Work Disability Trajectories under Three Workers’ Compensation Programs

Presenter/Principal Investigator: Emile Tompa
Co-investigators: Sheilah Hogg-Johnson, Ben Amick
Analyst: Qing Liao

IWH Plenary Series
April 2, 2013

Funding: Workplace Safety and Insurance Board Research Advisory Committee (WSIB-RAC)
Who We Are

The Institute for Work & Health is a not-for-profit research organization based in Toronto, Canada. We conduct and share research to protect and improve the health of working people. Our research is carried out in two broad domains:

1. preventing work-related injury and illness through studies of workplace programs and practices, prevention policies and the health of workers at a population level, and
2. improving the health and recovery of injured workers through research on treatment, return to work, disability prevention and management, and compensation policies

Our research is valued by policy-makers, workers and workplaces, clinicians, and occupational health, safety and disability management professionals.
Overview and Motivation for Study

- Dramatic increase in number of days on benefits per lost-time claim in Ontario over last 15 years
- In particular, increase in the rate of long duration lost-time claims
- In contrast, trend of declining claim rates over much of the 1990s
- Also, increase in proportion of healthcare only claims relative to lost-time
- Some concern that work disability as measured by days on benefits may be driven by program/legislative factors
Ontario Service Safety Alliance 2005 Annual Report

**LOST TIME INJURIES**

- Bar chart showing a decrease in lost time injuries from 2000 to 2005.
- Line chart showing a decrease in injury rate from 2000 to 2005.

**DAYS LOST IN INJURY YEAR**

- Bar chart showing an increase in days lost from 2000 to 2005.
- Line chart showing an increase in days per LTI from 2000 to 2005.

**Decreasing Lost-time Claim Rate**

**Increasing Number of Days Compensated**

www.iwh.on.ca
Previous Research

Hypotheses for Increasing Duration

• Injured worker characteristics - changing demographics
• Claims severity - increasing severity of claims
• Changing work environment - new challenges for RTW
• Policy change - recent policy and operational practices (Bill 99)

IWH Long Duration Claims Study (Hogg-Johnson et al.)

• Changes in policy and practices most likely explanation
Study Objectives

1. To investigate the labour-market earnings recoveries of workers’ compensation claimants with permanent impairments from three different benefits programs in Ontario, Canada.

2. To determine whether there is evidence of programmatic impact on the success of reintegration into the labour market.

3. To develop methods for evaluating earnings recovery of injured workers following work injury.
What’s New/Different About this Study

• Focus on injured workers with permanent impairments
• Use database of almost 3 decades length that allows us to evaluate three different Ontario benefits programs
• Large number of individuals who are not workers’ compensation claimants allows us to select strong comparators/controls
• Long follow-up of 10+ years of labour-market earnings for each program allows us to examine long-term labour market outcomes
Three Long-term Disability Programs (1)

Pre-1990 Program (sample frame from calendar year 1986)

• Bill 101: Permanent Disability program
• Single benefit received based on pre-injury earnings and the percentage of permanent total bodily impairment
• Program focused on benefits, with provision of vocational rehabilitation (VR) services
• All permanently impaired individuals received a life-time benefit
  net pre-injury earnings x percentage total bodily impairment x 90%
Three Long-term Disability Programs (2)

Post-1990 Program (sample frame from calendar year 1992)

• Bill 162: Future Economic Loss (FEL) and Non-economic Loss (NEL)
• Two benefits potentially received – a loss of earnings capacity/FEL and a nominal non-economic loss/NEL
• Program focused on labour-market re-entry (LMR), with highly structured review process

• *Individuals assessed as having a loss of earnings capacity received a FEL*
  (net pre-injury earnings – net post-injury earnings capacity) x 90%
• *Two reassessments over six years before lock-in to age 65*
Three Long-term Disability Programs (3)

Post-1998 Program (sample frame from calendar year 1998)
- Bill 99: Loss of Earnings Capacity (LOE)
- Two benefits potentially received – LOE and a NEL
- LMR less structured
- Increased obligations of injury employer (self-reliance)
- Wage-replacement rate reduced from 90% to 85%
- Individuals assessed as having a loss of earnings capacity received a wage replacement award
  \[(\text{net pre-injury earnings} - \text{net post-injury earnings capacity}) \times 85\%\]
- Intermittent monitoring and reassessment for six years before lock-in to age 65
## Summary Comparison of Three Programs

<table>
<thead>
<tr>
<th>Key Characteristics</th>
<th>Pre-1990 (Bill 101)</th>
<th>Post-1990 (Bill 162)</th>
<th>Post-1998 (Bill 99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core benefit type</td>
<td>Impairment based</td>
<td>Loss-of-earnings capacity based</td>
<td>Loss-of-earnings capacity based</td>
</tr>
<tr>
<td>Duration of benefits</td>
<td>lifetime</td>
<td>Until no loss of earnings capacity assessed, or age 65</td>
<td>Until no loss of earnings capacity assessed, or age 65</td>
</tr>
<tr>
<td>Replacement rate</td>
<td>90%</td>
<td>90%</td>
<td>85%</td>
</tr>
<tr>
<td>Other characteristics</td>
<td>VR</td>
<td>LMR highly structured</td>
<td>LMR less structured</td>
</tr>
</tbody>
</table>
Data Linkage Created for the Analysis

Principal Data Source

- Longitudinal Administrative Databank (LAD)
- 20% simple random sample of all Canadian tax filers
- Once selected, filers are included in every subsequent year
- Follows individuals from 1982 to most recent tax year
- Coverage is approximately 98% of working age adults

Injured Worker Sample Frames

- Identified from the WCB/WSIB administrative data files
- All injured workers with claims from 1986, 1992, and 1998 who sustained a permanent impairment
Linkage Process

• 1986 Sample Frame
• 1992 Sample Frame
• 1998 Sample Frame

link with SIN

Longitudinal Administrative Databank
1982-recent tax year

• 20% simple random sample of tax filers
• ideally 1 in 5 of a sample frame included
• 18-19% of injured worker sample frame identified
## Linked Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>whole cohort</strong></td>
<td>2,500</td>
<td>2,640</td>
<td>1,335</td>
</tr>
<tr>
<td><strong>females</strong></td>
<td>26%</td>
<td>33%</td>
<td>32%</td>
</tr>
<tr>
<td><strong>males</strong></td>
<td>74%</td>
<td>67%</td>
<td>68%</td>
</tr>
<tr>
<td><strong>age &lt;=24 in injury year</strong></td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>25&lt;=age&lt;=34 in injury year</strong></td>
<td>25%</td>
<td>28%</td>
<td>21%</td>
</tr>
<tr>
<td><strong>35&lt;=age&lt;=49 in injury year</strong></td>
<td>42%</td>
<td>44%</td>
<td>51%</td>
</tr>
<tr>
<td><strong>50&lt;=age&lt;=59 in injury year</strong></td>
<td>26%</td>
<td>24%</td>
<td>23%</td>
</tr>
<tr>
<td><strong>0%&lt;impairment&lt;=5%</strong></td>
<td>25%</td>
<td>25%</td>
<td>19%</td>
</tr>
<tr>
<td><strong>5%&lt;impairment&lt;=10%</strong></td>
<td>30%</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td><strong>10%&lt;impairment&lt;=20%</strong></td>
<td>32%</td>
<td>32%</td>
<td>35%</td>
</tr>
<tr>
<td><strong>20%&lt;impairment&lt;=50%</strong></td>
<td>11%</td>
<td>18%</td>
<td>24%</td>
</tr>
<tr>
<td><strong>impairment&gt;50%</strong></td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td><strong>pre-injury income &lt;$20K</strong></td>
<td>27%</td>
<td>30%</td>
<td>26%</td>
</tr>
<tr>
<td><strong>$20K&lt;=pre-injury income&lt;$40K</strong></td>
<td>42%</td>
<td>48%</td>
<td>46%</td>
</tr>
<tr>
<td><strong>$40K&lt;=pre-injury income&lt;$60K</strong></td>
<td>27%</td>
<td>19%</td>
<td>23%</td>
</tr>
<tr>
<td><strong>pre-injury income &gt;=$60K</strong></td>
<td>4%</td>
<td>3%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Matched Each Injured Workers with Similar Controls

Matching Characteristics:
- earnings in each of 4 years prior to accident year
- sex
- age
- province of residence
- propensity score
Earnings Recovery Analysis (1)

• Considered injured worker’s yearly labour-market earnings post-injury compared to average of match controls (proportion of earnings recovery)

• Injured worker earnings trajectory identified as proportion of earnings recovery each year over nine years

• Used statistical modeling techniques to cluster earnings recovery trajectories into groups based on similarity of trajectories
Earnings Recovery Analysis (2)

- Added variables to the statistical model that included program type, baseline characteristics (sex, age bracket, impairment bracket, pre-injury earnings bracket) and unemployment rate.
- **Used model to predict probability of an injured worker being in a particular trajectory based on program type and baseline characteristics.**
  - **Primary focus was on program type (1986, 1992, 1998)**
  - **Secondary focus was on baseline characteristics.**
Two Key Analysis Questions

Question 1: *How does program type (1986, 1992, 1998) affect the probability of being in a particularly trajectory?*

Question 2: *How do baseline characteristics of an injured worker (sex, age bracket, impairment bracket, pre-injury earnings bracket) affect the probability of being in a particular trajectory?*
Proportion of Earnings Recovery (1)

Example
Injured worker earnings in 2006: $20,000
Average labour-market earnings of matched controls in 2006: $50,000
Proportion of earnings recovery in 2006: 40%

Key difference between earnings recovery based on match controls versus pre-injury earnings

Earnings of controls vary over the life course and also affected by labour-market conditions
Proportion of Earnings Recovery (2)

Comparisons of injured worker labour-market earnings over 10 years post-accident with pre-injury earnings versus average control earnings

<table>
<thead>
<tr>
<th>Strata</th>
<th>Based on Pre-injury Earnings</th>
<th>95% Confidence Interval</th>
<th>Based on Controls</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>whole cohort</td>
<td>79%</td>
<td>84%</td>
<td>73%</td>
<td>69%</td>
</tr>
<tr>
<td>female</td>
<td>77%</td>
<td>83%</td>
<td>70%</td>
<td>71%</td>
</tr>
<tr>
<td>male</td>
<td>79%</td>
<td>86%</td>
<td>71%</td>
<td>68%</td>
</tr>
<tr>
<td>age&lt;=24 in injury year</td>
<td>168%</td>
<td>195%</td>
<td>137%</td>
<td>91%</td>
</tr>
<tr>
<td>25&lt;=age&lt;=34 in injury year</td>
<td>87%</td>
<td>96%</td>
<td>77%</td>
<td>67%</td>
</tr>
<tr>
<td>35&lt;=age&lt;=49 in injury year</td>
<td>70%</td>
<td>74%</td>
<td>66%</td>
<td>64%</td>
</tr>
<tr>
<td>50&lt;=age&lt;=59 in injury year</td>
<td>69%</td>
<td>82%</td>
<td>47%</td>
<td>76%</td>
</tr>
</tbody>
</table>
Results

• Identified 5 distinct trajectories
• For some sub-strata:
  • Program type was significant
  • Baseline characteristics were significant
Earnings Recovery Trajectories
controlling for baseline characteristics and unemployment rate

Ration of earnings recovery

5) highest trajectory
4) second highest trajectory
3) dramatic upwards spiral
2) dramatic downwards spiral
1) lowest trajectory

Group Percents

Year post-injury

25.8 12.9 19.6 32.6 9.0
Following slides focus on probability of being in each of the five trajectories for the sub-strata defined by:

10-20% impairment bracket
$20K-$40K pre-injury earnings bracket

males and females by each age bracket considered separately
Group membership probability under each compensation program controlling for year unemployment rate, male claimants, aged 25 to 34 in injury year, pre-injury income of $20000 to $40000 and impairment level between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, **male** claimants, aged **35 to 49** in injury year, pre-injury income of **$20000 to $40000** and impairment range between **10% to 20%**

**males, 35-49 age bracket, $20-$40K, and 10-20% impairment bracket** is the largest sub-strata

[Graph showing the probability distribution and different trajectories labeled as lowest, dramatic downwards spiral, dramatic upwards spiral, and highest trajectory.]
Group membership probability under each compensation program controlling for yearly unemployment rate, male claimants, aged 50 to 59 in injury year, pre-injury income of $20000 to $40000 and impairment range between 10% to 20%
Group membership probability under each compensation program controlling for year unemployment rate, female claimants, aged 25 to 34 in injury year, pre-injury income of $20000 to $40000 and impairment level between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, female claimants, aged 35 to 49 in injury year, pre-injury income of $20000 to $40000 and impairment range between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, female claimants, aged 50 to 59 in injury year, pre-injury income of $20000 to $40000 and impairment range between 10% to 20%
Summary of Findings

• Identified 5 distinct trajectories
• For most sub-strata the 1998 cohort had a statistically significant lower probability of the lowest earnings trajectory (1) and higher probability of the second highest one (4) (compared to the 1986 cohort)
• Two trajectories (2 and 3) were statistically similar in probability across the programs for all sub-strata
• The oldest age bracket (age 50 to 59) had a statistically significant higher probability of the highest trajectory
Future Directions

• Need to consider cohorts from several years of the newest program to better understand the impact of Bill 99 (1998 was the first year)
• Multi-year cohorts from each program will provide more precisions
• Future work needs to consider other injured worker characteristics such as occupation, industry, nature of injury, part of body
References


http://www.andrew.cmu.edu/user/bjones/index.htm
Emile Tompa
Scientist,
etompa@iwh.on.ca
416-927-2027 ext 2113
Identifying Comparators/Controls in the LAD

• Matched injured workers with similar uninjured individuals
• “Nearest Available Mahalanobis Metric Matching within Calipers Defined by the Propensity Score” (Rosenbaum and Rubin, 1985)
• For each injured worker selected up to ten controls based on:
  • propensity score (+/- 25% of 1 standard deviation)
  • labour-market earnings in each of over four years prior to accident (+/- 20%)
  • gender (exact match)
  • Age (+/- 2 years)
• Tested the quality of the matches in several ways
Earnings Recovery Analysis (2)

- SAS procedure for estimating grouping group-based trajectory models (Proc Traj)
- Specialized application of latent class finite mixture modeling that identify clusters of individuals following similar progressions over time of some outcome
- In this case outcome is earnings recovery
Group membership probability under each compensation program controlling for yearly unemployment rate, male claimants, aged ≤ 24 in injury year, pre-injury income of $20000 to $40000 and impairment level between 10% to 20%.
Group membership probability under each compensation program controlling for year unemployment rate, male claimants, aged 25 to 34 in injury year, pre-injury income of $20000 to $40000 and impairment level between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, male claimants, aged 35 to 49 in injury year, pre-injury income of $20,000 to $40,000 and impairment range between 10% to 20%.

Males, 35-49 age bracket, $20-$40K, and 10-20% impairment bracket is the largest sub-strata.

- Second highest trajectory
- Lowest trajectory
- Dramatic upwards spiral
- Dramatic downwards spiral
- Highest trajectory
Group membership probability under each compensation program controlling for yearly unemployment rate, male claimants, aged 50 to 59 in injury year, pre-injury income of $20000 to $40000 and impairment range between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, female claimants, aged <= 24 in injury year, pre-injury income of $20000 to $40000 and impairment level between 10% to 20%.
Group membership probability under each compensation program controlling for year unemployment rate, female claimants, aged 25 to 34 in injury year, pre-injury income of $20000 to $40000 and impairment level between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, female claimants, aged 35 to 49 in injury year, pre-injury income of $20000 to $40000 and impairment range between 10% to 20%
Group membership probability under each compensation program controlling for yearly unemployment rate, female claimants, aged 50 to 59 in injury year, pre-injury income of $20000 to $40000 and impairment range between 10% to 20%.