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ORIGINAL ARTICLE

Multimorbidity and intention to retire: a cross-sectional study on 14 European countries

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Abstract

Objectives To describe the association between multimorbidity and intention of retirement in Europe and to understand whether this relationship is modified by the working environment and disability integration policies.

Methods Participants were 11,790 employees aged 50–65 years old who responded to the sixth wave of SHARE project (2015). We modelled intention of retirement as a function of multimorbidity, adjusting for age, gender, education level, and household income by means of logistic models with country fixed effects. We then included the working conditions and an integration policy indicator as potential effect modifiers.

Results Overall, 36.6% of participants reported multimorbidity and 56.1% were willing to retire earlier. Multimorbidity was significantly associated with intention of retirement (OR = 1.58, 95% CI 1.37–1.84). Unfavourable working conditions were positively related to the intention to retire (OR = 1.99, 95% CI 1.53–2.58), while the integration policy was unrelated (OR = 1.84, 95% CI 0.80–4.23). Both did not modify the studied association (interaction terms: OR = 1.14, 95% CI 0.77–1.67, and OR = 0.85, 95% CI 0.58–1.24, respectively).

Conclusions Multimorbidity is associated with intention of retirement in Europe. This association was unaltered by working conditions and integration policies.

Keywords Multimorbidity · Chronic disease · Early retirement · Intention of retirement · Quality of work · SHARE

Introduction

The co-occurrence of multiple chronic conditions (i.e. multimorbidity) is growing worldwide, and it has climbed in the political agenda (Colombo et al. 2016), becoming a healthcare and research priority (Ramond-Roquin and Fortin 2016; Valderas et al. 2007). Multimorbidity becomes progressively more common with age (Barnett et al. 2012) and is associated with high mortality (Gijsen et al. 2001), reduced quality of life (Fortin et al. 2004) and functional status (Barnett et al. 2012), and increased healthcare use (Laires and Perelman 2018; Palladino et al. 2016). It has already been shown to generate substantial productivity losses to society (de Boer et al. 2018), but its link remains to be demonstrated with willingness to retire prematurely and, ultimately, to early retirement.

From a theoretical viewpoint, multimorbidity is identified as underlying the very beginning of the aetiology of disability, i.e. the pathway that links disease, impairment, functional limitations, and disability [proposed by Nagi (1991), and conceptualized further by others (Verbrugge and Jette 1994), using another framework developed by WHO (1980)]. Disease generates impairment [i.e. aberrant conditions of tissues, organs, and systems (Verbrugge and Jette 1994)], which in turn may lead to functional limitations [i.e. measures of behaviours that deviate from what is

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normally expected (Verbrugge and Jette 1994)] and disability [i.e. a gap between personal capability and environmental demand (Verbrugge and Jette 1994)]. Disability, in turn, means for instance that the patient may no longer be able to cope with the job requirements, ultimately leading to early retirement (Stattin 2005).

Early retirement is a process which often begins with consideration and intention to retire, then proceeds to a decision, and eventually ends with de facto retirement (Topa et al. 2009). Actual transitions into retirement may be driven not only by intentions, but also by changes in circumstances (e.g. accumulated assets) and opportunities (e.g. generous pensions). However, the employee's desire to retire is one of the strongest predictors of actual departure from working life, and a good marker on which to intervene in order to postpone or prevent early retirement (Harkonmaki et al. 2009; Wang and Shultz 2010).

Previous studies have identified several factors that play an important role in retirement intentions, such as the spouse's retirement status, gender, older age, and self-reported poor health (Siegrist et al. 2007; von Bonsdorff et al. 2010a, b). Yet, none has analysed the role of multimorbidity specifically, an established and easy-to-access marker of ill-health, on the workers' retirement intentions.

Among potential predictors of early retirement intentions, one of particular interest is the working environment, given its direct role on the employee's job satisfaction and motivation to stay at work. In fact, a consistent association has been shown between poor psychosocial quality of work and a desire to depart from work as early as possible among older European employees (Siegrist et al. 2007). Hence, we may first hypothesize that the relationship between multimorbidity and intention to retire may be reduced amongst workers who benefit from a favourable working context.

Secondly, despite wide variance across European countries, a greater focus has been given to policy initiatives supporting the labour market integration of people with a disability. Indeed, disability policies have shifted attention towards integration of workers with health problems as opposed to compensation measures or benefit programmes (OECD 2010). As a second hypothesis, we postulate that the link between multimorbidity and intention to retire is likely to be reduced by stronger integration policies.

Thus, this study describes and measures the association between multimorbidity and intention of retirement in Europe, and estimates whether this relationship is modified by the working environment and, more broadly, by national disability integration policies.

Methods

Sample

We used data from the last public release version of the SHARE project ("Survey of Health, Ageing and Retirement in Europe"; wave 6 from 2015). SHARE is a cross-national research project collecting health, social, and economic data on the European population aged ≥ 50 years. Although sampling differed slightly, all countries obtained probabilistic samples (Borsch-Supan 2017). Further details about data collection, sampling procedures, and other methodology aspects are available on the project's website (SHARE http://www.share-project.org). In this analysis, we restricted the sample to all employed men and women aged below 65 from the following countries: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, France, Greece, Italy, Luxembourg, Poland, Portugal, Sweden, and Spain. Participating countries in wave 6 of the SHARE project, Croatia, Estonia, and Slovenia were excluded from the analysis due to lack of data on the OECD scores for disability policies. This restriction resulted in a sample size of 11,790 participants (5685 men; 6105 women).

Measures

Exposure

All self-reported chronic conditions collected in wave 6 of the SHARE project were considered: heart attack or any other heart problem, high blood pressure, high cholesterol, stroke, diabetes or high blood sugar, chronic lung disease, cancer, stomach or duodenal ulcer, Parkinson's disease, cataracts, hip fracture, other fractures, Alzheimer's disease, dementia or other serious memory impairment, rheumatoid arthritis, osteoarthritis or other rheumatism, and chronic kidney disease. In addition, depression was also considered when a given SHARE participant attained a score of 4 or higher on the EURO-D scale (Prince et al. 1999). Multimorbidity was measured by the presence of at least two of these chronic health conditions (Diederichs et al. 2011).

Outcome

Intention of retirement was elicited by using the direct question: "Thinking about your present job, would you like to retire as early as you can from this job?" and coded as a binary variable (yes/no).

Covariates

We included additional measures as covariates in multivariable models: age; gender; household income (i.e. income adjusted for household size, in accordance with the OECD equivalent scale (Hoffmeyer-Zlotnik and Wolf 2004) and categorized into country-specific terciles); individual educational level, coded according to the 1997 International Standard Classification of Education (ISCED-97) and categorized into low (pre-primary, primary, and lower secondary), intermediate (upper secondary), and high (post-secondary) education; and country fixed effects.

Effect modifiers

Quality of work was assessed by a short battery of items derived from the effort–reward imbalance model questionnaire (Siegrist 1996), the psychometric properties of which were previously tested (van Vegchel et al. 2005). Given the constraints of a multi-disciplinary approach in the SHARE project, the inclusion of the full questionnaire was not possible. Thus, items were selected on the basis of factor loadings on respective original scale (Siegrist et al. 2007). Thus, two of six items measuring "effort" were included (i.e. time pressure and physically demanding) and five of 11 items assessing "reward" at work were included (i.e. support, recognition, salary/earnings, job promotion prospects, and job security). All items were measured on a four-point scale. "Effort–reward imbalance" was defined by the ratio of the sum score of the "effort" items (nominator) and of the sum score of the "reward" items (adjusted for number of items; denominator). Participants scoring in the EU upper terciles of this ratio of imbalance were considered experiencing poor quality of work (dichotomous variable) (Siegrist 1996).

In order to assess each country's policies on disability, we used the integration policy indicator published by OECD in 2010 (OECD 2010), consisting of ten sub-dimensions, which are measured on a scale of 0–5 to capture the intensity of each country's measures for activation and employment integration (maximum of 50 points). This integration score is a composite indicator of legal provisions to enhance labour market integration and access to rehabilitation services (for a detailed explanation see OECD 2010). Participants scoring below the EU median on this OECD score were considered to be within a context of poor integration policies (dichotomous variable).

Statistical analysis

Descriptive statistics were used to report on general characteristics of the study population and to compare SHARE participants with and without multimorbidity. A p value < 0.05 was determined as the significance level. Association of multimorbidity with intention of retirement was assessed through multivariable logistic regressions. Odds ratios (OR) and their corresponding 95% confidence intervals (95% CI) were reported. Model I reports the multivariable regression analysis results after adjustment for covariates (i.e. age, gender, education, income, and country fixed effects). Models II and III allow us to evaluate modification effects, with working conditions according to the "effort-reward model" (Model II), and the OECD integration policy indicator (Model III).. The modification effects were measured by testing the interaction between multimorbidity and both indicators of working conditions and integration policies and through stratified analysis. Calibrated individual weights, provided in the SHARE dataset, were applied to the analyses as a means to reduce the impact of potential selectivity bias that might be present in the data due to unit non-response (SHARE http://www.share-project.org). All statistical analyses were carried out using Stata 13 for Windows.

Results

Descriptive analysis

Over a third (36.6%) of the study population self-reported at least two chronic health conditions. Multimorbidity prevalence varied widely across EU countries (Supplementary file) and was more prevalent in women (39.8%), older people (60–65 years old: 41.6%), and among those with intermediate education (38.8%). Over half (56.1%) of European employees aged below 65 has considered leaving the job as early as possible (Table 1). A wide variation on the prevalence of retirement intention was also found across EU countries (Supplementary file).

Multimorbid employees significantly reported a greater intention to retire (62.5% versus 52.5% in the non-multimorbid group, respectively; $p < 0.001$. Table 1), poorer working conditions in both effort and reward dimensions, which was consistently verified for each item (except for job security, $p = 0.09$), and had higher frequency of imbalance regarding the effort–reward ratio (47.5% vs. 36.4% in the non-multimorbid group, respectively; $p < 0.001$; Table 1).

Cross-country correlations were observed between the intention to retire earlier and both worse working conditions (i.e. country's average on the effort–reward ratio; $R^2 = 0.55$) and poorer disability integration policies (i.e. average on the OECD score; $R^2 = 0.33$, Supplementary file).

The highest desire to retire was found in the subgroup of multimorbid employees who were also experiencing effort–reward imbalance in their jobs (75.1%), followed by those non-multimorbid employees exposed to effort–

Table 1 Sociodemographic and work characteristics of the study population, overall and stratified by multimorbidity (N = 11,790) (14 European countries, 2015)

	Overall	Multimorbidity		
		No 63.4% (n = 7474)	Yes 36.6% (n = 4315)	p value
Intention of retirement (%)	56.1% (n = 6614)	52.5% (n = 3924)	62.5% (n = 2697)	< 0.001
Age (mean, 95% CI)	56.3 (56.2–56.4)	56.1 (56.0–56.2)	56.6 (56.5–56.8)	< 0.001
Females (%)	47.5% (n = 5600)	45.1% (n = 3371)	51.7% (n = 2230)	< 0.001
Education (%)				
Low	21.6% (n = 2547)	20.9% (n = 1562)	22.9% (n = 988)	0.23
Intermediate	49.5% (n = 5836)	49.5% (n = 3700)	49.6% (n = 2140)	
High	28.9% (n = 3407)	29.7% (n = 2220)	27.5% (n = 1187)	
*Working conditions***				
Effort dimension (0–4, worst is 4)	2.5 (2.5–2.5)	2.4 (2.4–2.5)	2.6 (2.6–2.7)	< 0.001
Physically demanding	2.5 (2.4–2.5)	2.4 (2.4–2.5)	2.6 (2.6–2.7)	< 0.001
Time pressure	2.5 (2.5–2.5)	2.5 (2.4–2.5)	2.6 (2.5–2.7)	< 0.001
Reward dimension (0–4, better is 4)	2.7 (2.7–2.7)	2.7 (2.7–2.7)	2.6 (2.6–2.6)	< 0.001
Receive adequate support	2.8 (2.8–2.9)	2.9 (2.8–2.9)	2.8 (2.7–2.8)	0.004
Receive recognition	2.8 (2.7–2.8)	2.8 (2.8–2.8)	2.7 (2.6–2.7)	< 0.001
Adequate salary	2.5 (2.5–2.5)	2.5 (2.5–2.6)	2.4 (2.4–2.5)	0.002
Job promotion prospects	2.1 (2.0–2.1)	2.1 (2.1–2.2)	2.0 (1.9–2.0)	< 0.001
Job security	3.2 (3.1–3.2)	3.2 (3.2–3.2)	3.1 (3.1–3.2)	0.09
Effort–reward imbalance	40.5% (n = 4775)	36.4% (n = 2721)	47.5% (n = 2050)	< 0.001

*All results are based on weighted data

**Mean values and 95% CI are presented for each item, except for the effort–reward imbalance, which is calculated as a percentage. Countries: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, France, Greece, Italy, Luxembourg, Poland, Portugal, Sweden, and Spain. Year: 2015

reward imbalance (65.8%), by those multimorbid but without effort–reward imbalance (55.3%), and, lastly, by those with neither multimorbidity nor poor working conditions, reporting the lowest prevalence of willingness to retire (46.2%; Fig. 1).

Multivariable analysis

Multimorbidity was significantly associated with the employees' willingness to retire prematurely, regardless of the adjustment considered (Model I: OR = 1.58, 95% CI 1.37–1.84; Model II: OR = 1.53, 95% CI 1.26–1.84; and Model III: OR = 1.66, 95% CI 1.38–1.99; Table 2). Male gender, lower education, and poor working conditions were also significantly associated with intention to retire (Table 2 and more details in Supplementary file). No significant interaction effect between multimorbidity and working conditions was found (interaction term: OR = 1.14, 95% CI 0.77–1.67; Table 2). Although the effort–reward imbalance was positively related to the intention to retire, this variable did not significantly modify the multimorbidity–intention of retirement association. The integration policy was not related to the intention to retire (OR = 1.84, 95% CI 0.80–4.23; Table 2), nor did it modify the multimorbidity–intention of retirement association (interaction term: OR = 0.85, 95% CI 0.58–1.24; Table 2).

Discussion

In Europe, co-occurrence of chronic diseases is associated with the employees' intention of early retirement. This relationship was observed regardless of working conditions and labour integration policies. That is, even under the most favourable working conditions and strong integration policies, multimorbidity is associated with the likelihood of retirement intentions.

Early retirement is a transitional process, which often begins with intention, then proceeds to a decision to retire prematurely, and, if other conditions are met, ends with de facto retirement (Topa et al. 2009). Further understanding of this causal pathway and influencing factors may

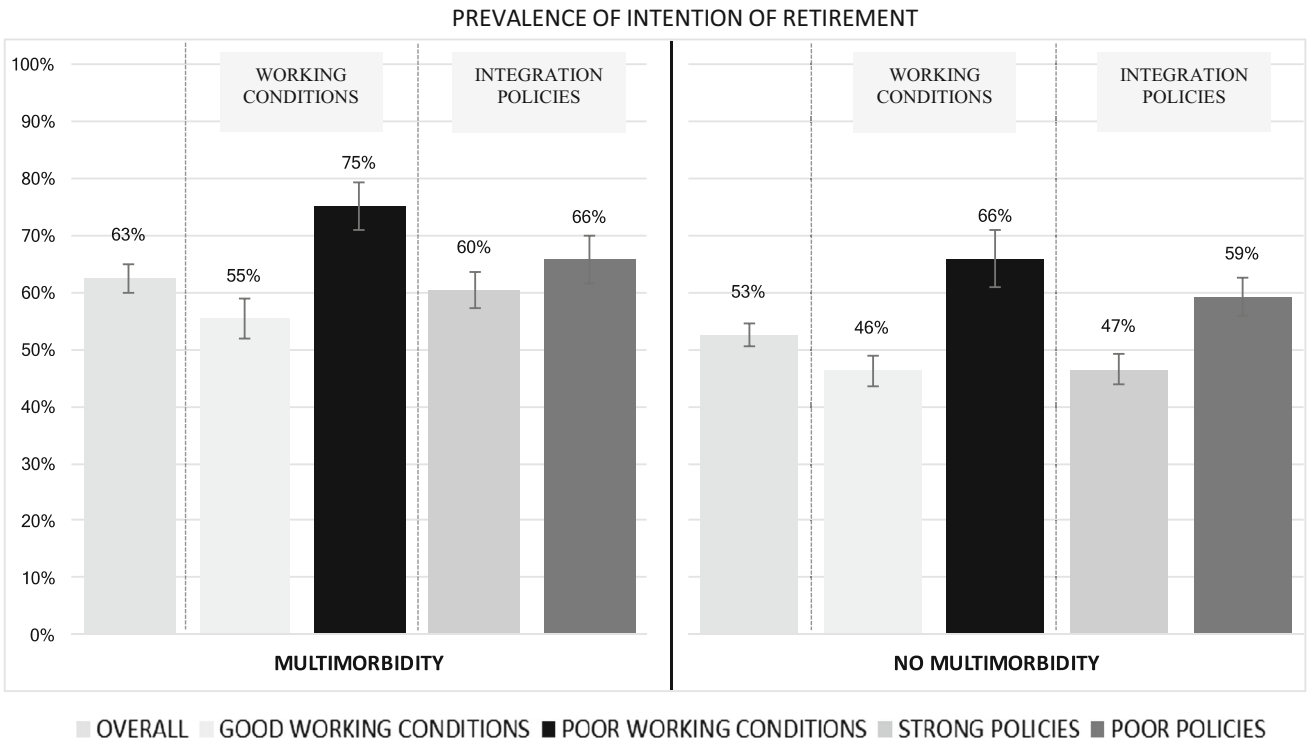

Fig. 1 Prevalence of intention of retirement in Europe, overall and stratified by multimorbidity, working conditions, and integration policies. *All differences between multimorbidity and non-multimorbidity are statistically significant ($p < 0.05$). Line inside bars refers to the 95% confident intervals. Countries: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, France, Greece, Italy, Luxembourg, Poland, Portugal, Sweden, and Spain. Year: 2015 (14 European countries, 2015)

generate considerable productivity gains. Previous literature has shown the impact of poor health on early retirement (Karpansalo et al. 2004; Laires et al. 2016; Ranzi et al. 2013; Pit et al. 2013; van den Berg et al. 2010; van Rijn et al. 2014) and even on intention to retire (Siegrist et al. 2007). However, to the best of our knowledge, this is the first study showing a clear relationship between poor health measured by multimorbidity and intention of retirement, the first step in the aforementioned causal chain.

Our findings are in line with prior research testing the effect of health on the willingness to consider retirement. Siegrist et al. analysed the first wave of the SHARE database (2004) and showed an association between poor self-rated health, depressive symptoms, and bodily symptoms with intended early retirement. Of note, these variables were treated as cofactors and not as the primary topic of research (Siegrist et al. 2007). In another study performed in Finland with data for the period 1998–2003, the relationship between somatic and mental health status and retirement intention was described, although again it was not the primary focus of the research (Volanen et al. 2010). In Denmark, Nexo and colleagues have shown that all levels of depressive symptoms were significantly associated with retirement intentions before the age of 62 (Nexo et al. 2015) Most research on this subject has used the proxy "self-perceived health" (Gommans et al. 2015; Heponiemi et al. 2008; Muurinen et al. 2014; Stynen et al. 2017; Suadicani et al. 2013; von Bonsdorff et al. 2010a, b), all but one (Gommans et al. 2015) showing a positive association with retirement intentions.

Despite the wide use of self-reported health in the literature, such data may be subject to systematic reporting differences, which may stem from the individuals' expectations regarding health, which in turn is highly influenced by many other factors, including education level and social status (Iburg et al. 2001). Our research sheds new light on the relationship between health and intention of retirement by using multimorbidity as a more objective measure of ill-health status. Note that even when controlling for self-reported health, the association between multimorbidity and intention of retirement holds significant (*data not shown*), which highlights that multimorbidity has an independent association with early retirement, regardless of self-perceived health. This may indicate that people's intentions are influenced by the accumulation of diseases they suffer from, which may affect the global well-being even if it does not necessarily worse perceived health.

Multimorbidity leads to reduced functional capacity, and workers suffering from multiple chronic diseases may

Table 2 Logistic regression models used to assess the association between multimorbidity and intention of retirement in Europe (14 European countries, 2015)

	Model I[a] OR (95% CI)	Model II[b] OR (95% CI)	Model III[c] OR (95% CI)
Multimorbidity	1.58 (1.37–1.84)	1.53 (1.26–1.84)	1.66 (1.38–1.99)
Age	1.00 (0.98–1.02)	0.99 (0.97–1.01)	0.99 (0.97–1.01)
Gender (females)	0.82 (0.71–0.94)	0.81 (0.69–0.95)	0.81 (0.69–0.95)
Education (ref. low)			
Intermediate	0.83 (0.68–1.02)	0.85 (0.67–1.07)	0.85 (0.67–1.07)
High	0.53 (0.42–0.66)	0.59 (0.46–0.77)	0.59 (0.46–0.77)
Income (ref. lowest)			
Middle	1.05 (0.89–1.25)	1.17 (0.96–1.42)	1.17 (0.96–1.42)
Upper	0.96 (0.81–1.13)	1.13 (0.93–1.37)	1.14 (0.93–1.38)
Effort–reward imbalance	–	1.99 (1.53–2.58)	2.10 (1.73–2.55)
Poor integration policies	–	–	1.84 (0.80–4.23)
Interaction multimorbidity–working conditions	–	1.14 (0.77–1.67)	–
Interaction multimorbidity–integration policies	–	–	0.85 (0.58–1.24)

Countries: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, France, Greece, Italy, Luxembourg, Poland, Portugal, Sweden, and Spain. Year: 2015

*Odds ratios (OR) and 95% confidence intervals (CI) are presented in the table

[a]Adjusted for age, gender, education, income, and country fixed effects

[b]Adjusted for all the above variables plus indicators of working conditions

[c]Adjusted for all the above variables plus the integration policy indicator from OECD

be prone to an imbalance regarding their ability to meet the working environment demands. Indeed, our research shows the dramatic effect of the co-occurrence of multimorbidity and poorer working conditions—three out of four European workers in this condition would retire immediately if allowed to.

Prior research has consistently shown that working conditions play a major role in the employees' willingness to quit their jobs and retire (Dal Bianco et al. 2014; Elovainio et al. 2005; Oude Hengel et al. 2012; Schreurs et al. 2011; Sejbaek et al. 2013; Siegrist et al. 2007; Stynen et al. 2017; von Bonsdorff et al. 2010a, b; Wienert et al. 2017). Recently, in Germany, Wienert and colleagues found a significant association between poor working conditions, also using the effort–reward imbalance model, and retirement intentions (Wienert et al. 2017). This association was mediated by self-rated work ability, which in turn is well known to be affected by health status (van den Berg et al. 2009). In the same year, other authors found that work-related resources can affect the retirement decision process of older Dutch workers (Stynen et al. 2017). Previously, in Finland, Elovainio and colleagues had found that job demands and job control are independent predictors of early retirement thoughts even when adjusted for age, gender, educational level, and self-rated health (Elovainio et al. 2005). The results of these studies were in line with those reported elsewhere (Dal Bianco et al. 2014; Sejbaek et al. 2013; Siegrist et al. 2007; Schreurs et al. 2011; Suadicani et al. 2013; von Bonsdorff et al. 2010a, b).

Given that retirement intentions are less likely to occur when individuals are well matched to the job requirements (i.e. no work disability, defined as the reduction of task performance and a restriction or incapacity to perform normal work (Stattin 2005)), even when suffering from chronic illnesses, one could expect that good job conditions would utterly break the health–retirement intention association. Our findings suggest otherwise. Despite the fact that many studies have approached both working conditions and health-related factors, insufficient knowledge is available in order to entirely explain these results. Thus, currently any explanation about why the association studied remains significant despite working conditions is speculative. However, a probable justification may reside in alternative pathways by which health influences early retirement (de Wind et al. 2013). An alternative aetiological route independent from work disability (and self-perceived work ability) may be related to the psychological impact of morbidity and other factors known to affect the employees' willingness to retire, such as the wish to do other things outside of work, enjoy life, have more flexibility, and spend more time with relatives, which may in some way also be affected by health status and independent of the actual worker's ability to cope with job requirements. For instance, van Solinge and Henkens showed that employees with a shorter subjective life expectancy more

often intended to retire earlier than those who expected a longer life (Van Solinge and Henkens 2010). Not surprisingly, self-awareness about health status influences the individual's priorities and expectations, including those regarding timing for retirement. This topic certainly deserves further attention.

An effort to increase integration policies has been observed in Europe over the last decades (Böheim and Leoni 2017), which signals an overarching concern to effectively integrate disability in the workplace. In particular, the employers' obligations towards their employees were the sub-component of this OECD index which had greater improvement (Böheim and Leoni 2017). Thus, one could expect that in general working conditions have been enhanced in Europe, but recent evidence shows that much more is still to be done in Europe in this regard, namely because of the aforementioned impact on intention to retire earlier (Eurofound 2017). In our research, we have shown that despite an observed cross-country correlation between the OECD integration index and retirement intentions in Europe, no statistically significant association was observed between this index and the retirement intention.

This might mean that this index is insufficient to fully capture each country's status on disability integration (i.e. low quality of this proxy) and/or that these policies are indeed ineffective targeting the employees' willingness to retire, even if effective on other outcomes. (For instance, there is a significant association between better scores on the integration index and better quality of work. *Data not shown, available upon request*.) Our results also show that these integration policies do not interfere with the association studied. This might be explained by hidden confounding, because, for instance, countries with higher scores on the OECD index are also richer and have more advanced welfare state regimes, which likely influences retirement intentions as well (Wang and Shultz 2010). Further research should be undertaken to address the multiple facets that are already (or should be) targeted by integration policies, namely illness and disability prevention, and how they might all affect early retirement intentions within each country's own context.

Strength and limitations

This study is hampered by some limitations that need to be recognized. First, the cross-sectional design of the study does not allow for an evaluation of the causal mechanism from multimorbidity to intention of retirement. Common factors, such as unobserved low socioeconomic status or poor psychosocial abilities, may be the cause of both multimorbidity and early retirement intention. However, the measurement of causality was beyond the scope of this study, and of the data we opted to use. Prospective information from the SHARE panel data may help address this limitation, while introducing other relevant technical caveats, namely attrition bias.

Secondly, the analysis is based on self-reported data, which might be subject to recall bias, justification bias (e.g. overstating negative health status as a way to justify one's willingness to retire), and misclassification bias (e.g. multimorbidity not clinically confirmed). However, evidence suggests that self-reported morbidity does not differ greatly from physician-reported data (Ferraro et al. 2000). On the other hand, participants were asked to report chronic conditions from a pre-defined list, which in fact might have caused an underestimation of multimorbidity. Note, however, that the most prevalent diseases were included in the list, thereby reducing this constraint. Lastly, the OECD scores used in this study do not account for all facets of disability policy (Böheim and Leoni 2017). Also, they have not been recently updated to the level required in this research and therefore this proxy does not necessarily measure the latest status of each country in terms of disability integration policies. Despite some evidence of slight evolution in this policy indicator across Europe, the overall dissimilarities between countries have not changed dramatically (Böheim and Leoni 2017). These limitations are balanced by several strengths. Most importantly, we used a large nationally representative sample from Europe, making our findings generalizable to the workforce in European countries.

Conclusion

Despite large variations in terms of national retirement policies, we observed a consistent association between multimorbidity and the desire to depart from work as early as possible in Europe, which is disrupted by neither better working conditions nor favourable integration policies. In fact, even countries more developed in terms of working conditions and integration of disability are not able to stop the willingness of multimorbid employees to retire earlier. Consequently, these findings suggest that health status of employees should be dealt more proactively, namely through primary health prevention and interventions aiming to reduce disability progression amongst those for whom co-occurrence of multiple diseases has already started.

Compliance with ethical standards

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

Informed consent Informed consents were obtained from all subjects at the time of enrolment.

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