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Are changes in labour market attachment over 12 years related to health status?

An analysis of the Northern Swedish Cohort

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ABSTRACT

Objective: The present study aims at using trajectory analysis to measure labour market attachment (LMA) over 12 years and at examining whether labour market tracks relate to perceived health status.

Design: Data were retrieved from a 26-year prospective cohort study, the Northern Swedish Cohort.

Setting and participants: All 9th grade students (n=1083) within the municipality of Luleå in northern Sweden were included in the baseline investigation in 1981. The vast majority (94%) of the original cohort participated at the fourth follow-up. In this study, 969 participants were included.

Measures: Perceived health status (psychological distress and non-optimal self-rated health) at age 42 and the data obtained from questionnaires.

Results: We have identified four tracks in relation to LMA across the 12-year period: 'permanent', 'high level', 'strengthening' and 'poor level' of attachment. LMA history relates to psychological distress. High level (OR 1.55 (1.06-2.27)), strengthening (OR 1.95 (1.29-2.93)) and poor attachment (OR 3.14 (2.10-4.70) involve higher OR for psychological distress compared to permanent attachment. The overall p-value remained significant in the final model (0.001). Analyses regarding non-optimal self-rated health displayed a similar pattern but this was not significant in the final model.

Conclusions: Our results suggest that health status in mid-life, particularly psychological distress, is related to patterns of LMA history, to a large part independently of other social risk factors and previous health. Consideration of

heterogeneity and time in labour market attachment might be important when analysing associations with perceived health.

Main strengths

- Using longitudinal data with exceptionally high response-rate
- Applying trajectory analysis which only has previously been sparsely used in this field
- Provides a uniquely rich and detailed data on temporary contracts over a long period of time

Limitations

- Relies on self-reported data
- Used a relatively small sample

INTRODUCTION

During the last three decades or so, demands for a more flexible workforce have increased all over the world. Flexibility in the labour market is reflected, for example, in the proportion of temporary employees, which in recent years has varied between 13 and 15% of the total working population in Europe.[1] Flexibility means that attachment to a workplace is weak and commonly interrupted by unemployment and other episodes out of work. In order to capture the total spectrum of employment relations – from being permanently employed through various non-permanent posts and unemployment, to those who are exempted from working – the concept of 'labour market attachment' (LMA) has been launched.[2, 3]

Some relations between labour market status and health status are widely accepted: permanent employment is considered beneficial to health, while unemployment is known to have adverse health effects[4-6] and being out of the labour market in the long term is commonly due to poor health.[7] But when it comes to the health implications of labour market status, between the extremes of the LMA spectrum, the evidence is much scarcer. Moderate LMA has been highlighted as potentially harmful for health status, but research on the topic is divergent.[8] Whereas some studies report worse self-rated health among temporary employees,[9] a few studies even suggest better self-rated health among fixed-term employees.[10] Some studies also indicate that deterioration in self-rated health may not be observable until the attachment is quite weak.[11] A major answer to the mixed research results may lie in the inherent difficulty in capturing the changeable nature of employment. Measurement of the employment situation at one or a few points in time, as in most of the previous studies,[12, 13] may overlook the factual exposures to different positions. Health effects of temporary employment could surface after several years of accumulation, as we have shown in a previous report,[14] or even when several years have passed after the exposure.[15] Moreover, it is possible that it is the chain of passages in different employments, the trajectory of LMA, that contributes to health status. E.g. becoming more strongly attached over time could contribute to health status differently than becoming less attached to the labour market even if the both groups holds same total exposure.

The few available studies about labour market trajectories and changes in health status have measured LMA in a few time points, and the goal has been descriptive rather than analytic.[13, 16] In the present study, particular emphasis is given to development of LMA. The method, trajectory analysis[17], offers a novel way to identify differential tracks of LMA

history in our population cohort. After obtaining a relevant set of tracks, our aim is to examine in which ways they relate to non-optimal self-rated health or perceived psychological distress.

METHOD

Population and procedures

The study was initiated in 1981 and included all pupils in their last year of compulsory school (n=1083), in the medium-sized industrial town of Luleå in northern Sweden (95% of the cohort were born in 1965). Since 1981 four additional follow-ups have been conducted.[18] The attrition rate in the most recent follow-up from 2007 was low; 94% (n=1005) of the original cohort who were still alive (n=1071) participated. Comprehensive questionnaires, completed by the participants in 1981, 1983, 1986, 1995 and 2007, were used as the main assessment method. This paper is based on data from the 1995 and 2007 follow-ups. Procedures of data collection are described more extensively elsewhere.[18] The study was approved by the Regional Ethical Review Board in Umeå, Sweden.

Measurements

LMA history

Participants' labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and rows representing different labour market positions. With the instruction 'During which periods have you been employed permanently or have had some type of temporary job contract or have been out of work?' the respondents were prompted to choose between 11 response options for each six-month period: 'permanently employed' (coded as 10), 'entrepreneur' (9), 'employed in project' (8), 'substitute' (7), 'probationary employment' (6), 'on-demand worker' (5), 'seasonal worker'

(4), 'temporary employee for other reasons' (3), 'in employment policy measure' (2), 'unemployed' (2), 'out of the labour market' (1). Unemployment and participation in policy measure were merged, and each option was coded to a variable that expressed the strength of LMA on a scale from 10 to 1, similar to previous research on LMA.[14] In the event of 'out of labour market', a continuum of five or more periods (i.e. 2.5 years) was required: if there were fewer than five, all periods were coded according to the last labour market position, to purposely exclude those on parental leave or studying from this category. These operations thus yielded a score of the strength of LMA for each of the 24 successive half-year periods. The scores served as the data for the trajectory analysis.

Indicators of health status

Psychological distress at age 30 and 42 was measured with a question that inquired whether the respondent during the last year had experienced any of the following symptoms: restlessness, concentration problems, being worried or anxious, palpitations, anxiety or panic or other nervous problems. Reporting one or more of the six symptoms was coded as 1 and none as 0, equalling a dichotomisation into the quartile with the most symptoms versus the rest. The question was derived from the 'Survey of living conditions'.[19]

Non-optimal self-rated health at age 30 and 42, was measured with one question, 'How do you rate your general health?', with response options: good, average or bad.[19] The responses were dichotomised into the quartile with the worst health (average or bad) coded as 1, and the rest (good) coded as 0.[20, 21]

Covariates

Socioeconomic position (SEP) in 2007 was based on one question about occupation, which was classified according to the Swedish socioeconomic classification of occupational categories.[22] Upper white-collar and self-employed were coded as 0, lower white-collar workers were coded as 1 and blue-collar workers were coded as 2.

Parental status in 2007, was coded as 0 for those having children and as 1 for the childless.

Marital status in 2007 was measured with one question: 'Are you married or co-habiting?' Yes was coded as 0 and no as 1.

Statistics

Trajectory analysis provided by Mplus program package was used to cluster the participants according their LMA history over the 12 years. The application of the statistics to corresponding data has been described elsewhere.[2, 17] For the present data, it was possible to include 12 time points in the trajectory analysis. The first and the second half of every second year were chosen in order to take into account possible systematic seasonal variation of LMA. The form of probability distribution for such data is multinomial, and on basis of the information criteria the quadratic polynomial trajectory model was preferred to the linear model.

We used logistic regression (odds ratio and 95% CI) to test whether LMA history was associated with non-optimal self-rated health and psychological distress at age 42. Adjustments were made for the health indicator at age 30, gender, socioeconomic position,

parental status and marital status. SPSS v17 was used for the regression analyses. Women and men were analysed together to preserve power.

RESULTS

In the trajectory analysis, values of the information criteria functions decreased as the number of trajectories was increased up to eight, which was considered optimal regarding the variation of the trajectories. Figure 1 illustrates the 'labour market tracks' based on means of the LMA scores of the individuals classified into each trajectory. This information was collapsed into four major labour market tracks as follows. More than half of the cohort was clustered into the track of 'permanent' employment throughout the follow-up. Moreover, a considerable part (tracks 2 and 3) maintained a continuously 'high level' of attachment, and about 12% (tracks 5 and 7) displayed a 'strengthening' of attachment towards the end of the follow-up. The attachment was permanently weak in about one of 10 (track 8), and a small cluster with a U-shaped pattern (track 4) was also seen; we decided to collapse these clusters and defined their attachment as 'poor'. Track 1, with three % of the cohort, included mainly disability pension recipients; they were excluded as their health was poor by definition. Thus, the final variable, called LMA history, comprised four tracks characterised as 'permanent', 'high level', 'strengthening' and 'poor'.

(Figure 1 here)

Table 1. Distribution (%) of dependent and independent variables in relation to LMA history. All values are displayed in %, except p-values.

	n=550 Permanent	n=163 High level	n=126 Strengthening	n=130 Poor	P-value (χ^2 test)
Track	0	1	2	3	
Dependent variables age 42					
Psychological distress	26.3	35.7	41.0	52.8	<0.001
Non-optimal self-rated health	29.1	36.2	39.2	48.1	<0.001
Independent variables					
Health status at age 30					
Psychological distress	19.4	27.3	36.3	31.9	<0.001
Non-optimal self-rated health	16.8	29.4	26.6	33.3	<0.001
Sociodemographics					<0.001
Blue-collar worker	33.5	25.8	35.7	47.7	
Lower white-collar worker	15.7	8.0	18.3	6.2	
Upper white-collar worker	50.8	66.3	46.0	46.2	
Single marital status	19.1	20.9	22.2	32.6	0.010
No child as parental status	17.3	16.6	15.1	19.4	0.831
Women	44.5	42.3	61.9	55.4	0.001

Table 1 shows the distribution of the key variables by LMA history. In general, LMA history with less strong attachment entailed poorer health at age 42. Concerning covariates, similar patterns were seen for psychological distress and non-optimal self-rated health at age 30, thus indicating that health status differed between LMA history already at baseline. There were also significant differences with regard to socioeconomic position; the proportion of blue-collar workers was highest in the group with poor attachment to the labour market. The poor attachment group was also most likely to be living without a partner (p=.010). Parental status did not differ between the groups. The proportion of women was higher in strengthening and poor level attachment, whereas the permanent and high level attachment were dominated by men (p=.001).

Table 2. Odds ratios (OR) and 95% confidence intervals (CI) for psychological distress and non-optimal self-rated health at age 42 as dependent variable for LMA history over 12 years as main exposure after adjustment for health status age 30, sociodemographic variables.

Trajectories		Psychological distress as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.55 (1.06–2.27)	1.56 (1.06–2.30)	1.50 (0.99–2.28)	1.54 (1.01–2.35)
Strengthening	n=126	1.95 (1.29–2.93)	1.77 (1.17–2.69)	1.68 (1.07–2.66)	1.57 (0.99–2.49)
Poor	n=130	3.14 (2.10–4.70)	2.77 (1.83–4.19)	2.87 (1.83–4.49)	2.52 (1.59–3.98)
P-value for LMA		<0.001	<0.001	<0.001	0.001

Trajectories		Non-optimal self-rated health as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.38 (0.96–2.00)	1.46 (1.00–2.13)	1.19 (0.81–1.76)	1.26 (0.85–1.87)
Strengthening	n=126	1.57 (1.05–2.36)	1.52 (1.00–2.29)	1.44 (0.94–2.20)	1.40 (0.91–2.16)
Poor	n=130	2.26 (1.53–3.34)	2.00 (1.34–3.00)	1.83 (1.21–2.77)	1.65 (1.08–2.53)
P-value for LMA		<0.001	0.003	0.025	0.087

Model 0 crude odds ratios
Model 1 odds ratios adjusted for sociodemographic variables (socioeconomic position, gender, marital status and parental status).
Model 2 odds ratios adjusted for health status at age 30
Model 3 odds ratios adjusted for models 1+2.

To analyse whether LMA history was related to poor health, self-rated health and psychological distress were regressed on LMA history with permanent attachment as the reference category, in multiple logistic regression models (Table 2). The LMA history had a significant overall p-value on both health outcomes. In unadjusted analyses with psychological distress, lower strength of attachment involved higher odds than permanent (Table 2, Model 0; LMA history p<0.001). In model 0 we found increased OR in relation to lower attachment to the labour market, ranging from high level OR 1.55, strengthening OR 1.95, and poor OR 3.14. Adjusting for covariates (sociodemographic and psychological distress at age 30, Models 1 and 2, respectively) resulted in attenuation of the ORs for those

with ‘strengthening’ and ‘poor’ attachment. Lastly, in the fully adjusted models (Model 3) only the high level and poor attachment were significantly related to psychological distress, with the ‘poorly’ attached displaying the numerically strongest association (OR=2.52). Although borderline significant, the OR for the ‘strengthening’ (OR=1.57) attachment was of comparable strength to the ‘high level’ attachment (OR=1.54). While with a slight decrease in OR along with adjustments for sociodemographic factors and previous health, the same pattern is still evident in the final model, and the overall p value remained highly significant (p=.001).

Results for non-optimal self-rated health were slightly less prominent than for psychological distress but pointed in the same direction. Unadjusted models (Table 2, Model 0) showed a significant overall relationship between LMA history and self-rated health (p<.001), and the LMA history with ‘strengthening’(OR= 1.57) and ‘poor’(OR=2.26) attachment had higher odds of having non-optimal self-rated health. For those with ‘high level’ (OR=1.38) of attachment the risk was numerically higher, although not significantly, than for those with ‘permanent’ attachment. After adjustment for health status at age 30 (Model 2) the results for the ‘strengthening’ group were attenuated below significance. In the final model, only the OR for the ‘poor’ attachment group was significantly high, while the overall p-value for the association of LMA history with non-optimal health dropped to borderline significance (p=.087).

DISCUSSION

In this study we have identified four tracks of LMA history over 12 years: permanent, high level, strengthening and poor. Compared to the cohort with 'permanent' attachment, we found a higher probability of psychological distress among three cohorts with non-permanent LMA. The differences were partially attributed to previous health and to some extent also to sociodemographic variables; nevertheless, the overall contribution of LMA history remained significant in the fully adjusted model. The results for non-optimal self-rated health were similar but somewhat weaker.

Much of the previous research has suggested that temporary employment is a stepping stone towards more stable employment.[23] In the present study we found that, although the greater part of the sample already had a fairly strong attachment or were moving towards stronger attachment, one track remained poorly attached to the labour market over the 12 years. Thus, while the stepping stone hypothesis might be correct for the majority, a substantial minority appear to be trapped in an employment situation of permanent temporariness. Further, we found more women than men in this least favourable situation. This is probably explained by the widespread use of 'on-demand employment contracts' in women-dominated sectors of business[24] such as care and welfare and education.[25]

Our findings importantly suggest that in addition to the present LMA, the LMA history is important for health. In line with previous research we found that the group with least attachment had the worst health status.[9, 11] As in our previous report showing a cumulative effect of temporary employment on health status,[14] the present report further corroborates

that employment history impacts on health status. However, a more nuanced picture emerged when the separate labour market tracks were considered.

First, even those with 'high level' attachment experienced psychological distress more commonly than those with 'permanent' attachment. Thus, it appears that even marginal exposure to what could be labelled 'LMA stress', can contribute to psychological distress over time.

Second, the group with 'strengthening' attachment, still experienced poor health more commonly than those with permanent attachment, even after adjustments for sociodemographic variables. This result suggests that earlier suboptimal attachment has a potentially 'scarring' effect. It is important to point out that in cross-sectional or short-term longitudinal designs, the 'strengthening' group would have been regarded as having a fairly favourable labour market attachment. This particular finding therefore stresses the importance of taking the specific patterns of the long-term labour market history into account when examining associations with health status.

Third, among those poorly attached to the labour market is where we found the highest ORs for poor health. The poorly attached were also more likely to have other risk factors for psychological distress, which seemed to partly account for the association. For example, being single involves a lower average household income and decreases the level of control [26], and poor previous health could also contribute to difficulties getting a stable attachment to the labour market, as those with health troubles could be less employable, particularly for blue-

collar occupations[27]. The poorly attached are also those with most experience of unemployment, which previously has been connected to mortality and morbidity[4, 28]. Thus, the poor mental health in this group seems to be a result not only of their enduringly unfavourable LMA history, but also of a range of coexisting burdensome life circumstances.

Methodological considerations

Our study relies on trajectory analysis, a method that became available in the beginning of the 2000s, largely by virtue of increased computing power. Instead of prefixing alternative developments, the analysis is seeking developmental trajectories that emerge from the data itself [17]. It gives each individual posterior probability values for each trajectory, and allocates them according to the highest probability into groups or categories so that individuals within a group are more similar than individuals between groups [29]. To our knowledge, trajectory analysis has been used only sparsely in previous studies about LMA.[30] In general, this study represents novel methodological ideas in a research area that has been obscured by the practice of measuring the labour market position cross-sectionally or with short-term transitions between labour market positions.

The longitudinal design of this study has been an asset, as it made it possible to adjust for previous health and thereby reduced the possibility of reverse causation, and especially as the attrition rate was kept low. Concerning the generalisability of this study, this cohort has been shown by a previous assessment to be representative of Sweden as a whole concerning demographic data.[18]

This study is based on self-reported data. Equivalent measures of self-rated health and psychological distress have displayed good validity by predicting future mortality and morbidity[31] even after adjustments for known health risks.[32] Furthermore, using retrospective measurement of LMA history could lead to recall bias, which could cause an underestimation of time in non-permanent contracts. Nevertheless, retrospective questions about occupational history have been shown to maintain good quality in terms of agreement with census data.[33]

Further, the fact that we combined tracks could be seen as a limitation of this study. However, in our understanding some of the tracks could be combined depending on their similar movement in the labour market. We first analysed each of the eight tracks separately in relation to the outcome, to make sure that none of combinations resulted in blurring of the results (data not shown). One limitation regarding the method was that, due to features of the program, only half of the time points (12 of 24 possible time points) could be included in the trajectory analysis. However, we used the first and second half of every second year to reduce the possibility of systematic error due to seasonal variations in employment status.

The structure behind the conceptualisation of LMA needs consideration. The LMA structure is based on the idea that there is a gradient in the labour market, with some positions being more strongly attached to the labour market than others. We have used a modified version of Aronsson's core-periphery model[34] to order the type of employment contract/situation, from the most attached to the least attached to labour market. Our structure is indeed a simplification of a more complex reality; this should be considered when interpreting the results.

Conclusions

Policymakers frequently promote flexible employment contracts. However, this study shows that those with the most favourable but long-term high level attachment suffer from worse health than those permanently attached. Further, despite a development towards favourable employment circumstances, health discrepancies can endure, suggesting a potentially 'scarring' effect. Last, those poorly attached display the worst health situation, this partly due to coexisting burdensome life circumstances. We firmly suggest that policymakers should consider the results of this study and take responsibility for creating employment opportunities suitable for maintaining a healthy working life, rather than promoting employment contracts characterised by poor attachment to the labour market.

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COMPETING INTERESTS

None declared.

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Key messages

- There is controversy whether being less attached to the labour market is related to poor health or not.
- This unclarity might partly stem from the failure to take heterogeneous employment histories into consideration
- We have applied trajectory analysis on 12-year labour market history and found associations between labour market attachment and health status.
- Those with high level, strengthening and poor level of non-permanent attachment displayed worse health status than those in permanent employment the entire 12-year period.
- Our findings illustrate the temporal complexities of labour market attachment's impact on health over time

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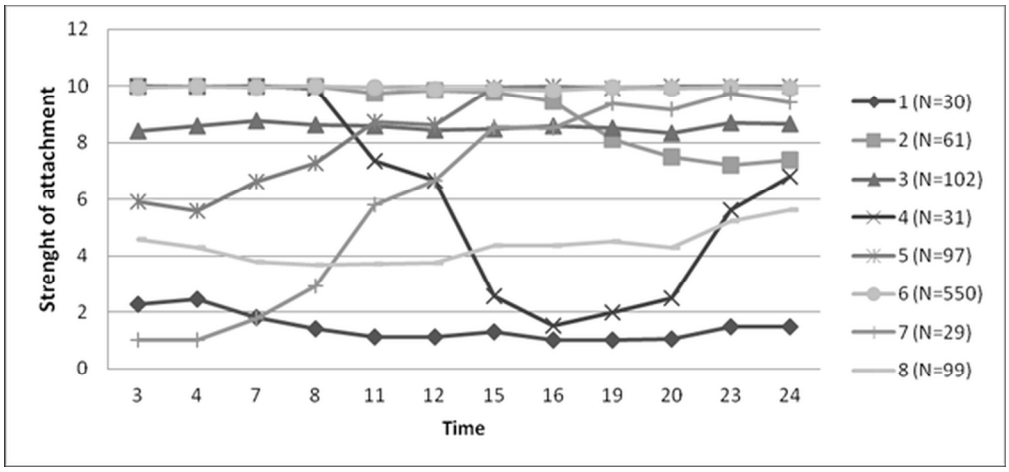
Figure 1. The number of cohort members clustered by trajectory analysis into eight tracks (curves based on means of the attachment at the time points).



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History of labour market attachment as determinant of the health status: a 12-year follow-up of the Northern Swedish Cohort

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History of labour market attachment as determinant of the health status: a 12-year follow-up of the Northern Swedish Cohort

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ABSTRACT

Objective: The present study aims at using trajectory analysis to measure labour market attachment (LMA) over 12 years and at examining whether labour market tracks relate to perceived health status.

Design: Data were retrieved from a 26-year prospective cohort study, the Northern Swedish Cohort.

Setting and participants: All 9th grade students (n=1083) within the municipality of Luleå in northern Sweden were included in the baseline investigation in 1981. The vast majority (94%) of the original cohort participated at the fourth follow-up. In this study, 969 participants were included.

Measures: Perceived health status (psychological distress and non-optimal self-rated health) at age 42 and the data obtained from questionnaires.

Results: We have identified four tracks in relation to LMA across the 12-year period: 'permanent', 'high level', 'strengthening' and 'poor level' of attachment. LMA history relates to psychological distress. High level (OR 1.55 (1.06-2.27)), strengthening (OR 1.95 (1.29-2.93)) and poor attachment (OR 3.14 (2.10-4.70) involve higher OR for psychological distress compared to permanent attachment. The overall p-value remained significant in the final model (0.001). Analyses regarding non-optimal self-rated health displayed a similar pattern but this was not significant in the final model.

Conclusions: Our results suggest that health status in mid-life, particularly psychological distress, is related to patterns of LMA history, to a large part independently of other social risk factors and previous health. Consideration of heterogeneity and time in labour market attachment might be important when analysing associations with perceived health.

Main strengths

- Using longitudinal data with exceptionally high response-rate
- Applying trajectory analysis which only has previously been sparsely used in this field
- Provides a uniquely rich and detailed data on temporary contracts over a long period of time

Limitations

- Relies on self-reported data
- Used a relatively small sample

Key messages

- There is controversy whether being less attached to the labour market is related to poor health or not.
- This unclarity might partly stem from the failure to take heterogeneous employment histories into consideration
- We have applied trajectory analysis on 12-year labour market history and found associations between labour market attachment and health status.
- Those with high level, strengthening and poor level of non-permanent attachment displayed worse health status than those in permanent employment the entire 12-year period.
- Our findings illustrate the temporal complexities of labour market attachment's impact on health over time

INTRODUCTION

During the last three decades or so, demands for a more flexible workforce have increased all over the world. Flexibility in the labour market is reflected, for example, in the proportion of temporary employees, which in recent years has varied between 13 and 15% of the total working population in Europe.[1] To the individual, the consequence of the flexible employment means that attachment to a workplace is weak and commonly interrupted by unemployment and other episodes out of work. In order to capture the total spectrum of employment relations, both with regard to quality and quantity, we have chosen to work with the concept of 'labour market attachment' (LMA) in this study. In our definition of the LMA spectra we have included permanent, non-permanent employment, unemployment and those who are exempted from working. [2-4]

Some relations between labour market status and health status are widely accepted: permanent employment is considered beneficial to health, while unemployment is known to have adverse health effects[5-7] and being out of the labour market in the long term is commonly due to poor health.[8] But when it comes to the health implications of labour market status, between the extremes of the LMA spectrum, the evidence is much scarcer. Previous studies has proposed that temporary employment could be a risk of poor psychosocial work characteristics[9] with temporary employees more commonly experiencing job insecurity and having a low cash margin [10], which are some of the factors that can be a potential pathways linking weak LMA to poor health. We have for example shown that long term temporary employees often experience difficulties to work full-time (underemployment) which influences their financial situation in a negative way [11]which can be a source of worry.[12] Poor health could also be mediated through job strain, although it seems as this group affected more by limited influence or control rather than high demands.[13] Moderate LMA has been highlighted as potentially harmful for health status, but research on the topic is divergent.[14]

Whereas some studies report worse self-rated health among temporary employees,[15] a few studies even suggest better self-rated health among fixed-term employees.[16] Some studies also indicate that deterioration in self-rated health may not be observable until the attachment is quite weak.[17] A major answer to the mixed research results may lie in the inherent difficulty in capturing the changeable nature of employment. Measurement of the employment situation at one or a few points in time, as in most of the previous studies,[18, 19] may overlook the factual exposures to different positions. Health effects of temporary employment could surface after several years of accumulation, as we have shown in a previous report,[20] or even when several years have passed after the exposure.[21] Moreover, it is possible that it is the chain of passages in different employments, the trajectory of LMA, that contributes to health status. E.g. becoming more strongly attached over time could contribute to health status differently than becoming less attached to the labour market even if the both groups holds same total exposure.

There are a lot of studies about particular labour market status as predictor of health. An inherent problem of such studies is the amount of exposure: cross-sectional information of the status includes great variation, a variable based on duration of the ongoing status is bound to use cross-sectional health data, and in prospective follow-up settings there may be periods in several statuses during the follow-up. The problem is of special importance in research of the health effects of atypical employment, as there are a wide range of statuses between permanent employment and overt unemployment. To address this topic, we have introduced a score that sums up the exposure to different types of non-permanent employment during the follow-up [20]. The score, however, does not take into account timing of the exposures. One way to capture the status chains, or the passages in and the transitions between different labour market positions, is provided by trajectory analysis. Applying this method with a four

class response variable (permanent employment, non-permanent employment, unemployment and out of the labour force) the members of the Northern Swedish Cohort have been clustered onto six different 'labour market attachment tracks'[2]. For the trajectory analysis of the present study, labour market attachment was measured by a ten class indicator, in order to articulate in more detail the trajectories of non-permanent employment and their association with health.

The few available studies about labour market trajectories in field of public health have measured LMA in a few time points, e.g. between one time point to another[9] and the goal has been descriptive rather than analytic.[19, 22] In the present study, we have applied a refined scale with regard to LMA. In the measure we have included a spectrum of types of employment situations and also covered a time-span of 12 year. The method, trajectory analysis[23], offers a novel way to identify differential tracks of LMA history in our population cohort. After obtaining a relevant set of tracks, our aim is to examine in which ways they relate to non-optimal self-rated health or perceived psychological distress.

METHOD

Population and procedures

The study was initiated in 1981 and included all pupils in their last year of compulsory school (n=1083), in the medium-sized industrial town of Luleå in northern Sweden (95% of the cohort were born in 1965). Since 1981 four additional follow-ups have been conducted.[24] The attrition rate in the most recent follow-up from 2007 was low; 94% (n=1005) of the original cohort who were still alive (n=1071) participated. Comprehensive questionnaires, completed by the participants in 1981, 1983, 1986, 1995 and 2007, were used as the main

assessment method. This paper is based on data from the 1995 and 2007 follow-ups. Procedures of data collection are described more extensively elsewhere.[24] The study was approved by the Regional Ethical Review Board in Umeå, Sweden.

Measurements

LMA history

We name the response variable of the trajectory analysis as "labour market attachment" (LMA). It aims to serve as a conceptual and empirical tool to sort out the employment statuses of the post-industrial labour market into a continuum .[25, 26] Crudely, it "refers to whether or not people have continuous employment (for example all year or only part of it) and whether or not they have periods of unemployment" [27] At headline level [28] there are four major classes of LMA: non-employment, unemployment, temporary employment and permanent employment. Within each class, several subclasses can be discerned. In the present study, the interest focuses on differential temporary employment. Seen through LMA, temporary employment covers a set of positions defined by formal job contracts, regardless of the psychological contract, [29] job commitment [30] or perceived job insecurity.[31]

Participants' labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and rows representing different labour market positions. With the instruction 'During which periods have you been employed permanently or have had some type of temporary job contract or have been out of work?' the respondents were prompted to choose between 11 response options for each six-month period: 'permanently employed' (coded as 10), 'entrepreneur' (9), 'employed in project' (8),

‘substitute’ (7), ‘probationary employment’ (6), ‘on-demand worker’ (5), ‘seasonal worker’ (4), ‘temporary employee for other reasons’ (3), ‘in employment policy measure’ (2), ‘unemployed’ (2), ‘out of the labour market’ (1). Unemployment and participation in policy measure were merged, and each option was coded to a variable that expressed the strength of LMA on a scale from 10 to 1. The ranking of contracts has been tested in previous research on accumulation of temporary employment[20] and was based on Aronsson’s core-periphery model [32]which proposes that there is a health gradient in relation to type of employment contract. The model ranks contracts based on duration, possibility of on the job training, autonomy, and job security.[32] However, we have extended the ranking by also include three labour market positions of non-employment. In the event of ‘out of labour market’, a continuum of five or more periods (i.e. 2.5 years) was required: if there were fewer than five, all periods were coded according to the last labour market position, to purposely exclude those on parental leave or studying from this category. As the last category ‘out of labour market’ was given the lowest score in relation to LMA. The intention for this group was that it was suppose to be contained by those mainly on sickness benefit (supported by analysis, data not shown), not those temporarily not working due to parental leave or education). These operations thus yielded a score of the strength of LMA for each of the 24 successive half-year periods. The scores served as the data for the trajectory analysis.

Indicators of health status

Psychological distress at age 30 and 42 was measured with a question that inquired whether the respondent during the last year had experienced any of the following symptoms: restlessness, concentration problems, being worried or anxious, palpitations, anxiety or panic or other nervous problems. Reporting one or more of the six symptoms was coded as 1 and

none as 0, equalling a dichotomisation into the quartile with the most symptoms versus the rest. The question was derived from the 'Survey of living conditions'.[33]

Non-optimal self-rated health at age 30 and 42, was measured with one question, 'How do you rate your general health?', with response options: good, average or bad.[33] The responses were dichotomised into the quartile with the worst health (average or bad) coded as 1, and the rest (good) coded as 0.[10, 34]

Covariates

Socio-economic position strong predictor of health [35-38]. LMA have been shown to be related to occupational class [39] it is important to consider socio-economic position as a possible confounder when studying the relationship between temporary employment and illness. In this study *Socioeconomic position (SEP) in 2007* was based on one question about occupation, which was classified according to the Swedish socioeconomic classification of occupational categories.[40] Upper white-collar and self-employed were coded as 0, lower white-collar workers were coded as 1 and blue-collar workers were coded as 2.

Also partnership and parenthood are important factors in relation to LMA as these two may be postponed due to insecure working arrangement [39, 41], which could influence social aspects related to illness [39]. Marriage or having a partner is also important to consider when studying LMA, as it can be beneficial to health and financial resources [42]. *Parental status in*

2007, was coded as 0 for those having children and as 1 for the childless. *Marital status in 2007* was measured with one question: 'Are you married or co-habiting?' Yes was coded as 0 and no as 1.

More women than men have poor LMA in terms of temporary employment. [43] Gender has been considered as an important factor in relation to poor LMA and illness, where women's health might be at greater risk. [44]*Women* were coded as 0 and *Men* as one.

Statistics

The participants were clustered according to the development of their LMA over the 12 years applying trajectory analysis.[23] The method has been established as a way of studying individual developmental courses over age or time, and for identifying distinctive groups of individual trajectories within the population that emerge, instead of predefined criteria, from the data itself. Trajectory analysis consists of three steps. First, the appropriate probabilistic model is chosen for the response variable. Second step is to define degree of the polynomial form of the trajectories. Finally, the number of the clusters is decided, employing the statistical information criteria and the 'common sense criteria' with respect to the substance and aims of the study. As a result, the developmental trajectories within clusters are as similar as possible, and trajectories between clusters are as different as possible.[45] At individual level, cluster membership is dictated by the highest calculated posterior probability of belonging to a particular cluster.

Trajectory analyses were conducted with Mplus program package. The analysis allowed for 12 time points, and the first and the second half of every second year were chosen in order to take into account possible systematic seasonal variation of LMA.

We used logistic regression (odds ratio and 95% CI) to test whether LMA history was associated with non-optimal self-rated health and psychological distress at age 42. Adjustments were made for the health indicator at age 30, gender, socioeconomic position, parental status and marital status. SPSS v17 was used for the regression analyses. Women and men were analysed together to preserve power.

RESULTS

The data consists of 10 class ordinal indicator of LMA, and the form of probability distribution of longitudinal sequence of measurement for such variable is the multinomial distribution.

The adjusted Bayesian information criterion (BIC) value decreased from 17435.474 for the linear model to 16656.622 for the quadratic polynomial model, indicating that the latter can be preferred over the former. Other information criteria provided by the Mplus program as well pointed in the same direction.

Optimal number of trajectories was searched by checking the solutions up to nine. The adjustedn Bayesian information criterion (adj. BIC) was used fo choosing the solution.[46] The Adj. BIC value (as well as the other information criteria) decreased when the number of trajectories was increased, rapidly in the beginning and slower in the end. From seven-trajectory to eight-trajectory solution the figure decreased from 17856.940 to 17606.402.

Thereafter the decrease slowed down. We decided to continue with eight trajectories, as this solution provided, in addition to detailed depiction of differential LMA, the opportunity to exclude the cluster with zero LMA that was out of our research interest.

Figure 1 illustrates the 'labour market tracks' based on means of the LMA scores at each time point of the individuals classified into each trajectory. Individuals on track 1 (3% of the cohort) also were excluded, as they were mainly disability pension recipients and their health was poor by definition. The track of 'permanent' employment throughout the follow-up included more than half of the cohort, whereas the remaining six clusters were relatively small and there were relatively similar tracks. We collapsed these six clusters into three as follows. A considerable part (tracks 2 and 3) maintained a continuously 'high level' of attachment, and about 12% (tracks 5 and 7) displayed a 'strengthening' of attachment towards the end of the follow-up. The attachment was permanently weak in about one of 10 (track 8), and a small cluster with a U-shaped pattern (track 4) was also seen; we decided to collapse these clusters and defined their attachment as 'poor'. In addition to being substantially grounded, this collapsing provided statistical power for subsequent analyses. Thus, we arrived at a four class 'LMA history' variable that comprised 'permanent', 'high level', 'strengthening' and 'poor' LMA (Figure 2).

(Figure 1 here)

Table 1. Distribution (%) of dependent and independent variables in relation to LMA history. All values are displayed in %, except p-values.

	n=550 Permanent	n=163 High level	n=126 Strengthening	n=130 Poor	P-value (χ^2 test)
Track	0	1	2	3	
Dependent variables age 42					
Psychological distress	26.3	35.7	41.0	52.8	<0.001
Non-optimal self-rated health	29.1	36.2	39.2	48.1	<0.001

Independent variables					
Health status at age 30					
Psychological distress	19.4	27.3	36.3	31.9	<0.001
Non-optimal self-rated health	16.8	29.4	26.6	33.3	<0.001
Sociodemographics					<0.001
Blue-collar worker	33.5	25.8	35.7	47.7	
Lower white-collar worker	15.7	8.0	18.3	6.2	
Upper white-collar worker	50.8	66.3	46.0	46.2	
Single marital status	19.1	20.9	22.2	32.6	0.010
No child as parental status	17.3	16.6	15.1	19.4	0.831
Women	44.5	42.3	61.9	55.4	0.001

Table 1 shows the distribution of the key variables by LMA history. In general, LMA history with less strong attachment entailed poorer health at age 42. Concerning covariates, similar patterns were seen for psychological distress and non-optimal self-rated health at age 30, thus indicating that health status differed between LMA history already at baseline. There were also significant differences with regard to socioeconomic position; the proportion of blue-collar workers was highest in the group with poor attachment to the labour market. The poor attachment group was also most likely to be living without a partner (p=.010). Parental status did not differ between the groups. The proportion of women was higher in strengthening and poor level attachment, whereas the permanent and high level attachment were dominated by men (p=.001).

Table 2. Odds ratios (OR) and 95% confidence intervals (CI) for psychological distress and non-optimal self-rated health at age 42 as dependent variable for LMA history over 12 years as main exposure after adjustment for health status age 30, sociodemographic variables.

Trajectories		Psychological distress as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.55 (1.06–2.27)	1.56 (1.06–2.30)	1.50 (0.99–2.28)	1.54 (1.01–2.35)
Strengthening	n=126	1.95 (1.29–2.93)	1.77 (1.17–2.69)	1.68 (1.07–2.66)	1.57 (0.99–2.49)
Poor	n=130	3.14 (2.10–4.70)	2.77 (1.83–4.19)	2.87 (1.83–4.49)	2.52 (1.59–3.98)

P-value for LMA		<0.001	<0.001	<0.001	0.001

Trajectories		Non-optimal self-rated health as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.38 (0.96–2.00)	1.46 (1.00–2.13)	1.19 (0.81–1.76)	1.26 (0.85–1.87)
Strengthening	n=126	1.57 (1.05–2.36)	1.52 (1.00–2.29)	1.44 (0.94–2.20)	1.40 (0.91–2.16)
Poor	n=130	2.26 (1.53–3.34)	2.00 (1.34–3.00)	1.83 (1.21–2.77)	1.65 (1.08–2.53)
P-value for LMA		<0.001	0.003	0.025	0.087

Model 0 crude odds ratios
Model 1 odds ratios adjusted for sociodemographic variables (socioeconomic position, gender, marital status and parental status).
Model 2 odds ratios adjusted for health status at age 30
Model 3 odds ratios adjusted for models 1+2.

To analyse whether LMA history was related to poor health, self-rated health and psychological distress were regressed on LMA history with permanent attachment as the reference category, in multiple logistic regression models (Table 2). The LMA history had a significant overall p-value on both health outcomes. In unadjusted analyses with psychological distress, lower strength of attachment involved higher odds than permanent (Table 2, Model 0; LMA history p<0.001). In model 0 we found increased OR in relation to lower attachment to the labour market, ranging from high level OR 1.55 (CI 1.06–2.27), strengthening OR 1.95(CI 1.29–2.93) , and poor OR 3.14 (CI 2.10–4.70). Adjusting for covariates (sociodemographic and psychological distress at age 30, Models 1 and 2, respectively) resulted in attenuation of the ORs for those with 'strengthening' and 'poor' attachment. Lastly, in the fully adjusted models (Model 3) only the high level and poor attachment were significantly related to psychological distress, with the 'poorly' attached displaying the numerically strongest association (OR=2.52 CI 1.59–3.98). Although borderline significant, the OR for the 'strengthening' (OR=1.57 CI 0.99–2.49) attachment was of comparable strength to the 'high level' attachment (OR=1.54 CI 1.01–2.35). While with a

slight decrease in OR along with adjustments for sociodemographic factors and previous health, the same pattern is still evident in the final model, and the overall p value remained highly significant (p=.001).

Results for non-optimal self-rated health were slightly less prominent than for psychological distress but pointed in the same direction. Unadjusted models (Table 2, Model 0) showed a significant overall relationship between LMA history and self-rated health (p<.001), and the LMA history with 'strengthening'(OR= 1.57 CI 1.05–2.36) and 'poor'(OR=2.26 CI 1.53–3.34) attachment had higher odds of having non-optimal self-rated health. For those with 'high level' (OR=1.38 CI 0.96–2.00) of attachment the risk was numerically higher, although not significantly, than for those with 'permanent' attachment. After adjustment for health status at age 30 (Model 2) the results for the 'strengthening' group were attenuated below significance. In the final model, only the OR for the 'poor' attachment group was significantly high, while the overall p-value for the association of LMA history with non-optimal health dropped to borderline significance (p=.087).

DISCUSSION

In this study we have identified four tracks of LMA history over 12 years: permanent, high level, strengthening and poor. Compared to the cohort with 'permanent' attachment, we found a higher probability of psychological distress among three cohorts with non-permanent LMA. The differences were partially attributed to previous health and to some extent also to sociodemographic variables; nevertheless, the overall contribution of LMA history remained significant in the fully adjusted model. The results for non-optimal self-rated health were similar but somewhat weaker.

Much of the previous research has suggested that temporary employment is a stepping stone towards more stable employment.[47] In the present study we found that, although the greater part of the sample already had a fairly strong attachment or were moving towards stronger attachment, one track remained poorly attached to the labour market over the 12 years. Thus, while the stepping stone hypothesis might be correct for the majority, a substantial minority appear to be trapped in an employment situation of permanent temporariness. Further, we found more women than men in this least favourable situation. This is probably explained by the widespread use of 'on-demand employment contracts' in women-dominated sectors of business[43] such as care and welfare and education [48] which are two industries which together stands for 33% of all temporary contracts in Sweden[11]. These results can be interpreted as, even Sweden is considered one of the top ranked gender equal countries, with regard to high labour market participation among women, and the internal labour market is still gender segregated.

Our findings importantly suggest that in addition to the present LMA, the LMA history is important for health. In line with previous research we found that the group with least attachment had the worst health status.[15, 17] As in our previous report showing a cumulative effect of temporary employment on health status,[20] the present report further corroborates that employment history impacts on health status. However, a more nuanced picture emerged when the separate labour market tracks were considered.

First, even those with 'high level' attachment experienced psychological distress more commonly than those with 'permanent' attachment. Thus, it appears that even marginal

exposure to what could be labelled 'LMA stress', can contribute to psychological distress over time.

Second, the group with 'strengthening' attachment, still experienced poor health more commonly than those with permanent attachment, even after adjustments for sociodemographic variables. This result suggests that earlier suboptimal attachment has a potentially 'scarring' effect. It is important to point out that in cross-sectional or short-term longitudinal designs, the 'strengthening' group would have been regarded as having a fairly favourable labour market attachment. This particular finding therefore stresses the importance of taking the specific patterns of the long-term labour market history into account when examining associations with health status.

Third, among those poorly attached to the labour market is where we found the highest ORs for poor health. The poorly attached were also more likely to have other risk factors for psychological distress, which seemed to partly account for the association. For example, being single involves a lower average household income and decreases the level of control [49], and poor previous health could also contribute to difficulties getting a stable attachment to the labour market, as those with health troubles could be less employable, particularly for blue-collar occupations[50]. The poorly attached are also those with most experience of unemployment, which previously has been connected to mortality and morbidity[5, 51]. Thus, the poor mental health in this group seems to be a result not only of their enduringly unfavourable LMA history, but also of a range of coexisting burdensome life circumstances. As described in the introduction job insecurity, finical stress, lack of reciprocity, uncertainty, lack of autonomy are some of the broad range of potential pathways linking temporary employment to poor health in previous studies [9, 10, 15, 52-54]. Although mediating

mechanisms has not been within the scope of this paper, our results can understood in the light of potential pathways presented in previous research.

Methodological considerations

Our study relies on trajectory analysis, a method that became available in the beginning of the 2000s, largely by virtue of increased computing power. Instead of prefixing alternative developments, the analysis is seeking developmental trajectories that emerge from the data itself [17]. It gives each individual posterior probability values for each trajectory, and allocates them according to the highest probability into groups or categories so that individuals within a group are more similar than individuals between groups [55]. To our knowledge, trajectory analysis has been used only sparsely in previous studies about LMA.[56] Our previous research using a core-periphery structure has only yielded a measure summarizing the total accumulation of peripheral employment over 12-years[20], this study has added new knowledge to the field by showing when exposure is taking place and provided patterns of labour market history, this specific knowledge has hinted about potential scaring effects of poor LMA (seen in the strengthening group) which is a knowledge previously hidden due to methodological limitations. In general, this study represents novel methodological ideas in a research area that has been obscured by the practice of measuring the labour market position cross-sectionally or with short-term transitions between labour market positions.

The longitudinal design of this study has been an asset, as it made it possible to adjust for previous health and thereby reduced the possibility of reverse causation, and especially as the attrition rate was kept low. Concerning the generalisability of this study, this cohort has been

shown by a previous assessment to be representative of Sweden as a whole concerning demographic data.[24] It is plausible that health effects of poor labour market attachment operate depending on the social context. E.g. that health implications might be more of less evident depending on structural factors such as national labour market policies, education system and legislation.[57] Sweden is part of the Scandinavian welfare regimes which are considered to have strong Social Democratic values and government funded benefits during episodes of unemployment. The welfare state Sweden could therefore possible reduce negative health effects of flexible employment,[58] which is in contrast to the results in our study. However, Swedish unions has criticised the current labour market regulations for being too liberal regarding temporary employment. With current regulation it's possible hire a substitute for up to two years and after that hire the same person on a general temporary employment contract for up to two years, this causes a situation where people are at risk of becoming long term temporary.[59] As a result of this approximately 10% of all temporary employees has been employed by the same employer for 5 years or more. The Swedish labour market regulation could therefore be a reason to the noticeable finding in this study; where a substantial part of the workers followed remained poorly attached over the 12 years which was examined. Long term temporary employment could be a future problem, and also a relevant group to study further in future research.

Sample size was limited in this study which is pointing to potential future research, which would benefit from analysing datasets with a larger sample size, such studies would be able to stratify analysis on gender or socioeconomic position, this could enrich the understanding of the field of LMA and illness. In this study we have focused on poor LMA as a risk factor for poor health, there are however a range of other circumstances the relates to precarious employment which could explain the results, such as vulnerability, lack of benefits, low

wages, disempowerment[44]. Therefore we would recommend future research to elaborate on other aspects of precariousness linked to poor LMA, as well as exploring the validity of the phenomena in a different context, e.g. country with different social and labour policies.

This study is based on self-reported data. Equivalent measures of self-rated health and psychological distress have displayed good validity by predicting future mortality and morbidity[60] even after adjustments for known health risks.[61] Furthermore, using retrospective measurement of LMA history could lead to recall bias. Nevertheless, retrospective questions about occupational history have been shown to maintain good quality in terms of agreement with census data.[62]

Further, the fact that we combined tracks could be seen as a limitation of this study. However, in our understanding some of the tracks could be combined depending on their similar movement in the labour market. We first analysed each of the eight tracks separately in relation to the outcome, to make sure that none of combinations resulted in blurring of the results (data not shown). One limitation regarding the method was that, due to features of the program, only half of the time points (12 of 24 possible time points) could be included in the trajectory analysis. However, we used the first and second half of every second year to reduce the possibility of systematic error due to seasonal variations in employment status.

The structure behind the conceptualisation of LMA needs consideration. The LMA structure is based on the idea that there is a gradient in the labour market, with some positions being more strongly attached to the labour market than others. We have used a modified version of Aronsson's core-periphery model[32] to order the type of employment contract/situation, from the most attached to the least attached to labour market. Our structure is indeed a

simplification of a more complex reality; this should be considered when interpreting the results. The LMA variable and socioeconomic position is partly overlapping as the group of entrepreneurs both is part of the SEP classification and the LMA variable. This overlap could cause over adjustment in the logistic regression analysis. As these two variables partly measure the same phenomenon, adjusting for socioeconomic position could adjust part of the true effect of LMA.

Conclusions

Policymakers frequently promote flexible employment contracts. However, this study shows that those with the most favourable but long-term high level attachment suffer from worse health than those permanently attached. Further, despite a development towards favourable employment circumstances, health discrepancies can endure, suggesting a potentially 'scarring' effect. Last, those poorly attached display the worst health situation, this partly due to coexisting burdensome life circumstances. We firmly suggest that policymakers should consider the results of this study and take responsibility for creating employment opportunities suitable for maintaining a healthy working life, rather than promoting employment contracts characterised by poor attachment to the labour market.

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CONTRIBUTORSHIP STATEMENT'

AH, PEG, PV and AW have substantially contributions to conception and design. AW and PEG have contributed to analysis and interpretation of data. AW, AH, PV and PEG have drafted the article and revising it critically for important intellectual content. All authors have given their final approval of the version to be published.

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DATA SHARING STATEMENT

See Hammarström and Janlert [24] for details of the NSC data and procedures. The Northern Swedish Cohort is conducted at Umeå University. The dataset is not freely available, and researchers interested in collaboration should get into contact with the Principal Investigator, Anne Hammarström.

COMPETING INTERESTS

None declared.

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Figure 1. The number of cohort members clustered by trajectory analysis into eight tracks (curves based on means of the attachment at the time points).

Figure 2. Collapsed tracks of labour market attachment history. Permanent, high level, strengthening and poor attachment.

History of labour market attachment as determinant of the health status: a 12-year follow-up of the Northern Swedish Cohort

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ABSTRACT

Objective: The present study aims at using trajectory analysis to measure labour market attachment (LMA) over 12 years and at examining whether labour market tracks relate to perceived health status.

Design: Data were retrieved from a 26-year prospective cohort study, the Northern Swedish Cohort.

Setting and participants: All 9th grade students (n=1083) within the municipality of Luleå in northern Sweden were included in the baseline investigation in 1981. The vast majority (94%) of the original cohort participated at the fourth follow-up. In this study, 969 participants were included.

Measures: Perceived health status (psychological distress and non-optimal self-rated health) at age 42 and the data obtained from questionnaires.

Results: We have identified four tracks in relation to LMA across the 12-year period: 'permanent', 'high level', 'strengthening' and 'poor level' of attachment. LMA history relates to psychological distress. High level (OR 1.55 (1.06-2.27)), strengthening (OR 1.95 (1.29-2.93)) and poor attachment (OR 3.14 (2.10-4.70) involve higher OR for psychological distress compared to permanent attachment. The overall p-value remained significant in the final model (0.001). Analyses regarding non-optimal self-rated health displayed a similar pattern but this was not significant in the final model.

Conclusions: Our results suggest that health status in mid-life, particularly psychological distress, is related to patterns of LMA history, to a large part independently of other social risk factors and previous health. Consideration of heterogeneity and time in labour market attachment might be important when analysing associations with perceived health.

Main strengths

- Using longitudinal data with exceptionally high response-rate
- Applying trajectory analysis which only has previously been sparsely used in this field
- Provides a uniquely rich and detailed data on temporary contracts over a long period of time

Limitations

- Relies on self-reported data
- Used a relatively small sample

INTRODUCTION

During the last three decades or so, demands for a more flexible workforce have increased all over the world. Flexibility in the labour market is reflected, for example, in the proportion of temporary employees, which in recent years has varied between 13 and 15% of the total working population in Europe.[1] To the individual, the consequence of the flexible employment means that attachment to a workplace is weak and commonly interrupted by unemployment and other episodes out of work. In order to capture the total spectrum of employment relations, both with regard to quality and quantity, we have chosen to work with the concept of 'labour market attachment' (LMA) in this study. In our definition of the LMA spectra we have included permanent, non-permanent employment, unemployment and those who are exempted from working. [2-4]

Some relations between labour market status and health status are widely accepted: permanent employment is considered beneficial to health, while unemployment is known to have adverse health effects[5-7] and being out of the labour market in the long term is commonly due to poor health.[8] But when it comes to the health implications of labour market status, between the extremes of the LMA spectrum, the evidence is much scarcer. Previous studies has proposed that temporary employment could be a risk of poor psychosocial work characteristics[9] with temporary employees more commonly experiencing job insecurity and having a low cash margin [10], which are some of the factors that can be a potential pathways linking weak LMA to poor health. We have for example shown that long term temporary employees often experience difficulties to work full-time (underemployment) which influences their financial situation in a negative way [11]which can be a source of worry.[12] Poor health could also be mediated through job strain, although it seems as this group affected more by limited influence or control rather than high demands.[13] Moderate LMA has been highlighted as potentially harmful for health status, but research on the topic is divergent.[14] Whereas some studies report worse self-rated health among temporary employees,[15] a few studies even suggest better self-rated health among fixed-term employees.[16] Some studies also indicate that deterioration in self-rated health may not be observable until the attachment is quite weak.[17] A major answer to the mixed research results may lie in the inherent difficulty in capturing the changeable nature of employment. Measurement of the employment situation at one or a few points in time, as in most of the previous studies,[18, 19] may overlook the factual exposures to different positions. Health effects of temporary employment could surface after several years of accumulation, as we have shown in a previous report,[20] or even when several years have passed after the exposure.[21] Moreover, it is possible that it is the chain of passages in different employments, the trajectory of LMA, that contributes to health status. E.g. becoming more strongly attached over time

could contribute to health status differently than becoming less attached to the labour market even if the both groups holds same total exposure.

There are a lot of studies about particular labour market status as predictor of health. An inherent problem of such studies is the amount of exposure: cross-sectional information of the status includes great variation, a variable based on duration of the ongoing status is bound to use cross-sectional health data, and in prospective follow-up settings there may be periods in several statuses during the follow-up. The problem is of special importance in research of the health effects of atypical employment, as there are a wide range of statuses between permanent employment and overt unemployment. To address this topic, we have introduced a score that sums up the exposure to different types of non-permanent employment during the follow-up [20]. The score, however, does not take into account timing of the exposures. One way to capture the status chains, or the passages in and the transitions between different labour market positions, is provided by trajectory analysis. Applying this method with a four class response variable (permanent employment, non-permanent employment, unemployment and out of the labour force) the members of the Northern Swedish Cohort have been clustered onto six different 'labour market attachment tracks'[2]. For the trajectory analysis of the present study, labour market attachment was measured by a ten class indicator, in order to articulate in more detail the trajectories of non-permanent employment and their association with health.

The few available studies about labour market trajectories in field of public health have measured LMA in a few time points, e.g. between one time point to another[9] and the goal has been descriptive rather than analytic.[19, 22] In the present study, we have applied a

refined scale with regard to LMA. In the measure we have included a spectrum of types of employment situations and also covered a time-span of 12 year. The method, trajectory analysis[23], offers a novel way to identify differential tracks of LMA history in our population cohort. After obtaining a relevant set of tracks, our aim is to examine in which ways they relate to non-optimal self-rated health or perceived psychological distress.

METHOD

Population and procedures

The study was initiated in 1981 and included all pupils in their last year of compulsory school (n=1083), in the medium-sized industrial town of Luleå in northern Sweden (95% of the cohort were born in 1965). Since 1981 four additional follow-ups have been conducted.[24] The attrition rate in the most recent follow-up from 2007 was low; 94% (n=1005) of the original cohort who were still alive (n=1071) participated. Comprehensive questionnaires, completed by the participants in 1981, 1983, 1986, 1995 and 2007, were used as the main assessment method. This paper is based on data from the 1995 and 2007 follow-ups. Procedures of data collection are described more extensively elsewhere.[24] The study was approved by the Regional Ethical Review Board in Umeå, Sweden.

Measurements

LMA history

We name the response variable of the trajectory analysis as "labour market attachment" (LMA). It aims to serve as a conceptual and empirical tool to sort out the employment statuses of the post-industrial labour market into a continuum .[25, 26] Crudely, it "refers to whether or not people have continuous employment (for example all year or only part of it) and

whether or not they have periods of unemployment" [27] At headline level [28] there are four major classes of LMA: non-employment, unemployment, temporary employment and permanent employment. Within each class, several subclasses can be discerned. In the present study, the interest focuses on differential temporary employment. Seen through LMA, temporary employment covers a set of positions defined by formal job contracts, regardless of the psychological contract, [29] job commitment [30] or perceived job insecurity.[31]

Participants' labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and rows representing different labour market positions. With the instruction 'During which periods have you been employed permanently or have had some type of temporary job contract or have been out of work?' the respondents were prompted to choose between 11 response options for each six-month period: 'permanently employed' (coded as 10), 'entrepreneur' (9), 'employed in project' (8), 'substitute' (7), 'probationary employment' (6), 'on-demand worker' (5), 'seasonal worker' (4), 'temporary employee for other reasons' (3), 'in employment policy measure' (2), 'unemployed' (2), 'out of the labour market' (1). Unemployment and participation in policy measure were merged, and each option was coded to a variable that expressed the strength of LMA on a scale from 10 to 1. The ranking of contracts has been tested in previous research on accumulation of temporary employment[20] and was based on Aronsson's core-periphery model [32]which proposes that there is a health gradient in relation to type of employment contract. The model ranks contracts based on duration, possibility of on the job training, autonomy, and job security.[32] However, we have extended the ranking by also include three labour market positions of non-employment. In the event of 'out of labour market', a continuum of five or more periods (i.e. 2.5 years) was required: if there were fewer than five, all periods were coded according to the last labour market position, to purposely exclude

those on parental leave or studying from this category. As the last category 'out of labour market' was given the lowest score in relation to LMA. The intention for this group was that it was suppose to be contained by those mainly on sickness benefit (supported by analysis, data not shown), not those temporarily not working due to parental leave or education). These operations thus yielded a score of the strength of LMA for each of the 24 successive half-year periods. The scores served as the data for the trajectory analysis.

Indicators of health status

Psychological distress at age 30 and 42 was measured with a question that inquired whether the respondent during the last year had experienced any of the following symptoms: restlessness, concentration problems, being worried or anxious, palpitations, anxiety or panic or other nervous problems. Reporting one or more of the six symptoms was coded as 1 and none as 0, equalling a dichotomisation into the quartile with the most symptoms versus the rest. The question was derived from the 'Survey of living conditions'.[33]

Non-optimal self-rated health at age 30 and 42, was measured with one question, 'How do you rate your general health?', with response options: good, average or bad.[33] The responses were dichotomised into the quartile with the worst health (average or bad) coded as 1, and the rest (good) coded as 0.[10, 34]

Covariates

Socio-economic position strong predictor of health [35-38]. LMA have been shown to be related to occupational class [39] it is important to consider socio-economic position as a possible confounder when studying the relationship between temporary employment and illness. In this study *Socioeconomic position (SEP) in 2007* was based on one question about occupation, which was classified according to the Swedish socioeconomic classification of occupational categories.[40] Upper white-collar and self-employed were coded as 0, lower white-collar workers were coded as 1 and blue-collar workers were coded as 2.

Also partnership and parenthood are important factors in relation to LMA as these two may be postponed due to insecure working arrangement [39, 41], which could influence social aspects related to illness [39]. Marriage or having a partner is also important to consider when studying LMA, as it can be beneficial to health and financial resources [42]. *Parental status in 2007*, was coded as 0 for those having children and as 1 for the childless. *Marital status in 2007* was measured with one question: 'Are you married or co-habiting?' Yes was coded as 0 and no as 1.

More women than men have poor LMA in terms of temporary employment. [43] Gender has been considered as an important factor in relation to poor LMA and illness, where women's health might be at greater risk. [44]*Women* were coded as 0 and *Men* as one.

Statistics

The participants were clustered according to the development of their LMA over the 12 years applying trajectory analysis.[23] The method has been established as a way of studying individual developmental courses over age or time, and for identifying distinctive groups of individual trajectories within the population that emerge, instead of predefined criteria, from the data itself. Trajectory analysis consists of three steps. First, the appropriate probabilistic

model is chosen for the response variable. Second step is to define degree of the polynomial form of the trajectories. Finally, the number of the clusters is decided, employing the statistical information criteria and the 'common sense criteria' with respect to the substance and aims of the study. As a result, the developmental trajectories within clusters are as similar as possible, and trajectories between clusters are as different as possible.[45] At individual level, cluster membership is dictated by the highest calculated posterior probability of belonging to a particular cluster.

Trajectory analyses were conducted with Mplus program package. The analysis allowed for 12 time points, and the first and the second half of every second year were chosen in order to take into account possible systematic seasonal variation of LMA.

We used logistic regression (odds ratio and 95% CI) to test whether LMA history was associated with non-optimal self-rated health and psychological distress at age 42. Adjustments were made for the health indicator at age 30, gender, socioeconomic position, parental status and marital status. SPSS v17 was used for the regression analyses. Women and men were analysed together to preserve power.

RESULTS

The data consists of 10 class ordinal indicator of LMA, and the form of probability distribution of longitudinal sequence of measurement for such variable is the multinomial distribution.

The adjusted Bayesian information criterion (BIC) value decreased from 17435.474 for the linear model to 16656.622 for the quadratic polynomial model, indicating that the latter can be preferred over the former. Other information criteria provided by the Mplus program as well pointed in the same direction.

Optimal number of trajectories was searched by checking the solutions up to nine. The adjustedn Bayesian information criterion (adj. BIC) was used fo choosing the solution.[46] The Adj. BIC value (as well as the other information criteria) decreased when the number of trajectories was increased, rapidly in the beginning and slower in the end. From seven-trajectory to eight-trajectory solution the figure decreased from 17856.940 to 17606.402. Thereafter the decrease slowed down. We decided to continue with eight trajectories, as this solution provided, in addition to detailed depiction of differential LMA, the opportunity to exclude the cluster with zero LMA that was out of our research interest.

Figure 1 illustrates the 'labour market tracks' based on means of the LMA scores at each time point of the individuals classified into each trajectory. Individuals on track 1 (3% of the cohort) also were excluded, as they were mainly disability pension recipients and their health was poor by definition. The track of 'permanent' employment throughout the follow-up included more than half of the cohort, whereas the remaining six clusters were relatively small and there were relatively similar tracks. We collapsed these six clusters into three as follows. A considerable part (tracks 2 and 3) maintained a continuously 'high level' of attachment, and about 12% (tracks 5 and 7) displayed a 'strengthening' of attachment towards the end of the follow-up. The attachment was permanently weak in about one of 10 (track 8), and a small

cluster with a U-shaped pattern (track 4) was also seen; we decided to collapse these clusters and defined their attachment as 'poor'. In addition to being substantially grounded, this collapsing provided statistical power for subsequent analyses. Thus, we arrived at a four class 'LMA history' variable that comprised 'permanent', 'high level', 'strengthening' and 'poor' LMA (Figure 2).

(Figure 1 here)

Table 1. Distribution (%) of dependent and independent variables in relation to LMA history. All values are displayed in %, except p-values.

	n=550 Permanent	n=163 High level	n=126 Strengthening	n=130 Poor	P-value (χ^2 test)
Track	0	1	2	3	
Dependent variables age 42					
Psychological distress	26.3	35.7	41.0	52.8	<0.001
Non-optimal self-rated health	29.1	36.2	39.2	48.1	<0.001
Independent variables					
Health status at age 30					
Psychological distress	19.4	27.3	36.3	31.9	<0.001
Non-optimal self-rated health	16.8	29.4	26.6	33.3	<0.001
Sociodemographics					<0.001
Blue-collar worker	33.5	25.8	35.7	47.7	
Lower white-collar worker	15.7	8.0	18.3	6.2	
Upper white-collar worker	50.8	66.3	46.0	46.2	
Single marital status	19.1	20.9	22.2	32.6	0.010
No child as parental status	17.3	16.6	15.1	19.4	0.831
Women	44.5	42.3	61.9	55.4	0.001

Table 1 shows the distribution of the key variables by LMA history. In general, LMA history with less strong attachment entailed poorer health at age 42. Concerning covariates, similar patterns were seen for psychological distress and non-optimal self-rated health at age 30, thus indicating that health status differed between LMA history already at baseline. There were also significant differences with regard to socioeconomic position; the proportion of blue-

collar workers was highest in the group with poor attachment to the labour market. The poor attachment group was also most likely to be living without a partner (p=.010). Parental status did not differ between the groups. The proportion of women was higher in strengthening and poor level attachment, whereas the permanent and high level attachment were dominated by men (p=.001).

Table 2. Odds ratios (OR) and 95% confidence intervals (CI) for psychological distress and non-optimal self-rated health at age 42 as dependent variable for LMA history over 12 years as main exposure after adjustment for health status age 30, sociodemographic variables.

Trajectories		Psychological distress as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.55 (1.06–2.27)	1.56 (1.06–2.30)	1.50 (0.99–2.28)	1.54 (1.01–2.35)
Strengthening	n=126	1.95 (1.29–2.93)	1.77 (1.17–2.69)	1.68 (1.07–2.66)	1.57 (0.99–2.49)
Poor	n=130	3.14 (2.10–4.70)	2.77 (1.83–4.19)	2.87 (1.83–4.49)	2.52 (1.59–3.98)
P-value for LMA		<0.001	<0.001	<0.001	0.001

Trajectories		Non-optimal self-rated health as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.38 (0.96–2.00)	1.46 (1.00–2.13)	1.19 (0.81–1.76)	1.26 (0.85–1.87)
Strengthening	n=126	1.57 (1.05–2.36)	1.52 (1.00–2.29)	1.44 (0.94–2.20)	1.40 (0.91–2.16)
Poor	n=130	2.26 (1.53–3.34)	2.00 (1.34–3.00)	1.83 (1.21–2.77)	1.65 (1.08–2.53)
P-value for LMA		<0.001	0.003	0.025	0.087

Model 0 crude odds ratios
Model 1 odds ratios adjusted for sociodemographic variables (socioeconomic position, gender, marital status and parental status).
Model 2 odds ratios adjusted for health status at age 30
Model 3 odds ratios adjusted for models 1+2.

To analyse whether LMA history was related to poor health, self-rated health and psychological distress were regressed on LMA history with permanent attachment as the reference category, in multiple logistic regression models (Table 2). The LMA history had a significant overall p-value on both health outcomes. In unadjusted analyses with

psychological distress, lower strength of attachment involved higher odds than permanent (Table 2, Model 0; LMA history p<0.001). In model 0 we found increased OR in relation to lower attachment to the labour market, ranging from high level OR 1.55 (CI 1.06–2.27), strengthening OR 1.95(CI 1.29–2.93) , and poor OR 3.14 (CI 2.10–4.70). Adjusting for covariates (sociodemographic and psychological distress at age 30, Models 1 and 2, respectively) resulted in attenuation of the ORs for those with 'strengthening' and 'poor' attachment. Lastly, in the fully adjusted models (Model 3) only the high level and poor attachment were significantly related to psychological distress, with the 'poorly' attached displaying the numerically strongest association (OR=2.52 CI 1.59–3.98). Although borderline significant, the OR for the 'strengthening' (OR=1.57 CI 0.99–2.49) attachment was of comparable strength to the 'high level' attachment (OR=1.54 CI 1.01–2.35). While with a slight decrease in OR along with adjustments for sociodemographic factors and previous health, the same pattern is still evident in the final model, and the overall p value remained highly significant (p=.001).

Results for non-optimal self-rated health were slightly less prominent than for psychological distress but pointed in the same direction. Unadjusted models (Table 2, Model 0) showed a significant overall relationship between LMA history and self-rated health (p<.001), and the LMA history with 'strengthening'(OR= 1.57 CI 1.05–2.36) and 'poor'(OR=2.26 CI 1.53–3.34) attachment had higher odds of having non-optimal self-rated health. For those with 'high level' (OR=1.38 CI 0.96–2.00) of attachment the risk was numerically higher, although not significantly, than for those with 'permanent' attachment. After adjustment for health status at age 30 (Model 2) the results for the 'strengthening' group were attenuated below significance. In the final model, only the OR for the 'poor' attachment group was significantly

high, while the overall p-value for the association of LMA history with non-optimal health dropped to borderline significance (p=.087).

DISCUSSION

In this study we have identified four tracks of LMA history over 12 years: permanent, high level, strengthening and poor. Compared to the cohort with 'permanent' attachment, we found a higher probability of psychological distress among three cohorts with non-permanent LMA. The differences were partially attributed to previous health and to some extent also to sociodemographic variables; nevertheless, the overall contribution of LMA history remained significant in the fully adjusted model. The results for non-optimal self-rated health were similar but somewhat weaker.

Much of the previous research has suggested that temporary employment is a stepping stone towards more stable employment.[47] In the present study we found that, although the greater part of the sample already had a fairly strong attachment or were moving towards stronger attachment, one track remained poorly attached to the labour market over the 12 years. Thus, while the stepping stone hypothesis might be correct for the majority, a substantial minority appear to be trapped in an employment situation of permanent temporariness. Further, we found more women than men in this least favourable situation. This is probably explained by the widespread use of 'on-demand employment contracts' in women-dominated sectors of business[43] such as care and welfare and education [48] which are two industries which together stands for 33% of all temporary contracts in Sweden[11]. These results can be interpreted as, even Sweden is considered one of the top ranked gender equal countries, with

regard to high labour market participation among women, and the internal labour market is still gender segregated.

Our findings importantly suggest that in addition to the present LMA, the LMA history is important for health. In line with previous research we found that the group with least attachment had the worst health status.[15, 17] As in our previous report showing a cumulative effect of temporary employment on health status,[20] the present report further corroborates that employment history impacts on health status. However, a more nuanced picture emerged when the separate labour market tracks were considered.

First, even those with 'high level' attachment experienced psychological distress more commonly than those with 'permanent' attachment. Thus, it appears that even marginal exposure to what could be labelled 'LMA stress', can contribute to psychological distress over time.

Second, the group with 'strengthening' attachment, still experienced poor health more commonly than those with permanent attachment, even after adjustments for sociodemographic variables. This result suggests that earlier suboptimal attachment has a potentially 'scarring' effect. It is important to point out that in cross-sectional or short-term longitudinal designs, the 'strengthening' group would have been regarded as having a fairly favourable labour market attachment. This particular finding therefore stresses the importance of taking the specific patterns of the long-term labour market history into account when examining associations with health status.

Third, among those poorly attached to the labour market is where we found the highest ORs for poor health. The poorly attached were also more likely to have other risk factors for psychological distress, which seemed to partly account for the association. For example, being single involves a lower average household income and decreases the level of control [49], and poor previous health could also contribute to difficulties getting a stable attachment to the labour market, as those with health troubles could be less employable, particularly for blue-collar occupations[50]. The poorly attached are also those with most experience of unemployment, which previously has been connected to mortality and morbidity[5, 51]. Thus, the poor mental health in this group seems to be a result not only of their enduringly unfavourable LMA history, but also of a range of coexisting burdensome life circumstances. As described in the introduction job insecurity, finical stress, lack of reciprocity, uncertainty, lack of autonomy are some of the broad range of potential pathways linking temporary employment to poor health in previous studies [9, 10, 15, 52-54]. Although mediating mechanisms has not been within the scope of this paper, our results can understood in the light of potential pathways presented in previous research.

Methodological considerations

Our study relies on trajectory analysis, a method that became available in the beginning of the 2000s, largely by virtue of increased computing power. Instead of prefixing alternative developments, the analysis is seeking developmental trajectories that emerge from the data itself [17]. It gives each individual posterior probability values for each trajectory, and allocates them according to the highest probability into groups or categories so that individuals within a group are more similar than individuals between groups [55]. To our knowledge, trajectory analysis has been used only sparsely in previous studies about

LMA.[56] Our previous research using a core-periphery structure has only yielded a measure summarizing the total accumulation of peripheral employment over 12-years[20], this study has added new knowledge to the field by showing when exposure is taking place and provided patterns of labour market history, this specific knowledge has hinted about potential scaring effects of poor LMA (seen in the strengthening group) which is a knowledge previously hidden due to methodological limitations. In general, this study represents novel methodological ideas in a research area that has been obscured by the practice of measuring the labour market position cross-sectionally or with short-term transitions between labour market positions.

The longitudinal design of this study has been an asset, as it made it possible to adjust for previous health and thereby reduced the possibility of reverse causation, and especially as the attrition rate was kept low. Concerning the generalisability of this study, this cohort has been shown by a previous assessment to be representative of Sweden as a whole concerning demographic data.[24] It is plausible that health effects of poor labour market attachment operate depending on the social context. E.g. that health implications might be more of less evident depending on structural factors such as national labour market policies, education system and legislation.[57] Sweden is part of the Scandinavian welfare regimes which are considered to have strong Social Democratic values and government funded benefits during episodes of unemployment. The welfare state Sweden could therefore possible reduce negative health effects of flexible employment,[58] which is in contrast to the results in our study. However, Swedish unions has criticised the current labour market regulations for being too liberal regarding temporary employment. With current regulation it's possible hire a substitute for up to two years and after that hire the same person on a general temporary employment contract for up to two years, this causes a situation where people are at risk of

becoming long term temporary.[59] As a result of this approximately 10% of all temporary employees has been employed by the same employer for 5 years or more. The Swedish labour market regulation could therefore be a reason to the noticeable finding in this study; where a substantial part of the workers followed remained poorly attached over the 12 years which was examined. Long term temporary employment could be a future problem, and also a relevant group to study further in future research.

Sample size was limited in this study which is pointing to potential future research, which would benefit from analysing datasets with a larger sample size, such studies would be able to stratify analysis on gender or socioeconomic position, this could enrich the understanding of the field of LMA and illness. In this study we have focused on poor LMA as a risk factor for poor health, there are however a range of other circumstances the relates to precarious employment which could explain the results, such as vulnerability, lack of benefits, low wages, disempowerment[44]. Therefore we would recommend future research to elaborate on other aspects of precariousness linked to poor LMA, as well as exploring the validity of the phenomena in a different context, e.g. country with different social and labour policies.

This study is based on self-reported data. Equivalent measures of self-rated health and psychological distress have displayed good validity by predicting future mortality and morbidity[60] even after adjustments for known health risks.[61] Furthermore, using retrospective measurement of LMA history could lead to recall bias. Nevertheless, retrospective questions about occupational history have been shown to maintain good quality in terms of agreement with census data.[62]

Further, the fact that we combined tracks could be seen as a limitation of this study. However, in our understanding some of the tracks could be combined depending on their similar movement in the labour market. We first analysed each of the eight tracks separately in relation to the outcome, to make sure that none of combinations resulted in blurring of the results (data not shown). One limitation regarding the method was that, due to features of the program, only half of the time points (12 of 24 possible time points) could be included in the trajectory analysis. However, we used the first and second half of every second year to reduce the possibility of systematic error due to seasonal variations in employment status.

The structure behind the conceptualisation of LMA needs consideration. The LMA structure is based on the idea that there is a gradient in the labour market, with some positions being more strongly attached to the labour market than others. We have used a modified version of Aronsson's core-periphery model[32] to order the type of employment contract/situation, from the most attached to the least attached to labour market. Our structure is indeed a simplification of a more complex reality; this should be considered when interpreting the results. The LMA variable and socioeconomic position is partly overlapping as the group of entrepreneurs both is part of the SEP classification and the LMA variable. This overlap could cause over adjustment in the logistic regression analysis. As these two variables partly measure the same phenomenon, adjusting for socioeconomic position could adjust part of the true effect of LMA.

Conclusions

Policymakers frequently promote flexible employment contracts. However, this study shows that those with the most favourable but long-term high level attachment suffer from worse

health than those permanently attached. Further, despite a development towards favourable employment circumstances, health discrepancies can endure, suggesting a potentially 'scarring' effect. Last, those poorly attached display the worst health situation, this partly due to coexisting burdensome life circumstances. We firmly suggest that policymakers should consider the results of this study and take responsibility for creating employment opportunities suitable for maintaining a healthy working life, rather than promoting employment contracts characterised by poor attachment to the labour market.

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COMPETING INTERESTS

None declared.

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Key messages

- There is controversy whether being less attached to the labour market is related to poor health or not.
- This unclarity might partly stem from the failure to take heterogeneous employment histories into consideration
- We have applied trajectory analysis on 12-year labour market history and found associations between labour market attachment and health status.
- Those with high level, strengthening and poor level of non-permanent attachment displayed worse health status than those in permanent employment the entire 12-year period.
- Our findings illustrate the temporal complexities of labour market attachment's impact on health over time

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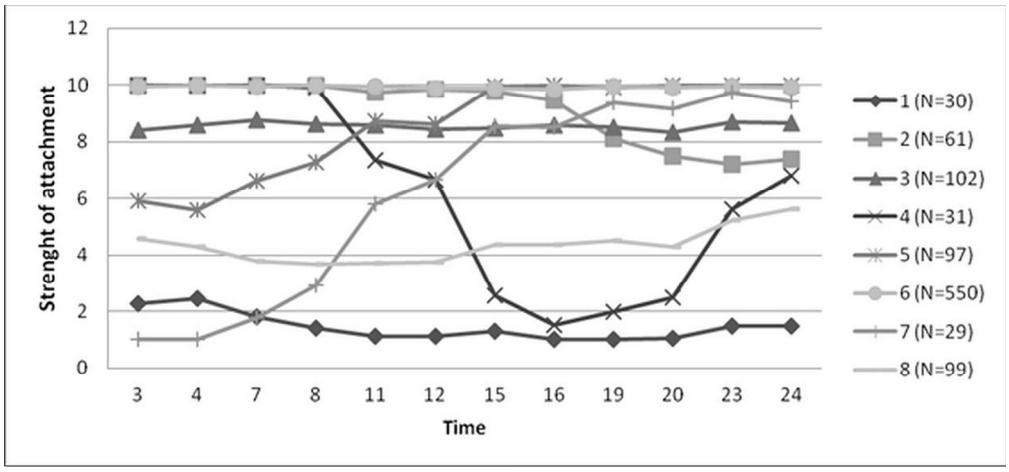
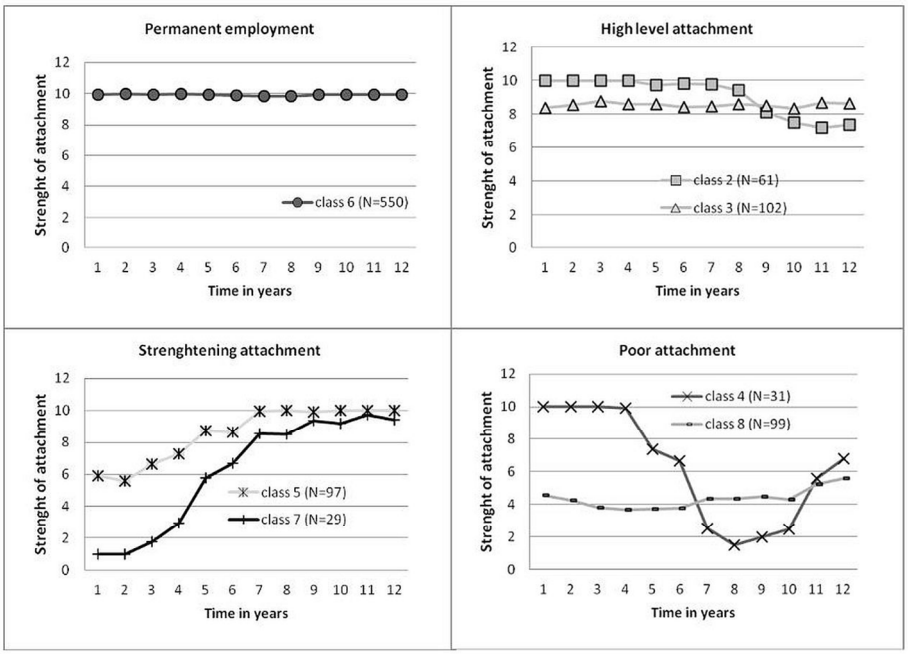
Figure 1. The number of cohort members clustered by trajectory analysis into eight tracks (curves based on means of the attachment at the time points).

Figure 2. Collapsed tracks of labour market attachment history. Permanent, high level, strengthening and poor attachment.



194x90mm (300 x 300 DPI)



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History of labour market attachment as a determinant of health status: a 12-year follow-up of the Northern Swedish Cohort

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History of labour market attachment as a determinant of health status: a 12-year follow-up of the Northern Swedish Cohort

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ABSTRACT

Objective: The present study aims at using trajectory analysis to measure labour market attachment (LMA) over 12 years and at examining whether labour market tracks relate to perceived health status.

Design: Data were retrieved from a 26-year prospective cohort study, the Northern Swedish Cohort.

Setting and participants: All 9th grade students (n=1083) within the municipality of Luleå in northern Sweden were included in the baseline investigation in 1981. The vast majority (94%) of the original cohort participated at the fourth follow-up. In this study, 969 participants were included.

Measures: Perceived health status (psychological distress and non-optimal self-rated health) at age 42 and the data obtained from questionnaires.

Results: We have identified four tracks in relation to LMA across the 12-year period: 'permanent', 'high level', 'strengthening' and 'poor level' of attachment. LMA history relates to psychological distress. High level (OR 1.55 (1.06-2.27)), strengthening (OR 1.95 (1.29-2.93)) and poor attachment (OR 3.14 (2.10-4.70) involve higher OR for psychological distress compared to permanent attachment. The overall p-value remained significant in the final model (0.001). Analyses regarding non-optimal self-rated health displayed a similar pattern but this was not significant in the final model.

Conclusions: Our results suggest that health status in mid-life, particularly psychological distress, is related to patterns of LMA history, to a large part independently of other social risk factors and previous health. Consideration of heterogeneity and time in labour market attachment might be important when analysing associations with perceived health.

Main strengths

- Using longitudinal data with exceptionally high response-rate
- Applying trajectory analysis which only has previously been sparsely used in this field
- Provides a uniquely rich and detailed data on temporary contracts over a long period of time

Limitations

- Relies on self-reported data
- Used a relatively small sample

Key messages

- There is controversy as to whether being less attached to the labour market is related to poor health or not.
- This unclarity might partly stem from the failure to take heterogeneous employment histories into consideration
- We have applied trajectory analysis to 12-year labour market history and found associations between labour market attachment and health status.
- Those with high level, strengthening and poor level of non-permanent attachment displayed worse health status than those in permanent employment in the entire 12-year period.
- Our findings illustrate the temporal complexities of labour market attachment's impact on health over time

INTRODUCTION

During the last three decades or so, demands for a more flexible workforce have increased all over the world. Flexibility in the labour market is reflected, for example, in the proportion of temporary employees, which in recent years has varied between 13 and 15% of the total working population in Europe.[1] To the individual, the consequence of flexible employment is that attachment to a workplace is weak and commonly interrupted by unemployment and other episodes out of work. In order to capture the total spectrum of employment relations, with regard to both quality and quantity, we have chosen to work with the concept of 'labour market attachment' (LMA) in this study. In our definition of the LMA spectrum we have included permanent, non-permanent employment, unemployment and those who are exempted from working. [2-4]

Some relations between labour market status and health status are widely accepted: permanent employment is considered beneficial to health, while unemployment is known to have adverse health effects[5-7] and being out of the labour market in the long term is commonly due to poor health.[8] But when it comes to the health implications of labour market status, between the extremes of the LMA spectrum, the evidence is much scarcer. Previous studies have proposed that temporary employment could be a risk of poor psychosocial work characteristics [9] with temporary employees more commonly experiencing job insecurity and having a low cash margin [10], which are some of the factors that can be potential pathways linking weak LMA to poor health. We have for example shown that long-term temporary employees often experience difficulties working full-time (underemployment) which influences their financial situation in a negative way [11] and can thus be a source of

worry.[12] Poor health can also be mediated through job strain, although it seems as if this group is affected more by limited influence or control rather than high demands.[13] Moderate LMA has been highlighted as potentially harmful for health status, but research on the topic is divergent.[14] Whereas some studies report worse self-rated health among temporary employees,[15] a few studies even suggest better self-rated health among fixed-term employees.[16] Some studies also indicate that deterioration in self-rated health may not be observable until the attachment is quite weak.[17] A major answer to the mixed research results may lie in the inherent difficulty in capturing the changeable nature of employment. Measurement of the employment situation at one or a few points in time, as in most of the previous studies,[18, 19] may overlook the factual exposures to different positions. Health effects of temporary employment could surface after several years of accumulation, as we have shown in a previous report,[20] or even when several years have passed after the exposure.[21] Moreover, it is possible that it is the chain of passages in different employments, the trajectory of LMA, that contributes to health status. E.g. becoming more strongly attached over time could contribute to health status differently than becoming less attached to the labour market even if the both groups holds same total exposure.

There are a lot of studies about particular labour market statuses as predictors of health. An inherent problem of such studies is the amount of exposure: cross-sectional information about status includes great variation, a variable based on the duration of the ongoing status is bound to use cross-sectional health data, and in prospective follow-up settings there may be periods in several statuses during the follow-up. The problem is of special importance in research on the health effects of atypical employment, as there are a wide range of statuses between permanent employment and overt unemployment. To address this topic, we have introduced a score that sums up the exposure to different types of non-permanent employment during the

follow-up [20]. The score, however, does not take into account the timing of the exposures. One way to capture the status chains, or the passages in and the transitions between different labour market positions, is provided by trajectory analysis. Applying this method with a four-class response variable (permanent employment, non-permanent employment, unemployment and out of the labour force) the members of the Northern Swedish Cohort have been clustered into six different 'labour market attachment tracks'[2]. For the trajectory analysis of the present study, labour market attachment was measured by a ten-class indicator, in order to articulate in more detail the trajectories of non-permanent employment and their association with health.

The few available studies about labour market trajectories in the field of public health have measured LMA at a few time points, e.g. between one time point and another[9] and the goal has been descriptive rather than analytic.[19, 22] In the present study, we have applied a refined scale with regard to LMA. In the measure we have included a spectrum of types of employment situations and also covered a time-span of 12 years. The method, trajectory analysis[23], offers a novel way to identify differential tracks of LMA history in our population cohort. After obtaining a relevant set of tracks, our aim is to examine in which ways they relate to non-optimal self-rated health or perceived psychological distress.

METHOD

Population and procedures

The study was initiated in 1981 and included all pupils in their last year of compulsory school (n=1083), in the medium-sized industrial town of Luleå in northern Sweden (95% of the cohort were born in 1965). Since 1981 four additional follow-ups have been conducted.[24]

The attrition rate in the most recent follow-up from 2007 was low; 94% (n=1005) of the original cohort who were still alive (n=1071) participated. Comprehensive questionnaires, completed by the participants in 1981, 1983, 1986, 1995 and 2007, were used as the main assessment method. This paper is based on data from the 1995 and 2007 follow-ups. Procedures of data collection are described more extensively elsewhere.[24] The study was approved by the Regional Ethical Review Board in Umeå, Sweden.

Measurements

LMA history

We name the response variable of the trajectory analysis 'labour market attachment' (LMA). It aims to serve as a conceptual and empirical tool to sort the employment statuses of the post-industrial labour market along a continuum.[25, 26] Crudely, it 'refers to whether or not people have continuous employment (for example all year or only part of it) and whether or not they have periods of unemployment' [27] At headline level [28] there are four major classes of LMA: non-employment, unemployment, temporary employment and permanent employment. Within each class, several subclasses can be discerned. In the present study, the interest is focused on differential temporary employment. Seen through LMA, temporary employment covers a set of positions defined by formal job contracts, regardless of the psychological contract, [29] job commitment [30] or perceived job insecurity.[31]

Participants' labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and rows representing different labour market positions. With the instruction 'During which periods have you been employed permanently or have had some type of temporary job contract or have been out of work?' the respondents were prompted to choose between 11 response options for each six-month period: 'permanently employed' (coded as 10), 'entrepreneur' (9), 'employed in project' (8),

‘substitute’ (7), ‘probationary employment’ (6), ‘on-demand worker’ (5), ‘seasonal worker’ (4), ‘temporary employee for other reasons’ (3), ‘in employment policy measure’ (2), ‘unemployed’ (2), ‘out of the labour market’ (1). Unemployment and participation in policy measure were merged, and each option was coded to a variable that expressed the strength of LMA on a scale from 10 to 1. The ranking of contracts has been tested in previous research on the accumulation of temporary employment[20] and was based on Aronsson’s core-periphery model,[32] which proposes that there is a health gradient in relation to the type of employment contract. The model ranks contracts based on duration, possibility of on-the-job training, autonomy, and job security.[32] However, we have extended the ranking by also including three labour market positions of non-employment. In the event of ‘out of labour market’, a continuum of five or more periods (i.e. 2.5 years) was required: if there were fewer than five, all periods were coded according to the last labour market position, to purposely exclude those on parental leave or studying from this category. As the last category ‘out of labour market’ was given the lowest score in relation to LMA. The intention for this group was that it was supposed to be contained by those mainly on sickness benefit (supported by analysis, data not shown), not those temporarily not working due to parental leave or education). These operations thus yielded a score of the strength of LMA for each of the 24 successive half-year periods. The scores served as the data for the trajectory analysis.

Indicators of health status

Psychological distress at age 30 and 42 was measured with a question that inquired whether the respondent during the last year had experienced any of the following symptoms: restlessness, concentration problems, being worried or anxious, palpitations, anxiety or panic or other nervous problems. Reporting one or more of the six symptoms was coded as 1 and none as 0, equalling a dichotomisation into the quartile with the most symptoms versus the rest. The question was derived from the ‘Survey of living conditions’.[33]

Non-optimal self-rated health at age 30 and 42, was measured with one question, 'How do you rate your general health?', with response options: good, average or bad.[33] The responses were dichotomised into the quartile with the worst health (average or bad) coded as 1, and the rest (good) coded as 0.[10, 34]

Covariates

Socio-economic position is a strong predictor of health [35-38]. LMA has been shown to be related to occupational class.[39] It is important to consider socio-economic position as a possible confounder when studying the relationship between temporary employment and illness. In this study *Socioeconomic position (SEP) in 2007* was based on one question about occupation, which was classified according to the Swedish socioeconomic classification of occupational categories.[40] Upper white-collar and self-employed were coded as 0, lower white-collar workers were coded as 1 and blue-collar workers were coded as 2.

Partnership and parenthood are also important factors in relation to LMA as these two may be postponed due to insecure working arrangement [39, 41], which could influence social aspects related to illness [39]. Marriage or having a partner is also important to consider when studying LMA, as it can be beneficial to health and financial resources [42]. *Parental status in 2007*, was coded as 0 for those having children and as 1 for the childless. *Marital status in 2007* was measured with one question: 'Are you married or co-habiting?' Yes was coded as 0 and no as 1.

More women than men have poor LMA in terms of temporary employment. [43] Gender has been considered as an important factor in relation to poor LMA and illness, where women's health might be at greater risk. [44] *Women* were coded as 0 and *Men* as one.

Statistics

The participants were clustered according to the development of their LMA over the 12 years applying trajectory analysis.[23] The method has been established as a way of studying individual developmental courses over age or time, and for identifying distinctive groups of individual trajectories within the population that emerge, instead of predefined criteria, from the data itself. Trajectory analysis consists of three steps. First, the appropriate probabilistic model is chosen for the response variable. The second step is to define the degree of the polynomial form of the trajectories. Finally, the number of the clusters is decided, employing the statistical information criteria and the 'common sense criteria' with respect to the substance and aims of the study. As a result, the developmental trajectories within clusters are as similar as possible, and trajectories between clusters are as different as possible.[45] At individual level, cluster membership is dictated by the highest calculated posterior probability of belonging to a particular cluster.

Trajectory analyses were conducted with the Mplus program package. The analysis allowed for 12 time points, and the first and the second half of every second year were chosen in order to take into account possible systematic seasonal variation of LMA.

We used logistic regression (odds ratio and 95% CI) to test whether LMA history was associated with non-optimal self-rated health and psychological distress at age 42. Adjustments were made for the health indicator at age 30, gender, socioeconomic position, parental status and marital status. SPSS v17 was used for the regression analyses. Women and men were analysed together to preserve power.

RESULTS

The data consists of a ten-class ordinal indicator of LMA, and the form of probability distribution of longitudinal sequence of measurement for such variable is the multinomial distribution.

The adjusted Bayesian information criterion (BIC) value decreased from 17435.474 for the linear model to 16656.622 for the quadratic polynomial model, indicating that the latter can be preferred to the former. Other information criteria provided by the Mplus program likewise pointed in the same direction.

The optimal number of trajectories was searched by checking the solutions up to nine. The adjusted Bayesian information criterion (Adj. BIC) was used for choosing the solution.[46] The Adj. BIC value (as well as the other information criteria) decreased when the number of trajectories was increased, rapidly at the beginning and slower at the end. From seven-trajectory to eight-trajectory solution the figure decreased from 17856.940 to 17606.402. Thereafter the decrease slowed down. We decided to continue with eight trajectories, as this solution provided, in addition to detailed depiction of differential LMA, the opportunity to exclude the cluster with zero LMA that was outside our research interest.

(Figure 1 here)

Figure 1 illustrates the 'labour market tracks' based on means of the LMA scores at each time point of the individuals classified into each trajectory. Individuals on track 1 (3% of the cohort) also were excluded, as they were mainly disability pension recipients and their health was poor by definition. The track (6) of 'permanent' employment throughout the follow-up included more than half of the cohort, whereas the remaining six clusters were relatively small and there were relatively similar tracks. We collapsed these six clusters into three as follows. A considerable part (class 2 and 3) maintained a continuously 'high level' of attachment, and

about 12% (class 5 and 7) displayed a 'strengthening' of attachment towards the end of the follow-up. The attachment was permanently weak in about 1 of 10 (class 8), and a small cluster with a U-shaped pattern (class 4) was also seen; we decided to collapse these clusters and defined their attachment as 'poor'. In addition to being substantially grounded, this collapsing provided statistical power for subsequent analyses. Thus, we arrived at a four class 'LMA history' variable that comprised 'permanent'(class 6), 'high level'(class 2 and 3), 'strengthening'(class 5 and 7) and 'poor' (class 4 and 8) LMA (Figure 2).

(Figure 2 here)

Table 1. Distribution (%) of dependent and independent variables in relation to LMA history. All values are displayed in %, except p-values.

	n=550 Permanent	n=163 High level	n=126 Strengthening	n=130 Poor	P-value (χ^2 test)
Track	0	1	2	3	
Dependent variables age 42					
Psychological distress	26.3	35.7	41.0	52.8	<0.001
Non-optimal self-rated health	29.1	36.2	39.2	48.1	<0.001
Independent variables					
Health status at age 30					
Psychological distress	19.4	27.3	36.3	31.9	<0.001
Non-optimal self-rated health	16.8	29.4	26.6	33.3	<0.001
Sociodemographics					<0.001
Blue-collar worker	33.5	25.8	35.7	47.7	
Lower white-collar worker	15.7	8.0	18.3	6.2	
Upper white-collar worker	50.8	66.3	46.0	46.2	
Single marital status	19.1	20.9	22.2	32.6	0.010
No child as parental status	17.3	16.6	15.1	19.4	0.831
Women	44.5	42.3	61.9	55.4	0.001

Table 1 shows the distribution of the key variables by LMA history. In general, LMA history with less strong attachment entailed poorer health at age 42. Concerning covariates, similar

patterns were seen for psychological distress and non-optimal self-rated health at age 30, thus indicating that health status differed between LMA history already at baseline. There were also significant differences with regard to socioeconomic position; the proportion of blue-collar workers was highest in the group with poor attachment to the labour market. The poor attachment group was also most likely to be living without a partner (p=.010). Parental status did not differ between the groups. The proportion of women was higher in strengthening and poor level attachment, whereas the permanent and high level attachment were dominated by men (p=.001).

Table 2. Odds ratios (OR) and 95% confidence intervals (CI) for psychological distress and non-optimal self-rated health at age 42 as dependent variable for LMA history over 12 years as main exposure after adjustment for health status age 30, sociodemographic variables.

Trajectories		Psychological distress as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.55 (1.06–2.27)	1.56 (1.06–2.30)	1.50 (0.99–2.28)	1.54 (1.01–2.35)
Strengthening	n=126	1.95 (1.29–2.93)	1.77 (1.17–2.69)	1.68 (1.07–2.66)	1.57 (0.99–2.49)
Poor	n=130	3.14 (2.10–4.70)	2.77 (1.83–4.19)	2.87 (1.83–4.49)	2.52 (1.59–3.98)
P-value for LMA		<0.001	<0.001	<0.001	0.001

Trajectories		Non-optimal self-rated health as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.38 (0.96–2.00)	1.46 (1.00–2.13)	1.19 (0.81–1.76)	1.26 (0.85–1.87)
Strengthening	n=126	1.57 (1.05–2.36)	1.52 (1.00–2.29)	1.44 (0.94–2.20)	1.40 (0.91–2.16)
Poor	n=130	2.26 (1.53–3.34)	2.00 (1.34–3.00)	1.83 (1.21–2.77)	1.65 (1.08–2.53)
P-value for LMA		<0.001	0.003	0.025	0.087

Model 0 crude odds ratios
Model 1 odds ratios adjusted for sociodemographic variables (socioeconomic position, gender, marital status and parental status).
Model 2 odds ratios adjusted for health status at age 30
Model 3 odds ratios adjusted for models 1+2.

To analyse whether LMA history was related to poor health, self-rated health and psychological distress were regressed on LMA history with permanent attachment as the reference category, in multiple logistic regression models (Table 2). The LMA history had a significant overall p-value on both health outcomes. In unadjusted analyses with psychological distress, lower strength of attachment involved higher odds than permanent (Table 2, Model 0; LMA history p<0.001). In model 0 we found increased OR in relation to lower attachment to the labour market, ranging from high level OR 1.55 (CI 1.06–2.27), strengthening OR 1.95 (CI 1.29–2.93) , and poor OR 3.14 (CI 2.10–4.70). Adjusting for covariates (sociodemographic and psychological distress at age 30, Models 1 and 2, respectively) resulted in attenuation of the ORs for those with 'strengthening' and 'poor' attachment. Lastly, in the fully adjusted models (Model 3) only the high level and poor attachment were significantly related to psychological distress, with the 'poorly' attached displaying the numerically strongest association (OR=2.52 CI 1.59–3.98). Although borderline significant, the OR for the 'strengthening' (OR=1.57 CI 0.99–2.49) attachment was of comparable strength to the 'high level' attachment (OR=1.54 CI 1.01–2.35). While with a slight decrease in OR along with adjustments for sociodemographic factors and previous health, the same pattern is still evident in the final model, and the overall p value remained highly significant (p=.001).

Results for non-optimal self-rated health were slightly less prominent than for psychological distress but pointed in the same direction. Unadjusted models (Table 2, Model 0) showed a significant overall relationship between LMA history and self-rated health (p<.001), and the LMA history with 'strengthening'(OR= 1.57 CI 1.05–2.36) and 'poor'(OR=2.26 CI 1.53–3.34) attachment had higher odds of having non-optimal self-rated health. For those with 'high level' (OR=1.38 CI 0.96–2.00) of attachment the risk was numerically higher, although

not significantly, than for those with 'permanent' attachment. After adjustment for health status at age 30 (Model 2) the results for the 'strengthening' group were attenuated below significance. In the final model, only the OR for the 'poor' attachment group was significantly high, while the overall p-value for the association of LMA history with non-optimal health dropped to borderline significance (p=.087).

DISCUSSION

In this study we have identified four tracks of LMA history over 12 years: permanent, high level, strengthening and poor. Compared to the cohort with 'permanent' attachment, we found a higher probability of psychological distress among three cohorts with non-permanent LMA. The differences were partially attributed to previous health and to some extent also to sociodemographic variables; nevertheless, the overall contribution of LMA history remained significant in the fully adjusted model. The results for non-optimal self-rated health were similar but somewhat weaker.

Much of the previous research has suggested that temporary employment is a stepping stone towards more stable employment.[47] In the present study we found that, although the greater part of the sample already had a fairly strong attachment or were moving towards stronger attachment, one track remained poorly attached to the labour market over the 12 years. Thus, while the stepping stone hypothesis might be correct for the majority, a substantial minority appear to be trapped in an employment situation of permanent temporariness. Further, we found more women than men in this least favourable situation. This is probably explained by the widespread use of 'on-demand employment contracts' in women-dominated sectors of business[43] such as care and welfare and education [48] which are two industries which

together stand for 33% of all temporary contracts in Sweden[11]. These results can be interpreted as showing that, even though Sweden is considered one of the top-ranked gender-equal countries with regard to high labour market participation among women, the internal labour market is still gender-segregated.

Our findings importantly suggest that in addition to the present LMA, the LMA history is important for health. In line with previous research we found that the group with least attachment had the worst health status.[15, 17] As in our previous report showing a cumulative effect of temporary employment on health status,[20] the present report further corroborates that employment history impacts on health status. However, a more nuanced picture emerged when the separate labour market tracks were considered.

First, even those with 'high level' attachment experienced psychological distress more commonly than those with 'permanent' attachment. Thus, it appears that even marginal exposure to what could be labelled 'LMA stress', can contribute to psychological distress over time

Second, the group with 'strengthening' attachment, still experienced poor health more commonly than those with permanent attachment, even after adjustments for sociodemographic variables. This result suggests that earlier suboptimal attachment has a potentially 'scarring' effect. It is important to point out that in cross-sectional or short-term longitudinal designs, the 'strengthening' group would have been regarded as having a fairly favourable labour market attachment. This particular finding therefore stresses the importance of taking the specific patterns of the long-term labour market history into account when examining associations with health status.

Third, among those poorly attached to the labour market is where we found the highest ORs for poor health. The poorly attached were also more likely to have other risk factors for psychological distress, which seemed to partly account for the association. For example, being single involves a lower average household income and decreases the level of control [49], and poor previous health could also contribute to difficulties getting a stable attachment to the labour market, as those with health troubles could be less employable, particularly for blue-collar occupations[50]. The poorly attached are also those with most experience of unemployment, which previously has been connected to mortality and morbidity[5, 51]. Thus, the poor mental health in this group seems to be a result not only of their enduringly unfavourable LMA history, but also of a range of coexisting burdensome life circumstances. As described in the introduction job insecurity, financial stress, lack of reciprocity, uncertainty and lack of autonomy are some of the broad range of potential pathways linking temporary employment to poor health in previous studies [9, 10, 15, 52-54]. Although mediating mechanisms has not been within the scope of this paper, our results can be understood in the light of potential pathways presented in previous research.

Methodological considerations

Our study relies on trajectory analysis, a method that became available in the beginning of the 2000s, largely by virtue of increased computing power. Instead of prefixing alternative developments, the analysis is seeking developmental trajectories that emerge from the data itself [17]. It gives each individual posterior probability values for each trajectory, and allocates them according to the highest probability into groups or categories so that individuals within a group are more similar than individuals between groups [55]. To our knowledge, trajectory analysis has been used only sparsely in previous studies about LMA.[56] Our previous research using a core-periphery structure has only yielded a measure summarising the total accumulation of peripheral employment over 12 years,[20] whereas this

study has added new knowledge to the field by showing when exposure takes place and has provided patterns of labour market history, and this specific knowledge has hinted about potential scarring effects of poor LMA (seen in the strengthening group), knowledge that has previously been hidden due to methodological limitations. In general, this study represents novel methodological ideas in a research area that has been obscured by the practice of measuring the labour market position cross-sectionally or with short-term transitions between labour market positions.

The longitudinal design of this study has been an asset, as it made it possible to adjust for previous health and thereby reduced the possibility of reverse causation, and especially as the attrition rate was kept low. Concerning the generalisability of this study, this cohort has been shown by a previous assessment to be representative of Sweden as a whole concerning demographic data.[24] It is plausible that health effects of poor labour market attachment operate depending on the social context. For example, health implications might be more or less evident depending on structural factors such as national labour market policies, education system and legislation.[57] Sweden is part of the Scandinavian welfare regimes which are considered to have strong Social Democratic values and government-funded benefits during episodes of unemployment. The welfare state Sweden could therefore possibly reduce negative health effects of flexible employment,[58] which is in contrast to the results in our study. However, Swedish unions have criticised the current labour market regulations for being too liberal regarding temporary employment. With current regulations it is possible to hire a substitute for up to two years and after that hire the same person on a general temporary employment contract for up to two years. This causes a situation where people are at risk of becoming long-term temporary.[59] As a result of this approximately 10% of all temporary employees have been employed by the same employer for 5 years or more. The Swedish

labour market regulation could therefore be a reason for the noticeable finding in this study, where a substantial part of the workers followed remained poorly attached over the 12 years which were examined. Long-term temporary employment could be a future problem, and also a relevant group to study further in future research.

The sample size was limited in this study, which is a pointer for potential future research, which would benefit from analysing datasets with a larger sample size. Such studies would be able to stratify analyses of gender or socioeconomic position, which could enrich the understanding of the field of LMA and illness. In this study we have focused on poor LMA as a risk factor for poor health, but there are a range of other circumstances relating to precarious employment which could explain the results, such as vulnerability, lack of benefits, low wages and disempowerment[44]. Therefore we would recommend future research to elaborate on other aspects of precariousness linked to poor LMA, as well as exploring the validity of the phenomena in a different context, e.g. countries with different social and labour policies.

This study is based on self-reported data. Equivalent measures of self-rated health and psychological distress have displayed good validity by predicting future mortality and morbidity[60] even after adjustments for known health risks.[61] Furthermore, using retrospective measurement of LMA history could lead to recall bias. Nevertheless, retrospective questions about occupational history have been shown to maintain good quality in terms of agreement with census data.[62]

Further, the fact that we combined tracks could be seen as a limitation of this study. However, in our understanding some of the tracks could be combined depending on their similar

movement in the labour market. We first analysed each of the eight tracks separately in relation to the outcome, to make sure that none of combinations resulted in blurring of the results (data not shown). One limitation regarding the method was that, due to features of the program, only half of the time points (12 of 24 possible time points) could be included in the trajectory analysis. However, we used the first and second half of every second year to reduce the possibility of systematic error due to seasonal variations in employment status.

The structure behind the conceptualisation of LMA needs consideration. The LMA structure is based on the idea that there is a gradient in the labour market, with some positions being more strongly attached to the labour market than others. We have used a modified version of Aronsson's core-periphery model[32] to order the type of employment contract/situation, from the most attached to the least attached to labour market. Our structure is indeed a simplification of a more complex reality; this should be considered when interpreting the results. The LMA variable and socioeconomic position are partly overlapping, as the group of entrepreneurs is part of both the SEP classification and the LMA variable. This overlap could cause over-adjustment in the logistic regression analysis. As these two variables partly measure the same phenomenon, adjusting for socioeconomic position could adjust for part of the true effect of LMA.

Conclusions

Policymakers frequently promote flexible employment contracts. However, this study shows that those with the most favourable but long-term high level attachment suffer from worse health than those permanently attached. Further, despite a development towards favourable employment circumstances, health discrepancies can endure, suggesting a potentially

‘scarring’ effect. Last, those poorly attached display the worst health situation, this partly due to coexisting burdensome life circumstances. We firmly suggest that policymakers should consider the results of this study and take responsibility for creating employment opportunities suitable for maintaining a healthy working life, rather than promoting employment contracts characterised by poor attachment to the labour market.

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CONTRIBUTORSHIP STATEMENT

AH, PEG, PV and AW have substantially contributions to conception and design. AW and PEG have contributed to analysis and interpretation of data. AW, AH, PV and PEG have drafted the article and revising it critically for important intellectual content. All authors have given their final approval of the version to be published.

DATA SHARING STATEMENT

See Hammarström and Janlert for details of the NSC data and procedures. The Northern Swedish Cohort is conducted at Umeå University. The dataset is not freely available, and researchers interested in collaboration should get into contact with the Principal Investigator, Anne Hammarström.

COMPETING INTERESTS

None declared.

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Figure 1. The number of cohort members clustered by trajectory analysis into eight tracks (curves based on means of the attachment at the time points).

Figure 2. Collapsed tracks of labour market attachment history. Permanent, high level, strengthening and poor attachment.

History of labour market attachment as a determinant of ~~the~~ health status: a 12-year follow-up of the Northern Swedish Cohort

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ABSTRACT

Objective: The present study aims at using trajectory analysis to measure labour market attachment (LMA) over 12 years and at examining whether labour market tracks relate to perceived health status.

Design: Data were retrieved from a 26-year prospective cohort study, the Northern Swedish Cohort.

Setting and participants: All 9th grade students (n=1083) within the municipality of Luleå in northern Sweden were included in the baseline investigation in 1981. The vast majority (94%) of the original cohort participated at the fourth follow-up. In this study, 969 participants were included.

Measures: Perceived health status (psychological distress and non-optimal self-rated health) at age 42 and the data obtained from questionnaires.

Results: We have identified four tracks in relation to LMA across the 12-year period: 'permanent', 'high level', 'strengthening' and 'poor level' of attachment. LMA history relates to psychological distress. High level (OR 1.55 (1.06-2.27)), strengthening (OR 1.95 (1.29-2.93)) and poor attachment (OR 3.14 (2.10-4.70) involve higher OR for psychological distress compared to permanent attachment. The overall p-value remained significant in the final model (0.001). Analyses regarding non-optimal self-rated health displayed a similar pattern but this was not significant in the final model.

Conclusions: Our results suggest that health status in mid-life, particularly psychological distress, is related to patterns of LMA history, to a large part independently of other social risk factors and previous health. Consideration of heterogeneity and time in labour market attachment might be important when analysing associations with perceived health.

Main strengths

- Using longitudinal data with exceptionally high response-rate
- Applying trajectory analysis which only has previously been sparsely used in this field
- Provides a uniquely rich and detailed data on temporary contracts over a long period of time

Limitations

- Relies on self-reported data
- Used a relatively small sample

INTRODUCTION

During the last three decades or so, demands for a more flexible workforce have increased all over the world. Flexibility in the labour market is reflected, for example, in the proportion of temporary employees, which in recent years has varied between 13 and 15% of the total working population in Europe.[1] To the individual, the consequence of ~~the~~ flexible employment ~~means~~ is that attachment to a workplace is weak and commonly interrupted by unemployment and other episodes out of work. In order to capture the total spectrum of employment relations, ~~both~~ with regard to both quality and quantity, we have chosen to work with the concept of 'labour market attachment' (LMA) in this study. In our definition of the LMA spectrum~~a~~ we have included permanent, non-permanent employment, unemployment and those who are exempted from working. [2-4]

Some relations between labour market status and health status are widely accepted: permanent employment is considered beneficial to health, while unemployment is known to have adverse health effects[5-7] and being out of the labour market in the long term is commonly due to poor health.[8] But when it comes to the health implications of labour market status, between the extremes of the LMA spectrum, the evidence is much scarcer. Previous studies haves proposed that temporary employment could be a risk of poor psychosocial work characteristics [9] with temporary employees more commonly experiencing job insecurity and having a low cash margin [10], which are some of the factors that can be a potential pathways linking weak LMA to poor health. We have for example shown that long--term temporary employees often experience difficulties to working full-time (underemployment) which influences their financial situation in a negative way [11] and which can thus be a source of worry.[12] Poor health canould also be mediated through job strain, although it seems as if this group is affected more by limited influence or control rather than high demands.[13] Moderate LMA has been highlighted as potentially harmful for health status, but research on the topic is divergent.[14] Whereas some studies report worse self-rated health among temporary employees,[15] a few studies even suggest better self-rated health among fixed-term employees.[16] Some studies also indicate that deterioration in self-rated health may not be observable until the attachment is quite weak.[17] A major answer to the mixed research results may lie in the inherent difficulty in capturing the changeable nature of employment. Measurement of the employment situation at one or a few points in time, as in most of the previous studies,[18, 19] may overlook the factual exposures to different positions. Health effects of temporary employment could surface after several years of accumulation, as we have shown in a previous report,[20] or even when several years have passed after the exposure.[21] Moreover, it is possible that it is the chain of passages in different employments, the trajectory of LMA, that contributes to health status. E.g. becoming

more strongly attached over time could contribute to health status differently than becoming less attached to the labour market even if the both groups holds same total exposure.

There are a lot of studies about particular labour market statuses as predictors of health. An inherent problem of such studies is the amount of exposure: cross-sectional information ~~of~~ ~~the~~about status includes great variation, a variable based on the duration of the ongoing status is bound to use cross-sectional health data, and in prospective follow-up settings there may be periods in several statuses during the follow-up. The problem is of special importance in research on~~f~~ the health effects of atypical employment, as there are a wide range of statuses between permanent employment and overt unemployment. To address this topic, we have introduced a score that sums up the exposure to different types of non-permanent employment during the follow-up [20]. The score, however, does not take into account the timing of the exposures. One way to capture the status chains, or the passages in and the transitions between different labour market positions, is provided by trajectory analysis. Applying this method with a ~~four~~ four-class response variable (permanent employment, non-permanent employment, unemployment and out of the labour force) the members of the Northern Swedish Cohort have been clustered ~~onto~~into six different 'labour market attachment tracks'[2]. For the trajectory analysis of the present study, labour market attachment was measured by a ten--class indicator, in order to articulate in more detail the trajectories of non-permanent employment and their association with health.

The few available studies about labour market trajectories in the field of public health have measured LMA ~~in~~ at a few time points, e.g. between one time point ~~to~~ and another[9] and the goal has been descriptive rather than analytic.[19, 22] In the present study, we have applied a

refined scale with regard to LMA. In the measure we have included a spectrum of types of employment situations and also covered a time-span of 12 years. –The method, trajectory analysis[23], offers a novel way to identify differential tracks of LMA history in our population cohort. After obtaining a relevant set of tracks, our aim is to examine in which ways they relate to non-optimal self-rated health or perceived psychological distress.

METHOD

Population and procedures

The study was initiated in 1981 and included all pupils in their last year of compulsory school (n=1083), in the medium-sized industrial town of Luleå in northern Sweden (95% of the cohort were born in 1965). Since 1981 four additional follow-ups have been conducted.[24] The attrition rate in the most recent follow-up from 2007 was low; 94% (n=1005) of the original cohort who were still alive (n=1071) participated. Comprehensive questionnaires, completed by the participants in 1981, 1983, 1986, 1995 and 2007, were used as the main assessment method. This paper is based on data from the 1995 and 2007 follow-ups. Procedures of data collection are described more extensively elsewhere.[24] The study was approved by the Regional Ethical Review Board in Umeå, Sweden.

Measurements

LMA history

We name the response variable of the trajectory analysis ~~as “~~‘labour market attachment~~”~~’ (LMA). It aims to serve as a conceptual and empirical tool to sort ~~out~~ the employment statuses of the post-industrial labour market ~~into~~ along a continuum-.[25, 26] Crudely, it “‘refers to whether or not people have continuous employment (for example all year or only part of it)

and whether or not they have periods of unemployment"–' [27] At headline level [28] there are four major classes of LMA: non-employment, unemployment, temporary employment and permanent employment. Within each class, several subclasses can be discerned. In the present study, the interest is focuseds on differential temporary employment. Seen through LMA, temporary employment covers a set of positions defined by formal job contracts, regardless of the psychological contract, [29] job commitment [30] or perceived job insecurity.[31]

Participants' labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and rows representing different labour market positions. With the instruction 'During which periods have you been employed permanently or have had some type of temporary job contract or have been out of work?' the respondents were prompted to choose between 11 response options for each six-month period: 'permanently employed' (coded as 10), 'entrepreneur' (9), 'employed in project' (8), 'substitute' (7), 'probationary employment' (6), 'on-demand worker' (5), 'seasonal worker' (4), 'temporary employee for other reasons' (3), 'in employment policy measure' (2), 'unemployed' (2), 'out of the labour market' (1). Unemployment and participation in policy measure were merged, and each option was coded to a variable that expressed the strength of LMA on a scale from 10 to 1. The ranking of contracts has been tested in previous research on the accumulation of temporary employment[20] and was based on Aronsson's core-periphery ~~model~~ model.[32] which proposes that there is a health gradient in relation to the type of employment contract. The model ranks contracts based on duration, possibility of on-the-job training, autonomy, and job security.[32] However, we have extended the ranking by also includinge three labour market positions of non-employment. In the event of 'out of labour market', a continuum of five or more periods (i.e. 2.5 years) was required: if there were fewer than five, all periods were coded according to the last labour market position, to purposely

exclude those on parental leave or studying from this category. As the last category 'out of labour market' was given the lowest score in relation to LMA. The intention for this group was that it was supposed to be contained by those mainly on sickness benefit (supported by analysis, data not shown), not those temporarily not working due to parental leave or education). These operations thus yielded a score of the strength of LMA for each of the 24 successive half-year periods. The scores served as the data for the trajectory analysis.

Indicators of health status

Psychological distress at age 30 and 42 was measured with a question that inquired whether the respondent during the last year had experienced any of the following symptoms: restlessness, concentration problems, being worried or anxious, palpitations, anxiety or panic or other nervous problems. Reporting one or more of the six symptoms was coded as 1 and none as 0, equalling a dichotomisation into the quartile with the most symptoms versus the rest. The question was derived from the 'Survey of living conditions'.[33]

Non-optimal self-rated health at age 30 and 42, was measured with one question, 'How do you rate your general health?', with response options: good, average or bad.[33] The responses were dichotomised into the quartile with the worst health (average or bad) coded as 1, and the rest (good) coded as 0.[10, 34]

Covariates

Socio-economic position is a strong predictor of health [35-38]. LMA has~~ve~~ been shown to be related to occupational ~~class~~ class.[39] ~~it~~ It is important to consider socio-economic position as a possible confounder when studying the relationship between temporary employment and illness. In this study *Socioeconomic position (SEP) in 2007* was based on one question about occupation, which was classified according to the Swedish socioeconomic classification of occupational categories.[40] Upper white-collar and self-employed were coded as 0, lower white-collar workers were coded as 1 and blue-collar workers were coded as 2.

~~Also p~~Partnership and parenthood are also important factors in relation to LMA as these two may be postponed due to insecure working arrangement [39, 41], which could influence social aspects related to illness [39]. Marriage or having a partner is also important to consider when studying LMA, as it can be beneficial to health and financial resources [42]. *Parental status in 2007*, was coded as 0 for those having children and as 1 for the childless. *Marital status in 2007* was measured with one question: 'Are you married or co-habiting?' Yes was coded as 0 and no as 1.

More women than men have poor LMA in terms of temporary employment. [43] Gender has been considered as an important factor in relation to poor LMA and illness, where women's health might be at greater risk. [44] *Women* were coded as 0 and *Men* as one.

Statistics

The participants were clustered according to the development of their LMA over the 12 years applying trajectory analysis.[23] The method has been established as a way of studying individual developmental courses over age or time, and for identifying distinctive groups of individual trajectories within the population that emerge, instead of predefined criteria, from the data itself. Trajectory analysis consists of three steps. First, the appropriate probabilistic

model is chosen for the response variable. ~~Second~~ The second step is to define the degree of the polynomial form of the trajectories. Finally, the number of the clusters is decided, employing the statistical information criteria and the 'common sense criteria' with respect to the substance and aims of the study. As a result, the developmental trajectories within clusters are as similar as possible, and trajectories between clusters are as different as possible.[45] At individual level, cluster membership is dictated by the highest calculated posterior probability of belonging to a particular cluster.

Trajectory analyses were conducted with the Mplus program package. The analysis allowed for 12 time points, and the first and the second half of every second year were chosen in order to take into account possible systematic seasonal variation of LMA.

We used logistic regression (odds ratio and 95% CI) to test whether LMA history was associated with non-optimal self-rated health and psychological distress at age 42. Adjustments were made for the health indicator at age 30, gender, socioeconomic position, parental status and marital status. SPSS v17 was used for the regression analyses. Women and men were analysed together to preserve power.

RESULTS

The data consists of a ten ~~10~~ class ordinal indicator of LMA, and the form of probability distribution of longitudinal sequence of measurement for such variable is the multinomial distribution.

The adjusted Bayesian information criterion (BIC) value decreased from 17435.474 for the linear model to 16656.622 for the quadratic polynomial model, indicating that the latter can be preferred ~~over~~ to the former. Other information criteria provided by the Mplus program ~~as well~~likewise pointed in the same direction.

~~Optimal~~ The optimal number of trajectories was searched by checking the solutions up to nine. The adjusted~~n~~ Bayesian information criterion (Aadj. BIC) was used for choosing the solution.[46] The Adj. BIC value (as well as the other information criteria) decreased when the number of trajectories was increased, rapidly ~~in~~ at the beginning and slower ~~in~~ at the end. From seven-trajectory to eight-trajectory solution the figure decreased from 17856.940 to 17606.402. Thereafter the decrease slowed down. We decided to continue with eight trajectories, as this solution provided, in addition to detailed depiction of differential LMA, the opportunity to exclude the cluster with zero LMA that was out~~of~~side our research interest.

Figure 1 illustrates the 'labour market tracks' based on means of the LMA scores at each time point of the individuals classified into each trajectory. Individuals on track 1 (3% of the cohort) also were excluded, as they were mainly disability pension recipients and their health was poor by definition. The track of 'permanent' employment throughout the follow-up included more than half of the cohort, whereas the remaining six clusters were relatively small and there were relatively similar tracks. We collapsed these six clusters into three as follows. A considerable part (tracks 2 and 3) maintained a continuously 'high level' of attachment, and about 12% (tracks 5 and 7) displayed a 'strengthening' of attachment towards the end of the follow-up. The attachment was permanently weak in about ~~one~~ 1 of 10 (track 8), and a small

cluster with a U-shaped pattern (track 4) was also seen; we decided to collapse these clusters and defined their attachment as 'poor'. In addition to being substantially grounded, this collapsing provided statistical power for subsequent analyses. Thus, we arrived at a four class 'LMA history' variable that comprised 'permanent', 'high level', 'strengthening' and 'poor' LMA (Figure 2).

(Figure 1 here)

Table 1. Distribution (%) of dependent and independent variables in relation to LMA history. All values are displayed in %, except p-values.

	n=550 Permanent	n=163 High level	n=126 Strengthening	n=130 Poor	P-value (χ^2 test)
Track	0	1	2	3	
Dependent variables age 42					
Psychological distress	26.3	35.7	41.0	52.8	<0.001
Non-optimal self-rated health	29.1	36.2	39.2	48.1	<0.001
Independent variables					
Health status at age 30					
Psychological distress	19.4	27.3	36.3	31.9	<0.001
Non-optimal self-rated health	16.8	29.4	26.6	33.3	<0.001
Sociodemographics					<0.001
Blue-collar worker	33.5	25.8	35.7	47.7	
Lower white-collar worker	15.7	8.0	18.3	6.2	
Upper white-collar worker	50.8	66.3	46.0	46.2	
Single marital status	19.1	20.9	22.2	32.6	0.010
No child as parental status	17.3	16.6	15.1	19.4	0.831
Women	44.5	42.3	61.9	55.4	0.001

Table 1 shows the distribution of the key variables by LMA history. In general, LMA history with less strong attachment entailed poorer health at age 42. Concerning covariates, similar patterns were seen for psychological distress and non-optimal self-rated health at age 30, thus indicating that health status differed between LMA history already at baseline. There were also significant differences with regard to socioeconomic position; the proportion of blue-

collar workers was highest in the group with poor attachment to the labour market. The poor attachment group was also most likely to be living without a partner (p=.010). Parental status did not differ between the groups. The proportion of women was higher in strengthening and poor level attachment, whereas the permanent and high level attachment were dominated by men (p=.001).

Table 2. Odds ratios (OR) and 95% confidence intervals (CI) for psychological distress and non-optimal self-rated health at age 42 as dependent variable for LMA history over 12 years as main exposure after adjustment for health status age 30, sociodemographic variables.

Trajectories		Psychological distress as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.55 (1.06–2.27)	1.56 (1.06–2.30)	1.50 (0.99–2.28)	1.54 (1.01–2.35)
Strengthening	n=126	1.95 (1.29–2.93)	1.77 (1.17–2.69)	1.68 (1.07–2.66)	1.57 (0.99–2.49)
Poor	n=130	3.14 (2.10–4.70)	2.77 (1.83–4.19)	2.87 (1.83–4.49)	2.52 (1.59–3.98)
P-value for LMA		<0.001	<0.001	<0.001	0.001

Trajectories		Non-optimal self-rated health as outcome			
		Model 0	Model 1	Model 2	Model 3
Permanent	n=550	1	1	1	1
High level	n=163	1.38 (0.96–2.00)	1.46 (1.00–2.13)	1.19 (0.81–1.76)	1.26 (0.85–1.87)
Strengthening	n=126	1.57 (1.05–2.36)	1.52 (1.00–2.29)	1.44 (0.94–2.20)	1.40 (0.91–2.16)
Poor	n=130	2.26 (1.53–3.34)	2.00 (1.34–3.00)	1.83 (1.21–2.77)	1.65 (1.08–2.53)
P-value for LMA		<0.001	0.003	0.025	0.087

Model 0 crude odds ratios
Model 1 odds ratios adjusted for sociodemographic variables (socioeconomic position, gender, marital status and parental status).
Model 2 odds ratios adjusted for health status at age 30
Model 3 odds ratios adjusted for models 1+2.

To analyse whether LMA history was related to poor health, self-rated health and psychological distress were regressed on LMA history with permanent attachment as the reference category, in multiple logistic regression models (Table 2). The LMA history had a significant overall p-value on both health outcomes. In unadjusted analyses with

psychological distress, lower strength of attachment involved higher odds than permanent (Table 2, Model 0; LMA history p<0.001). In model 0 we found increased OR in relation to lower attachment to the labour market, ranging from high level OR 1.55 (CI 1.06–2.27), strengthening OR 1.95 (CI 1.29–2.93) , and poor OR 3.14 (CI 2.10–4.70). Adjusting for covariates (sociodemographic and psychological distress at age 30, Models 1 and 2, respectively) resulted in attenuation of the ORs for those with 'strengthening' and 'poor' attachment. Lastly, in the fully adjusted models (Model 3) only the high level and poor attachment were significantly related to psychological distress, with the 'poorly' attached displaying the numerically strongest association (OR=2.52 CI 1.59–3.98). Although borderline significant, the OR for the 'strengthening' (OR=1.57 CI 0.99–2.49) attachment was of comparable strength to the 'high level' attachment (OR=1.54 CI 1.01–2.35). While with a slight decrease in OR along with adjustments for sociodemographic factors and previous health, the same pattern is still evident in the final model, and the overall p value remained highly significant (p=.001).

Results for non-optimal self-rated health were slightly less prominent than for psychological distress but pointed in the same direction. Unadjusted models (Table 2, Model 0) showed a significant overall relationship between LMA history and self-rated health (p<.001), and the LMA history with 'strengthening'(OR= 1.57 CI 1.05–2.36) and 'poor'(OR=2.26 CI 1.53–3.34) attachment had higher odds of having non-optimal self-rated health. For those with 'high level' (OR=1.38 CI 0.96–2.00) of attachment the risk was numerically higher, although not significantly, than for those with 'permanent' attachment. After adjustment for health status at age 30 (Model 2) the results for the 'strengthening' group were attenuated below significance. In the final model, only the OR for the 'poor' attachment group was significantly

high, while the overall p-value for the association of LMA history with non-optimal health dropped to borderline significance (p=.087).

DISCUSSION

In this study we have identified four tracks of LMA history over 12 years: permanent, high level, strengthening and poor. Compared to the cohort with 'permanent' attachment, we found a higher probability of psychological distress among three cohorts with non-permanent LMA. The differences were partially attributed to previous health and to some extent also to sociodemographic variables; nevertheless, the overall contribution of LMA history remained significant in the fully adjusted model. The results for non-optimal self-rated health were similar but somewhat weaker.

Much of the previous research has suggested that temporary employment is a stepping stone towards more stable employment.[47] In the present study we found that, although the greater part of the sample already had a fairly strong attachment or were moving towards stronger attachment, one track remained poorly attached to the labour market over the 12 years. Thus, while the stepping stone hypothesis might be correct for the majority, a substantial minority appear to be trapped in an employment situation of permanent temporariness. Further, we found more women than men in this least favourable situation. This is probably explained by the widespread use of 'on-demand employment contracts' in women-dominated sectors of business[43] such as care and welfare and education [48] which are two industries which together stands for 33% of all temporary contracts in Sweden[11]. These results can be interpreted as showing that, even though Sweden is considered one of the top--ranked gender

gender-equal countries, with regard to high labour market participation among women, and the internal labour market is still gender-segregated.

Our findings importantly suggest that in addition to the present LMA, the LMA history is important for health. In line with previous research we found that the group with least attachment had the worst health status.[15, 17] As in our previous report showing a cumulative effect of temporary employment on health status,[20] the present report further corroborates that employment history impacts on health status. However, a more nuanced picture emerged when the separate labour market tracks were considered.

First, even those with 'high level' attachment experienced psychological distress more commonly than those with 'permanent' attachment. Thus, it appears that even marginal exposure to what could be labelled 'LMA stress', can contribute to psychological distress over time.

Second, the group with 'strengthening' attachment, still experienced poor health more commonly than those with permanent attachment, even after adjustments for sociodemographic variables. This result suggests that earlier suboptimal attachment has a potentially 'scarring' effect. It is important to point out that in cross-sectional or short-term longitudinal designs, the 'strengthening' group would have been regarded as having a fairly favourable labour market attachment. This particular finding therefore stresses the importance of taking the specific patterns of the long-term labour market history into account when examining associations with health status.

Third, among those poorly attached to the labour market is where we found the highest ORs for poor health. The poorly attached were also more likely to have other risk factors for psychological distress, which seemed to partly account for the association. For example, being single involves a lower average household income and decreases the level of control [49], and poor previous health could also contribute to difficulties getting a stable attachment to the labour market, as those with health troubles could be less employable, particularly for blue-collar occupations[50]. The poorly attached are also those with most experience of unemployment, which previously has been connected to mortality and morbidity[5, 51]. Thus, the poor mental health in this group seems to be a result not only of their enduringly unfavourable LMA history, but also of a range of coexisting burdensome life circumstances. As described in the introduction job insecurity, finanicial stress, lack of reciprocity, uncertainty, and lack of autonomy are some of the broad range of potential pathways linking temporary employment to poor health in previous studies [9, 10, 15, 52-54]. Although mediating mechanisms has not been within the scope of this paper, our results can be understood in the light of potential pathways presented in previous research.

Methodological considerations

Our study relies on trajectory analysis, a method that became available in the beginning of the 2000s, largely by virtue of increased computing power. Instead of prefixing alternative developments, the analysis is seeking developmental trajectories that emerge from the data itself [17]. It gives each individual posterior probability values for each trajectory, and allocates them according to the highest probability into groups or categories so that individuals within a group are more similar than individuals between groups [55]. To our knowledge, trajectory analysis has been used only sparsely in previous studies about

LMA.[56] Our previous research using a core-periphery structure has only yielded a measure summarisszing the total accumulation of peripheral employment over 12 -years,[20] whereas, this study has added new knowledge to the field by showing when exposure is takesing place and has provided patterns of labour market history, and this specific knowledge has hinted about potential scaring effects of poor LMA (seen in the strengthening group) which is a, knowledge that has previously been hidden due to methodological limitations. In general, this study represents novel methodological ideas in a research area that has been obscured by the practice of measuring the labour market position cross-sectionally or with short-term transitions between labour market positions.

The longitudinal design of this study has been an asset, as it made it possible to adjust for previous health and thereby reduced the possibility of reverse causation, and especially as the attrition rate was kept low. Concerning the generalisability of this study, this cohort has been shown by a previous assessment to be representative of Sweden as a whole concerning demographic data.[24] It is plausible that health effects of poor labour market attachment operate depending on the social context. For example, E.g. that health implications might be more orf less evident depending on structural factors such as national labour market policies, education system and legislation.[57] Sweden is part of the Scandinavian welfare regimes which are considered to have strong Social Democratic values and government--funded benefits during episodes of unemployment. The welfare state Sweden could therefore possibly reduce negative health effects of flexible employment,[58] which is in contrast to the results in our study. However, Swedish unions haves criticised the current labour market regulations for being too liberal regarding temporary employment. With current regulations it 's is possible to hire a substitute for up to two years and after that hire the same person on a general temporary employment contract for up to two years. ,This causes a situation where

people are at risk of becoming long- -term temporary.[59] As a result of this approximately 10% of all temporary employees haves been employed by the same employer for 5 years or more. The Swedish labour market regulation could therefore be a reason to for the noticeable finding in this study; , where a substantial part of the workers followed remained poorly attached over the 12 years which waswere examined. Long Long-term temporary employment could be a future problem, and also a relevant group to study further in future research.

Sample The sample size was limited in this study, which is a pointer for ing to potential future research, which would benefit from analysing datasets with a larger sample size. ; Such studies would be able to stratify analysis ofn gender or socioeconomic position, this which could enrich the understanding of the field of LMA and illness. In this study we have focused on poor LMA as a risk factor for poor health, but there are however a range of other circumstances the relatinges to precarious employment which could explain the results, such as vulnerability, lack of benefits, low wages and, disempowerment[44]. Therefore we would recommend future research to elaborate on other aspects of precariousness linked to poor LMA, as well as exploring the validity of the phenomena in a different context, e.g. countriesy with different social and labour policies.

This study is based on self-reported data. Equivalent measures of self-rated health and psychological distress have displayed good validity by predicting future mortality and morbidity[60] even after adjustments for known health risks.[61] Furthermore, using retrospective measurement of LMA history could lead to recall bias. Nevertheless, retrospective questions about occupational history have been shown to maintain good quality in terms of agreement with census data.[62]

Further, the fact that we combined tracks could be seen as a limitation of this study. However, in our understanding some of the tracks could be combined depending on their similar movement in the labour market. We first analysed each of the eight tracks separately in relation to the outcome, to make sure that none of combinations resulted in blurring of the results (data not shown). One limitation regarding the method was that, due to features of the program, only half of the time points (12 of 24 possible time points) could be included in the trajectory analysis. However, we used the first and second half of every second year to reduce the possibility of systematic error due to seasonal variations in employment status.

The structure behind the conceptualisation of LMA needs consideration. The LMA structure is based on the idea that there is a gradient in the labour market, with some positions being more strongly attached to the labour market than others. We have used a modified version of Aronsson's core-periphery model[32] to order the type of employment contract/situation, from the most attached to the least attached to labour market. Our structure is indeed a simplification of a more complex reality; this should be considered when interpreting the results. The LMA variable and socioeconomic position ~~is~~ are partly overlapping, as the group of entrepreneurs ~~both~~ is part of both the SEP classification and the LMA variable. This overlap could cause ~~over~~ over-adjustment in the logistic regression analysis. As these two variables partly measure the same phenomenon, adjusting for socioeconomic position could adjust for part of the true effect of LMA.

Conclusions

Policymakers frequently promote flexible employment contracts. However, this study shows

that those with the most favourable but long-term high level attachment suffer from worse health than those permanently attached. Further, despite a development towards favourable employment circumstances, health discrepancies can endure, suggesting a potentially 'scarring' effect. Last, those poorly attached display the worst health situation, this partly due to coexisting burdensome life circumstances. We firmly suggest that policymakers should consider the results of this study and take responsibility for creating employment opportunities suitable for maintaining a healthy working life, rather than promoting employment contracts characterised by poor attachment to the labour market.

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COMPETING INTERESTS

None declared.

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Key messages

- There is controversy as to whether being less attached to the labour market is related to poor health or not.
- This unclarity might partly stem from the failure to take heterogeneous employment histories into consideration
- We have applied trajectory analysis ~~on~~ to 12-year labour market history and found associations between labour market attachment and health status.
- Those with high level, strengthening and poor level of non-permanent attachment displayed worse health status than those in permanent employment in the entire 12-year period.
- Our findings illustrate the temporal complexities of labour market attachment's impact on health over time

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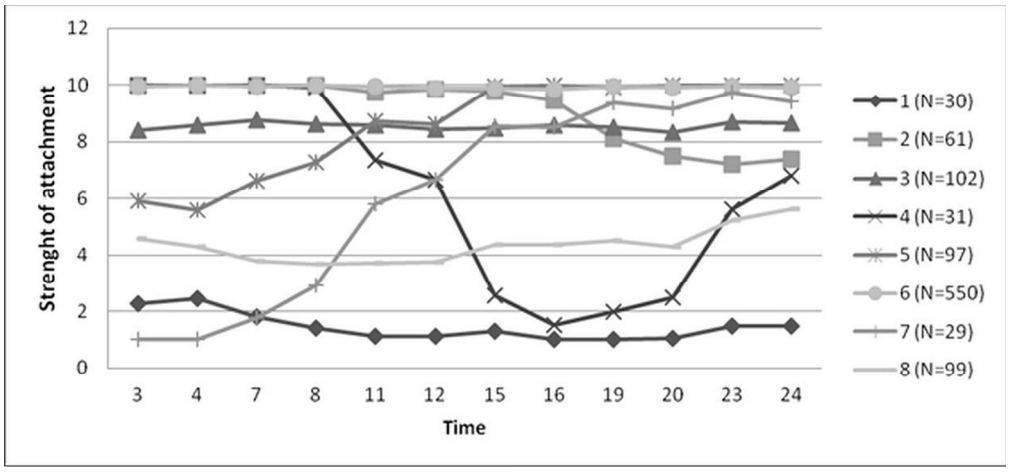
Figure 1. The number of cohort members clustered by trajectory analysis into eight tracks (curves based on means of the attachment at the time points).

Figure 2. Collapsed tracks of labour market attachment history. Permanent, high level, strengthening and poor attachment.



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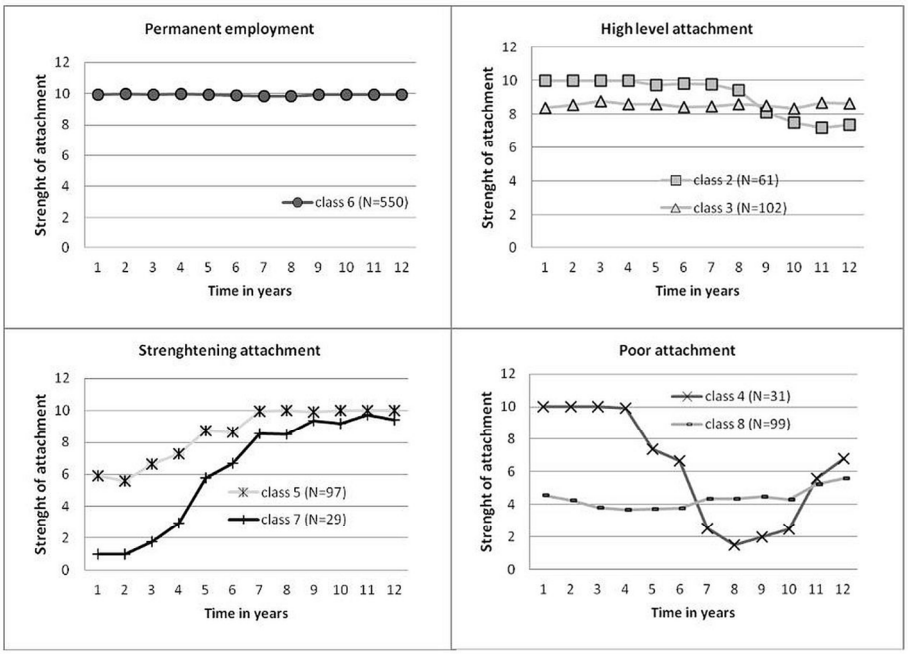

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