamic pathways of subjects (Elder *et al.*, 2015) and examines how social processes are structured over a subject's life (Mayer, 2009). It also allows healthy ageing trajectories to be explored through

the cumulative advantages and disadvantages theory (Dannefer, 2003), which argues that lifecourses show strong path-dependencies and that early-life circumstances influence life patterns and have long-term consequences late in life.

Individuals' lives take place across several different domains, among which work and family have important implications for health. The favourable effects of 'standard' life patterns are well documented for both men and women, but we have little knowledge of how different domains combine. An unstable family, single parenthood or being without a family for most of one's life tend to affect late-life health and subjective wellbeing adversely (Barban, 2013; O'Flaherty *et al.*, 2016; Arpino *et al.*, 2021). Unstable employment histories and long periods of inactivity, meanwhile, have negative effects on wellbeing and quality of life, and are associated with higher health risks (Wahrendorf, 2015; Ponomarenko, 2016; Devillanova *et al.*, 2019; Zella *et al.*, 2022). Women in the United Kingdom (UK) experiencing distinct periods throughout the lifecourse of either work or family care have been found to have a lower risk of frailty (Lu *et al.*, 2017) or generally better health trajectories (Di Gessa *et al.*, 2020) in late life than those performing primarily domestic duties in their life.

Women assume a multiplicity of roles and responsibilities in work and family life (Allen and Martin, 2017), highlighting the intersections among different domains. Work–family balance has become more complex, and the complexity affects more families, as women have increased their participation in the labour market, often manifesting in a mix of employment and inactivity tightly linked to the different stages of family formation (Chłoń-Domińczak *et al.*, 2019). Role accumulation theory (Martikainen, 1995) associates positive outcomes with the combination of marital, parental and work roles in terms of financial independence, personality enrichment and gratification. In contrast, the multiple role theory (Goode, 1960) suggests that when women have to balance their household and care obligations with their employment duties, negative effects and higher expectations and demands will follow.

Few studies have attempted to evaluate the relationship between combined work and family patterns, and health. Van Hedel *et al.* (2016) found that single working mothers in the United States of America (USA) and Europe are at greater risk of heart disease, stroke and smoking. Women re-entering full-time work after family leave showed more symptoms of depression than women re-entering part-time work (Engels *et al.*, 2019). In the USA, higher mortality risks have been reported for single working mothers and non-working mothers (Sabbath *et al.*, 2015; McKetta *et al.*, 2018), married mothers who are not employed (Sabbath *et al.*, 2015), and employed women who have never married and are not mothers (McKetta *et al.*, 2018) than for mothers re-entering the labour market after a short break. In summary, 'non-standard' lifecourse patterns, such as unemployment and single parenthood, appear to be associated with negative health outcomes. We therefore expect that, compared to stable employment, experiencing a non-standard or non-working career impairs healthy ageing (Hypothesis H1a). Likewise, non-standard family patterns are potentially more harmful than a 'standard' family structure (Hypothesis H1b). Finally, especially for women, employment and family trajectories should intersect and a combination of stable and 'standard' lifecourse patterns should come with healthy ageing (Hypothesis H1c).

Childhood conditions often lay the ground for future opportunities and risks. People who are born into and grow up in disadvantaged conditions are more likely to attain a lower level of education, get lower-quality jobs, have higher poverty risks, experience a less-stable family life, suffer poorer health (Wickrama *et al.*, 2019) and face a higher risk of functional limitations in old age (Iveson *et al.*, 2020). Effects of early conditions tend to persist over the lifecourse, even when controlling for other factors (Iveson *et al.*, 2020). We therefore expect individuals who have experienced poor childhood conditions to be less likely to enjoy healthy ageing (Hypothesis H2a) and we expect these effects to be only partially mediated through lifecourse patterns (Hypothesis H2b).

The role of the welfare state

An individual's lifecourse, health and active ageing outcomes depend on contextual aspects (Bambra, 2006; Beckfield and Krieger, 2009), including culture and institutions, such as the labour market, social protection and health-care provision (Pfau-Effinger, 2005; Kohli, 2007; Börsch-Supan *et al.*, 2009; Madero-Cabib *et al.*, in press). Contexts can favour conditions more conducive to good health or conversely mitigate the consequences of less-favourable conditions, and thus shape their long-term effects on health (Beckfield *et al.*, 2015). Indeed, the provision of services and benefits to people outside the labour market could support them and thereby reduce the negative impact of unstable work on health, while policies promoting family formation could help mothers to re-enter the labour market after childbearing (Barbieri and Bozzon, 2016).

In this study, we introduce the contextual dimension of individual lifecourse trajectories through healthy ageing by comparing three welfare state regimes (Esping-Andersen, 1990; Ferrera, 1996): social democratic (Nordic), conservative (Continental) and southern European (Latin) countries. Anglo-Saxon (liberal) regimes, we should note, are not represented in the data we use. Clearly, there is heterogeneity within countries (Principi *et al.*, in press) and the situation in each country is evolving, with some recently promoting reforms. However, the life trajectories we observe evolved during earlier decades under regimes that clearly present a characteristic combination of state provision and decommodification levels, influencing lifecourse patterns and health consequences differently (Bambra and Eikemo, 2009; Komp-Leukkunen, 2019). Countries of the Nordic regimes, for instance, are characterised by high (gender-)egalitarianism (from family to employment provision), state support for families that results in high employment participation by women, high rates of stable co-habitation and separation/divorce, and a low level of income inequality. Continental welfare states, meanwhile, provide lower levels of family services, less support for women's participation in the labour market and, until recently, have been characterised by highly stable family trajectories. Moreover, inequality is higher and strong cleavages persist in the domains of education and social background, while social mobility is limited. Finally, the Latin regime shares many traits with the Continental regime but with generally lower state provision whereby support and care obligations are generally delegated to families. Consequently, the participation of women in the labour market is consistently very low, family patterns

have been stable until recently, inequalities are high and employment among the older cohorts is characterised by high stability.

Past studies on the role of the welfare state in lifecourse patterns and health have underlined the importance of support for continuous employment, of active support for families and help in buffering the adverse effects of loss of employment (Barbieri and Bozzon, 2016; Zagel and Van Winkle, 2022). In countries of the Latin cluster (*e.g.* Italy), unstable employment tends to be highly vulnerable (Cutuli and Grotti, 2020), while Nordic welfare regimes offer more shelter for people when they are not able to work (Muntaner *et al.*, 2010). Furthermore, Zella and Harper (2018) found that, in Latin and Continental regimes, poor health and depression were more common among homemaker women than in social democratic and liberal clusters. We would therefore expect that in contexts prioritising the reduction of social inequalities with targeted social services, lifecourse patterns have a weaker effect on health (Chłoń-Domińczak *et al.*, 2019), while in Latin and Continental welfare regimes, a tight link between lifecourse patterns and healthy ageing should exist (Hypothesis H3).

Methods

Sample and measures

We used data from Waves 1–7 of SHARE, covering the years 2004–2019 (Börsch-Supan *et al.*, 2013). We derived lifecourse trajectories from age 15 to 59 before evaluating healthy ageing immediately after this period, *i.e.* at ages 60–65. Retrospective life-history data, including childhood conditions, were taken from Waves 3 and 7 (SHARELIFE). The use of a life-history calendar approach allows us to adjust for memory bias, while subsequent analysis demonstrated that the retrospective data collected were consistent (Havari and Mazzonna, 2015). The SHARE Job Episodes Panel provided the yearly information required to reconstruct employment and family histories between the ages of 15 and 59 (45 years in total).

We then selected participants aged 60–65 (cohorts born between 1938 and 1958) for whom complete information on the relevant variables was available (N = 15,952), enabling us to link each participant's state of health – measured once and in the time-point closest to when the participant was 60 – almost directly to previous lifecourses and thereby minimise the influence of unobserved events. Complete information was available for 93 per cent of the participants, and we found no significant differences in gender or health between this group and the 7 per cent whose information was incomplete. The data include 13 European countries grouped into three welfare clusters according to the classifications of Esping-Andersen (1990) and Ferrera (1996) employed in previous studies (Bambra and Eikemo, 2009; Möhring, 2016): Nordic (Sweden, Denmark), Continental (Austria, Germany, The Netherlands, France, Belgium, Luxembourg, Switzerland) and Latin (Spain, Italy, Greece, Portugal). No country from the liberal cluster takes part in SHARE.

Our main outcome variable is healthy ageing, measured by GALI (Robine, 2003; Van Oyen *et al.*, 2018). GALI is a single-item measure of prolonged limitations on health-related activity in different settings and life domains: it asks 'For the past six months at least, to what extent have you been limited because of a health problem

in activities people usually do?' and offers the following responses: 1 = severely limited, 2 = limited, but not severely and 3 = not limited. The instrument showed a good level of reliability and predictive and concurrent validity in relation to other self-reported health measures (*e.g.* chronic diseases and functional limitations) (Bogaert *et al.*, 2018; Van Oyen *et al.*, 2018). To check for robustness, we compared GALI with three other health measures. Activities of daily living (ADL) (Katz *et al.*, 1963) and instrumental activities of daily living (IADL) (Lawton and Brody, 1969) measure limitations on six basic activities and seven other activities, respectively. We also accounted for the number of chronic diseases, specifically ten conditions diagnosed in participants by a doctor.

Work and family trajectories are the main explanatory factors. We developed trajectories using yearly information on the family situation, employment status and the situation during gaps in employment, which we explain below.

Childhood family conditions are measured by the Childhood Socioeconomic Circumstances index (Wahrendorf and Blane, 2015). This assigns scores from 0 (most advantaged) to 4 (most disadvantaged) and considers four indicators assessed at age 10: number of books in the household; rooms per person; how many (from a list of possible features) are found in the home (*e.g.* hot running water, indoor toilet); and occupation of the main breadwinner. Childhood health status is measured as a binary indicator (good/excellent; fair/poor) – an approach that is widely adopted in the literature (*e.g.* Zella and Harper, 2018).

Control variables include age, sex, country of residence, the number of children (both natural and adopted) and the interview year. Level of education is scored as low, medium or high using the International Standard Classification of Education (ISCED-97) (UNESCO, 2006), where low is ISCED 0–2, medium is ISCED 3 or 4 and high is ISCED 5 or 6. Occupation is defined using the International Standard Classification of Occupations (ISCO) provided in SHARELIFE, where higher values represent lower-grade occupations. We calculated the mean ISCO weighted for the duration of each job held during the observation period by each individual. Health status during adulthood is assessed using the question 'Have you ever received a physical injury that has led to any permanent handicap, disability or limitations in what you can do in daily life?', which offers yes/no answers. Previous situations might also affect healthy ageing via the contemporary economic and social situations (Abud *et al.*, 2022; Rojo-Perez *et al.*, 2022). To determine whether such mediation is relevant, we consider, in line with previous research, in some models multiple dimensions of the current situation, and in specific the ability of the household to make ends meet (ranging from 1 = with great difficulty to 4 = easily), household type (alone, with the partner, with others), doing social activities (voluntary or charity work; educational or training courses; sport, social or other kinds of clubs; political or community-related organisations) and living area (rural areas, large/small towns, big cities/metropolitan areas). Table 1 reports the descriptive statistics.

Family and employment trajectories and analytical strategy

We began by defining a set of distinct work and family patterns through sequence analysis. This approach considers distinct statuses, their duration and the order in

Table 1. Sample and descriptive statistics

	Male		Female		Total	
	N	% or mean (SD)	N	% or mean (SD)	N	% or mean (SD)
Mean age (SD)	7,578	61.88 (1.6)	8,374	61.88 (1.6)	15,952	61.88 (1.64)
Welfare state:						
Nordic	1,271	16.8	1,468	17.5	2,739	17.2
Continental	3,969	52.4	4,376	52.3	8,345	52.3
Latin	2,338	30.9	2,530	30.2	4,868	30.5
GALI:						
Not limited	5,050	66.6	5,112	61.0	10,162	63.7
Limited	1,847	24.4	2,473	29.5	4,320	27.1
Severely limited	681	9.0	789	9.4	1,470	9.2
ADL (1+ limitations)	446	5.9	539	6.4	985	6.2
IADL (1+ limitations)	448	5.9	954	11.4	1,402	8.8
Chronic disease (1+)	3,152	41.6	3,739	44.7	6,891	43.2
Physical injury (yes)[1]	1,019	13.4	896	10.7	1,915	12.0
CSC index:						
Most advantaged	1,169	15.4	1,262	15.1	2,431	15.2
Advantaged	3,133	41.3	3,621	43.2	6,754	42.3
Middle	2,292	30.2	2,440	29.1	4,732	29.7
Disadvantaged	923	12.2	1,005	12.0	1,928	12.1

Most disadvantaged	61	0.8	46	0.5	107	0.7
Health status during childhood:						
Good/excellent	6,964	91.9	7,568	90.4	14,532	91.1
Fair/poor	614	8.1	806	9.6	1,420	8.9
Level of education:						
Low	2,691	35.5	3,530	42.2	6,221	39.0
Medium	2,791	36.8	2,869	34.3	5,660	35.5
High	2,096	27.7	1,975	23.6	4,071	25.5
Mean ISCO (SD)[2]	7,553	5.04 (2.4)	7,514	4.75 (2.2)	15,067	4.89 (2.3)
Mean number of children (SD)	6,495	2.27 (1.0)	7,433	2.28 (1.1)	13,928	2.27 (1.1)
Making ends meet:[3]						
With great difficulty	617	8.5	795	9.9	1,412	9.2
With some difficulty	1,502	20.7	1,756	21.8	3,258	21.3
Fairly easily	2,280	31.5	2,574	32.0	4,854	31.7
Easily	2,850	39.3	2,924	36.3	5,774	37.8
Participation in activities (yes)[3,4]	3,306	45.6	3,602	44.8	6,908	45.2
Household type:[3]						
Alone	837	11.6	1,542	19.2	2,379	15.5
With partner	4,410	60.8	4,763	59.2	9,173	60.0
With others	2,002	27.6	1,744	21.6	3,746	24.5
Living area:[3]						
Rural area	2,294	31.6	2,469	30.6	4,763	31.1

(*Continued*)

Table 1. (*Continued.*)

	Male		Female		Total	
	N	% or mean (SD)	N	% or mean (SD)	N	% or mean (SD)
Large/small town	3,077	42.5	3,393	42.2	6,470	42.3
A big city/metropolitan area	1,878	25.9	2,187	27.2	4,065	26.6

Notes: SD: standard deviation. GALI: Global Activity Limitation Indicator. ADL: activities of daily living. IADL: instrumental activities of daily living. CSC index: Childhood Socioeconomic Circumstances index. ISCO: International Standard Classification of Occupations. 1. During adulthood. 2. Calculated only for those experiencing at least one spell of employment. 3. Calculated on a reduced sample of N = 15,298. 4. Any among: voluntary or charity work; educational or training course; sport, social or other kind of club; political or community-related organisation.

which they occurred, and the number and timing of transitions between statuses (Scherer, 2001; Brzinsky-Fay *et al.*, 2006). We kept family and employment trajectories separate, which allowed us to assess their relevance separately and to consider possible interactions between domains. Statuses were defined on the basis of a literature review (*see* Table S1 in the online supplementary material). The employment trajectories we developed distinguish between five states: (a) in education (including training); (b) employed (including short-term jobs); (c) unemployed (and actively searching for a job); (d) inactive (*i.e.* not searching for a job); and (e) retired.[1] Family histories, meanwhile, comprise four states: (a) no partner, no children; (b) partner (married or co-habiting), no children; (c) partner, children (whether natural or adopted); and (d) no partner, children. We started with a theoretical classification of sequences. Employment sequences are defined as similar if they include the same states with the same level of permanence. We then distinguished 'stable/standard' careers – represented primarily by employment and retirement in the final part of the sequence – from 'non-standard careers', which included one or more periods of unemployment or inactivity. 'Standard' families are identified by a common progression through states – single/couple/couple with children – while 'non-standard' families experienced multiple events (couple formation and separation, with or without children) or progressed through states in a different order. To identify the stage at which families were formed, age at birth of first child was categorised as 'early' (age <25 years) or 'standard/late' (age ≥25 years) (Zagel and Van Winkle, 2022). An initial classification was carried out on these theoretical bases, then confronted with data-driven cluster solutions obtained using Ward's hierarchic cluster algorithm on the basis of pairwise distances among sequences, calculated through the optimal matching algorithm. We slightly adjusted the initial classification on the basis of these results, specifically by adding 'single parenthood' to distinguish those participants from the 'unstable relations' family group. This new group appears to face specific conditions associated with negative health outcomes (McKetta *et al.*, 2018). Moreover, we more accurately distinguished between 'non-standard' employment patterns among women (*e.g.* 'early retirement'; 'employed, then inactive') and split 'standard' employment patterns in order to reflect periods of education/training and thus form a more detailed picture of potential health consequences (Devillanova *et al.*, 2019). Lifecourse patterns were identified for the whole sample (17,262 men and 18,950 women) and applied to the sample described above (N = 15,952)[2] to assess the relationship between employment and family patterns, on the one hand, and healthy ageing, on the other, using separate models for men and women and for each country cluster. Ordered logistic regressions were employed with GALI as the dependent variable. As robustness checks, we added contemporary variables to these models. We also tested the findings for the three other health measures (ADL, IADL, chronic diseases) through ordinary least-square regression (OLS). We report below the odds ratio and standard error (SE) for ordered logistic models and beta coefficients (SE) for OLS regressions; all models report robust standard errors. Models with interaction terms for work and family patterns are represented as average predicted probabilities (APPs) for GALI and average predictive values (APVs) for the other health outcomes. Contrasts are used to further analyse

APPs and APVs in an attempt to evaluate whether employment and family patterns display any significant interaction effect when compared against the reference category.

Results

Employment and family patterns

Figures 1 and 2 display the employment and family patterns plotting the status distribution for each age, while Table 2 reports the distribution of patterns in the analytical sample.

For men we identify three patterns, all dominated by employment (Figure 1, panel A): (a) 'long education (*i.e.* into the early twenties) and continuous employment' (22%); (b) the 'full-working career' (75%), characterised by a shorter period in education and then continuous work (this is the prevalent pattern); and (c) a
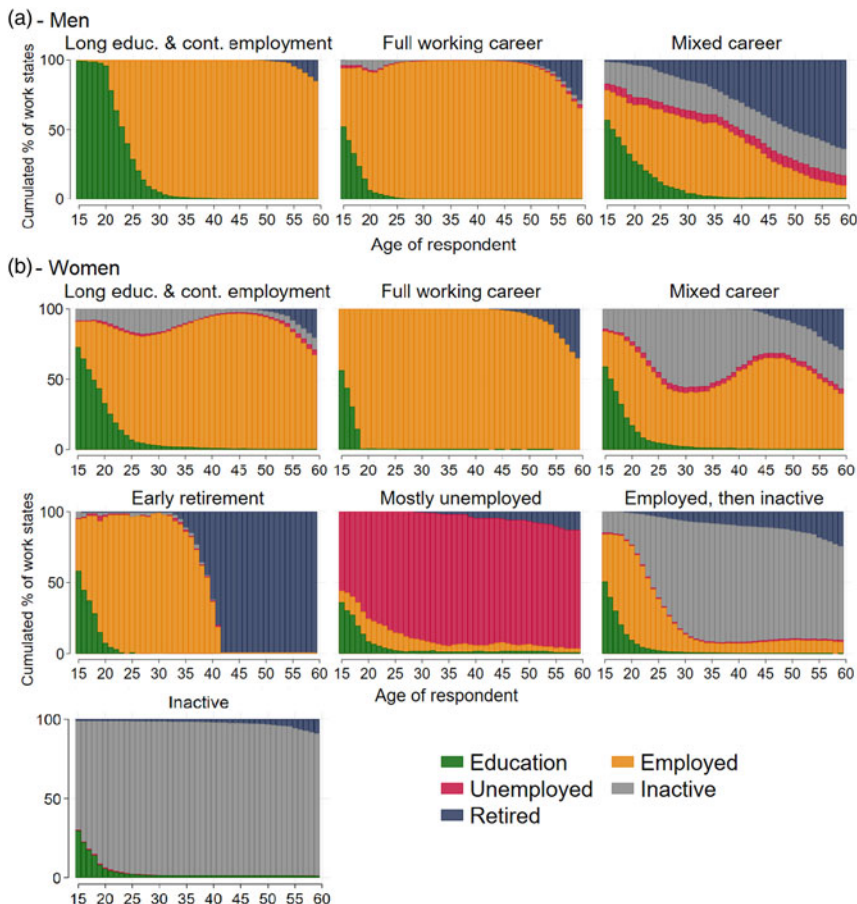
Figure 1. Employment trajectories.
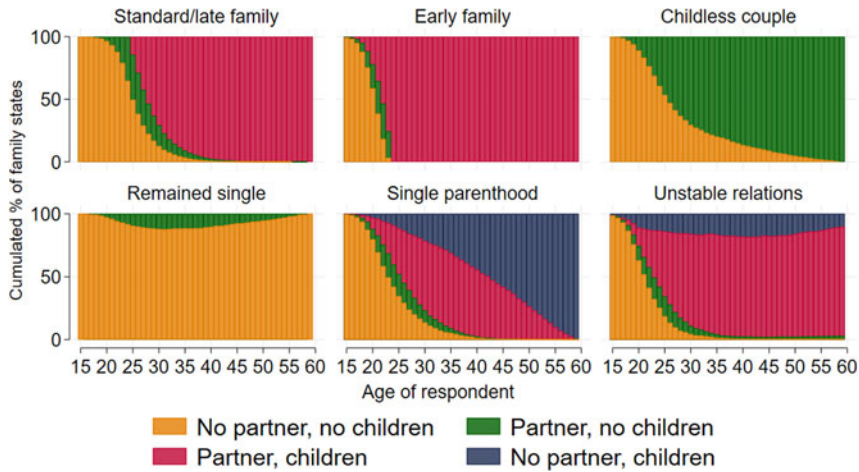*Note*: Long educ. & cont. employment: long education and continuous employment.

Figure 2. Family trajectories.

Table 2. Distribution of employment and family trajectories

	Male		Female		Total	
	N	%	N	%	N	%
Work patterns:						
Long education and continuous employment	1,643	21.7	3,771	45.0	5,414	33.9
Full working career	5,684	75.0	1,786	21.3	7,470	46.8
Mixed career	251	3.3	730	8.7	981	6.1
Early retirement	–	–	64	0.8	64	0.4
No employment[1]	–	–	889	10.6	889	5.6
Employed, then inactive	–	–	1,134	13.5	1,134	7.1
Family patterns:						
Standard/late family	4,233	55.9	2,825	33.7	7,058	44.2
Early family	1,278	16.9	3,143	37.5	4,421	27.7
Childless couple	687	9.1	612	7.3	1,299	8.1
Remained single	406	5.4	339	4.0	745	4.7
Single parenthood	326	4.3	626	7.5	952	6.0
Unstable relations	648	8.6	829	9.9	1,477	9.3

Notes: N = 15,952. 1. 'No employment' pattern includes 'mostly unemployed' and 'inactive'.

small group of men followed a 'mixed career' pattern (3%), including a short working period followed by short spells of unemployment, inactivity and a high proportion of (early) retirement.

The picture for women is more complex (Figure 1, panel B). We distinguish three employment-oriented (75%) and four mostly non-employment-oriented patterns (25%). In these cohorts, only 21 per cent of women followed a 'full working career', and almost three times as many women than men (9%) had a 'mixed career'; but the pattern for more than twice as many women as men (45%) is 'long education and continuous employment'. In addition to these three groups (also seen in men), another four patterns are visible in women: (d) 'early retirement', often around the early forties (1%); (e) 'Employed, then inactive' (14%), which includes women who experienced short spells of employment followed by long spells of economic inactivity; and two patterns featuring no period of employment, which we group together as 'no employment' in Table 2 (11%), composed of (f) 'mostly unemployed' (1%) and (g) mostly economically 'inactive' women (10%). For women, the 'mixed career' category captures those who are in the process of leaving and later re-entering employment, most likely to have and raise children.

Six family patterns are identified for both genders (Figure 2): (a) 'standard or late family', which typically describes long relationships with one or more children; (b) 'early family' likewise; (c) 'childless couple'; (d) 'remained single'; (e) 'single parenthood', which covers a long period alone with children and can follow relationship breakdown; and (f) a group with 'unstable relations', which includes individuals entering subsequent relationships/marriages. Most men (56%) followed the standard family pattern and 17 per cent had children who were born early in a long relationship, while women are found in standard and early families (34 and 38%, respectively). Single parenthood is higher among women (8% *versus* 4% of men), while childless unions (9% of men *versus* 7% of women) and 'unstable relations' (10% of women *versus* 9% of men) account for less than 10 per cent of the sample.

These patterns are consistent with those found in previous studies (Kovalenko and Mortelmans, 2014; O'Flaherty *et al.*, 2016; Ponomarenko, 2016; Han *et al.*, 2017; Komp-Leukkunen, 2019; Zagel and Van Winkle, 2022) and provide a comprehensive picture of the wide range of family and work trajectories, capturing the differences between genders.

Healthy ageing and previous lifecourse patterns

Notwithstanding our relatively young sample (aged 60–65), we find that 24 per cent of men report limitations and 9 per cent report severe limitations. The situation is worse for women, with the corresponding figures being almost 30 and 9 per cent, respectively (*see* Table 1). In the next steps we investigated the extent to which the previous lifecourse relates to differences in healthy ageing. Table 3 presents the results of the ordered logistic regression models we applied to GALI, evaluating the role of early-life conditions (Model 1 'Early life'), the impact of work and family patterns (Model 2 'Full life') and their combined effect (Model 3 'Full life with interaction'). Positive coefficients indicate greater limitations.

As expected, 'non-standard' employment and 'not employed' careers, as well as 'non-standard' family patterns, are associated negatively with healthy ageing (H1a and H1b) because participants following these lifecourse patterns tend to face greater limitations. Men are more likely to have limitations if they followed

Table 3. Global Activity Limitation Instrument (GALI) by lifecourse patterns

Outcome: GALI	Male (N = 7,578)			Female (N = 8,374)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age	0.985 (0.015)	0.986 (0.016)	0.986 (0.016)	1.040** (0.014)	1.043** (0.015)	1.045** (0.015)
CSC index	1.066* (0.032)	1.031 (0.032)	1.031 (0.032)	1.098*** (0.031)	1.061* (0.031)	1.074* (0.031)
Child health (fair/poor)	1.665*** (0.139)	1.551*** (0.134)	1.550*** (0.134)	2.017*** (0.142)	1.807*** (0.129)	1.784*** (0.127)
Education (medium)	0.731*** (0.048)	0.806*** (0.055)	0.804** (0.055)	0.752*** (0.044)	0.827** (0.051)	0.796*** (0.048)
Education (high)	0.549*** (0.039)	0.733*** (0.064)	0.730*** (0.063)	0.630*** (0.041)	0.769*** (0.06)	0.718*** (0.053)
Injury (yes)		3.143*** (0.215)	3.149*** (0.215)		3.684*** (0.251)	3.696*** (0.253)
ISCO		1.053*** (0.013)	1.054*** (0.013)		1.052*** (0.014)	1.023* (0.01)
Number of children		1.094*** (0.028)	1.093*** (0.029)		1.056* (0.026)	1.054* (0.026)
Work pattern (Ref. Long education and continuous employment):						
Full working career		1.119 (0.087)	1.083 (0.1)		0.923 (0.058)	0.984 (0.109)
Mixed career		2.279*** (0.336)	2.248*** (0.512)		1.062 (0.09)	0.997 (0.144)
Early retirement					1.743* (0.43)	
No employment					1.867*** (0.221)	
Employed then inactive					1.174* (0.089)	
No/little employment						1.19 (0.123)
Family pattern (Ref. Standard family):						
Early family		1.043 (0.073)	0.938 (0.19)		1.073 (0.06)	1.076 (0.091)
Remained single		1.366* (0.171)	1.451 (0.43)		1.471** (0.197)	1.113 (0.208)

(*Continued*)

Table 3. (Continued.)

Outcome: GALI	Male (N = 7,578)			Female (N = 8,374)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Childless couple		1.230* (0.133)	1.065 (0.217)		1.164 (0.126)	1.107 (0.171)
Single parenthood		1.091 (0.137)	0.771 (0.254)		1.273** (0.116)	1.320* (0.157)
Unstable relations		1.249* (0.112)	1.38 (0.251)		1.380*** (0.117)	1.306* (0.15)
Family patterns × Work pattern (Ref. Standard family × Long education and continuous employment):						
Early family × Full working career			1.144 (0.248)			0.826 (0.126)
Early family × Mixed career			0.834 (0.366)			1.088 (0.21)
Early family × No/little employment						1.144 (0.148)
Remained single × Full working career			0.918 (0.291)			1.2 (0.35)
Remained single × Mixed career			0.995 (0.443)			3.102* (1.469)
Remained single × No/little employment						2.706** (0.968)
Childless couple × Full working career			1.186 (0.264)			1.054 (0.248)
Childless couple × Mixed career			1.392 (0.69)			0.778 (0.285)
Childless couple × No/little employment						1.223 (0.326)
Single parenthood × Full working career			1.54 (0.551)			0.845 (0.199)
Single parenthood × Mixed career			1.175 (0.761)			0.92 (0.283)
Single parenthood × No/little employment						0.977 (0.28)
Unstable relations × Full working career			0.867 (0.181)			1.016 (0.203)
Unstable relations × Mixed career			1.164 (0.64)			1.207 (0.404)
						1.22 (0.317)

Unstable relations × No/little employment						
/cut1	36.658 (12.764)	43.981 (13.018)	44.083 (13.032)	38.353 (11.766)	49.551 (12.041)	47.959 (12.039)
/cut2	38.333 (12.763)	45.734 (13.018)	45.838 (13.032)	40.231 (11.766)	51.519 (12.041)	49.929 (12.039)

Notes: Ordered logistic regression: odds ratios and robust standard errors. GALI: 1 = not limited, 2 = limited, 3 = severely limited. All models are adjusted by country and interview year. International Standard Classification of Occupations (ISCO) has value '0' for those who have never held employment. In Model 3, employment patterns 4–7 for women are grouped. CSC index: Childhood Socioeconomic Circumstances index. Ref.: reference category. /cut1 is the estimated cutpoint on the latent variable used to differentiate GALI 'not limited' from 'limited', /cut 2 to differentiate 'limited' from 'severely limited' when values of the predictor variables are evaluated at zero.
Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

unstable, 'mixed' career and family patterns such as 'childless union', 'singlehood' or 'unstable relations' patterns. The 'non-standard' career trajectory is particularly consequential, coming with more than double the risk of limitations. Women experience greater limitations if they were never employed (almost twice the risk of limitations), retired early or experienced prolonged inactivity, and also if they remained single or their relationship broke down (especially if this left them as single parents). This remains true after controlling for early-life conditions.

The analyses also show that, for both genders, poor socio-economic status and health during childhood are associated with limitations in old age (H2a). While lifecourse patterns mediate the effect of socio-economic conditions in men (though not in women: H2b), poor childhood health has significant implications for healthy ageing in both genders, regardless of lifecourse. In addition, we find confirmation for a well-known hypothesis that education facilitates healthy ageing (and health in general), as do higher occupational positions.

Thus far, we have looked at employment and family trajectories separately. While this might be reasonable for men, for women we know that there are strong interactions between the two domains. Hence, we also report the combined effect of employment and family patterns on healthy ageing (Model 3) (Figure 3), showing the average predicted probability of each level of GALI (not limited, limited, severely limited) for each employment pattern and the various combinations with family careers. This has the advantage of allowing us to identify the relative differences alongside the absolute levels of limitation.

These results partially confirm H1c: a combination of 'standard' trajectories in both employment and family life creates the best preconditions for healthy ageing. More specifically, the negative consequences of non-continuous employment patterns become even greater when combined with 'non-standard' family paths. This effect is particularly strong in single women with a 'mixed career' or 'no/little employment', who have a higher probability of experiencing limitations, including severe limitations (Figure 3, panel B, $p < 0.05$). Combined effects are less relevant in men; indeed, generally speaking, the interactions between domains do not reach statistical significance in regard to men (Figure 3, panel A).

Welfare regimes vary considerably in how successful they are in realising healthy ageing (Jagger *et al.*, 2010). In our sample (Figure S1 in the online supplementary material), men and women living in Nordic or Latin countries (except Portugal) undergo lower levels of severe limitation than those living in Continental countries. Here we are interested in determining whether different life trajectories lead to different consequences for healthy ageing in different contexts (*see* Models 4 'Full welfare' and 5 'Full welfare with interaction' in Tables S2 and S3, respectively, in the online supplementary material). While we find that education plays a particularly protective role in the Latin countries, our hypothesis that a tighter connection of trajectories and healthy ageing would be found in the Continental and Latin clusters (H3) is not confirmed. 'Mixed' careers are particularly consequential in the Nordic countries; for men, this is also the case in Continental countries. For women, long periods of non-employment are associated with substantively higher health risks in the North, which might in part be a selection effect, given that this pattern is much less common in the Nordic countries. Moreover, unstable family patterns are less consequential in southern countries and come with slightly higher
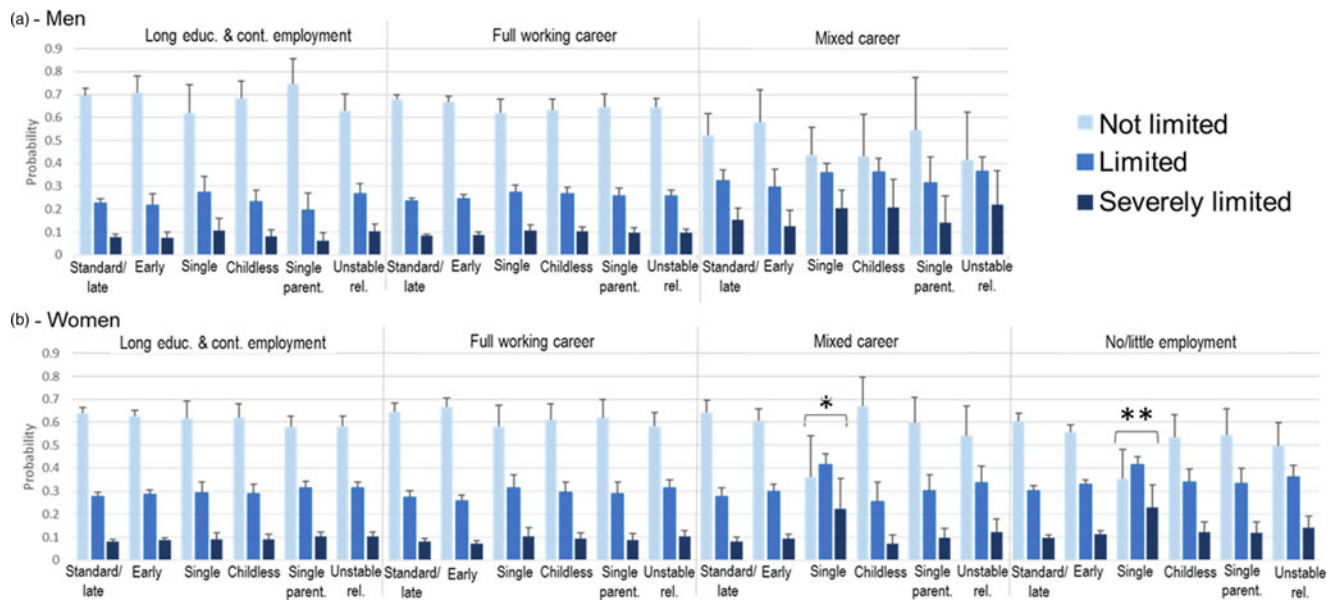
Figure 3. Combined effects of employment and family trajectories.
Notes: Predicted probabilities with 95 per cent confidence interval (lower part omited). Employment patterns 4–7 for women are grouped together.
Significance levels: * *p* < 0.05, ** *p* < 0.01 *versus* 'Long education and continuous employment × Standard/late family'.
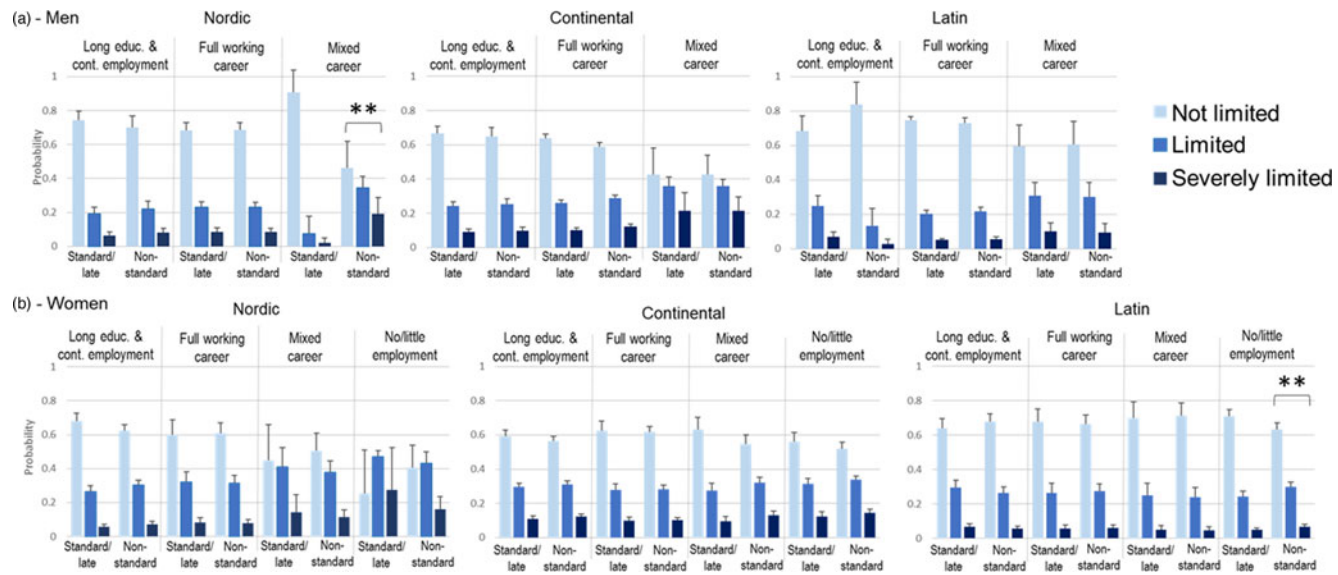
Figure 4. Combined effects of employment and family trajectories, by welfare cluster.
Notes: Predicted probabilities with 95 per cent confidence intervals (lower part omited). Employment patterns 4–7 for women are grouped together.
Significance level: ** *p* < 0.01 *versus* 'Long education and continuous employment × Standard/late family'.

health risks in Continental countries. Finally, we looked at the intersections of work and family patterns internationally. To do so, we had to simplify family patterns into 'standard' and 'non-standard' trajectories (the latter comprise early family, childless couples, remaining single, single parenthood and unstable relations). Figure 4 reports the predicted probabilities for GALI.

In all three contexts, there are only very limited signs that intersections are relevant, with two exceptions. Women with a 'non-standard' family pattern and 'no/ little employment' living in Latin countries are less likely to enjoy healthy ageing than women with a 'standard family' and who follow 'long education and continuous employment' patterns (Figure 4, panel B). The same is true for men who follow a 'non-standard' family pattern and a 'mixed career' living in Nordic countries (Figure 4, panel A).

As a final step, we performed two robustness checks. Firstly, we used ADL, IADL and chronic diseases[3] to ensure that our results are valid when measures other than GALI are used. Overall, multivariate regression models (for details, *see* Tables S4 and S5 in the online supplementary material) based on Models 2 'Full life' and 3 'Full life with interaction' produced results in line with those observed when using GALI. Non-standard work and family patterns and non-employed careers are predictors of poor health. Secondly, we added contemporary economic and social situations to the models to evaluate to what extent they mediate the lifecourse trajectory effects (for details, *see* Table S6 in the online supplementary material). Though influential in their own right,[4] current situations do not (fully) account for trajectories, while some non-standard patterns remained significant, namely mixed career for men, early retirement and non-employment for women, and unstable family patterns for both genders (Model 2). Additionally, the combined effect of work and family patterns remained significant (Model 3). Together, these findings provide support for our argument that the holistic lifecourse perspective adds relevant insight.

Discussion and conclusions

This study investigates the implications of work- and family-related lifecourse trajectories for healthy ageing in Europe. To do this, we adopt the WHO framework and an equality perspective to enrich the current literature, which tends to focus on single countries, only considers health and wellbeing measures, and hardly looks beyond more than one life-sphere. The results highlight that a lifecourse approach to study ageing is essential and confirm the substantive importance of employment and family patterns for healthy ageing. The relevance of trajectories also goes well beyond a part mediated through the effects of individuals' current socio-economic situation, which were confirmed as predictors of healthy ageing (Abud *et al.*, 2022; Rojo-Perez *et al.*, 2022). In particular, in both genders, 'non-standard' trajectories are associated with a reduced capacity to live a long life to one's full potential, such as being limited in participating actively in society according to one's own needs and preferences. In fact, the WHO (2015) already considers employment to be key to enjoying healthy ageing, not only due to its financial effect but also because it promotes social inclusion, interactions and physical activity. Specifically, men who undergo considerable periods of unemployment and

women experiencing no or few spells of employment have a lower probability of healthy ageing than those with a 'full career'. This result is in line with studies linking worse health and lower life-quality to a non-standard career and low employment consistency (Wahrendorf, 2015; Lu *et al.*, 2017; Di Gessa *et al.*, 2020; Zella *et al.*, 2022). Indeed, employment seems to be a protective factor for both men and women, although a selection effect (continuously employed participants are healthier) must be acknowledged (van der Noordt *et al.*, 2014). Interestingly, employment also has a protective effect for women almost entirely independently of their family life. Moreover, in a departure from studies on the UK population (Lu *et al.*, 2017; Di Gessa *et al.*, 2020), we find no evidence that employment breaks taken by women to take care of their families are favourably linked with positive health (trajectories) compared to continuous employment. As regards family patterns, men and women who remain single and whose relationships break down, men in childless couples and single mothers exhibit a higher risk of activity limitations in old age than mothers and fathers in stable unions. These results suggest that the stable presence of a partner, as opposed to having children, is key to the promotion of healthy ageing. These findings are in line with suggestions that the 'standard' family offers potential benefits through social support (Litwin *et al.*, 2020) and in socio-economic terms. In contrast to other studies (O'Flaherty *et al.*, 2016), however, we find no support for the idea that early family formation affects the likelihood of healthy ageing. What counts is the stability of unions.

While both family and employment trajectories are important predictors of healthy ageing, they appear to have mostly independent influences, with little support being found for the idea that intersections are important. This implies that there is no trade-off for women that might render employment less important, such as living a life dedicated to one's family. If anything, negative effects reinforce each other, such as those of non-standard family life and non-employment for single women. These results could be explained in terms of the individual capacity and preferences highlighted in the WHO framework, which are the results of a lifetime pattern rather than specific events or characteristics.

In addition, we find evidence to confirm that early-life conditions affect health in later life. Notably, though, for women the effect persists after lifecourse patterns are added to the models, whereas for men their influence is completely mediated through employment and family trajectories. This in turn might also suggest that men can overcome disadvantages in early life to a greater extent than women can, implying greater agency in men. We can only speculate about the accumulation mechanism (Iveson *et al.*, 2020), which deserves additional analysis.

Our findings also provide evidence for heterogeneous effects among welfare regimes but not necessarily in the expected direction. Though we find health inequalities to be stronger in southern Europe, they are primarily driven by education. A recent study (Lu *et al.*, 2021) confirmed that education is a strong predictor of healthy ageing. As explained by the WHO, healthy ageing is influenced not only by individual characteristics but also by living environments and the interactions between these factors. Indeed, we expected participants living in countries with low support for work participation and family formation (Continental and Latin countries) to demonstrate a tighter connection between lifecourse patterns and healthy ageing (Zella and Harper, 2018). However, we did not find support for

this hypothesis in our results and, on the contrary, found that non-standard paths seem to be more consequential in Northern countries and to some extent in Continental countries. Women experiencing little or no employment in particular showed a significantly higher probability of limitations in all but the Latin countries. A possible explanation for this could be the buffering role played by the family in mitigating the negative effects of non-standard employment patterns through support and solidarity, which is common practice in Latin countries but much less common in Nordic ones (Tattarini *et al.*, 2018). Also, we might suggest that a selection effect may be present in the North, where the participation of women in the labour market is usually high (Bambra and Eikemo, 2009; Komp-Leukkunen, 2019). In fact, this finding does not imply that state intervention is not present but rather that such intervention might manifest through the promotion of specific employment patterns. Moreover, Zagel and Van Winkle (2022) confirmed that countries characterised by gender egalitarianism (*e.g.* the Nordic welfare regime) encourage women to remain active in the labour market, while those with more rigid normative values, such as the Latin countries, do not, and this encouragement will have a favourable effect on health in age over the long term. Still, in the Latin countries, women experiencing non-standard family patterns and no/little employment are found to have a lower risk of healthy ageing. Understanding exactly how contextual aspects shape the relationship between lifecourse trajectories and healthy ageing deserves additional analysis, which could benefit from an in-depth consideration of the historical moments underlying specific social contexts (Corna, 2013).

In spite of the key findings and insights that we offer, it should be noted that this study is not free of limitations. First, given that a complete control for unobserved heterogeneity was not possible, we do not attempt to estimate any causal effects of life trajectories. Therefore, the results are potentially affected by self-selection issues in relation to individuals in particular work and family patterns. Still, previous health conditions and early-lifecourse stages capture, at least partly, important heterogeneities, rendering our results reasonably sound. Second, to identify typical patterns, we had to simplify our approach; thus, following previous literature, we considered statuses that could have reduced the variety of lifecourse patterns in potentially relevant areas. Finally, by narrowly focusing on three welfare clusters, we might have missed the specific impacts of different labour market regulations and family norms across countries, which in turn might also have affected the comparability of the life-history data we used, which were self-reported and thus subject to different interpretations.

Despite these limitations, this study is still able to provide, for the first time, a valuable insight into the relationship between lifecourse patterns and healthy ageing, according to the WHO framework combining work and family trajectories. Within the 'Decade of Healthy Ageing' (WHO, 2020) – which promotes a collaborative, multi-sectoral action plan geared towards inclusion, universality, equity and solidarity, where no one is left behind – the importance of life patterns in producing long-term health inequalities (Jones *et al.*, 2019) cannot be ignored. Importantly, the main results we obtained using GALI proved robust when checked against three other health measures. This provides proof of its validity but also shows that, in terms of drivers, there is not much difference between different outcome measures.

Our findings come with some important implications. First of all, we underline that the basis for healthy ageing is laid out very early in life. Investment in early living conditions and in education is therefore crucial. However, while it is certainly true that adopting healthy behaviours will help individuals enjoy healthy ageing (Visser *et al.*, 2019), our study also highlights the importance of structural and institutional context, which are often beyond the control of individuals (Lak *et al.*, 2020). Setting the conditions for continuous employment is an important step to favour healthy ageing and will enable men and women to play an active part in society well into old age. Appropriate child-care services and active support for women's employment, together with decent and stable conditions of employment, will pay off in the long term.

Notes

1 A distinction of full-time and part-time work, though potentially relevant (especially for women), was not possible due to data constraints.
2 No relevant differences emerge in the distribution of sequences in the two samples.
3 Chronic diseases included the following: heart condition, stroke or cerebral vascular disease, diabetes or high blood sugar, chronic lung disease, arthritis including osteoarthritis or rheumatism, cancer or a malignant tumour, stomach or duodenal/peptic ulcer, Parkinson's disease, cataracts and hip fractures.
4 The ability to make ends meet and to participate in activities serve as protective factors for limitations in both genders, whereas living in a big city or metropolitan area favours healthy ageing only in men.

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