

# The influence of chronic health problems and work-related factors on loss of paid employment among older workers

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► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/jech-2015-205719>).

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Received 5 March 2015

Revised 28 May 2015

Accepted 8 June 2015

Published Online First

25 June 2015

## ABSTRACT

**Background** With an ageing society and increasing retirement ages, it is important to understand how employability can be promoted in older workers with health problems. The current study aimed to determine whether (1) different chronic health problems predict transitions from paid employment to disability benefits, unemployment and early retirement, and (2) how work-related factors modify these associations.

**Methods** Self-report questionnaire data was used from the Dutch longitudinal Study on Transitions in Employment, Ability and Motivation with 3 years of follow-up (2010–2013), among employees aged 45–64 years (N=8149). The influence of baseline chronic health problems and work-related factors on transitions from paid employment to disability benefits, unemployment and early retirement during follow-up was estimated in a competing risks proportional hazards model. Relative excess risk of transitions due to the interaction between chronic health problems and work-related factors was assessed.

**Results** Severe headache, diabetes mellitus and musculoskeletal, respiratory, digestive and psychological health problems predicted an increased risk of disability benefits (HR range 1.78–2.79). Circulatory (HR=1.35) and psychological health problems (HR=2.58) predicted unemployment, and musculoskeletal (HR=1.23) and psychological health problems (HR=1.57) predicted early retirement. Work-related factors did not modify the influence of health problems on unemployment or early retirement. Psychosocial work-related factors, especially autonomy, modified the influence of health problems on disability benefits. Specifically, among workers with health problems, higher autonomy, higher support and lower psychological job demands reduced the risk of disability benefits by 82%, 49%, and 11%, respectively.

**Conclusions** All health problems affected disability benefits to a similar extent, but psychological health problems especially predicted unemployment and early retirement. For older workers with health problems, promoting an optimal work environment has the potential to contribute to sustainable employment.

labour force exit, while (re-)employment has in fact been found to be good for health.<sup>1 2</sup>

A recent systematic literature review on longitudinal studies showed that self-perceived general health, mental health and various chronic diseases were associated with exit from the workforce through unemployment and work disability.<sup>3</sup> A benefit for work disability can be granted temporarily, but return to paid employment is often relatively low.<sup>4</sup> Studies on the role of health in early retirement present an inconclusive picture. In the aforementioned review, general health was related to early retirement, but chronic diseases only showed a marginal relation and in a qualitative study both good and poor health were found to be important for early retirement.<sup>3 5</sup> Comparing the influence of different health problems on multiple exit routes is difficult because only few original articles<sup>6</sup> have focused on more than one specific exit route and/or health problem.

When comparing the influence of health on different transitions out of paid employment, it should be acknowledged that these transitions are related events. The probability of one exit route, that is, early retirement, disability pension or unemployment, may depend on the probability of other exit routes. For example, workers with health problems have a higher risk of transitioning to disability benefits, leaving healthier employees viable for other transitions at a later point in time, in essence the healthy worker effect.<sup>7</sup> Furthermore, disability and unemployment are to some extent communicating vessels that depend on eligibility criteria in the social security system; empirical evidence has shown that restrictions in disability enrolment had spillover effects on transitions to unemployment.<sup>8</sup> When studying determinants of early exit from paid employment, the interdependency and time-dependency of different routes needs to be considered, which requires an analytical approach that incorporates such so-called ‘competing risks’.

Work-related factors may also play a role in whether and when workers exit from the workforce. Several studies have reported that work-related factors may directly influence exit from the workforce.<sup>9–12</sup> Recent findings show that among workers with chronic health problems, favourable psychosocial resources relate to remaining in employment and reducing sickness absence.<sup>13 14</sup> In the current study, we will determine whether work-related factors modify the influence of health on early exit from the workforce via disability benefits,

## INTRODUCTION

Western society is being confronted with an ageing population. The resulting strain on social security systems has made it increasingly important that older workers remain in employment for a longer time period. As a consequence of living more years with chronic health problems, older workers are now also more likely to experience health-driven



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**To cite:** Leijten FRM, de Wind A, van den Heuvel SG, et al. *J Epidemiol Community Health* 2015;**69**:1058–1065.

unemployment and early retirement. Such knowledge can contribute to the development of workplace interventions aimed at keeping employees (with health problems) in employment for a longer time period.

In summary, the objectives of the current study were to add to the existing literature by determining among older workers whether (1) the presence of *different* chronic health problems predict a future transition from paid employment to disability benefits, unemployment or early retirement, and (2) work-related factors modify the influence of chronic health problems on these transitions.

## METHODS

### Study design

In the current study, data from the Study on Transitions in Employment, Ability and Motivation (STREAM) were used. STREAM is a longitudinal Dutch cohort study with 3 years of follow-up (2010–2013). The STREAM sample was drawn from an online panel and was stratified according to 5-year age groups and work status (ie, employed, self-employed, non-employed). Participants between the ages of 45 and 64 annually filled in an online questionnaire on a variety of topics, including employment status, work characteristics and health. More detailed information on the STREAM study design can be found elsewhere.<sup>15</sup> The current study builds on prior STREAM publications that have focused on facets of sustainable employability of employees still working, for example, sickness absence, work ability and productivity.<sup>14 16</sup>

In total, 15 118 respondents participated in the first wave of STREAM (2010). Only baseline employed respondents were included in the current study ( $n=10\,464$ ), with complete baseline information on work-related factors ( $n=10\,383$ ). Self-employed workers were excluded because these workers may experience different working circumstances than employees, for example, with regard to social support from colleagues or supervisors, or the level of autonomy in conducting work tasks. Furthermore, only employees who participated in more than one wave were included in the current study ( $n=9501$ ) because we were interested in transitions that could occur during the follow-up period. Lastly, a selection was made of respondents that remained employed or made a transition to disability pension, unemployment or early retirement during follow-up. Thus, workers who made other transitions, for example, to self-employment, statutory retirement or to becoming a housewife/houseman were excluded as well as persons with a mixed participation status, for example, simultaneously in paid employment and early retirement (overall excluding a further 1352 persons). This resulted in a total study population of 8149.

The VU University Medical Centre Amsterdam medical ethical committee declared that the Medical Research Involving Human Subjects Act does not apply to STREAM. The medical ethical committee had no objection to the execution of this study. In the information provided to STREAM participants, it was made clear that their privacy would be guaranteed, that all answers would be treated confidentially and that data would be stored in secured computer systems.<sup>15</sup>

### Loss of paid employment

The outcome of interest in the current study was loss of paid employment. Employment status was operationalised with the question “In which situation are you currently?” (one or more paid jobs as an employee, work disabled, unemployed, (early) retired) and a question on whether persons received different

types of government financial benefits. Based on this, four mutually exclusive employment status were defined at each follow-up wave: disability benefits, unemployment, early retirement and employment. Subsequently, three transitions groups were defined from baseline employment to disability benefits, unemployment and early retirement during follow-up, as well as a group with sustained employment.

The work status disability benefits was defined on the basis of whether participants stated they were currently receiving work disability benefits. In the Netherlands, disability benefits are calculated on the basis of a disability percentage, determined by the difference between what an individual can theoretically earn with his or her maintained functional abilities and what he or she earned prior to the disability or what a comparable person without any disability earns. Only if there is a reduction of (potential) income greater than 35%, disability benefits will be granted (<http://www.government.nl>). From the moment of initial sickness absence, it generally takes 2 years before one can apply for disability benefits. Thus, the transition from employment to disability benefits was defined over a 2-year period in the current study.

Unemployment was defined on the basis of whether persons indicated they were unemployed. If respondents indicated that they were early retired or retired and under the age of 65 at the time of the questionnaire, then this was defined as the work status ‘early retirement’. The transition from employment to unemployment and early retirement could occur over a 1-year period.

Employment was defined as having one or more paid job(s) as an employee. Employment was also defined as having less than 100 sickness absence days ( $\approx 6$  months) in the past 12 months in order to ensure that the predictors (health and work-related factors) were measured prior to the transitions, as long-term sickness absence is an inherent predecessor of disability benefits.

### Chronic health problems

The presence of a chronic health problem was assessed at baseline using the following question, “Do you (currently) have one or more of the following chronic diseases, disorders or handicaps?”<sup>17</sup> Thirteen answer options (ie, chronic diseases, disorders or handicaps) were provided for which participants could indicate whether these were present. Seven categories of health problems were created for the current study: severe headache or migraine, diabetes mellitus and musculoskeletal, circulatory, respiratory, digestive and psychological health problems. Different musculoskeletal disorders were classified together into one category. Specific answer options were not studied, namely, rare health problems with a prevalence typically below 1% (eg, epilepsy). We also classified participants into two groups based on whether any of the seven categories of health problems were present or whether none of these categories were present.

### Work-related factors

Physical work load and three psychosocial work-related factors (ie, psychological job demands, autonomy and support) were assessed at baseline. Physical load was assessed using five items on force exertion, static load and vibration (Cronbach’s  $\alpha=0.86$ ).<sup>18 19</sup> Psychological job demands was assessed using four items on how fast, how much, how hard and how hectic an individual’s work is (Cronbach’s  $\alpha=0.86$ ).<sup>20</sup> Autonomy was assessed using five items on making decisions, deciding the order and speed of conducting tasks, having to find solutions, and being able to take time off (Cronbach’s  $\alpha=0.77$ ).<sup>21</sup> Support at work was assessed using four items on whether colleagues

and/or supervisors are willing to help and listen to work-related problems (Cronbach's  $\alpha=0.80$ ).<sup>20</sup> Items on the four work-related factor scales were all measured on five-point Likert scales ranging from 1 'almost never' to 5 'always', and were all dichotomised at the median value.

**Individual factors**

The factors age, gender and educational level were included as potential confounders. Three categories of educational level were used: low (lower general secondary educational, preparatory secondary vocational education), medium (intermediate vocational training, higher general secondary education, preuniversity education) and high (higher vocational education, university education).

**Statistical analyses**

Descriptive statistics were used to report on the baseline characteristics (ie, work-related, health, demographic and occupation factors) of the study population and the frequencies of transitions between the annual waves.

The influence of baseline chronic health problems and work-related factors on transitions from paid employment to disability benefits, unemployment, and early retirement during follow-up was assessed in a competing risks proportional hazards model.<sup>22</sup> This model takes into account that these outcome routes are related events; that is, the risk of one event depends on whether the other event has occurred. This is of particular importance for labour force exit routes, since disability will most often occur at a younger age than early retirement and eligibility criteria and financial consequences also play a role.

Sub-HR and their 95% CIs are presented from multivariable models that included all health problems simultaneously in order to take multimorbidity into consideration, as well as work-related and individual factors. The influence of having any of the health problems as compared to having none of these on loss of paid employment was analysed in a multivariable model including work-related and individual factors. An HR greater than one for a particular determinant indicates an increased risk of a specific transition occurring during the follow-up, considering the competing risks of the other transition routes. In order to determine whether taking competing risks into account indeed influenced our findings, sensitivity analyses with standard Cox proportional hazards models were also conducted. The findings from the two models were compared by looking at the percent change in (sub)HR.

In order to determine whether work-related factors modify the influence of health problems on transitions from paid employment, relative excess risk due to interaction (RERI) terms were calculated. Multiple testing and chance findings would have been a problem had the interaction effect of each specific health problem with each work-related factor on the three forms of loss of paid employment been analysed (ie,  $7 \times 4 \times 3 = 84$  statistical tests). The dichotomous classification of any of the specific health problems being present as compared to none of these health problems was used for the effect modification analyses. In sensitivity analyses, the specific interaction of musculoskeletal and psychological health problems with work-related factors on transitions were also assessed. RERI terms were calculated using HRs as estimates of relative risk;  $RERI = (HR(\text{health problem and unfavourable work factor}) - (HR(\text{health problem and favourable work factor}) - (HR(\text{no health problem and unfavourable work factor}) + 1))$ .<sup>23 24</sup> The HR terms used to calculate the RERI term, the RERI term itself and its 95% CI, as calculated with the  $\delta$  method, are reported.<sup>23 25</sup> To determine the role of work-

related factors in loss of paid employment specifically among workers with health problems, the risk of loss of paid employment between workers with health problems and favourable versus unfavourable work-related factors was also compared in terms of percent change in HR. All RERI analyses were adjusted for age, gender and educational level.

Analyses were conducted in SPSS V.20 and STATA V.13.1.

**RESULTS**

**Study population**

Baseline characteristics of the study population are presented in table 1. Participants were on average 53 years old, and slightly more males than females participated in the current study. Most participants had a medium or high educational level. At baseline, workers were predominantly employed in the following types of companies: health and well-being, public administration, education and industry (according to EU NACE classification of economic activities of organisations).

Musculoskeletal health problems were most prevalent (29.6%), followed by circulatory health problems and severe headache. Psychological health problems were the least prevalent (2.9%); 49.1% of the study sample had one or more health problem.

During the 3 year follow-up, 14.1% of the sample (n=1147) lost their paid employment; 7% of the workers retired early (n=570; 27.9 per 1000 person-years), 5.8% became unemployed (n=474; 23.2 per 1000 person-years) and 1.3% started receiving disability benefits (n=103; 5.0 per 1000 person-years).

**Table 1** Baseline characteristics of the sample: individual factors, work-related factors and chronic health problems in older employees (N=8149)

Individual factors		
Age	Mean (SD)	53.4 (5.07)
Gender		
Male	n (%)	4611 (56.6)
Education		
Low	n (%)	2144 (26.3)
Medium	n (%)	3202 (39.3)
High	n (%)	2803 (34.4)
Work-related factors		
Physical load	Mean (SD)	1.79 (0.88)
Higher (>1.40)	n (%)	3878 (47.6)
Lower ( $\leq$ 1.40)	n (%)	4271 (52.4)
Psychological job demands	Mean (SD)	3.16 (0.76)
Higher (>3.25)	n (%)	3059 (37.5)
Lower ( $\leq$ 3.25)	n (%)	5090 (62.5)
Autonomy	Mean (SD)	3.85 (0.69)
Lower (<4.00)	n (%)	3846 (47.2)
Higher ( $\geq$ 4.00)	n (%)	4303 (52.8)
Support	Mean (SD)	3.60 (0.76)
Lower (<3.75)	n (%)	4023 (49.4)
Higher ( $\geq$ 3.75)	n (%)	4126 (50.6)
Health problem		
Any of the health problem	n (%)	3998 (49.1)
Musculoskeletal	n (%)	2412 (29.6)
Severe headache	n (%)	658 (8.1)
Circulatory	n (%)	737 (9.0)
Respiratory	n (%)	564 (6.9)
Digestive	n (%)	445 (5.5)
Diabetes mellitus	n (%)	506 (6.2)
Psychological	n (%)	234 (2.9)

## Determinants of loss of paid employment

### Chronic health problems

With the exception of circulatory health problems, the presence of all health problems at baseline were related to an increased risk of disability benefits, ranging from 1.78 (95% CI 1.06 to 2.99) for severe headache to 2.79 (95% CI 1.45 to 5.39) for psychological health problems. Employees with circulatory (HR 1.35; 95% CI 1.03 to 1.77) and psychological (HR 2.58; 95% CI 1.83 to 3.62) health problems at baseline were at an increased risk of unemployment. Employees with musculoskeletal (HR 1.23; 95% CI 1.06 to 1.42) and psychological (HR 1.57; 95% CI 1.05 to 2.34) health problems were at an increased risk of early retirement.

The sensitivity analyses showed that HRs estimated by the standard Cox proportional hazards model (see online supplementary table S1) for chronic health problems on the transition to disability benefits were larger than in the competing risks model, up to 20% for psychological health problems. For unemployment and early retirement, estimates were approximately the same (maximum change 1.1%) (table 2).

### Work-related factors

In the multivariable analyses, adjusted for individual factors and health, work-related factors were not statistically significant independent risk factors of disability benefits. Lower physical load was a risk factor of unemployment. Lower support was a risk factor of both unemployment and early retirement (table 2).

### Effect modification of work-related factors on health-employment transitions

The only statistically significant RERI was for health problems and autonomy for disability benefits (RERI 2.09; 95% CI 0.77

to 3.41). Specifically, workers with health problems and lower autonomy had an 82% greater risk of disability benefits than those with health problems and higher autonomy (see HRs in table 3). Although other RERIs were not statistically significant, we observed some indications that, among workers with a health problem, those with unfavourable psychosocial work-related factors had a greater risk of disability benefits compared to those with favourable psychosocial work-related factors. Namely, workers with lower social support and higher psychological job demands showed 49% and 11%, respectively, greater risk of disability benefits than workers with health problems and higher social support and lower psychological job demands (see HRs in table 3).

Likewise, although the overall RERI was not statistically significant, we found an indication that workers with health problems and higher physical load had a 27% greater risk of early retirement than workers with health problems and lower physical load (see HRs in table 3). There was no indication of modification by work-related factors for the effects of health problems on unemployment (see table 3).

Similar to the overall health problem analyses, in the sensitivity analyses too we found that persons with musculoskeletal and psychological health problems and unfavourable psychosocial work-related factors were at a greater risk of disability benefits (see online supplementary tables S2 and S3). This increased risk ranged from 28% to 45% for musculoskeletal health problems, and from 108% to 185% for psychological health problems.

## DISCUSSION

Workers with chronic health problems had an increased risk of starting to receive disability benefits during the 3 year follow-up, ranging from 1.78 with severe headache to 2.79 with

**Table 2** Multivariable analyses of the relations between the presence of a chronic health problem and loss of paid employment using competing risks proportional hazards models (N=8149)

	Disability benefit n=103/8149 HR (95% CI)	Unemployment n=474/8149 HR (95% CI)	Early retirement n=570/8149 HR (95% CI)
<i>Any of the health problems</i>	3.48 (2.18 to 5.56)	1.32 (1.10 to 1.58)	1.11 (0.96 to 1.28)
<i>Specific health problem</i>			
Musculoskeletal	2.19 (1.49 to 3.22)	1.05 (0.87 to 1.28)	1.23 (1.06 to 1.42)
Severe headache	1.78 (1.06 to 2.99)	0.95 (0.68 to 1.33)	1.18 (0.86 to 1.63)
Circulatory	1.49 (0.88 to 2.54)	1.35 (1.03 to 1.77)	1.01 (0.81 to 1.26)
Respiratory	2.02 (1.18 to 3.44)	0.96 (0.68 to 1.35)	0.69 (0.50 to 0.93)
Digestive	1.97 (1.17 to 3.33)	0.89 (0.60 to 1.33)	0.86 (0.64 to 1.14)
Diabetes mellitus	2.43 (1.44 to 4.09)	1.14 (0.82 to 1.60)	1.15 (0.92 to 1.44)
Psychological	2.79 (1.45 to 5.39)	2.58 (1.83 to 3.62)	1.57 (1.05 to 2.34)
<i>Individual factors</i>			
Age (years)	1.05 (1.01 to 1.10)	1.01 (0.99 to 1.03)	1.66 (1.60 to 1.71)
Gender (male)	0.77 (0.51 to 1.15)	0.88 (0.74 to 1.06)	1.40 (1.19 to 1.64)
<i>Education</i>			
Low	1.56 (0.92 to 2.63)	1.50 (1.20 to 1.88)	0.83 (0.69 to 1.00)
Medium	1.44 (0.87 to 2.36)	1.17 (0.94 to 1.45)	0.85 (0.72 to 1.02)
High	Reference	Reference	Reference
<i>Work-related factors</i>			
Higher physical load	1.08 (0.71 to 1.63)	0.82 (0.68 to 0.99)	1.16 (1.00 to 1.36)
Higher psychological job demands	0.88 (0.60 to 1.28)	0.87 (0.72 to 1.06)	0.98 (0.84 to 1.14)
Lower autonomy	1.22 (0.82 to 1.83)	1.14 (0.95 to 1.38)	1.08 (0.93 to 1.25)
Lower support	1.33 (0.90 to 1.98)	1.46 (1.22 to 1.75)	1.16 (1.00 to 1.35)

HRs for the specific health problems, individual and work-related factors are presented from the same multivariable analyses. HRs presented for the category any of the health problems are from multivariable analyses including individual and work-related factors.

**Table 3** Modification of work-related factors on the relation between chronic health problems and loss of paid employment using relative excess risk due to interaction

		n	Disability benefit n=103/8149		Unemployment n=474/8149		Early retirement n=570/8149	
			RERI (95% CI)	HR (95% CI)	RERI (95% CI)	HR (95% CI)	RERI (95% CI)	HR (95% CI)
Health problem	Physical load		−0.20 (−2.39 to 1.99)		0.00 (−0.38 to 0.37)		0.17 (−0.14 to 0.48)	
Not present	Lower	3071		Reference		Reference	Reference	
Not present	Higher	1080		1.45 (0.62 to 3.36)		0.81 (0.62 to 1.06)	1.11 (0.89 to 1.40)	
Present	Lower	1928		4.16 (2.08 to 8.33)		1.31 (1.03 to 1.67)	1.05 (0.86 to 1.29)	
Present	Higher	2070		4.41 (2.19 to 8.86)		1.12 (0.88 to 1.43)	1.33 (1.10 to 1.61)	
Health problem	Psychological job demands		0.80 (−0.66 to 2.17)		−0.33 (−0.78 to 0.12)		0.15 (−0.17 to 0.46)	
Not present	Lower	2668		Reference		Reference	Reference	
Not present	Higher	1483		0.56 (0.21 to 1.51)		1.04 (0.78 to 1.38)	0.95 (0.74 to 1.20)	
Present	Lower	2422		2.90 (1.68 to 5.03)		1.46 (1.17 to 1.82)	1.08 (0.91 to 1.29)	
Present	Higher	1576		3.22 (1.82 to 5.70)		1.16 (0.89 to 1.51)	1.17 (0.95 to 1.44)	
Health problem	Autonomy		2.09 (0.77 to 3.41)		−0.27 (−0.77 to 0.22)		0.16 (−0.15 to 0.47)	
Not present	Higher	2295		Reference		Reference	Reference	
Not present	Lower	1856		0.43 (0.17 to 1.11)		1.30 (0.99 to 1.70)	1.05 (0.84 to 1.32)	
Present	Higher	2008		1.87 (1.02 to 3.45)		1.49 (1.15 to 1.93)	1.06 (0.87 to 1.30)	
Present	Lower	1990		3.40 (1.94 to 5.96)		1.52 (1.17 to 1.96)	1.28 (1.05 to 1.56)	
Health problem	Social support		1.35 (−0.44 to 3.14)		−0.05 (−0.58 to 0.47)		−0.20 (−0.58 to 0.18)	
Not present	Higher	2200		Reference		Reference	Reference	
Not present	Lower	1951		1.13 (0.49 to 2.61)		1.58 (1.20 to 2.08)	1.31 (1.04 to 1.64)	
Present	Higher	1926		3.02 (1.52 to 5.99)		1.41 (1.06 to 1.86)	1.25 (0.99 to 1.59)	
Present	Lower	2072		4.50 (2.33 to 8.71)		1.94 (1.50 to 2.51)	1.36 (1.09 to 1.69)	

Analyses are adjusted for age, gender and educational level.  
RERI, relative excess risk due to interaction.



psychological health problems. Alongside psychological health problems, only circulatory and musculoskeletal health problems were related to transitions to unemployment and early retirement, respectively. Within the group of workers with health problems, those with favourable psychosocial work-related factors had a lower risk of disability benefits; this risk reduction was up to 82% with higher autonomy.

As poor health is a pre-requisite of receiving disability benefits, it is not surprising that workers with health problems were at an increased risk. The effects of the seven health problems on disability benefits were relatively comparable in the current study. Similarly, in the review by van Rijn *et al*,<sup>3</sup> the risk of disability pension ranged from 1.80 with poor mental health to 2.35 with respiratory health problems. In the prospective French GAZEL cohort study, greater differences were found between health problems with psychiatric diagnosis being the strongest predictor of disability pension (HR 7.56 for men, HR 4.14 for women) and respiratory diagnosis the weakest (HR 3.92 for men, HR 2.62 for women).<sup>26</sup> There may be diverse reasons for mixed findings, such as the registry method of health via self- versus physician-reports, the severity of the health problems and different definitions of disability across different systems.

When compared to other health problems, psychological health problems had the strongest relation with unemployment and early retirement in the current study. Past studies using STREAM data on the effects of chronic health problems on sickness absence, productivity and work ability, have also shown especially large effects of psychological health problems.<sup>14 16</sup> In line with this, the recent Organisation for Economic Co-operation and Development (OECD) report on mental health and work in the Netherlands states that more needs to be achieved for workers with moderate and mild mental health problems.<sup>27</sup> Workplace adjustments and accommodations may be needed because health problems can cause an imbalance in demands and resources.<sup>16</sup> Workers with psychological health problems, however, are less likely to disclose their health problems to their managers, and disclosure is a pre-requisite for obtaining necessary accommodations.<sup>28 29</sup> In the current study, the prevalence of psychological health problems was 2.9%; this group possibly contains persons with moderate to severe mental health problems, as in 2011 the prevalence of mild mental health problems in the Netherlands was found to be 9.6%, moderate 2.5% and severe 1.6%.<sup>30</sup> This could in part explain the strong effects of psychological health problems on loss of paid employment.

For early retirement it should be acknowledged that this is a complex transition: not only poor health is a predictor, but good health can also play a role in that workers want to enjoy their retirement while still in good health.<sup>5</sup> Financial arrangements and opportunities at both the national and organisational level must also be considered in early retirement transitions.<sup>31</sup> Macrolevel determinants should be considered in future research on loss of paid employment, such as the economic situation in an occupational sector or an organisation, as this may also lead to socioeconomic differences.

Among workers with any of the seven categories of chronic health problems, higher autonomy had the strongest modifying effect on the risk of disability benefits, followed by higher social support and lower psychological job demands. In order to restore the balance between demands and resources for those workers with health problems, autonomy can play a crucial role as it allows a worker to make necessary adjustments (eg, deciding how and in which order to conduct work tasks, being able to think of solutions for how to approach things and decide

when to take time off from work).<sup>32</sup> Furthermore, colleague and supervisor support can emotionally help a worker, but also makes it easier for him or her to attain accommodations in the workplace.<sup>32</sup> In line with this, the greater the perceived adjustment latitude a worker with health problems has, that is, the extent to which his or her work effort can be adjusted, the lower the sickness absence.<sup>33</sup> If interventions can successfully ensure that favourable work-related factors are present, our findings suggest that the risk of loss of paid employment would decrease. Future research should also explore the modifying role of other work-related factors that have been found to have a direct association with continued employment, such as challenging work and organisational commitment.<sup>31 34</sup>

### Strengths and limitations

A strength of the current study is that different health problems, work-related factors and forms of early loss of paid employment were incorporated in one study; this made it possible to compare effects. This allowed for competing risk analyses to be used, which take into account multiple competing events and help to compare these findings to that of a traditional Cox model. In the current study we found that the influence of health on disability benefits reduced with up to 20% for psychological health problems in the competing risks model. Such an attenuation may be expected, and has been shown in a simulation study,<sup>35</sup> because a portion of the workers with, especially psychological, health problems also show transition to unemployment and early retirement and thus less workers with (such) health problems are viable to transition to disability benefits.

A limitation in this study is that work status was based on self-reported data and we did not have information on the exact percentage of work disability benefits that workers actually received. Furthermore, we did not consider whether and when workers returned to paid employment or to other employment status. For workers who started to receive disability benefits or retired early, re-entering to paid employment was relatively rare, 9% and 0.1%, respectively. Unemployment, however, was a more temporary transition, namely, 25% returned to paid employment within the next year. In future research it would be beneficial to use objective work status information, for example, based on tax registry information alongside self-reported data to study the main source of income, different routes out of employment and combined work status (eg, being early retired and working part-time) that can allow for different approaches to be used, such as multistate and working life expectancies models.<sup>36 37</sup> Related to this, a limitation of the current study is that the time of an event was studied on a 1-year basis, that is, between questionnaire waves. This, however, is somewhat crude and again using objective information could allow for the exact time of a transition.

When assessing effect modification we did not look at separate health problems, because otherwise too many interaction terms would be tested and statistical power was low due to too few events during follow-up in some subgroups. In sensitivity analyses of effect modification of musculoskeletal and psychological health problems, findings from the overall analyses were confirmed. All of the effect modification terms had large CIs. For this reason we also determined the role of work-related factors in loss of paid employment, specifically in workers with health problems based on the clinically relevant differences in HRs.

### CONCLUSIONS

The presence of almost all chronic health problems predicted, to a similar extent, that workers started to receive disability benefits, whereas predominantly psychological health problems

predicted unemployment and, to a lesser extent, early retirement. Favourable psychosocial work-related factors reduced the risk of receiving disability benefits for persons with health problems. Alongside good health, our study suggests that promoting favourable psychosocial work-related factors among ageing workers can contribute to sustainable employment.

### What is already known on this subject

A recent systematic review found that poor health is a strong predictor of exiting the workforce via disability benefits, followed by unemployment, and least of all via early retirement. This review also points out that the studies included did not analyse exit routes simultaneously, thereby omitting the potential effect of competing risks. Several studies have reported that work-related factors may directly influence exit from the workforce, but these studies do not address whether these also modify the effects of health on loss of paid employment.

### What this study adds

This study adds to the current state-of-knowledge by assessing the influence of seven chronic health problems and three forms of early loss of paid employment in one study, which allows for better comparisons to be made. Interestingly, only small differences were seen between health problems with regard to their influence on disability benefits. Psychological health problems were strong predictors of unemployment, and less so of early retirement. Most promising, however, is the finding of the current study that among workers with different types of chronic health problems, favourable psychosocial work-related factors reduced the risk of disability benefits. This suggests that promoting an optimal work environment for older employees could substantially contribute to sustainable employability.

**Acknowledgements** The authors would like to thank Karen van Hedel and David van Klaveren for providing advice on several exploratory analyses. The current study was conducted with financial support from the Dutch Ministry of Social Affairs and Employment.

**Contributors** All authors contributed to the research question development and drafting of the manuscript. FRML, AdW, SR, SGvdH and AB were primarily involved in deciding on analyses techniques. FRML conducted these in collaboration/discussion with AdW and AB. JFY and AJvdB critically revised the manuscript and were involved in discussions around the analyses. AB, SGvdH, JFY and AJvdB were also involved in the larger design of the STREAM study.

**Funding** Dutch Ministry of Social Affairs and Employment.

**Competing interests** None declared.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** The data is not available for others at this point in time. If persons are interested in the data, however, they can send a request to the project leader.

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