Sick leave patterns as predictors of being granted a disability pension or experiencing long-term sick leave: A 6.75-year follow-up study in municipal eldercare workers

Stapelfeldt CM, Nielsen CV, Andersen NT, Krane L, Borg V, Fleten N, Jensen C

Implementation Work Disability Prevention Knowledge
Risk – what is already known?

- Low socioeconomic status (occupation)
- Work environment factors
- High age
- Single men

- Sick leave length
  - Short-term sick leave?
Objective

To study whether a workplace-registered frequent short-term sick leave spell pattern was an early indicator of future disability pension or future long-term sick leave among municipal eldercare workers.
How to operationalise sick leave

- Frequency per year
- Length in total per year
- Spell duration
- Incidence rate
- Cumulative incidence proportion (CIP)

<table>
<thead>
<tr>
<th>Sick leave patterns</th>
<th>= Short</th>
<th>= Long</th>
<th>= Mix</th>
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<tbody>
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Sick leave patterns

- 0-2 short spells: 53%
- 3-17 short spells: 21%
- 2-13 mixed spells: 21%
- 1-5 Long spells: 5%
Outcome

- National register on public transfer payments (DREAM)
  - Disability pension (yes / no)
  - Long-term sick leave (8 consecutive weeks)
Analyses (1:2)

- Wash-out period (2005)
  - Confounding by long-term sick leave immediately before outcome
- Cumulative Incidence Proportion (Kaplan-Meier curve)
- Entry date 1\textsuperscript{st} Jan. 2006
- Follow-up 352 weeks
  - Event / competing risk (\textit{early retirement benefit}, \textit{retirement pension or death}) / censored observations (emigration)
Analyses (2:2)

- Relative cumulative incidence (RR, 95% CI)
  - granted a disability pension
  - experiencing long-term sick leave
  - generalised linear regression model (pseudo values method)

- Adjustments
  - Age, occupation, unfavourable work factors
  - Total sick leave length
Study participants

- 2,774 eldercare workers employed throughout 2004 (96% women)
- Median age 48.3 (18-68) years
- Homecare personnel (69%)
- 30-37 hours/week (91%)
Results

- **Wash-out**
  - Disability pension
    - 133 (4.8%)
  - Long-term sick leave
    - 379 (13.7%)

- **Time at risk (789,468 / 582,095 weeks)**
  - Disability pension: 112 (4.2%)
  - Long-term sick leave: 761 (32.2%)
Disability pension

The RR (95% CI) of being granted a disability pension within 352 weeks

<table>
<thead>
<tr>
<th>(n=1,818)</th>
<th>Unadjusted</th>
<th>Adjusted *</th>
<th>Adjusted †</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall diff. between the spell patterns</td>
<td>P=0.008</td>
<td>p=0.02</td>
<td>P=0.43</td>
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<td>Sick leave patterns:</td>
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<tr>
<td>0-2 short spells</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>3-17 short spells</td>
<td>2.22 (1.15-4.27)</td>
<td><strong>2.08 (1.00-4.35)</strong></td>
<td>1.76 (0.86-3.62)</td>
</tr>
<tr>
<td>2-13 mixed spells</td>
<td>2.63 (1.39-4.95)</td>
<td><strong>2.61 (1.33-5.12)</strong></td>
<td>2.04 (0.51-8.10)</td>
</tr>
<tr>
<td>1-5 long spells</td>
<td>3.24 (1.24-8.47)</td>
<td>2.77 (0.83-9.29)</td>
<td>1.95 (0.29-13.20)</td>
</tr>
</tbody>
</table>

- * (age, occupation and unfavourable work factors)
- † (age, occupation and unfavourable work factors and total sick leave)
## Long-term sick leave

The RR (95% CI) of experiencing long-term sick leave within 352 weeks

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<tr>
<td>Overall diff.</td>
<td>P&lt;0.0001</td>
<td>p&lt;0.0001</td>
<td>P=0.19</td>
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<td>between the spell</td>
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<td>patterns</td>
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<td>1.44 (1.21-1.71)</td>
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<td>1.20 (0.99-1.46)</td>
</tr>
<tr>
<td>2-13 mixed spells</td>
<td>1.78 (1.51-2.08)</td>
<td><strong>1.64 (1.40-1.94)</strong></td>
<td>1.31 (0.99-1.72)</td>
</tr>
<tr>
<td>1-5 long spells</td>
<td>1.61 (1.20-2.15)</td>
<td><strong>1.52 (1.13-2.03)</strong></td>
<td>1.23 (0.87-1.74)</td>
</tr>
</tbody>
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- † (age, occupation and unfavourable work factors and total sick leave)
Discussion

- Several strengths
  - Workplace-registered sick leave patterns
  - DREAM-registered outcome

- Limitations
  - Non-response
  - Wash-out period
  - Non-differential misclassification

\[ \text{Selection bias} \uparrow \]

\[ \text{Information bias} \uparrow \]
Conclusion

- Frequent short-term, mixed, and long-term sick leave patterns were early indicators of future long-term sick leave.

- Sick leave length was, however, a better indicator of future reduced workability than sick leave spell frequency.
Pseudo values

Analyzing survival curves at a fixed point in time

John P. Klein1, 2, 3, 4, 5, Brent Logan1, Mette Harboff2 and Per Kragh Andersen2

1Division of Biostatistics, Medical College of Wisconsin, 8701 Watertown Plank Road, Milwaukee, WI 53226, U.S.A.
2Department of Biostatistics, University of Copenhagen, Øster Farimagsgade 5, PB 2000, DK-1014 Copenhagen K, Denmark

SUMMARY

A common problem encountered in many medical applications is the comparison of survival curves. Often, rather than comparison of the entire survival curves, interest is focused on the comparison at a fixed point in time. In most cases, the naive test based on a difference in the estimates of survival is used for this comparison. In this note, we examine the performance of alternatives to the naive test. These include tests based on a number of transformations of the survival function and a test based on a generalized linear model for pseudo-observations. The type I errors and power of these tests for a variety of sample sizes are compared by a Monte Carlo study. We also discuss how these tests may be extended to situations where the data are stratified. The pseudo-value approach is also examined in more detailed regression analysis of the survival probability at a fixed point in time. The methods are illustrated on a study comparing survival for autologous and allogeneic bone marrow transplants. Copyright © 2007 John Wiley & Sons, Ltd.

KEY WORDS: generalized linear models; pseudo-value approach; variance stabilization transformation; Kaplan-Meier estimator; censored data

1. INTRODUCTION

In many applications of survival analysis techniques clinical investigators are interested in comparing two or more survival curves at a set of time points. These comparisons are often made in providing summary univariate statistics for a study prior to more extensive modelling. They may be made to provide a comparison of "cure rates" of the disease under study. For example, one may consider cure rates as a function of age, gender, risk factors, etc.

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Validation

Figure 2: The accuracy of DREAM to identify workplace-defined sick leave spells of >8 weeks. ROC curve showing the sensitivity and specificity corresponding to different choices of cut-off points in DREAM for sick leave spell durations of eight weeks or more defined in the workplace register.
Disability pension in Denmark

2012

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<thead>
<tr>
<th></th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
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<tbody>
<tr>
<td>Prevalence:</td>
<td>249,885</td>
<td>114,477</td>
<td>135,408</td>
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<tr>
<td>Incidence:</td>
<td>14,450</td>
<td>6,891</td>
<td>7,559</td>
</tr>
</tbody>
</table>
Cumulative incidence

Weeks until disability pension, censoring or competing risk
Cumulative incidence

Weeks until long-term sick leave, censoring or competing risk

0-2 short spells

3-17 short spells

2-13 mixed spells

1-5 long spells