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ORIGINAL ARTICLE

Return to work after first incidence of long-term sickness absence: A 10-year prospective follow-up study identifying labour-market trajectories using sequence analysis

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Abstract

Aims: The study aim was to identify prototypical labour-market trajectories following a first incidence of long-term sickness absence (LTSA), and to assess whether baseline socio-demographic characteristics are associated with the return-to-work (RTW) process and labour-market attachment (LMA). *Methods*: This prospective study used Norwegian administrative registers with quarterly information on labour-market participation to follow all individuals born 1952–1978 who underwent a first LTSA during the first quarter of 2004 (n =9607) over a 10-year period (2004–2013). Sequence analysis was used to identify prototypical labour-market trajectories and LMA; trajectory membership was examined with multinomial logistic regression. *Results*: Sequence analysis identified nine labour-market trajectories illustrating the complex RTW process, with multiple states and transitions. Among this sample, 68.2% had a successful return to full-time work, while the remaining trajectories consisted of part-time work, unemployment, recurrence of LTSA, rehabilitation and disability pension (DP). A higher odds ratio (OR) for membership to trajectories of weaker LMA was found for females and older participants, while being married/cohabitating, having children, working in the public sector, and having a higher education, income and occupational class were associated with a lower OR of recurrence, unemployment, rehabilitation and DP trajectories. These results are consistent with three LMA indicators. ***Conclusions*: Sequence analysis revealed prototypical labour-market trajectories and provided a holistic overview of the heterogeneous RTW processes. While the most frequent outcome was successful RTW, several unfavourable labour-market trajectories were identified, with trajectory membership predicted by socio-demographic measures.**

Keywords: *Long-term sickness absence, return to work, labour market attachment, labour market careers, sequence analysis, socio-economic inequality in health*

Introduction

Long-term sickness absence (LTSA) is a personal and public health problem with financial consequences for the employee, employer and society. Considering the multiple negative implications of ongoing absence due to sickness, knowledge about the return to work (RTW) process and factors associated with unsuccessful RTW is key to targeting interventions aimed at reducing work disability [1]. The RTW process can be complex and incompletely captured by static measures [2], while both outcome choices and follow-up times represent methodological challenges [3]. Although RTW may signal a successful end to LTSA, the original condition can also cause subsequent absences [4]. Temporary labour-market exit can therefore also indicate weaker labour-market attachment (LMA), as LTSA is associated with future sick listing [5], disability pension (DP) [6] and unemployment [7]. LMA refers to whether individuals are employed continuously or experience temporary or permanent non-employment [8] and can indicate whether the RTW process is successful in the long term.

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Table I. Definition and ranking of labour-market states.

Ranking	State	Definition
1	LTSA	Long-term sickness absence benefit
2	Rehabilitation	Work assessment allowance, medical rehabilitation allowance, vocational rehabilitation allowance, time-limited disability pension, qualification benefit
3	Unemployment	Unemployment benefit
4	Disability pension	Disability pension, preliminary disability pension
5	Part-time work	$\leqslant$ 30 hours a week
6	Full-time work	$>$ 30 hours a week
7	Other	Student benefit, parental leave benefit, social assistance benefit, old-age pension

Recent research has implemented sequence analysis to account for the complexity of the RTW process [3, 9–11]. This method provides a holistic study of individual labour-market trajectories by considering the timing, duration and order of multiple events [12]. By focusing on the longitudinal sequencing of states, sequence analysis captures whole trajectories of LMA and supplements multi-state models [e.g. 13], which emphasize instantaneous transitions [14]. The previous studies of RTW using sequence analysis [3, 9–11] reveal how the careers of sick-listed individuals unfold according to intervention and diagnosis, however, a general assessment of the overall RTW process using this method is currently lacking. Following all individuals experiencing all-cause LTSA for an extended period provides an overview of labour-market careers and exploits the potential of sequence analysis to render individual trajectories comprehensible.

Therefore, the study aim was to investigate the RTW process and subsequent LMA using sequence analysis. The primary aim was to identify prototypical labour-market trajectories following RTW after a first incidence of LTSA. The secondary aim was to assess whether baseline socio-demographic factors were associated with LMA and trajectory membership. A recent review showed that higher socio-economic position (SEP) was associated with positive RTW outcomes, while older age and being female were associated with negative RTW outcomes [1]. Detection of prototypical trajectories following RTW and prediction of trajectory membership based on socio-demographic characteristics may help identify individuals with a weak LMA [15].

Data and methods

Data and design

This prospective, population-based cohort study included all Norwegians born 1952–1978 who had a first incidence of LTSA during the first quarter of 2004 (2004Q1). Statistics Norway provided detailed administrative register data [16] on income, employment, welfare benefits (FD-Trygd), education (the Norwegian National Education Database), and demographics (the Central Population register). In previous studies of RTW using sequence analysis, register data has been linked to subsamples based on intervention [3, 9, 10] or region [11] with follow-up times of a few years. Here, individual's labour-market participation was followed from 2004Q1 to 2013Q4 (excluding those who are self-employed). A quarterly time-scale was used to facilitate the classification of trajectories, which can be complicated by long sequences [11, 17]. Individuals who died during the study period (n = 198) or who had missing baseline socio-demographic characteristics (n = 1421) were excluded. Women who gave birth during 2004 were excluded due to the high levels of sickness absence among pregnant workers (n = 2356) [18]. Individuals with missing labour-market information during at least 12 of the 40 quarters were also omitted (n = 571), because sequences with extensive ($\geqslant$ 30%) missing can affect sequence analysis results [19]. Thus, the final dataset included n = 9607 individuals. The results were robust across sample specifications (see online supplemental materials).

States

Table I shows the labour-market states. LTSA is physician-certified absence $>$ 16 days lasting up to one year, separated into the first occurrence (starting 2004Q1), second, third and fourth or higher occurrence. Rehabilitation benefits are reserved for workers with impaired work abilities and a prospect of RTW. DP is granted to individuals with a permanent loss of work ability. Full-time and part-time employment were defined as work $>$ 30 or $\leqslant$ 30 hours per week, respectively. Unemployment benefits are provided to individuals actively seeking employment; the remaining benefits constitute the 'other' state (e.g. parental leave benefit).

Because register data may contain overlaps between states, a ranking of simultaneous states was made [13]. Aggregating labour-market information from months to quarters generates further overlap.

To allow for more variability within labour-market trajectories, the rare and less stable states were prioritized according to the rankings in Table I. When aggregating from months to quarters, the modal state was preferred unless the numbers of states were equal, in which case the ranking was used to determine state.

Baseline socio-demographic characteristics

All baseline socio-demographic variables were measured during 2003. These include gender, age, marital status, number of children < 18 years old and sector. Education, income and occupational class were used to determine SEP. Education was operationalized as lower secondary, upper secondary, undergraduate and postgraduate degree. Yearly income was split into quartiles based on the income distribution of the full population during 2003. Occupational class was measured as manual workers, routine non-manuals, lower service class and higher service class [20]. Occupation during 2004 was used for individuals with no occupation during 2003.

Statistical analyses

Individuals' labour-market careers were analysed using sequence analysis. A sequence is a succession of observed states (e.g. labour-market states) per individual over time (e.g. 40 quarters). Optimal matching is used to measure the dissimilarity between individual sequences, in terms of operations required to transform one sequence into another [12]. Data-driven substitution costs were obtained by considering two states as similar if there was a high chance that both states would be followed by a common state one year (four quarters) later, while the costs of insertions/deletions were set to half the maximum substitution cost [21]. Ward's method, recommended for clustering in sequence analysis [19], was used to group similar sequences. Quality measures [22] and a substantive evaluation were used to determine the appropriate number of clusters (see online Supplemental Table S1). After considering a range of solutions, nine prototypical labour-market trajectories were selected. Prediction of membership to trajectories based on socio-demographic characteristics was based on multinomial logistic regression with odds ratios (OR) and 95% confidence intervals (CI).

Three measures of LMA were used. *Complexity* is a composite measure of career instability that captures the frequency of transitions, states and variations in the timing/duration of states [12]. A high career complexity reflects a turbulent career with frequent state shifts. Based on previous RTW studies [3, 9], a *volatility indicator* and an *integration indicator* were implemented [23]. Volatility is the proportion of employment episodes in relation to total episodes. Integration refers to how quickly and the extent to which the individual re-entered employment and is assessed by adding the number of employment episodes weighted by their position within the career trajectory [23]. Higher values (range 0–1) of volatility and integration indicate a positive RTW outcome.

Results

Table II shows baseline (2003) descriptive statistics and associations (mean values) with the three LMA measures relating to complexity, volatility and integration (2004–2013). Women and younger individuals had less-stable trajectories, fewer periods of employment and re-entered employment more slowly. Being married and having children were associated with more stable trajectories and a higher RTW process quality. Working in the public sector suggested more complexity but a higher RTW process quality compared with the private sector. Higher education, income and occupational class were associated with an improved LMA on all three measures.

Figure 1 shows nine prototypical RTW trajectories. The state distribution plot displays the proportion of individuals in each state during each quarter per cluster. The first six clusters represent successful RTW, and the last three shows weak LMA. Within this sample: 6553 (68.2%) individuals returned to stable full-time work (cluster 1); 395 (4.1%) returned to part-time work before stepping up to full-time work (cluster 2); 321 (3.3%) returned to full-time work before stepping down to part-time work (cluster 3); 691 (7.1%) returned to stable part-time work (cluster 4); and 266 (2.7%) returned to (mainly) full-time work but had several periods of unemployment (cluster 5). Cluster 6 included a large number of individuals who experienced prolonged or repeated LTSA periods before entering rehabilitation; among these 242 (2.5%) individuals, rehabilitation led to successful return to full-time work. For the 543 (5.6%) individuals in cluster 7, return to full-time/part-time work included repeated LTSA periods before initiating rehabilitation and receiving DP. In cluster 8, 451 (4.7%) individuals entered rehabilitation shortly after LTSA and either remained in rehabilitation or shifted to DP during the study period. Finally, 145 (1.5%) individuals received DP during most of the study period (cluster 9).

Table II. Distribution of baseline socio-demographic characteristics and mean values of labour-market attachment (complexity, volatility indicator, integration indicator).

	Mean	*n*	Complexity		Volatility indicator		Integration indicator	
			Mean	SD	Mean	SD	Mean	SD
Gender								
Male	0.52	4952	7.33	4.07	0.78	0.25	0.77	0.24
Female	0.48	4655	9.31	4.48	0.71	0.27	0.69	0.26
Age								
25–30	0.24	2332	10.18	4.62	0.68	0.25	0.67	0.25
31–35	0.18	1697	8.53	4.41	0.75	0.25	0.73	0.25
36–40	0.18	1776	7.80	4.15	0.77	0.25	0.75	0.25
41–45	0.18	1736	7.37	3.98	0.78	0.26	0.77	0.25
46–51	0.22	2066	7.15	3.87	0.76	0.28	0.75	0.27
Marital status								
Single	0.53	5115	8.88	4.54	0.72	0.27	0.70	0.26
Married/cohabitating	0.47	4492	7.61	4.10	0.77	0.25	0.76	0.25
Number of children < 18 years								
No children	0.45	4336	8.81	4.50	0.72	0.26	0.71	0.26
1 child	0.22	2113	8.14	4.30	0.75	0.27	0.73	0.26
2 children	0.23	2241	7.59	4.16	0.78	0.25	0.76	0.25
3 or more children	0.10	917	7.88	4.29	0.75	0.27	0.74	0.26
Sector								
Private sector	0.58	5566	8.14	4.31	0.73	0.27	0.72	0.26
Public sector	0.42	4041	8.49	4.48	0.76	0.25	0.75	0.24
Education								
Lower secondary education	0.19	1783	8.89	4.29	0.64	0.32	0.64	0.31
Upper secondary education	0.46	4377	7.93	4.26	0.76	0.25	0.75	0.24
Undergraduate	0.28	2671	8.61	4.57	0.76	0.23	0.75	0.23
Postgraduate	0.08	776	7.81	4.47	0.80	0.21	0.78	0.21
Income								
Income quartile 1	0.03	308	10.49	4.36	0.41	0.33	0.40	0.31
Income quartile 2	0.25	2372	9.69	4.37	0.64	0.30	0.63	0.29
Income quartile 3	0.38	3683	8.37	4.39	0.76	0.24	0.75	0.23
Income quartile 4	0.34	3244	6.96	3.96	0.83	0.20	0.81	0.19
Occupational class								
Manual	0.32	3098	8.46	4.26	0.70	0.29	0.69	0.28
Routine non-manual	0.27	2566	8.84	4.45	0.71	0.28	0.70	0.27
Lower service class	0.29	2833	8.05	4.41	0.79	0.22	0.78	0.21
Higher service class	0.12	1110	7.14	4.28	0.82	0.20	0.80	0.20
Total		9607	8.29	4.39	0.74	0.26	0.73	0.26

Note: Socio-demographic variables measured during 2003. Complexity, volatility indicator and integration indicator measured from 2004Q1 until 2013Q4. SD = standard deviation.

Table III shows the ORs for cluster memberships (reference = cluster 1) based on baseline socio-demographic measures. Women had a higher OR of belonging to the clusters involving part-time work: cluster 2 (OR = 3.11), cluster 3 (OR = 3.57), and cluster 4 (OR =5.23). They also had a higher OR of belonging to the two clusters that included rehabilitation: cluster 7 (OR =1.70) and cluster 8 (OR = 1.60). Overall, increasing age was associated with higher OR of part-time (cluster 4) and DP (cluster 9). Individuals aged 46–51 years at baseline had a higher OR of belonging to late rehabilitation (cluster 7; OR = 1.76), prolonged rehabilitation (cluster 8; OR = 2.27), and especially early DP (cluster 9; OR = 29.84). Being married/cohabitating was associated with a higher OR of return to full-time work via part-time work (cluster 2, OR = 1.47) and part-time work (cluster 4; OR = 1.45); this was also associated with a lower OR of returning to unemployment (cluster 5; OR = 0.71), successful rehabilitation (cluster 6; OR = 0.61), and DP (cluster 9; OR = 0.55). Having children was significantly associated with a lower OR of quickly shifting to DP (cluster 9). Working in the public sector indicated a higher OR of returning to full-time work via part-time work (cluster 2, OR = 1.66) and part-time work (cluster 4, OR = 1.50), and a lower OR of returning to unemployment (cluster 5; OR = 0.53) and successful rehabilitation (cluster 6; OR = 0.72). Overall, the three SEP indicators showed that higher SEP was associated with a more successful RTW.

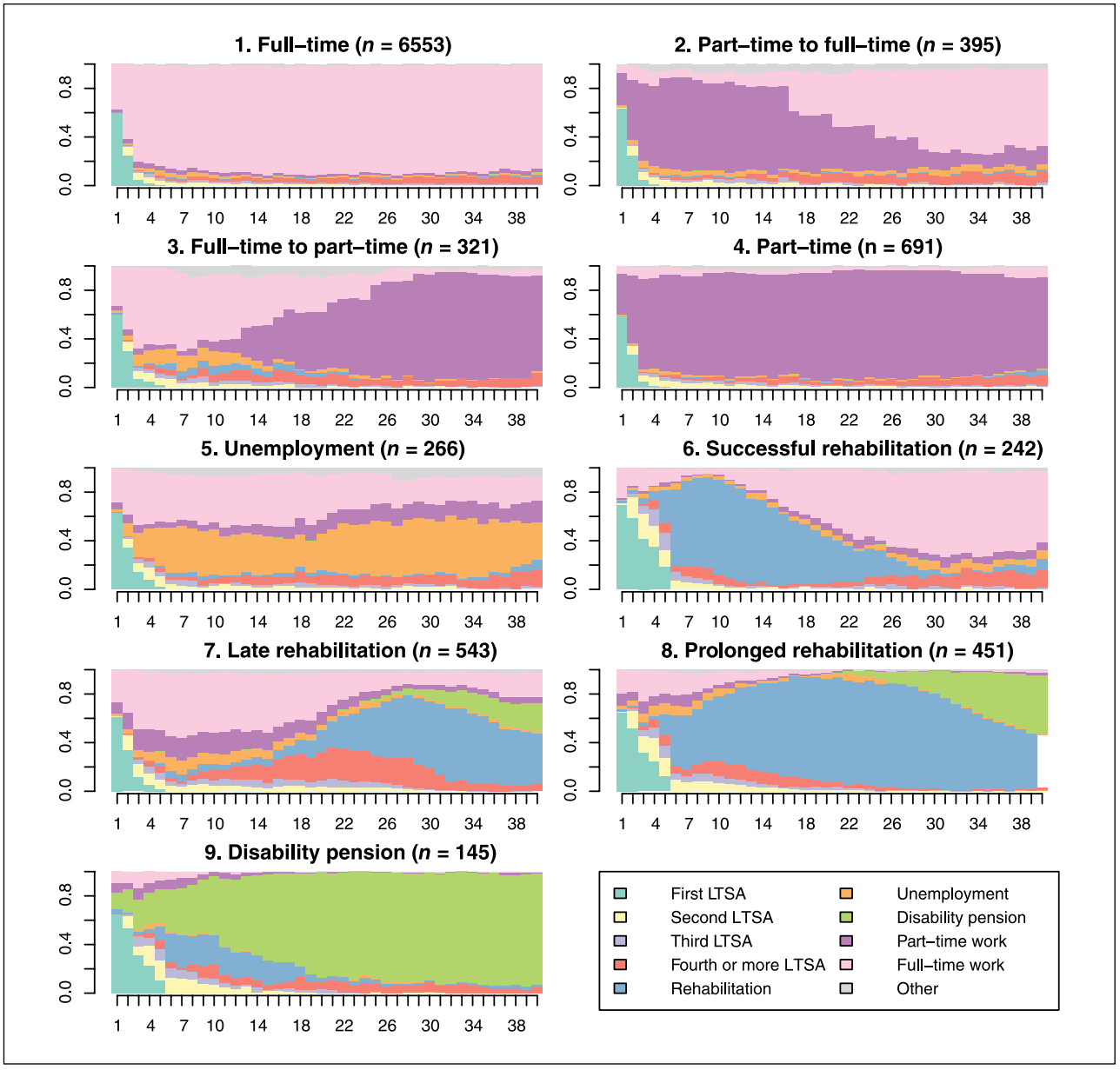

Figure 1. State distribution plot of labour-market trajectories after first incidence of long-term sickness absence in 2004Q1, Norway 2004–2013 (n = 9607).
Note: LTSA = Long-term sickness absence. Other = student benefit, parental leave benefit, social assistance benefit and old-age pension.

This was especially evident for income and education, but less so for occupational class. The ORs for belonging to clusters 7–9 decreased with increasing income and education, and there was a lower OR for membership the cluster of prolonged rehabilitation for the lower service class (cluster 8; OR = 0.46) and higher service class (cluster 8; OR = 0.32).

Discussion and conclusion

The aims of this study were to identify prototypical labour-market trajectories over a 10-year period following a first incidence of LTSA, and to investigate the associations between the RTW process, LMA and baseline socio-demographic characteristics. Sequence analysis identified nine trajectories, illustrating the complex RTW process, with multiple states and transitions. Among this sample, 68.2% successfully returned to stable, full-time work – indicating strong LMA – while others were distributed across other prototypical trajectories, of which five (clusters 5–9) indicated weaker LMA. Several baseline factors were associated with a long-term RTW process. A higher OR of membership to trajectories with weaker LMA

Table III. Multinomial logistic regression (adjusted odds ratios and 95% confidence intervals) of socio-demographic characteristics regressed on membership to prototypical labour-market trajectories (clusters) with stable full-time work (cluster 1) as reference.

	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9
Gender (ref. = male)								
Female	3.11***	3.57***	5.23***	1.20	1.21	1.70***	1.60***	0.81
	[2.35, 4.12]	[2.67, 4.79]	[3.97, 6.90]	[0.90, 1.59]	[0.90, 1.64]	[1.38, 2.09]	[1.26, 2.01]	[0.54, 1.21]
Age (ref. = 25–30)								
31–35	0.67*	1.11	1.56**	0.95	1.28	1.22	1.25	1.12
	[0.47, 0.95]	[0.78, 1.56]	[1.12, 2.18]	[0.66, 1.37]	[0.88, 1.86]	[0.91, 1.62]	[0.89, 1.75]	[0.39, 3.25]
36–40	0.77	0.79	1.78***	0.83	1.05	1.17	1.35	4.70***
	[0.54, 1.09]	[0.52, 1.20]	[1.28, 2.49]	[0.55, 1.24]	[0.70, 1.59]	[0.86, 1.59]	[0.96, 1.90]	[2.16, 10.26]
41–45	0.58**	0.97	1.79***	0.83	0.91	1.17	1.40	6.39***
	[0.40, 0.84]	[0.66, 1.43]	[1.30, 2.48]	[0.54, 1.26]	[0.58, 1.43]	[0.86, 1.60]	[0.99, 1.97]	[2.97, 13.77]
46–51	0.72	0.92	3.54***	0.73	0.85	1.76***	2.27***	29.84***
	[0.51, 1.03]	[0.63, 1.34]	[2.61, 4.79]	[0.47, 1.15]	[0.52, 1.36]	[1.32, 2.35]	[1.64, 3.13]	[15.29, 58.22]
Marital status (ref. = single)								
Married/cohabitating	1.47**	1.09	1.45***	0.71*	0.61**	0.81	0.94	0.55**
	[1.14, 1.90]	[0.83, 1.43]	[1.18, 1.78]	[0.52, 0.97]	[0.44, 0.83]	[0.66, 1.00]	[0.74, 1.18]	[0.38, 0.80]
Number of children <18 (ref. = no children)								
1 child	1.32	0.84	1.26	1.16	1.46*	0.86	1.17	0.59*
	[0.98, 1.77]	[0.62, 1.14]	[1.00, 1.59]	[0.84, 1.60]	[1.03, 2.06]	[0.67, 1.09]	[0.90, 1.51]	[0.38, 0.94]
2 children	1.26	0.66*	1.15	0.69	1.39	0.82	0.77	0.57*
	[0.93, 1.72]	[0.47, 0.93]	[0.89, 1.48]	[0.46, 1.01]	[0.96, 2.01]	[0.63, 1.06]	[0.57, 1.03]	[0.34, 0.95]
3 or more children	1.66*	0.52*	1.07	0.97	1.59	1.08	1.25	0.22**
	[1.11, 2.48]	[0.30, 0.91]	[0.76, 1.52]	[0.58, 1.62]	[0.96, 2.63]	[0.77, 1.53]	[0.87, 1.80]	[0.08, 0.64]
Sector (ref. = private sector)								
Public sector	1.36**	1.17	1.50***	0.53***	0.72*	0.90	0.87	1.00
	[1.08, 1.70]	[0.91, 1.50]	[1.24, 1.81]	[0.39, 0.72]	[0.53, 0.98]	[0.74, 1.10]	[0.70, 1.08]	[0.69, 1.45]

Table III. (Continued)

	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9
Education (ref. = lower secondary)								
Upper secondary	1.01	0.81	1.01	0.51***	0.77	0.60***	0.48***	0.52**
	[0.75, 1.37]	[0.58, 1.13]	[0.81, 1.26]	[0.38, 0.70]	[0.56, 1.07]	[0.48, 0.75]	[0.38, 0.61]	[0.35, 0.77]
Undergraduate	1.43*	1.03	0.70*	0.70	0.71	0.60***	0.66**	0.44**
	[1.01, 2.05]	[0.70, 1.52]	[0.52, 0.95]	[0.47, 1.05]	[0.45, 1.12]	[0.45, 0.81]	[0.48, 0.90]	[0.24, 0.82]
Postgraduate	1.15	1.21	0.45**	0.91	0.88	0.46**	0.35**	0.30
	[0.65, 2.06]	[0.70, 2.10]	[0.24, 0.83]	[0.50, 1.69]	[0.46, 1.70]	[0.28, 0.75]	[0.18, 0.70]	[0.08, 1.07]
Income (ref. = income quartile 1)								
Income quartile 2	0.60*	0.73	1.16	0.37***	0.52*	0.42***	0.28***	0.10***
	[0.38, 0.96]	[0.38, 1.39]	[0.73, 1.85]	[0.22, 0.62]	[0.28, 0.97]	[0.28, 0.65]	[0.19, 0.41]	[0.06, 0.18]
Income quartile 3	0.13***	0.35**	0.14***	0.13***	0.25***	0.18***	0.08***	0.02***
	[0.08, 0.21]	[0.18, 0.67]	[0.08, 0.23]	[0.08, 0.22]	[0.14, 0.48]	[0.11, 0.27]	[0.05, 0.11]	[0.01, 0.03]
Income quartile 4	0.07***	0.24***	0.07***	0.09***	0.11***	0.11***	0.05***	0.01***
	[0.04, 0.13]	[0.12, 0.49]	[0.04, 0.12]	[0.05, 0.16]	[0.05, 0.22]	[0.07, 0.17]	[0.03, 0.08]	[0.00, 0.02]
Occupational class (ref. = manual)								
Routine non-manual	1.35*	1.24	1.27*	0.89	0.73	0.87	0.84	1.09
	[1.02, 1.77]	[0.90, 1.71]	[1.02, 1.58]	[0.65, 1.21]	[0.53, 1.02]	[0.70, 1.10]	[0.66, 1.07]	[0.72, 1.64]
Lower service class	0.85	0.91	0.96	0.62*	0.53**	0.60***	0.46***	0.54
	[0.60, 1.21]	[0.62, 1.32]	[0.71, 1.29]	[0.41, 0.92]	[0.34, 0.81]	[0.45, 0.80]	[0.33, 0.65]	[0.28, 1.03]
Higher service class	0.53*	0.70	0.66	0.39**	0.80	0.72	0.32***	0.63
	[0.28, 0.99]	[0.40, 1.23]	[0.37, 1.17]	[0.19, 0.77]	[0.45, 1.43]	[0.47, 1.09]	[0.17, 0.59]	[0.23, 1.70]
n	395	321	691	266	242	543	451	145

Note: Significance probabilities: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Covariates measured in 2003. Trajectories from 2004 to 2013. Cluster 1 = stable full-time work; cluster 2 = part-time to full-time work; cluster 3 = full-time to part-time work; cluster 4 = stable part-time work; cluster 5 = unemployment; cluster 6 = rehabilitation to full-time work; cluster 7 = full-time or part-time work to long-term sickness absence and rehabilitation; cluster 8 = prolonged rehabilitation; cluster 9 = disability pension.

was found for females and older participants, while being married/cohabitating, having children, working in the public sector, and having a higher education, income and occupational class were associated with a lower OR of membership to trajectories that included unemployment, rehabilitation and DP. These results were consistent with the three indicators of LMA relating to complexity, volatility and integration.

The present study is not directly comparable with previous studies of the RTW process that used sequence analysis [3, 9–11] because of differences in samples, follow-up times and diagnoses. However, consistent with the only other sick-leave study that examined all-cause morbidity [9], the most frequent trajectory was from LTSA to continuous work, indicating successful RTW. In that study, individuals with mental health reasons (compared with other health reasons) had a less successful RTW process. A rapid, successful RTW was also the most common trajectory in a study of workers with musculoskeletal disorders, with workers with back strains more likely to experience sustained RTW, while workers with fractures or dislocations were more likely to have prolonged sickness absence [11].

Transitions between states in RTW research have also been used in multistate models [e.g. 13] and trajectory analysis [e.g. 15], emphasizing RTW as a heterogeneous and long-term process. The advantage of methods allowing for complex pattern analysis is illustrated in the present study by the trajectories of delayed success (cluster 6), relapse (cluster 7) and stepwise exit (cluster 8). Consistent with a previous study [13], these data demonstrate the importance of discriminating between full-time and part-time work. The trajectory of stepping-up (cluster 2) shows that part-time work can function as a transition to full-time employment, underscoring the importance of a flexible and including work life that enables individuals with temporary low-work ability to engage in part-time work until fully recovered [24]. Moreover, stepping-down from full-time to part-time work (cluster 3) and stable part-time work (cluster 4) can be understood as successful RTW for individuals with restricted functional abilities [13].

In Norway, rehabilitation benefits provide a secure source of income for individuals with long-lasting impaired function who intend medical or vocational rehabilitation. These analyses show that while rehabilitation leads to successful RTW (cluster 6), it also works as a stepping-stone to permanent DP (clusters 7–9). Rehabilitation resulting in successful RTW has also been shown previously [13]. However, rehabilitation can also mean long-term labour-market detachment, which can make RTW challenging. One study found a rate of only 27% RTW following rehabilitation benefits [25]. Accordingly, clusters 7–9 demonstrate that unsuccessful RTW is more common among individuals receiving rehabilitation benefits and, hence for some, rehabilitation postponed DP.

Prediction of trajectory membership found that high SEP was associated with positive RTW outcomes, while being older and female were associated with negative RTW, in accordance with a recent review [1]. Additionally, being married/cohabitating, having children and working in the public sector were also associated with positive RTW outcomes. Women were found to be at greater risk for trajectories of prolonged and repeated LTSA periods and rehabilitation, but not DP, which is consistent with previous research [26]. While both family and workplace characteristics have been suggested as possible explanations for these findings [26], the gender gap in sickness absence is still largely unexplained [27]. Public (as compared to private) sector workers had a lower OR of entering a trajectory of unemployment. One explanation could be that former sick-listed individuals are more vulnerable to downsizing and restructuring in the private sector [28]. The higher OR of belonging to trajectories of rehabilitation and DP for older workers may reflect worse prospects for rehabilitation and a preference for alternatives to re-employment, since they are less likely to RTW following vocational rehabilitation [29], and DP can act as a pathway to early retirement, since age is associated with a higher risk of DP [30]. Musculoskeletal diseases are presumably central to the socio-economic gradient in RTW, as socio-economic differences in sickness absence can be primarily attributed to physical working conditions [31]. While physical working conditions are the main explanatory factor for onset of sickness absence, the socio-economic gradient in unsuccessful RTW and trajectories of weaker LMA might be due to lower socio-economic groups having less access to health care, a higher prevalence of comorbid disorders, fewer material resources to cope with sickness, less social support, less control over work, poorer treatment compliance and greater treatment resistance [32].

Strengths and limitations

The primary strength of this study is the use of register data with full information on social benefits and several years of follow-up information on labour-market states, which is needed to obtain a sufficient overview of the RTW process [13]. Moreover, sequence analysis profits from the rich data and complements time-to-event analyses with a holistic description of labour-market trajectories. Additionally, population

data allow for the study of marginal groups. The majority of sick-listed individuals had a successful RTW; detection of alternative trajectories and the statistical power to assess predictors of trajectory membership [15] might not have been possible without complete registers.

One limitation of sequence analysis is that it is a descriptive and explorative method [3]. The combination of cluster analysis and inferential methods must be made with caution as the within-cluster heterogeneity are not reflected in the uncertainty of the parameter estimates of the multinomial logistic regression [22]. Furthermore, sequence analysis is also sensitive to choice of distance measure [21]. Another limitation is the lack of information on diagnoses and other explanatory variables. Two studies found that RTW trajectories varied based on diagnosis [9, 11]. Hence, reasons for LTSA might have provided valuable insight into the RTW process. While the present study included a number of socio-demographic variables, it lacks other variables such as work-related or personality factors that could elucidate why some people do not experience successful RTW. Moreover, future studies could also profit from information on short-term absence ($\leqslant$ 16 days), which this study lacks. Finally, generalization may be restricted to Nordic countries, given that the large variation in social security systems between countries makes comparisons difficult. However, because the Nordic welfare states have comparable systems, these findings might be generalized to those countries [13].

Conclusions

This study identified nine prototypical labour-market trajectories following a first incidence of LTSA. The application of sequence analysis highlighted the heterogeneity of the RTW process, capturing trajectories of multiple states and transitions. While the majority of individuals in this sample had a successful RTW, the trajectories also showed patterns of unemployment, recurrence of LTSA, rehabilitation and DP. The study also investigated whether LMA and trajectory membership were associated with socio-demographic variables. Female gender and older age were associated with a worse RTW process and weaker LMA, while being married/cohabitating, having children, working in the public sector and having a higher education, income and occupational class contributed to a lower OR of belonging to adverse trajectories. These findings contribute to our knowledge about the RTW process, including identification of trajectories and groups at greatest risk of long-term labour-market detachment. This insight may be important for targeting interventions aimed at reducing work disability and social insurance careers [25].

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