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ORIGINAL RESEARCH

Extending Working Lives: A Systematic Review of Healthy Working Life Expectancy at Age 50

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Abstract

Retirement ages for receipt of state/social pensions are rising in many countries in response to population ageing and increasing life expectancy. However, sickness absence and early retirement for health reasons (especially among adults aged ≥ 50) present challenges to this. Estimates of the average number of years people are both healthy and in work from age 50 are needed to inform policy making and assess the feasibility of policy changes. A systematic review was carried out to identify existing population indicators, and estimates, of life expectancy in health and work. Nine databases were systematically searched on the 30th January 2019. Eligible papers were identified using inclusion/exclusion criteria. Evidence synthesis was undertaken to explore indicators and estimates. Four studies were included for review from 1485 identified by the search. A narrative review was carried out; quantitative pooling of the results was not feasible due to high heterogeneity between studies. All estimates of the average number of years spent in both health and work from age 50 were below 10 years with the exception of a population subgroup of Finnish male executives (11.91 years). The review indicated that population indicators of health and work that could estimate the average number of years people are healthy and in work are rarely used, and that there are no current and reliable estimates. One indicator, Healthy Working Life Expectancy (measuring life expectancy in health and work from age 50), offers the potential to be a suitable measure for monitoring life expectancy in health and work.

Keywords Life expectancy · Working life expectancy · Dependency ratio · Retirement · Healthy ageing · Disability

1 Introduction

With increasing life expectancy and population ageing across the globe, worsening dependency ratios are driving extensions to working life through rising retirement ages. For example, state retirement age in Germany, Spain and the United Kingdom will increase to 67

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between 2023 and 2029 (Department for Work and Pensions 2017a, b; European Commission and Economic Policy Committee 2009; United Nations 2017). However, population morbidity and disability are changing inconsistently with life expectancy (Jagger 2015) and extensions to working life will prove difficult if adults are expected to work until they are older regardless of health problems and work disability.

Premature workforce exit and work absence can be due to functional limitation through physical or mental health conditions, inadequate provision of workplace accommodations, a lack of suitable employment opportunities such as access to jobs with low physical demands, and caring responsibilities (Department for Work and Pensions 2017a, b; Performance And Innovation Unit 2000; van den Berg et al. 2010a, b). The effect of health on work participation is especially influential in adults aged 50 years and over and must be considered if prolonged working lives are to be achieved and be sustainable (Haan and Myck 2009). Population health is therefore pivotal to the success of retirement-deferring policies, while work factors (such as access to work, job type and workplace support) can determine whether extended working lives are achievable (Wilkie 2012). Informed policy making and planning requires population-level evidence of the number of years that individuals are both healthy and in work. A population indicator of life expectancy in health and work from age 50 is needed to assess the feasibility of policy changes and guide interventions to improve work participation. The numerical estimates of such a metric would help clarify whether populations are in a position to extend working lives.

A systematic review was carried out to identify estimates of the number of years that adults aged 50 years and over are healthy and participating in paid employment (work). The objectives of this review were to identify and evaluate: evidence of estimates of time spent in health and work, how health and work participation has been operationalised, and factors associated with and drivers of reduced health and work participation.

2 Methods

Evidence was identified using a four-stage protocol for searching and filtering results from literature databases: search strategy and identification of studies (stage 1); study selection (stage 2); data extraction and quality assessment (stage 3); and analysis (stage 4). The systematic review protocol was registered with Prospero (CRD42019122189).

2.1 Stage 1: Search Strategy and Identification of Studies

A comprehensive search was conducted to identify observational studies in working-age populations that have used a population indicator to estimate the number of years adults are healthy and in work. Key databases were searched on the 30th January 2019: Embase [searched using OVID] (1974 to 29th January 2019); Allied and Complementary Medicine Database (AMED) [OVID] (1985 to February 2018); Medline [OVID] (1946 to January week 3 2019); Health Management Information Consortium (HMIC) (1979 to the 30th January 2019); Social Sciences Citation Index and Science Citation Index Expanded (Web of Science) (1970 to 29th January 2019); AgeLine [EBSCO] (1978 to the 30th January 2019, with some coverage from 1966 to 1977); CINAHL [EBSCO] (1937 to the 30th January 2019); PsycINFO [EBSCO] (1800 s to the 30th January 2019); and Grey literature database Open Grey. Search results matched at least one work-related search term and at least one health expectancy search term. Medline search terms are given in the electronic supplementary material.

Inclusion required population-level estimates of combined health and work statuses, where the population age range included 50–60 year olds. Because pension policies are applied to national populations, for study populations to be eligible for the systematic review they were required to be representative of a general population and not defined by health or work status in the key 50–60 age range. Exclusion criteria were that the full text was unavailable, the publishing language was not English, the study was not published as a research article or report, no numerical estimate was given for time spent in health and work, and the research did not investigate duration of combined work participation and health statuses. Studies without abstracts were not excluded in abstract screening.

2.2 Stage 2: Study Selection

Screening was carried out by the first author (MP) initially on titles, then abstracts and finally full texts, retaining studies at each stage that did not clearly meet exclusion criteria. Full texts were assessed for eligibility against the same inclusion and exclusion criteria described above. References of the retained results were then manually screened for any studies missed in the database searches. Finally, studies that were not the primary sources of the relevant evidence were excluded. Remaining studies were deemed eligible and included in the review. The senior author (RW) was the second reviewer for screening all abstracts and a random sample of 100 titles.

2.3 Stage 3: Data Extraction and Quality Assessment

Data extracted from studies included in the systematic review included study population, study design, sample size, research aim(s), the population summary indicator used and how it was defined, the statistical methodology employed to compute results, the number of years people were estimated to be healthy and in work, and factors identified as being associated with or predictive of the number of years spent healthy and in work.

Both reviewers (MP and RW) independently carried out quality assessment of the included studies using the QUality In Prognosis Studies (QUIPS) tool (Hayden et al. 2013). QUIPS is designed to assess bias in prognostic research but the quality concerns evaluated are appropriate for the non-randomised and non-interventional observational studies sought in this review. QUIPs contains six sets of questions to assess the presence of six types of bias (study participation, study attrition, the prognostic factor of interest, outcome measurement, study confounding, and statistical analysis and reporting). The QUIPS attention to bias related to prognostic factors of interest was redirected to any exposures measured. Reviewers used the QUIPS tool to assess whether each type of bias had been convincingly minimised (yes (Y)/partly (P)/no (N)/unclear (U)/not relevant (NA)) in the research identified. Where quality assessments differed, disagreements were either resolved at a consensus meeting or reflected in the results.

2.4 Stage 4: Data Synthesis

It was not feasible to quantitatively pool study findings on estimates of time spent in health and in work from age 50. There was a low number of eligible studies and a high level of heterogeneity between them. The four studies used different population indicators, statistical methods, and operationalisations of health and work. Additionally, estimates of time spent in health and work required transformation to be comparable from age 50. For these reasons as well as study population differences, a meta-analysis was not appropriate. Instead, a narrative synthesis of the evidence was carried out using textual descriptions, tabulation and data transformation (for example, estimates of time spent in health and work from age 16 were lowered by 34 years to give an approximation of the result from age 50) (Popay et al. 2006).

3 Narrative Review

3.1 Results

The search identified 1485 articles. Prior to title screening, 34 non-English language Open Grey articles were removed as well as 323 articles that were duplicated across databases (Fig. 1). Of the remaining 1128 articles, 729 were excluded in title screening and 349 were excluded in abstract screening. Full text screening for eligibility excluded a further 46 articles, leaving four studies for analysis (Table 1).

3.2 Data Quality

Mutafova et al. (1996)'s study of Occupational Handicap-Free Life Expectancy (OHFLE) was found to be of high quality using the QUIPs tool described in Sect. 2.3, while the studies of Occupationally Active Life Expectancy (OALE) and work participation with work ability (Kaprio et al. 1996) and Nurminen et al. 2004 respectively) were of acceptable quality (Table 2). The estimation of Healthy Working Life Expectancy in Europe by Lievre et al. (2007) was not published with sufficient detail to assess the quality of the research.

3.3 Evidence Synthesis: Narrative Review

Health was captured by Mutafova et al. (1996) and Kaprio et al. (1996) in the objective medical assessment of reduced work capacity. In both study contexts, a national programme assessed work capacity and provided disability pensions to those deemed unable to continue in paid employment. Both studies assume that working-age individuals are in work by default unless in receipt of a disability pension. Kaprio et al. (1996) estimated OALE for a cohort of men who had been certified as healthy at age 20 through medical examination for eligibility for military service. The outcome was reported as the age at which occupationally active life was expected to end. By subtracting 50 years from OALE results as presented, estimates ranged from 2.17 to 11.91 years from age 50 according to occupation category. Similarly, relevant analyses by Mutafova et al. (1996) were only available from age 16 (not from age 50) but suggested estimates of 8.9 and 9.5 years of work participation with work capacity ('no occupational handicap' or 'light occupational handicap') from age 50 for males and females respectively. Over the study period in Bulgaria, female OHFLE at age 16 and age 50 decreased slightly despite corresponding life expectancy increases (Mutafova et al. 1996).

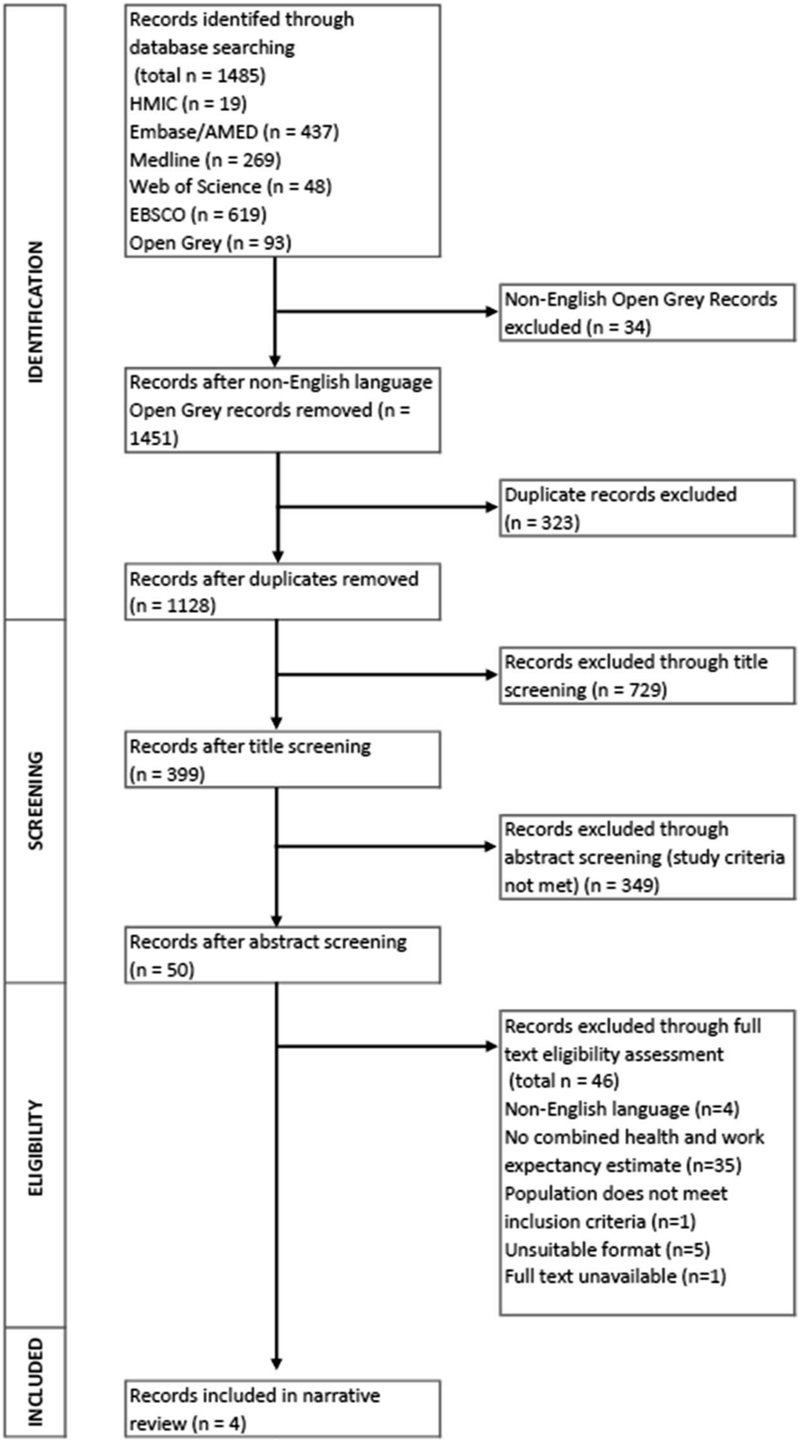

Fig. 1 Systematic review flow chart

Table 1 Summary of extracted data

Published outcome measure	Healthy working life expectancy (HWLE) (Lievre et al. 2007)	Occupational handicap-free life expectancy (OHFLE) (Mutafova et al. 1996)	Occupationally active life expectancy (OALE) (Kaprio et al. 1996)	Working life expectancy in varying states of work ability (Nurminen et al. 2004)
Published research aim(s)	To measure successful ageing through societal engagement (working) and the absence of disease/disability in European countries	To understand population health through both morbidity and mortality data in Bulgaria	To investigate how total life expectancy and occupationally active life expectancy differ by socioeconomic status in Finland	To estimate the duration of work life spent in different states of work ability (work capacity) between ages 45 and 63 in Finland
Health metric	Self-rated health	Clinical examination of work capacity	Clinical examination of work capacity	Self-rated work ability
Statistical analyses presented	Multi-state life table estimates of years in health and work from age 50 using interpolated Markov chain modelling	Cumulative person-year life table estimates of time in no/light/moderate/severe occupational handicap (age 16–59)	Kaplan–Meier mean time-to-event estimates from age 20 to: certified work disability; death; or normal retirement age (age 65)	Health expectancies estimated from conditional probabilities of staying in work
Derivation of work capacity duration *from age 50*	N/A (use results as published)	Subtraction of 34 years from summed life expectancy estimates with light/no occupational handicap from age 16	Subtraction of 50 years from the age at which work capacity is estimated to end (OALE)	Summation of life expectancy in good and in fair work ability from age 50

Estimate of number of years in health and work from age 50	Europe average: males 7.5 years; females 4.8.
	UK: males 8.8 (n = 1336); females 5.8 (n = 1561).
	Finland: males 6.3 (n = 1403); females: 6.2 (n = 1397).
	(See Lievre et al. (2007) for more)
		Males 6.8 years; females 8.5. (Study population was national population)	Executives 11.91 years (n = 127);
			clericals 9.77 (n = 314);
			skilled workers 8.31 (n = 578);
			unskilled workers 2.17 (n = 177);
			farmers 7.08 (n = 317).
			(All male)
				Males 5.48 years (n = 3460); females 6.06 (n = 2797).

Table 2 Summary of quality assessments of studies included in the systematic review

Minimisation of bias related to:	HWLE (Lievre et al. 2007)	OHFLE (Mutafova et al. 1996)	OALE (Kaprio et al. 1996)	Working life expectancy with work ability (Nurminen et al. 2004)
Study participation	U	Y	P	P
Study attrition	U	Y	U	U/P
Factors associated with the outcome measurement	NA	NA	Y	NA
The outcome measurement	Y	Y	Y	Y
Study confounding	NA	NA	N	NA
Analysis	Y	Y	P/Y	Y
Research quality	Unclear	High	Acceptable	Acceptable

Convincing minimisation (assessment = Y) of different types of bias is indicative of higher quality research [Key: yes (Y)/partly (P)/no (N)/unclear (U)/not relevant (NA)]

The remaining two studies investigated work participation with subjective health or work capacity self-assessment. Estimates of the duration of work participation in health (Lievre et al. 2007) or good or fair work ability (Nurminen et al. 2004) in these studies ranged from 5.5 years [France—Lievre et al. (2007), Finland—Nurminen et al. (2004)] to 9.7 [Greece—Lievre et al. (2007)] for males. The range of estimates for females was 2.9 years [Italy—Lievre et al. (2007)] to 6.2 [Finland—Lievre et al. (2007)]. Lievre et al. (2007) estimated UK HWLE as 7.4 years for males and 5.8 years for females, but data were only available for two time points so a correction factor was applied based on trends observed in other European countries studied. A summary of the extracted data is given in Table 1.

3.4 Factors Associated with Lower Estimates of Life Expectancy in Health and Work

Of all the studies in the review, only Kaprio et al. (1996) presented subgroup analyses to examine factors associated with duration of healthy and working life. Never being married and lower socioeconomic status (measured by occupation) were associated with lower OALE, lower total life expectancy, and a less favourable ratio of OALE to total life expectancy. OALE was 9.42 years from age 50 for ever married men, but men who had never married were not expected to stay in the workforce until they turned 50.

4 Discussion

The primary aim of this systematic review was to identify estimates of the number of years that adults in their later working lives (from age 50 years) are likely to be both healthy and in work. The systematic search identified four studies, which allowed review of how duration of health and work participation has been operationalised. Only one study reported potential determinants of reduced time spent in health and work.

Of the 1485 results identified in the systematic search, 1476 were not published articles with an estimate of time spent healthy and in work in later working-age life in the general population (Fig. 1). One article could not be checked for eligibility due to full text unavailability and ineligibility could not be confirmed for four articles excluded due to non-English publication language. The four included studies were published from 1996 to 2007, which was prior to the implementation of policies to extend working lives. Only one study identified a group of people who, on average, would be working until their 60s: male Finnish executives (approximately 8% of the study population, who had all been healthy at 20 years old) (Kaprio et al. 1996). Healthy Working Life Expectancy (Lievre et al. 2007) was the only indicator identified in this review to consider general health rather than work capacity, although no theoretical or statistical justification for the definitions of health and work participation were published or cited in the research. No rationale was given for the exclusion of individuals working fewer than 15 h per week, which will lead to lower estimates of the number of years that people are healthy and in work.

4.1 Operationalising Health and Work Capacity

The operationalisation of health and work in the studies using objective work capacity [OHFLE by Mutafova et al. (1996) and OALE by Kaprio et al. (1996)] does not allow for individuals to be healthy but not in work, nor in work but not healthy. This is a limitation due to the misalignment of objectively deemed and subjective work capacity (Nurminen 2004). Subjective health and work capacity are stronger predictors of work participation outcomes than objective medical evaluation of work capacity (Bound 1991; Haan and Myck 2009; Nurminen 2004). Further, use of an official disability status restricts poor health to a status that is difficult to leave once joined (Haan and Myck 2009) and is unlikely to detect population subgroups most affected by issues of absenteeism and presenteeism. Although the work ability index used by Nurminen et al. (2004) does not assume work ability from disability pension status and seeks to additionally capture physical and psychological work strain (Nurminen et al. 2004, p. 512), components of the work ability score are good self-reported proxies for aspects of objective work capacity assessment such as sickness absence information and number of diagnoses.

Aspects of the biopsychosocial model of disability—including vocational, educational, psychosocial and financial factors—are not recognised in the medical model of disability but are often key drivers of (in)ability to complete tasks and, therefore, (in)ability to participate in paid work (Chen 2007). In general, it is hard to predict the extent to which an individual experiences disability solely from medical assessment of physical, psychological or anatomical impairment (Chen 2007). In a work context this highlights the role of psychosocial working conditions, where workers' health is influenced not only by biological factors but macro- and meso-level factors including economic, social, political and workplace structures (Rugulies 2019). Modelling the health-related workforce participation behaviour of a population is not equivalent to estimating population employment with medically assessed health or work capacity (Nurminen 2004). These biopsychosocial and medical models (respectively) of health and work are likely to explain some of the variation in results identified in this review, although this is not clear due to the differences between each of the studies.

Observed effects on work participation due to objective (clinically assessed) health and more subjective measures could represent the lower and upper bounds of the true effect of health respectively (Bound 1991). Poor subjective health requires no medical diagnosis and is therefore more inclusive than clinical assessment of poor health or reduced work capacity (Haan and Myck 2009). Biases are largely unidirectional in objective health measures, whereas biases in subjective measures are more likely to be offset at population-level (Bound 1991). Furthermore the effect on work participation decisions attributed to self-rated health may capture some of the effect of economic factors, which influence both health and work participation outcomes (Bound 1991; Naik et al. 2017). Thus, effects are still meaningful but incorrectly attributed to health, and a population indicator such as HWLE (which already captures factors such as access to employment opportunities) could give accurate population-level observational results even if the potential for cause and effect interpretation is limited. Finally, the justification hypothesis is that some individuals rationalise non-employment through false subjective reports of poor health, although systematic misrepresentation of health among non-employed individuals is unlikely (Bound 1991; Cai 2010; Stern 1989).

Both subjective and objective methods of measuring health have limitations as health is a complex driver of workforce participation (Bound 1991) and accurately measuring health for work participation research is challenging (Bound 1991; Cai 2010). Changes to contextual, societal and economic conditions can have substantial and complex effects on the morbidity and mortality affecting a working-age population (Mutafova et al. 1996). The biopsychosocial relationship between health and work could strengthen the rationale for subjective health measures, as used by Lievre et al. (2007), over objective work capacity assessments (Kaprio et al. 1996; Mutafova et al. 1996) or even subjective assessments of work ability (Nurminen et al. 2004). Incorporating a subjective approach to health measurement recognises that individuals may take decisions for any number of reasons (Ringen 1995), also providing scope for employers to affect change in how individuals interact with their work environment without any improvement or decline in physical function.

4.2 Strengths and Limitations

A strength of this review is that the broad scope of the search strategy and dual-review screening process allowed numerical results to be identified despite the variety of individual study aims, designs and approaches to analysis. Although non-English language results were excluded, the majority of these were Open Grey results and no English language papers from this source were found to be eligible for the review.

The systematic review included assessment of the identification of papers by using a second reviewer for all abstract screening and a random sample of title screening and measuring agreement. Agreement in screening decisions for 100 randomly selected titles was substantial (84%, kappa statistic 0.64) and screening decisions were updated after disagreements were resolved in a consensus meeting. Reviewers agreed in 317 of the 338 abstract screening decisions. Despite a modest kappa statistic of 0.67, percentage agreement was high (94%). This was due to the method of calculating the kappa statistic; in cases where one decision (either to include or exclude) occurs much more commonly than the other, chance is credited for agreement due to common knowledge thereby resulting in a lower score (Tang et al. 2015).

The review findings are limited by the number of formal studies that have been carried out in this area. A meta-analysis was not appropriate due to the high level of heterogeneity across several aspects of the studies, and the role of factors driving health and work participation could not be determined as study authors were largely speculative on this matter. Finally, estimates of the number of years spent in health and work from age 50 transformed from OHFLE (Mutafova et al. 1996) and OALE (Kaprio et al. 1996) are underestimated due to persons who died before age 50 not being excluded.

4.3 Implications for Policy

Life expectancy and its subdivisions into health state life expectancies have important effects on societies at the individual and population level (Beltrán-Sánchez et al. 2015). Whether death is postponed in favour of extended disability and poor health, or in fact adults are experiencing a proportional (or equal) increase in number of healthy years is a crucial consideration for policy makers and health care providers contending with an ageing population. As life expectancy continues to increase in most countries, three main hypotheses have been proposed for the relationship between mortality and morbidity (Fries 1980; Manton 1982; Olshansky et al. 1991; Robine et al. 2003): the compression of morbidity hypothesis, in which population health improves as life expectancy increases; the expansion of morbidity hypothesis, in which mortality is deferred but the duration of morbidity is drawn out; and the dynamic equilibrium hypothesis in which the proportion of healthy life expectancy relative to total life expectancy is maintained. Adding to existing evidence that morbidity is compressing in some populations and expanding in others (Jagger 2015), the findings of this review suggest that existing evidence is insufficient to support the feasibility of policies seeking to extend working lives. Valid and reliable estimates of life expectancy in health and work from age 50 are needed to evaluate whether populations are ready to work later in life. These estimates would also serve to highlight where strategic intervention is needed to reduce health and work inequalities and make extended working lives achievable. Work is needed on the development and implementation of a population indicator suitable for this purpose. The benefits of successful ageing (health and productive activity in older age (Jagger et al. 2007; Lievre et al. 2007)) are not only multifarious but would allow for a new working understanding of the relationship between chronological age and the process of ageing (Spijker and MacInnes, 2013), which through policy making could lead to improved equitability and nationally affordability of healthcare and pension provision.

4.4 Implications for Research

The nature of work is changing. Increasingly, workers carry out non-manual, non-industrial work; accompanying this shift has been a decrease in workplace accidents and a rise in work-related mental health problems, stress and job strain (Baumberg 2012; Vickerstaff et al. 2012). Types of roles available are changing due to automation and redistribution of work, for example the offshoring of not only manufacturing jobs but, increasingly, also skilled professional and technical work (Barley et al. 2017). Further, with the rise of the 'gig economy', growing numbers of people are engaged in temporary and short-term work (Barley et al. 2017). A given illness or disability may be more or less disabling at work depending on the characteristics of the role (Baumberg 2012). The definition of 'work limiting disability' is tied to context; for example, a low number of accessible employment opportunities or a low demand for workers may mean that long term illness has a greater impact on ability to secure employment (Bartley and Owen 1996). This highlights the importance measuring both work capacity and participation among older adults and the use of a combined health and work indicator is advantageous in incorporating objective measures of work participation. Prevalence of longstanding limiting illness needs not increase in a population for changes in work factors (such as availability and nature of job opportunities) to increase levels of work limiting disability (Baumberg 2012). There is a need for a healthy working life expectancy indicator that allows for changes in the relationship between health and work (for example due to variation in the availability and nature of work opportunities).

The scarcity of studies identified in this review that have used a population indicator to measure the number of years that people are healthy and in work indicates the need to operationalise this construct to inform policy. Recent studies of working life expectancy with respect to health (de Wind et al. 2018) or disability (van der Noordt et al. 2019) status were ineligible for the systematic review as study populations were defined by health status at baseline and work status at baseline respectively (within the target age-range of 50–60 years). Additionally, this target age range was not captured in full in either study population where, in both cases, the youngest adults were aged 55 years. Population subgroups affected by poor health and work non-participation lower the average number of years spent in health and work. The review criterion that study populations represent a general population is necessary for the comparability of results to policies applied nationally, to demonstrate that the population indicator can be used for this purpose, and to inform strategic interventions to increase time spent in health and work.

The scarcity of studies identified in this review suggests that there are obstacles to the calculation of healthy working life expectancy. Two studies analysed data that were collected in relation to local policies (in order to monitor and support people with reduced work capacity) which are not routinely collected in other settings (Kaprio et al. 1996; Mutafova et al. 1996). Even in countries where such data sources continue to be available, the assumptions that people are in work unless in receipt of a disability pension are unlikely to be reasonable as societies and their workforces change (including the preferences a high proportion of older workers exercise in working only where jobs offer good-quality working lives (Maltby 2012)). Nurminen et al. (2004) analysed survey data collected as part of a standalone study, also making strong assumptions about the representativeness of the data to the general population. Of the studies identified in this review, only the analysis carried out by Lievre et al. (2007) has potential to be updated or replicated in new settings, although there are possible challenges in accessing mortality-linked longitudinal survey data and in the methodological and computational complexity of estimating multi-state life tables using interpolated Markov chain modelling. There is a need to adopt an indicator that can feasibly be estimated and routinely updated. 'Healthy Working Life Expectancy' (Lievre et al. 2007) may be a good starting point for this, although more work is needed on the operationalisation of health and work.

4.5 Concluding Remarks

This systematic review identified four studies that estimated the average number of years adults are both healthy and in work in later working-age life (from age 50). The low number of results is indicative of limitations in available data and/or methods for the calculation of healthy working life expectancy. Some numerical findings identified supported existing evidence that duration of health and work participation does not necessarily maintain a linear relationship with total life expectancy (Crimmins 2002; Mutafova et al. 1996; Nurminen 2004). The average number of years that people are healthy and in work therefore requires regular measurement to monitor workforce potential and inform policy making. This review also showed no general adoption of a population indicator for this purpose, and current and reliable estimates of the average duration of health and work participation (in any population and using any metric) were not identified. Evidence from the narrative review draws attention to the need for development of an appropriate population indicator that can be routinely estimated to monitor and guide improvements to population and workforce health and wellbeing.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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