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# Changes in economic difficulties and subsequent sickness absence: a prospective register-linkage study

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## ABSTRACT

**Objectives:** People's economic difficulties are associated with their health, but consequences of changes in economic difficulties are less understood. We aimed to examine the associations between changes in economic difficulties and subsequent sickness absence while considering socioeconomic circumstances and other covariates.

**Design:** A prospective cohort study.

**Setting:** Helsinki, Finland.

**Participants:** Municipal employees of the City of Helsinki, Finland (n=3859), who were respondents to the baseline (2000–2002) and follow-up (2007) questionnaire surveys and had register-based follow-up data on sickness absence until the end of 2010.

**Primary and secondary outcome measures:** Self-certified short (1–3 days) and medically certified intermediate (4–14 days) and long (15+ days) sickness absence spells were examined using employer's personnel register data.

**Results:** Persistent frequent economic difficulties predicted short (rate ratios (RR) 1.66 95% CI 1.49 to 1.86), intermediate (RR 2.13 95% CI 1.85 to 2.45) and long (RR 2.18 95% CI 1.75 to 2.70) sickness absence spells. Increasing economic difficulties similarly predicted sickness absence spells. The risks were somewhat stronger the longer the absence, and remained although attenuated somewhat after full adjustment. Weak risks were found also for persistent occasional economic difficulties and decreasing economic difficulties, and they attenuated further after full adjustments.

**Conclusions:** Changes in economic difficulties predict subsequent sickness absence even after considering income, baseline health and other covariates. Thus economic difficulties should be considered when addressing causes of sickness absence.

## INTRODUCTION

Sickness absence is a serious and costly work-life problem reflecting ill-health and loss of functioning and work ability among employed populations.<sup>1–2</sup> Socioeconomic position is a key determinant of sickness absence and those with lower education, occupational class and

## ARTICLE SUMMARY

### Article focus

- Economic difficulties are prevalent and they have been associated with various health-related outcomes.
- The contribution of changes in economic difficulties to subsequent sickness absence has not been previously studied.
- We hypothesised that persistent and increasing economic difficulties are associated with the risk of subsequent sickness absence of various lengths, and that these associations remain even after considering key covariates such as childhood economic difficulties and changes in income and employment status as well as baseline health functioning.

### Key messages

- This study showed that increasing and persistent economic difficulties predict short and long sickness absence among women and men.
- The increased risks remained after full adjustment for all covariates.
- These results suggest that economic difficulties need to be considered as potential causes of sickness absence across the socioeconomic strata.

### Strengths and limitations of this study

- A particular strength of this study was the prospective design with two repeated measures of economic difficulties and a register-based follow-up of subsequent shorter and longer sickness absence spells. The outcomes were objective and covered all sickness absence spells during the follow-up among both women and men. Moreover, the effects of several key covariates on the examined associations could be taken into account.
- Only middle-aged public sector employees from one employer were included limiting generalisability of the findings to other employment sectors and younger age groups.

income tend to have more sickness absence than their better-off counterparts.<sup>3–5</sup>

The key socioeconomic indicators are interrelated, and in a previous study the

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## Economic difficulties and sickness absence

association of income with subsequent sickness absence was largely attributable to education and occupational class.<sup>6</sup> However, the health consequences of wider material circumstances such as suffering from economic difficulties in terms of difficulties in buying food and clothes and paying bills<sup>7</sup> are poorly understood. Such economic difficulties may exist at varying income levels, including more affluent employed people, and have adverse consequences for health and health behaviours.<sup>8–10</sup> A Finnish study reported associations between severe economic difficulties, that is, job loss, unemployed spouse and financial hardship and sickness absence among public sector employees.<sup>11</sup>

Economic difficulties have been associated with several self-reported health outcomes<sup>12–16</sup> and health behaviours<sup>9 17</sup> independent of key socioeconomic indicators such as education, occupational class or income. Our previous study showed that changes in economic difficulties are associated with sleep problems.<sup>10</sup> In addition, changes in economic difficulties have been associated with objectively measured coronary outcomes among men.<sup>18</sup> However, previous studies have not addressed economic difficulties and their changes over time as determinants of sickness absence while taking simultaneously into account income and other key indicators of socioeconomic position.

In addition, when examining the contribution of economic difficulties to subsequent sickness absence, potential inter-relationships between different domains of socioeconomic position<sup>6</sup> need to be taken into account. As health functioning and health behaviours such as smoking and drinking as well as obesity are associated with both economic difficulties<sup>9 19</sup> and sickness absence,<sup>20–23</sup> they are potential confounders of the association between changes in economic difficulties and sickness absence. Finally, also economic difficulties in childhood have been associated with adult health-related outcomes independent of own socioeconomic position and should be considered.<sup>12–14 19</sup>

The main aim of this study was to examine the associations between changes in economic difficulties and subsequent sickness absence among women and men. A further aim was to examine whether the associations are affected after considering several socioeconomic circumstances, health behaviours and prior physical and mental health functioning.

## METHODS

### Data

The Helsinki Health Study baseline (2000–2002, n=8960, response rate 67%) and follow-up (2007, n=7332, response rate 83%) mail survey data among employees of the City Helsinki, Finland, were prospectively linked with the employer's personnel register data on sickness absence spells of varying lengths. The City of Helsinki is the largest employer in Finland, with hundreds of different occupations covered within, for

example, healthcare, education and culture, public transport and social welfare. Occupational healthcare is provided for all employees and personnel administration is shared.

At baseline, all participants were aged 40–60 years, and 80% were women. The follow-up survey was sent to all those who responded at baseline irrespective of their employment status at follow-up. All those who participated both at baseline and follow-up, remained employed by the City of Helsinki during the register-based follow-up and gave an informed consent to link their survey responses to the register data (78%) were included in this study (n=4236). These inclusion criteria were applied as we aimed to focus on the consequences of changes in economic difficulties for subsequent sickness absence, and such data were available for only those participants who continued to work for the City of Helsinki over the entire follow-up. Most of the participants were full time employees (87%), but we also included for example, part-time employees.

Those with missing data on economic difficulties (n=325) were excluded from the analyses. Sickness absence rates of those with missing data did not differ from the total study population (table 1). After excluding those with no follow-up data on sickness absence (n=52), the final sample comprised 3207 women and 652 men.

Ethical approval for the Helsinki Health Study was received from the Department of Public Health, University of Helsinki and the City of Helsinki health authorities.

### Economic difficulties and their changes over time

Economic difficulties were measured using two identical questions repeated at baseline and follow-up.<sup>7</sup> The questions asked, first about the frequency of difficulties in purchasing food and clothes (range from 'always' to 'never') and paying bills (range from 'very little' to 'very much'). Responses to the two questions were combined to indicate no economic difficulties, occasional difficulties and frequent difficulties at baseline and follow-up. Changes in economic difficulties were examined using the baseline and follow-up responses. Those with no economic difficulties at either time point served as a reference category. Other categories comprised those with persistent occasional and persistent frequent as well as decreasing or increasing economic difficulties. Further details of the measurement of economic difficulties are reported elsewhere.<sup>10</sup>

Correlation between the two items on economic difficulties was 0.59, and the Cronbach  $\alpha$  0.74. Correlations between economic difficulties at baseline and socioeconomic circumstances varied from weak to moderate. The strongest correlations were between economic difficulties and income (0.32) and economic difficulties and housing tenure (0.28). Of those belonging to the highest income quartile, 9% reported frequent economic difficulties, while the corresponding figure was

**Table 1** Sickness absence spells per 100 person-years by changes in economic difficulties

	Sickness absence spells/100 person-years						All
	No change (none– none)	No change (occasional– occasional)	No change (frequent– frequent)	Decrease	Increase	Missing data on economic difficulties	
N	1586	434	404	834	653	325	4236
1–3 days (self-certified)	128.77	169.03	215.08	155.17	177.83	145.09	155.49
4–14 days (medically certified)	43.73	63.22	92.20	59.03	71.58	52.20	58.51
15+ days (medically certified)	14.64	21.29	30.32	21.48	25.13	20.74	20.32

37% among those belonging to the lowest income quartile. Childhood economic difficulties and occupational class correlated only modestly with economic difficulties at baseline (0.13 and 0.19, respectively). Correlation between baseline and follow-up economic difficulties was 0.52.

### Sickness absence spells

The employer's personnel register data are complete and comprise all start and end dates for each sickness absence spell among all employees. Absences of less than 4 days are self-certified. For absences of 4 days or longer, medical certification is required. Outcomes of this study comprised all self-certified short (1–3 days), and medically confirmed intermediate (4–14 days) and long (15 days or longer) sickness absence spells. The register-based follow-up started from the day of returning the follow-up survey questionnaire, and continued until 31 December 2010. Mean follow-up time was 2.7 years. If the respondent left employment (retired, other job), the follow-up was terminated. The sickness absence spells only comprised the respondents' absence due to illness and any absence for example due to caring a sick child was excluded. In addition, all other interruptions in employment other than own illness were subtracted from the follow-up time.

### Covariates

Covariates comprised sex, age, childhood economic difficulties, occupational class, baseline and follow-up income, housing tenure, smoking, heavy drinking, obesity and physical and mental functioning at baseline. Childhood economic difficulties were measured by a question asking about serious financial difficulties in the family when the respondent was below 16 years. Occupational class was based on occupations recorded in the employer's personnel register. Four classes were used: professionals and managers, semiprofessionals, routine non-manual employees and manual workers. Household income in an average month was asked at baseline and follow-up. It comprised all income after taxes, as well as any welfare benefits and other sources of income. Income was weighted by the number of people living in the same household<sup>24</sup> and divided into quartiles. Housing tenure was classified into owner-

occupiers and others, and was added in the study as an additional measure of material socioeconomic circumstances. Current smoking was classified into smokers and non-smokers. Heavy drinking was measured based on weekly consumption of beer, wine and spirits. Heavy drinking referred to consumption of pure alcohol more than 280 g/week for men and 140 g/week for women. Body mass index (BMI=weight/height<sup>2</sup>) was calculated from self-reported height and weight, and those with BMI 30 kg/m<sup>2</sup> or more were classified as obese. Physical and mental functioning were measured using the Short Form 36 (SF-36) questionnaire at baseline and follow-up.<sup>25–27</sup> The SF-36 comprises 36 items which can be compressed to physical and mental component summaries with the scores ranging from 0 to 100. Higher scores indicate better functioning. Following previous procedures,<sup>13 28</sup> the scores were dichotomised using the lowest quartile as a cut-off point to indicate poor mental and physical functioning at baseline. Cut-off points were calculated separately for women and men. Missing responses were included in the reference category for covariates. Complete case analysis produced similar results (data not shown), but for more stable estimates, we preferred to avoid redundant loss of data.

### Statistical analyses

We first calculated numbers of sickness absence spells per 100 person-years by changes in economic difficulties. Next, the associations between changes in economic difficulties and subsequent sickness absence were examined by fitting Poisson regression models (rate ratios, and their 95% CI). The numbers of short, intermediate and long sickness absence spells during the follow-up were used as outcomes. The numbers of spells were preferred as these are not dominated by one or a few very long spells but enable to effectively use information of several spells. We also took into account differences in the individual follow-up times by using the logarithm of the time until censoring as the offset. Overdispersion reflected in SE was corrected by scaling. Models were adjusted first for age and sex (model 0), and further covariates were separately added to the model 0. The model 1 included childhood economic difficulties, model 2 occupational class, model 3 baseline and follow-up income and model 4 housing tenure. Model 5

## Economic difficulties and sickness absence

included simultaneously all covariates in models 0–4 as well as smoking, drinking and baseline mental and physical functioning. Separate effects of health behaviours and obesity were initially examined, but as their contribution was small, all health-related covariates were simultaneously adjusted for in the full model 5. Although sickness absence is more prevalent among women than men,<sup>29 30</sup> no gender interactions in the effects of changes in economic difficulties on subsequent sickness absence were found. Thus, all the analyses were conducted in the pooled data. An SAS statistical programme, V.9.2 was used for all the analyses.

### RESULTS

Regarding sociodemographic characteristics, 83% of participants were women and mean age at baseline was 47.8 years (SD 5.7 years). Around 12% were manual workers, while 37% of participants were occupied in routine non-manual positions, a fifth as semiprofessionals, and the rest were professionals or managers at baseline. However, men and women had different occupations and more men than women were professionals and managers, but also more men than women were manual workers (further data not shown).

Around 40% of all the participants reported no economic difficulties at either time point (table 1). Persistent occasional economic difficulties were reported by 11% and persistent frequent economic difficulties by 10% of participants. In addition, 21% reported a decrease and 17% an increase in economic difficulties. The number of sickness absence spells varied by economic difficulties (table 1). The number of short sickness absence spells per 100 person-years was 129 among those with no economic difficulties as compared with 215 among those with persistent frequent economic difficulties, and 178 among those with economic difficulties increasing over the follow-up. Similar patterns also applied for intermediate and long sickness absence spells, but the rates were at a lower level.

Poisson regression analysis confirmed the importance of changes in economic difficulties to subsequent sickness absence of various lengths (table 2). Thus, as compared with those with no economic difficulties at either time point, reporting persistent occasional, frequent as well as decreasing and increasing economic difficulties were associated with subsequent short sickness absence after adjusting for sex and age (model 0). However, the associations were strongest for those reporting persistent frequent economic difficulties. Adjustments for childhood economic difficulties (model 1) and current socioeconomic circumstances (models 2–4) made only minor contributions to these associations. Thus, all the associations remained after considering occupational class (model 2), changes in income (model 3) and housing tenure (model 4). After full adjustment for all socioeconomic circumstances, health behaviours and baseline health (model 5) the associations somewhat attenuated

but remained except for decreasing economic difficulties. The adjustments mainly contributed to the association between persistent frequent economic difficulties and self-certified sickness absence.

For medically confirmed intermediate and long sickness absence spells the associations were similar but somewhat stronger as compared with self-certified sickness absence (table 2). The associations also tended to be stronger the lengthier the absence. Thus, adjusting for sex and age, persistent occasional and frequent as well as decreasing and increasing economic difficulties were associated with subsequent medically confirmed intermediate sickness absence spells. Similar associations were found for medically confirmed long sickness absence spells. Again, adjustments for childhood economic difficulties, occupational class, baseline and follow-up income as well as housing tenure attenuated only slightly the associations between changes in economic difficulties and subsequent intermediate and long sickness absence (models 2–4). Similar to short self-certified sickness absence, all the associations remained except for the association between decreasing economic difficulties and intermediate sickness absence which disappeared after full adjustment for all socioeconomic circumstances, health behaviours, obesity and health functioning (model 5). The attenuation in the effects after full adjustments was greatest for persistent frequent economic difficulties also regarding intermediate and long sickness absence spells.

### DISCUSSION

#### Principal findings

This study examined changes in economic difficulties and their associations with subsequent sickness absence of varying lengths among middle-aged women and men. The first main finding was that persistent and increasing economic difficulties were consistently associated with subsequent shorter and longer sickness absence spells, with the associations being somewhat stronger the longer the absence. Also decreasing economic difficulties continued to be associated with sickness absence. Second, the contribution of socioeconomic circumstances including changes in income to the associations was minor and the associations remained even after additionally considering health behaviours and baseline health functioning.

#### Previous studies

Although income and other socioeconomic differences in sickness absence have been addressed in several studies,<sup>3 6</sup> previous evidence regarding the contribution of economic difficulties to sickness absence is practically non-existent. Prospective, register-based studies examining changes in economic difficulties using more objective measures of health and functioning are lacking. However, our results are line with an earlier study that reported an association between baseline financial

**Table 2** Associations between changes in economic difficulties and subsequent self-certified short (1–3 days) and medically certified intermediate (4–14 days) and long (15 days or more) sickness absence among women and men (n=3859)

	Model 0: sex and age adjusted for		Model 1: model 0 + childhood economic difficulties		Model 2: model 0 + occupational class		Model 3: model 0 + baseline and follow-up income		Model 4: model 0 + housing tenure		Model 5: models 0–4 + smoking, drinking, obesity, baseline poor mental and physical health functioning	
	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)
Sickness absence of 1–3 days												
No change (none–none)	1.00		1.00		1.00		1.00		1.00		1.00	
No change (occasional–occasional)	1.28	1.13 to 1.44	1.27	1.12 to 1.43	1.25	1.11 to 1.41	1.24	1.10 to 1.40	1.22	1.08 to 1.37	1.17	1.04 to 1.32
No change (frequent–frequent)	1.66	1.49 to 1.86	1.63	1.46 to 1.83	1.61	1.43 to 1.80	1.56	1.38 to 1.76	1.50	1.34 to 1.69	1.28	1.14 to 1.45
Decrease	1.20	1.09 to 1.32	1.19	1.07 to 1.31	1.18	1.07 to 1.30	1.16	1.05 to 1.29	1.14	1.03 to 1.26	1.06	0.96 to 1.17
Increase	1.36	1.23 to 1.51	1.36	1.23 to 1.50	1.32	1.19 to 1.46	1.33	1.19 to 1.47	1.29	1.16 to 1.42	1.20	1.09 to 1.33
Sickness absence of 4–14 days												
No change (none–none)	1.00		1.00		1.00		1.00		1.00		1.00	
No change (occasional–occasional)	1.44	1.23 to 1.68	1.42	1.22 to 1.66	1.31	1.13 to 1.52	1.31	1.12 to 1.54	1.35	1.15 to 1.58	1.23	1.06 to 1.42
No change (frequent–frequent)	2.13	1.85 to 2.45	2.08	1.80 to 2.39	1.74	1.52 to 2.00	1.77	1.52 to 2.06	1.86	1.61 to 2.15	1.39	1.20 to 1.61
Decrease	1.36	1.19 to 1.54	1.34	1.17 to 1.52	1.25	1.11 to 1.42	1.26	1.10 to 1.43	1.27	1.11 to 1.44	1.12	0.99 to 1.27
Increase	1.64	1.44 to 1.86	1.63	1.43 to 1.86	1.46	1.29 to 1.66	1.47	1.29 to 1.69	1.51	1.33 to 1.73	1.31	1.15 to 1.49
Sickness absence of 15 days or more												
No change (none–none)	1.00		1.00		1.00		1.00		1.00		1.00	
No change (occasional–occasional)	1.50	1.18 to 1.91	1.49	1.17 to 1.89	1.36	1.08 to 1.72	1.42	1.11 to 1.81	1.42	1.11 to 1.81	1.31	1.04 to 1.65
No change (frequent–frequent)	2.18	1.75 to 2.70	2.12	1.70 to 2.64	1.73	1.39 to 2.14	1.93	1.52 to 2.44	1.92	1.53 to 2.41	1.41	1.12 to 1.77
Decrease	1.52	1.25 to 1.85	1.50	1.23 to 1.82	1.39	1.15 to 1.68	1.45	1.19 to 1.77	1.43	1.17 to 1.74	1.25	1.04 to 1.52
Increase	1.78	1.46 to 2.18	1.77	1.45 to 2.16	1.57	1.29 to 1.91	1.66	1.35 to 2.04	1.66	1.36 to 2.03	1.44	1.18 to 1.75

difficulty and sickness absence at follow-up.<sup>11</sup> Also overall, previous studies have typically had only one measurement of further socioeconomic circumstances rendering changes over time in socioeconomic circumstances and their contribution to sickness absence unaddressed. However, a recent study showed cumulative exposure to low-income and economic resources to be associated with sickness absence.<sup>31</sup> In addition to income that study also comprised data on household wealth based on taxation value of the household property. An earlier study showed that cumulative economic difficulty is more harmful for health than single short-term episodes in childhood or adulthood.<sup>32</sup>

As economic difficulties cannot be conceptualised as a direct proxy for income and the effects of income have previously been shown to attenuate after considering further key socioeconomic circumstances,<sup>6</sup> one might have assumed that for example housing tenure as a more stable indicator of wealth would contribute to the associations. Nonetheless, this was not found. Thus, neither changes in income nor material socioeconomic circumstances could explain the found associations. Persistence of the associations between economic difficulties and various health-related outcomes even after considering multiple socioeconomic circumstances from childhood to adulthood is in line with previous evidence.<sup>10 12–15 18</sup>

Although health functioning reflects health and work ability among employees and is associated with subsequent sickness absence,<sup>25–27 33</sup> its contribution to the examined associations was relatively small. The associations also remained unaffected by heavy drinking, smoking and obesity which all contribute to sickness absence.<sup>20 21</sup> This further highlights the independence of the associations between economic difficulties and subsequent health. Considering baseline health also partly helps rule out reverse causality, as one might assume that those with poorer health have ended up having economic difficulties at baseline due to inability to work and having higher expenses. However, recent evidence suggests that poor economic resources are more likely to precede sickness absence than vice versa.<sup>31</sup> Nonetheless, our findings might also be seen as unexpected, as from an economic perspective, one might have assumed economic difficulties to act as a disincentive to absence from work. However, only very long sickness absence spells affect the pay.

The association between decreasing economic difficulties and subsequent sickness absence may also sound unexpected, as one could posit that decrease in economic difficulties is beneficial for health and functioning. However, the association could be due to residual confounding as participants with decreasing economic difficulties have reported either frequent or at least occasional economic difficulties at baseline. In line with the assumptions regarding residual confounding, an earlier British study among civil servants found that

participants with insecure job situations at baseline and secure at follow-up also reported poorer health at follow-up.<sup>34</sup> The earlier and our findings thus suggest that even after removal of harmful exposures, their effects on health may to some extent remain.

Finally, regarding more specific potential interpretations of the results and the nature of economic difficulties, one might assume that they reflect lack of adequate resources beyond the financial or material situation. For example, excessive consumption habits, earlier major debt or lack of control over one's life might contribute to the reported economic difficulties. Accordingly, the debt/income ratio has been associated with poor self-rated health.<sup>35</sup> However, the nature of economic difficulties likely differs between those with high and low income or other socioeconomic circumstances. Economic difficulties at various socioeconomic levels also likely result from distinct reasons. Among those with low income, economic difficulties may derive from lack of money to cover basic necessities such as paying everyday bills and rent, whereas among those with high income, economic difficulties may derive from conspicuous consumption such as affording a luxury car, holiday or summer house.

Although economic difficulties can be conceptualised as a domain of material socioeconomic circumstances,<sup>16 18 36</sup> the origins of their effects might be attributed to psychological or psychosocial stress or strain. This would provide an alternative interpretation for observing similar associations of economic difficulties and health outcomes across varying income levels. In some other studies, explicit perceived financial strain<sup>37</sup> has been queried and it has equally shown associations with a health-related outcome as economic difficulties queried in a more concrete way as in this study.<sup>12</sup> Earlier studies have further considered the contribution of various behavioural, biological and psychosocial factors to the associations between socioeconomic circumstances, economic difficulties and health.<sup>13 18 38</sup> However, such potential covariates have not been able to substantially explain the found associations. Further scrutiny is needed to better understand the nature and pathways of economic difficulties in the production of ill-health.

### Strengths and weaknesses

The strengths of this study include a prospective design and register-based, objective data on sickness absence. Such register-based datasets are rare, fully covering, valid and albeit collected for administrative purposes, they are also highly suitable for scientific research.<sup>39</sup> Economic difficulties were identically measured at two time points enabling us to examine persistent, increasing and decreasing economic difficulties over time. This extends previous evidence which is mainly based on economic difficulties at one time point. A further strength was that the register-based follow-up begun after the follow-up survey had been conducted. This strengthened the

opportunities for causal inferences. We were also able to consider the effects of childhood economic difficulties, baseline and follow-up income and further socio-economic circumstances, health behaviours and health on the associations. This highlights the robustness of the effects of persistent and increasing economic difficulties on subsequent sickness absence. Finally, we were able to include both self-certified and medically certified sickness absence spells and show the contribution of economic difficulties on sickness absence of various lengths.

This study had some limitations. First, these data only comprised middle-aged public sector employees from a single, albeit the largest employer in Finland. Although this limits generalisability of our findings, there is no particular reason to assume that the associations between economic difficulties and sickness absence would largely differ by setting, employer or employment sector. Furthermore, the predominance of women in the examined cohort is a limitation of this study and might also affect the generalisability of the results. However, the proportion of women corresponds to the gender distribution within the City of Helsinki in this age group and within the municipal sector more general.<sup>40</sup> Additionally, as the associations were similar among women and men and no gender interactions were found, this suggests that the contribution of changes in economic difficulties to subsequent sickness absence is similar for both women and men. Second, we focused on sickness absence as a measure of health, and only employed participants were included. Thus, the associations between economic difficulties and health can be conservative and the level of economic difficulties are likely higher and the impact on health stronger in the general population. Third, response rates to the surveys varied from moderate at baseline to relatively high at follow-up. The non-response remains a potential source of bias and selection and loss to follow-up may have affected our findings. Register-based follow-up data were complete, but available for only those who had provided informed consent to register linkage. We have previously analysed the representativeness of our data, non-response, attrition and the effects of providing consent for register linkage.<sup>41</sup> These analyses suggest that the data are broadly representative of the target population, and have remained representative over time. Thus, non-response, attrition or providing consent are unlikely to distort our main findings. However, men, younger participants, those with lower socioeconomic position and long sickness absence were slightly over-represented among the non-respondents at baseline and more likely to drop-out over the follow-up, or decline consent for register linkage. These small differences suggest that the associations might again be conservative as some of those with poorest situation and health were not included. These groups are also over-represented among those who select out of the general workforce.<sup>42</sup> Finally, our 5-year to 7-year follow-up between baseline and follow-up surveys was relatively long. It is possible

that other changes occurred over the follow-up that remained unmeasured. Neither can we rule out that economic difficulties fluctuated and this remained undetected between the two surveys.

## CONCLUSIONS

Persistent and increasing economic difficulties were associated with subsequent sickness absence even after considering income, other covariates and baseline health. Our findings further suggest that wider economic circumstances need to be considered when focusing on the socioeconomic differences in sickness absence and aiming to narrow the existing inequalities in health and functioning among employed people and addressing causes of sickness absence in general.

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**Contributors** TL, EL and OR contributed to the planning of the study and analyses, commented on the manuscript text, as well as approved submission of the final version. TL conducted the analyses and drafted the first version of the manuscript.

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**Competing interests** None.

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## Economic difficulties and sickness absence

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