Work Disability Trajectories under Three Workers' Compensation Programs

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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
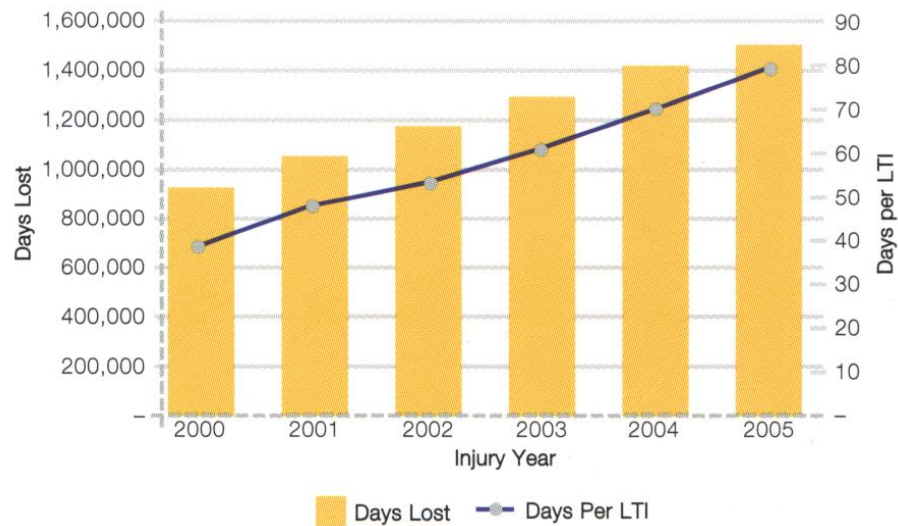
Ontario Service Safety Alliance 2005 Annual Report
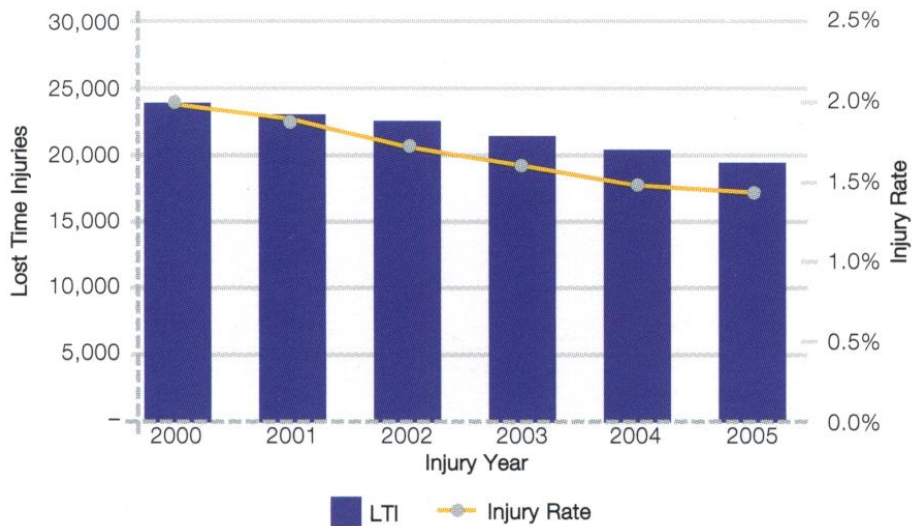
Decreasing Lost-time Claim Rate
~
Increasing Number of Days Compensated

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*

    (net pre-injury earnings – net post-injury earnings capacity) x 85%

- *Intermittent monitoring and reassessment for six years before lock-in to age 65*

Summary Comparison of Three Programs

| Key Characteristics	Pre-1990 (Bill 101)	Post-1990 (Bill 162)	Post-1998 (Bill 99)
Core benefit type	Impairment based	Loss-of-earnings capacity based	Loss-of-earnings capacity based
Duration of benefits	lifetime	Until no loss of earnings capacity assessed, or age 65	Until no loss of earnings capacity assessed, or age 65
Replacement rate	90%	90%	85%
Other characteristics	VR	LMR highly structured	LMR less structured Self-reliance

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 — link with SIN →

1992 Sample Frame — link with SIN →

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
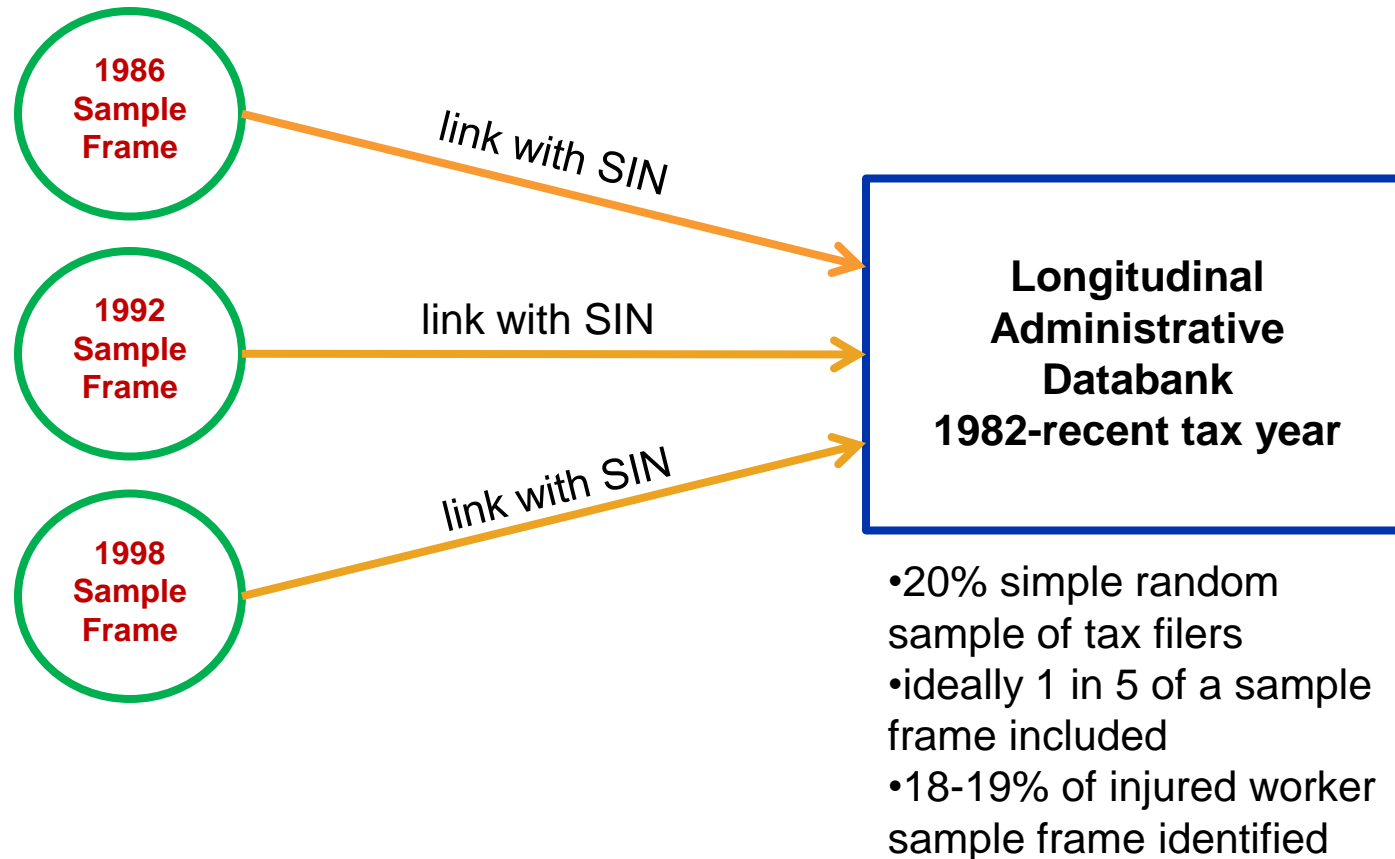
Linked Sample Characteristics

	1986	1992	1998
whole cohort	2,500	2640	1,335
females	26%	33%	32%
males	74%	67%	68%
age<=24 in injury year	6%	5%	5%
25<=age<=34 in injury year	25%	28%	21%
35<=age<=49 in injury year	42%	44%	51%
50<=age<=59 in injury year	26%	24%	23%
0%<impairment<=5%	25%	25%	19%
5%<impairment<=10%	30%	23%	20%
10%<impairment<=20%	32%	32%	35%
20%<impairment<=50%	11%	18%	24%
impairment>50%	2%	1%	2%
pre-injury income<$20K	27%	30%	26%
$20K<=pre-injury income<$40K	42%	48%	46%
$40K<=pre-injury income<$60K	27%	19%	23%
pre-injury income>=$60K	4%	3%	5%

Matched Each Injured Workers with Similar Controls

up to 10 controls

Injured Claimant

matched

Uninjured Control (×10)
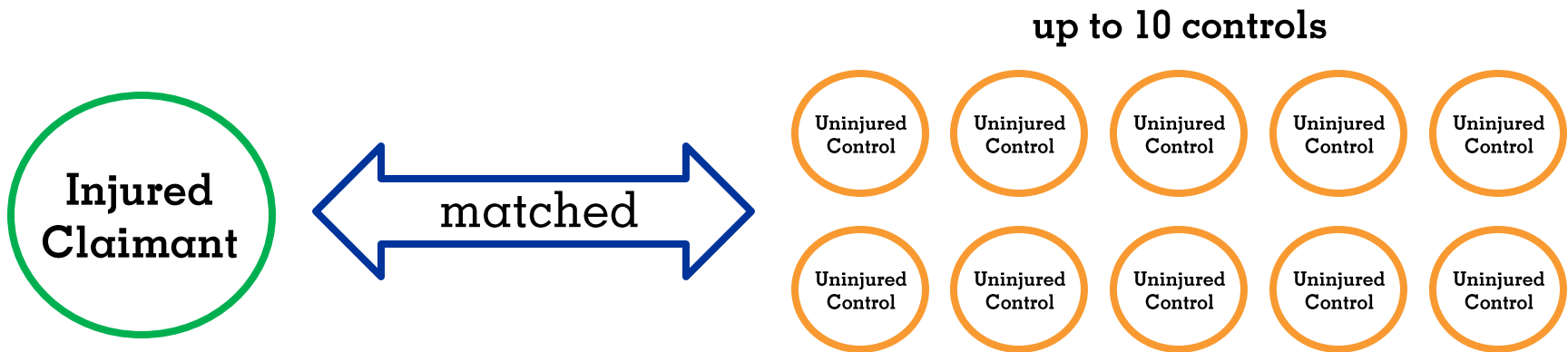
Matching Characteristics
earnings in each of 4 years prior to accident year
sex
age
province of residence
propensity score

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
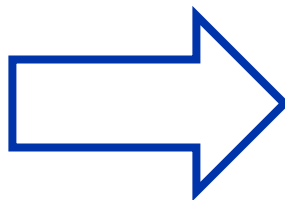
Earnings of controls vary over the life course and also affected by labour-market conditions

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

Strata	1998 Cohort					
	Based on Pre-injury Earnings	95% Confidence Interval		Based on Controls	95% Confidence Interval	
whole cohort	79%	84%	73%	69%	72%	66%
female	77%	83%	70%	71%	77%	65%
male	79%	86%	71%	68%	71%	65%
age<=24 in injury year	168%	195%	137%	91%	103%	78%
25<=age<=34 in injury year	87%	96%	77%	67%	72%	61%
35<=age<=49 in injury year	70%	74%	66%	64%	67%	61%
50<=age<=59 in injury year	69%	82%	47%	76%	84%	67%

Results

- Identified 5 distinct trajectories
- For some sub-strata:
  - Program type was significant
  - Baseline characteristics were significant

Earnings Recovery Trajectories
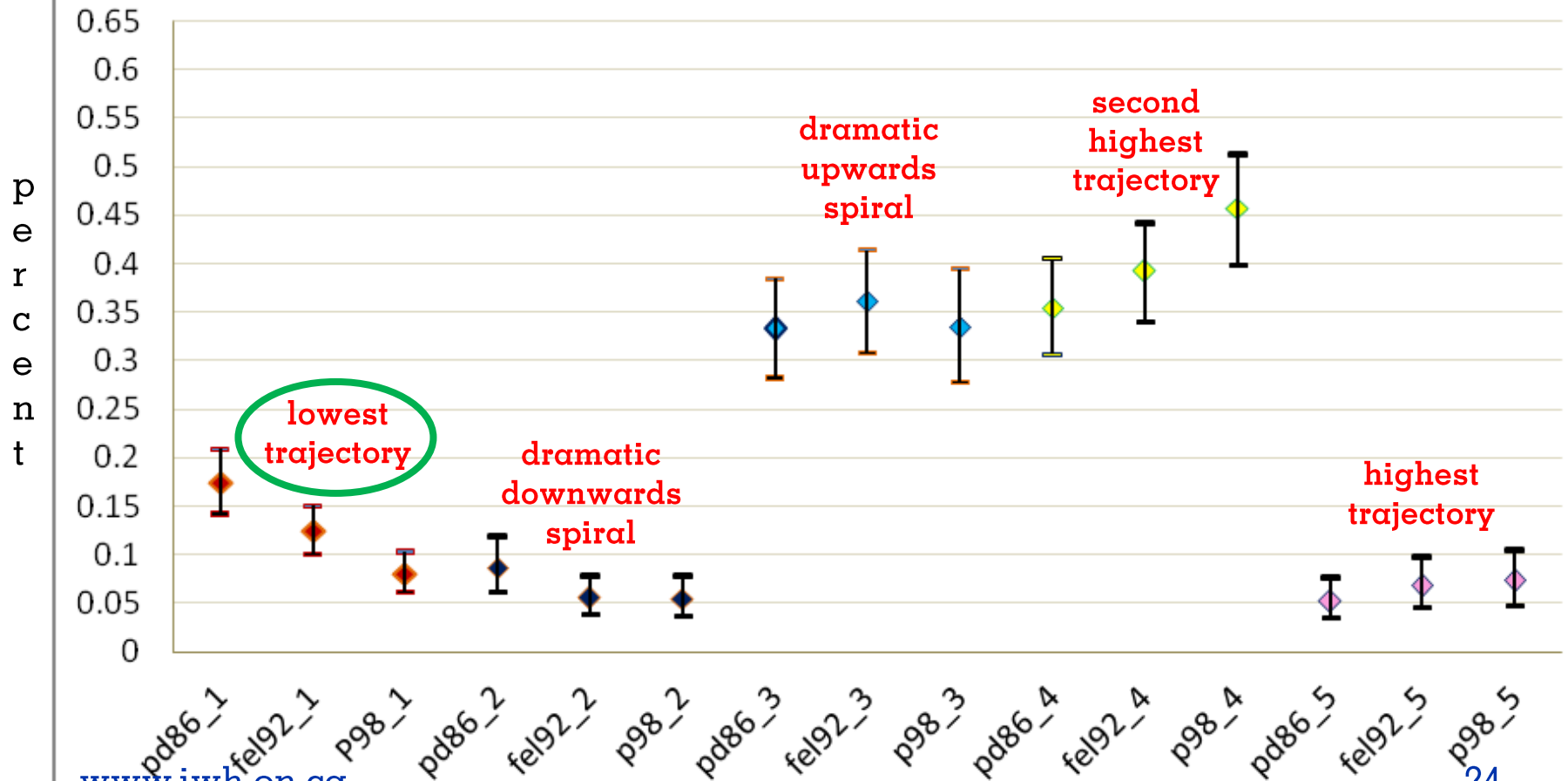controlling for baseline characteristics and unemployment rate
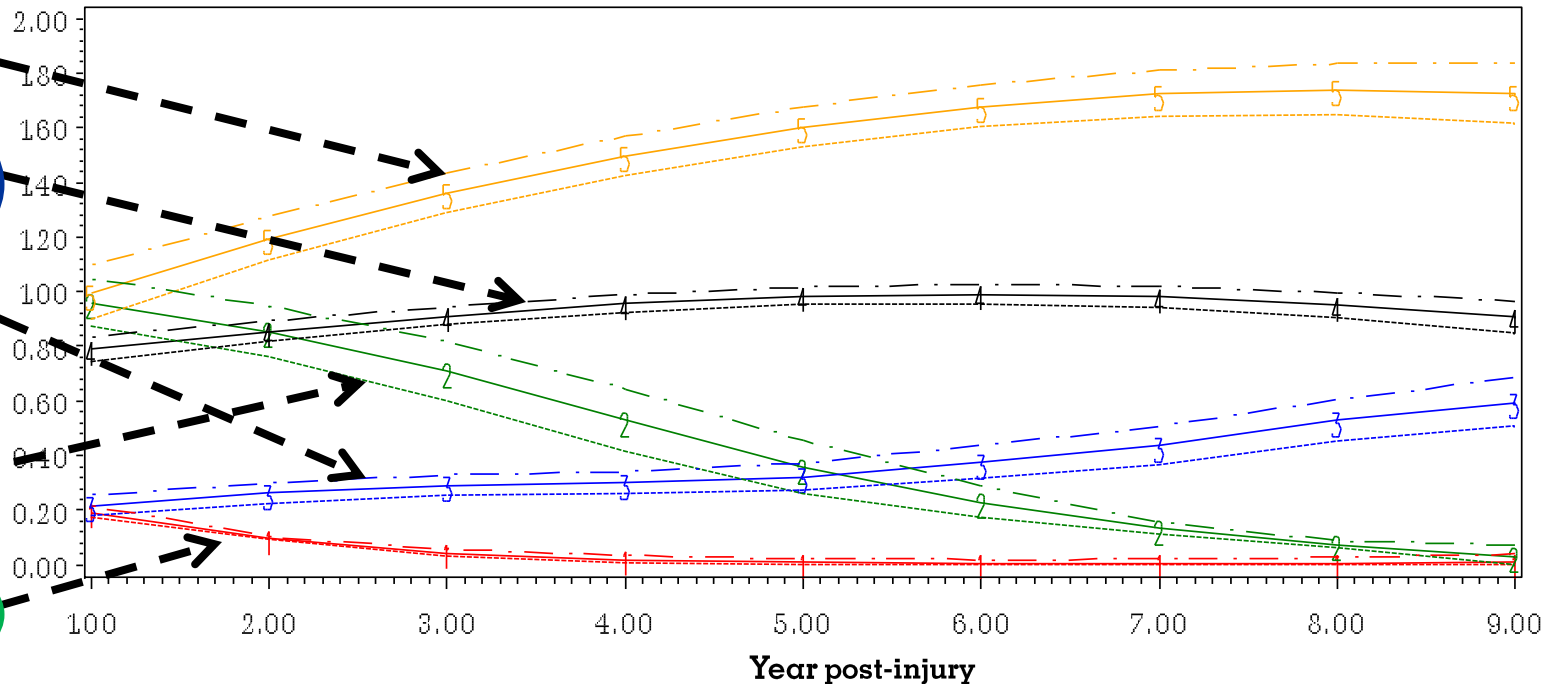
Following slides focus on probability of being in each of the five trajectories for the sub-strata defined by:

10-20% impairment bracket
$20K-$40K pre-injury earnings bracket
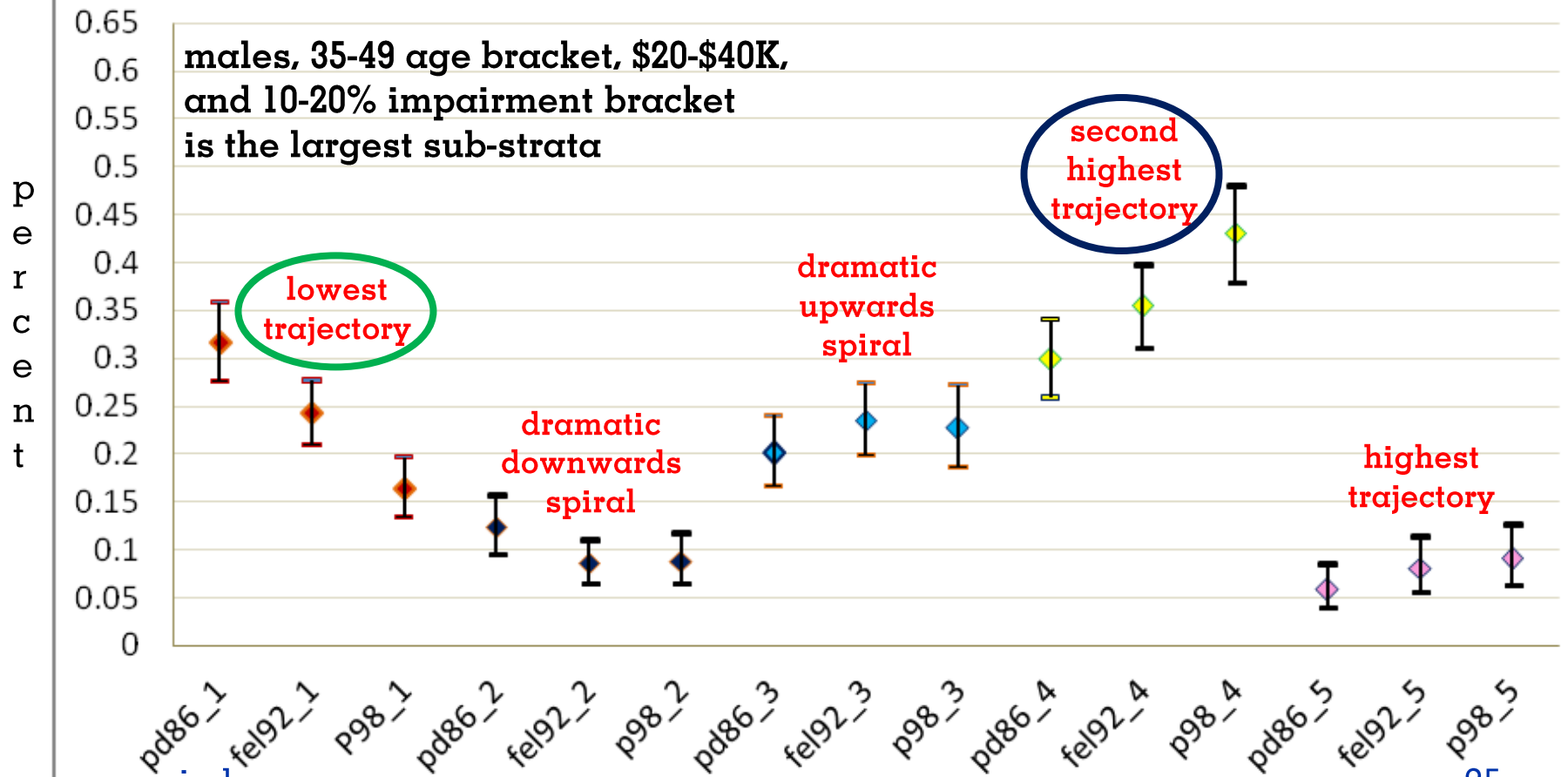
males and females by each age bracket
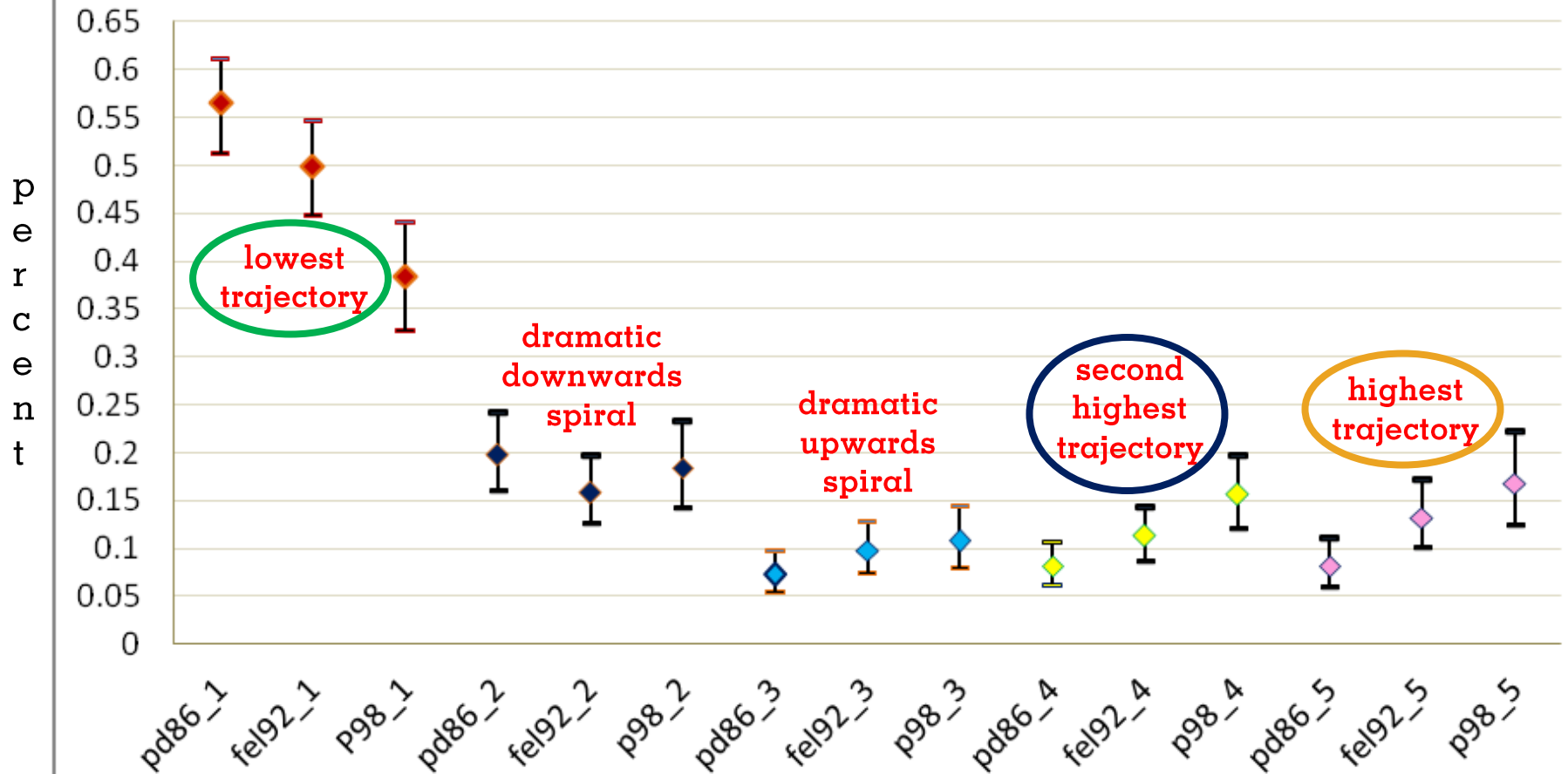considered separately

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%**
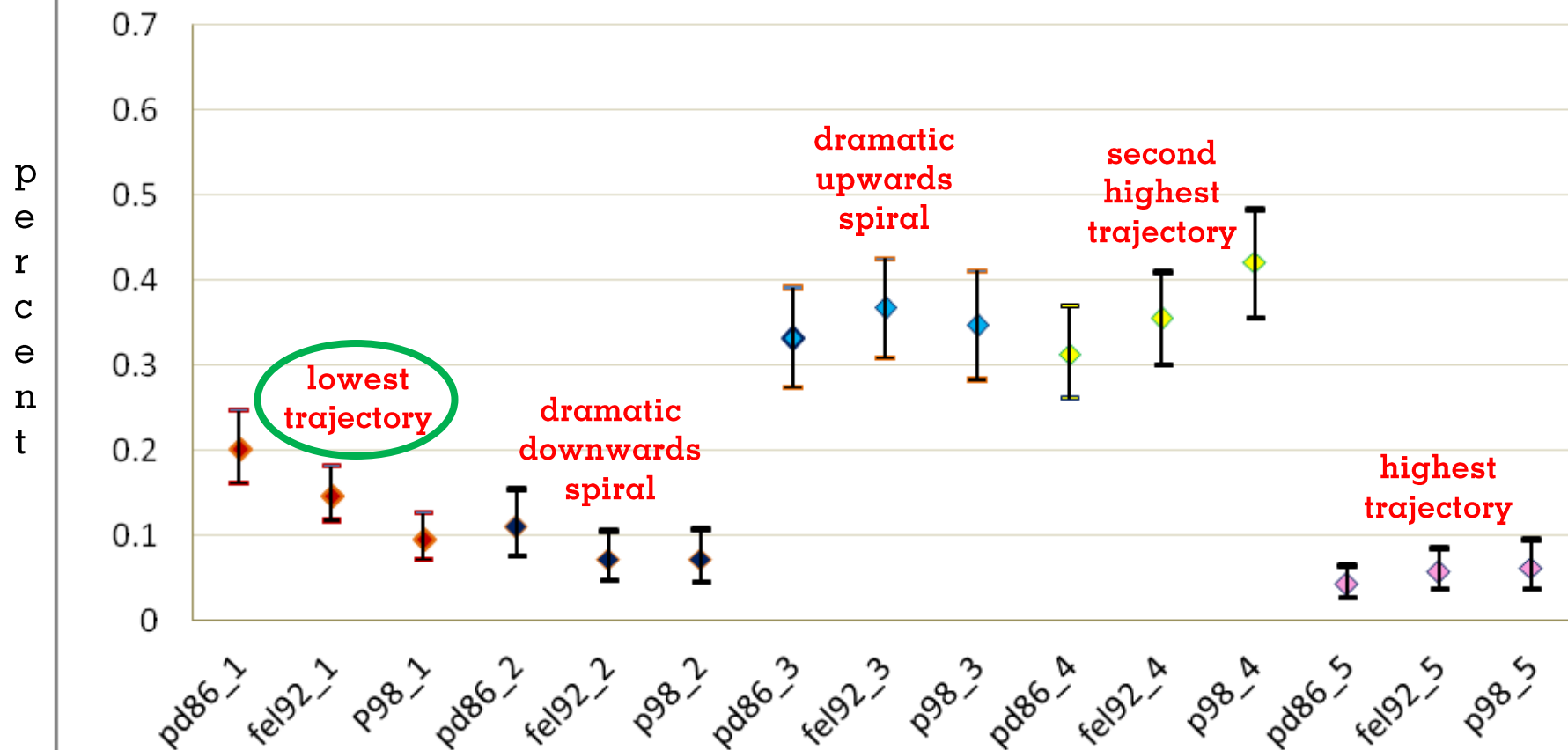
Group membership probability under each compensation program controlling for yearly unemployment rate, **male** claimants, aged **35 to 49** in injury year, pre-injury income of **$20000 to $40000** and impairment range between **10% to 20%**

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

lowest trajectory

dramatic downwards spiral

dramatic upwards spiral

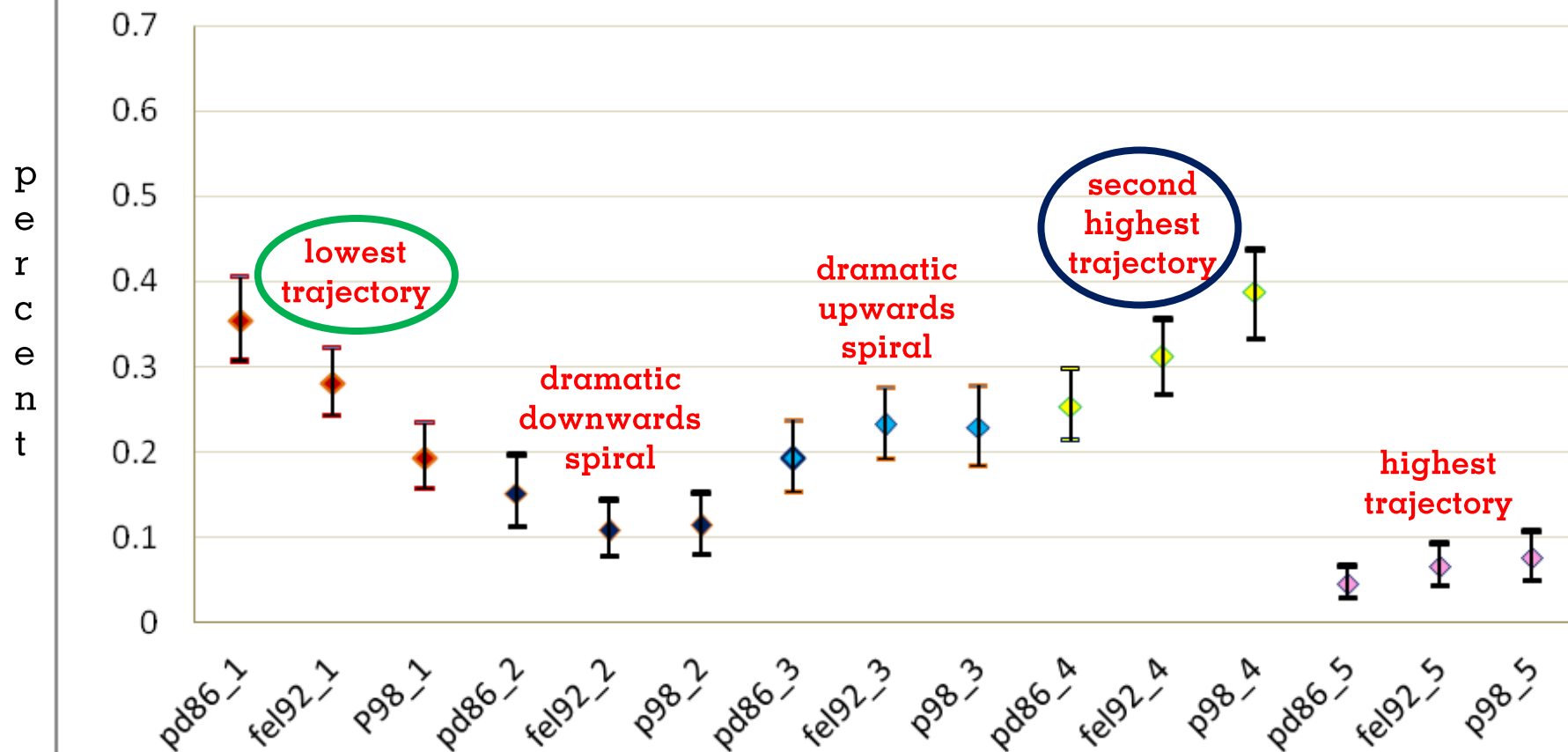second highest trajectory

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 betweeen **10% to 20%**
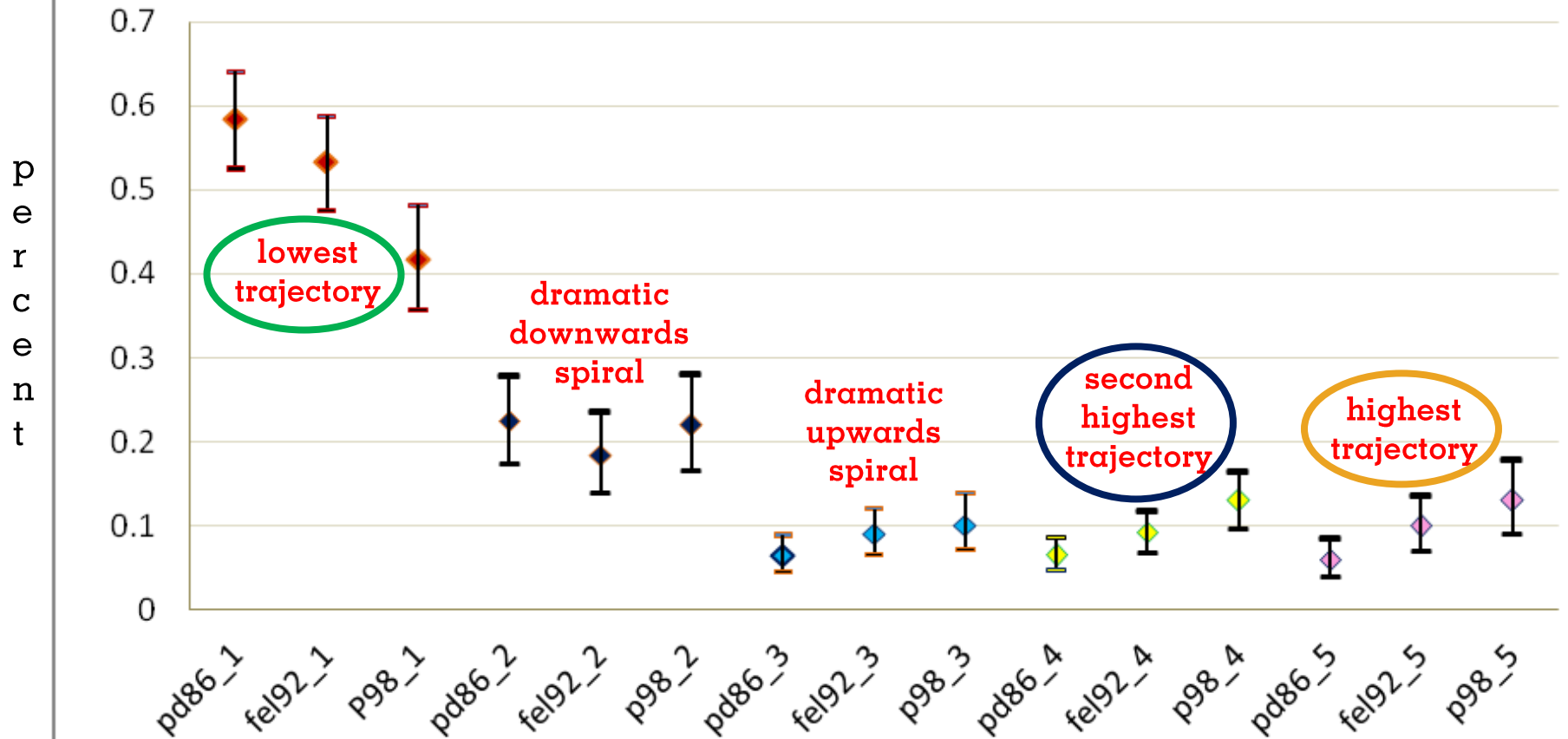
Group membership probability under each compensation program controlling for year unemployment rate, **female** claimants, aged **25 to 34** in injury year, pre-injury income of **$20000 to $40000** and impairment level between **10% to 20%**

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 betweeen 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

Rosenbaum PR, Rubin DB. 1985. Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score. *The American Statistician*, 39: 33-38.

Jones BL, Nagin DS, Roeder K. 2001. A SAS Procedure Based on Mixture Models for Estimating Developmental Trajectories. *Sociological Methods & Research*, 29.3: 374-393.

Jones BL, Nagin DS. 2007. Advances in Group-Based Trajectory Modeling and an SAS Procedure for Estimating Them. *Sociological Methods & Research*, 35.4: 542-571.

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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)
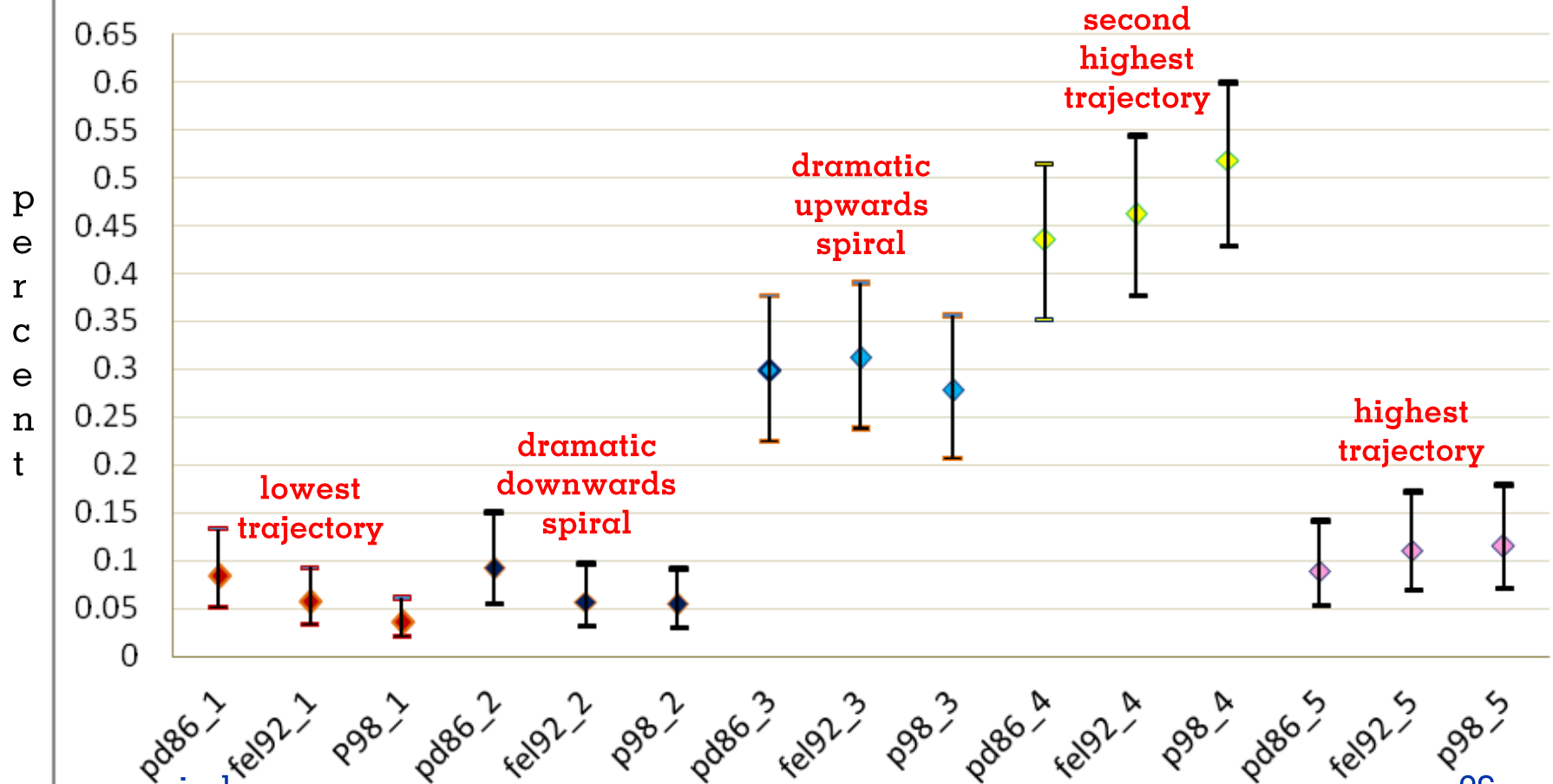- Tested the quality of the matches in several ways

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
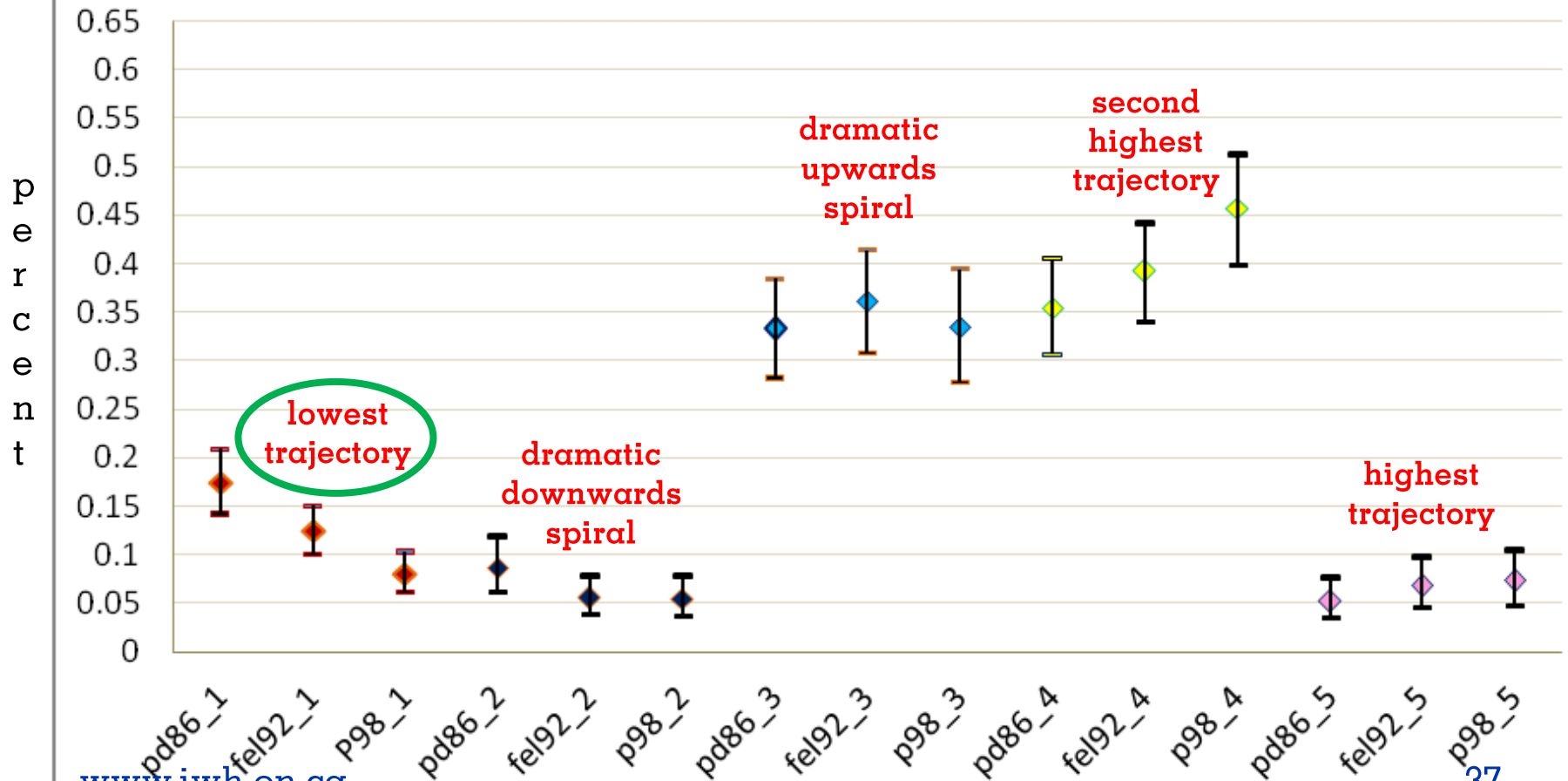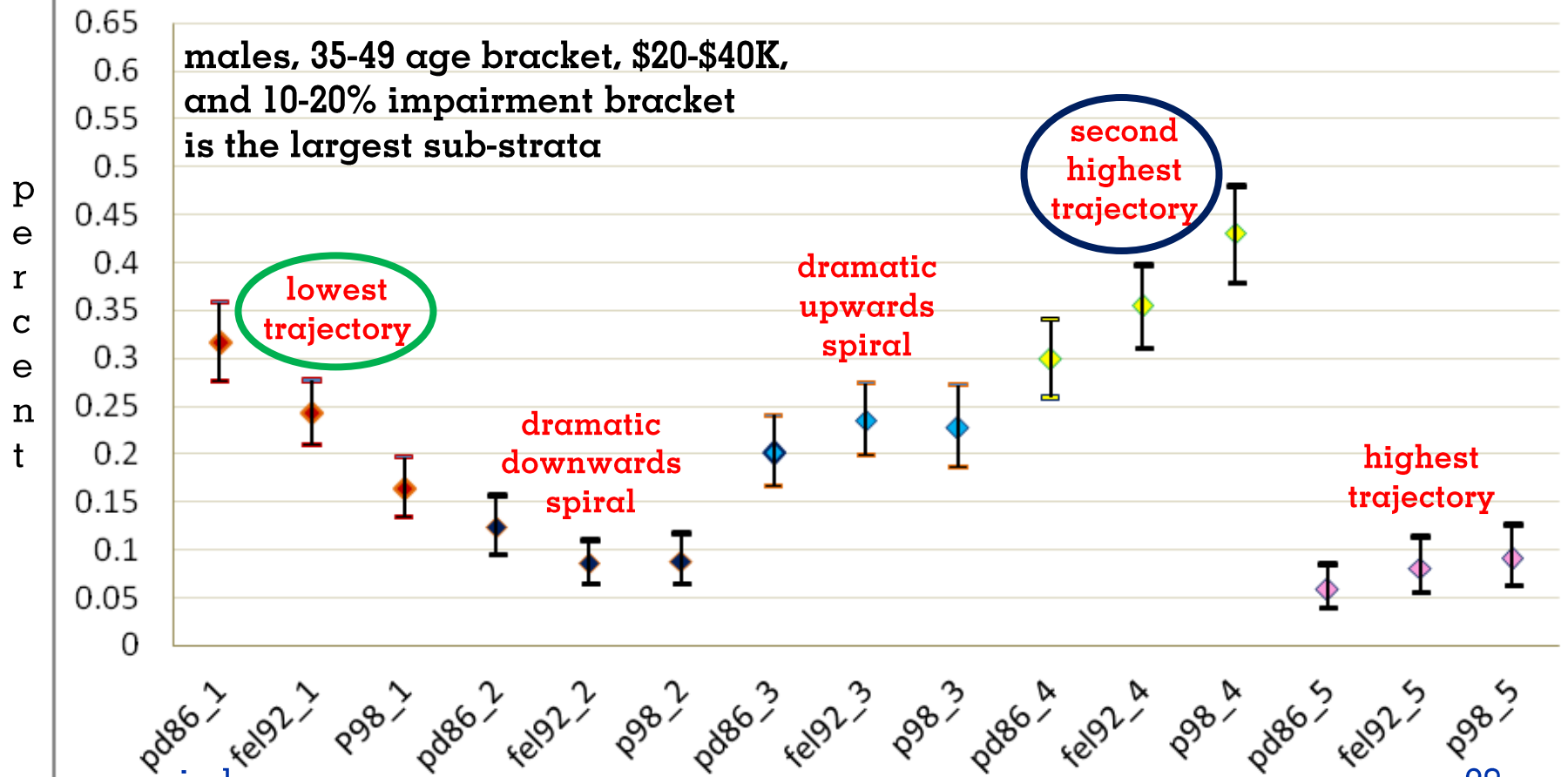- In this case outcome is earnings recovery

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%**
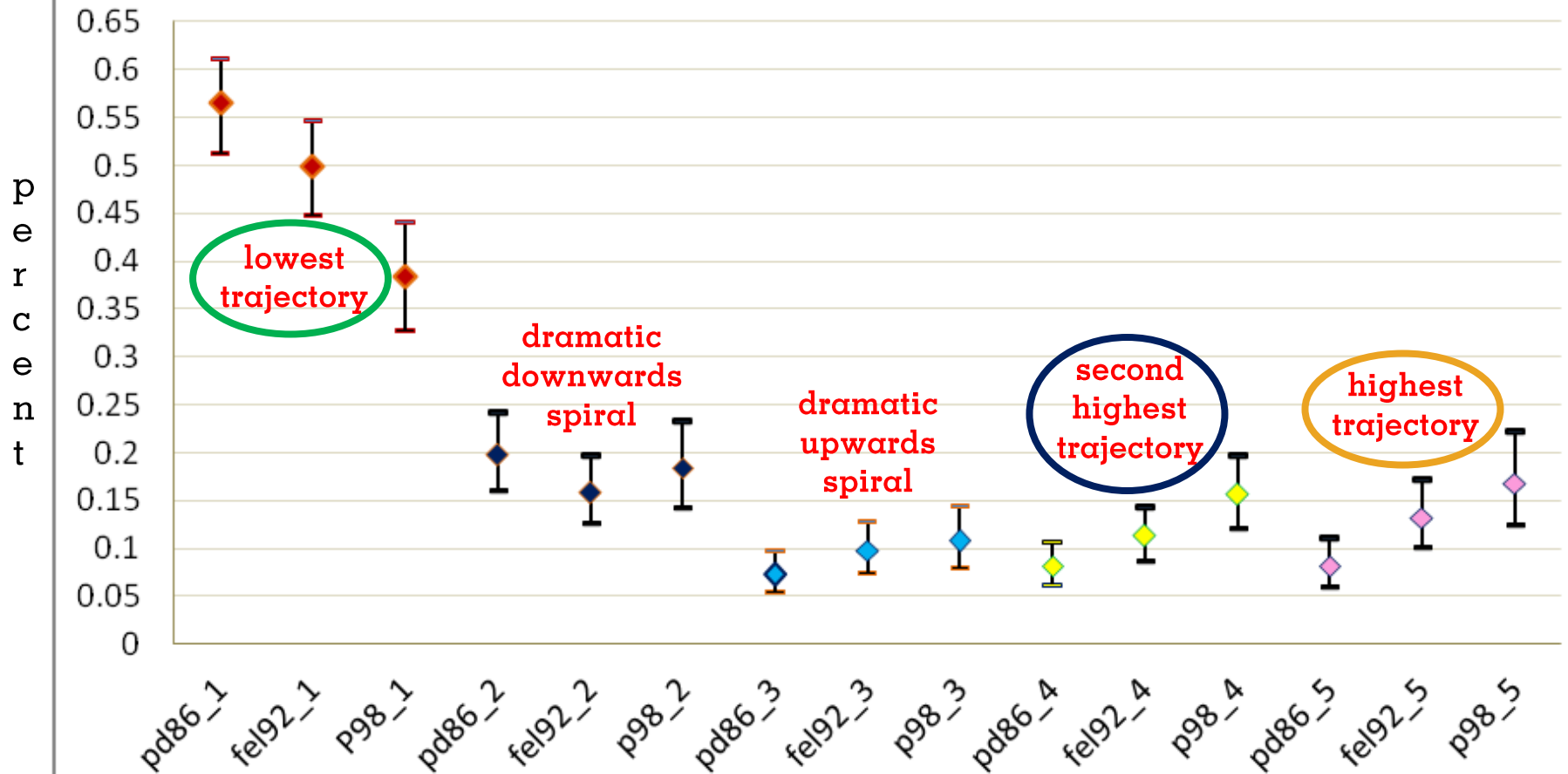
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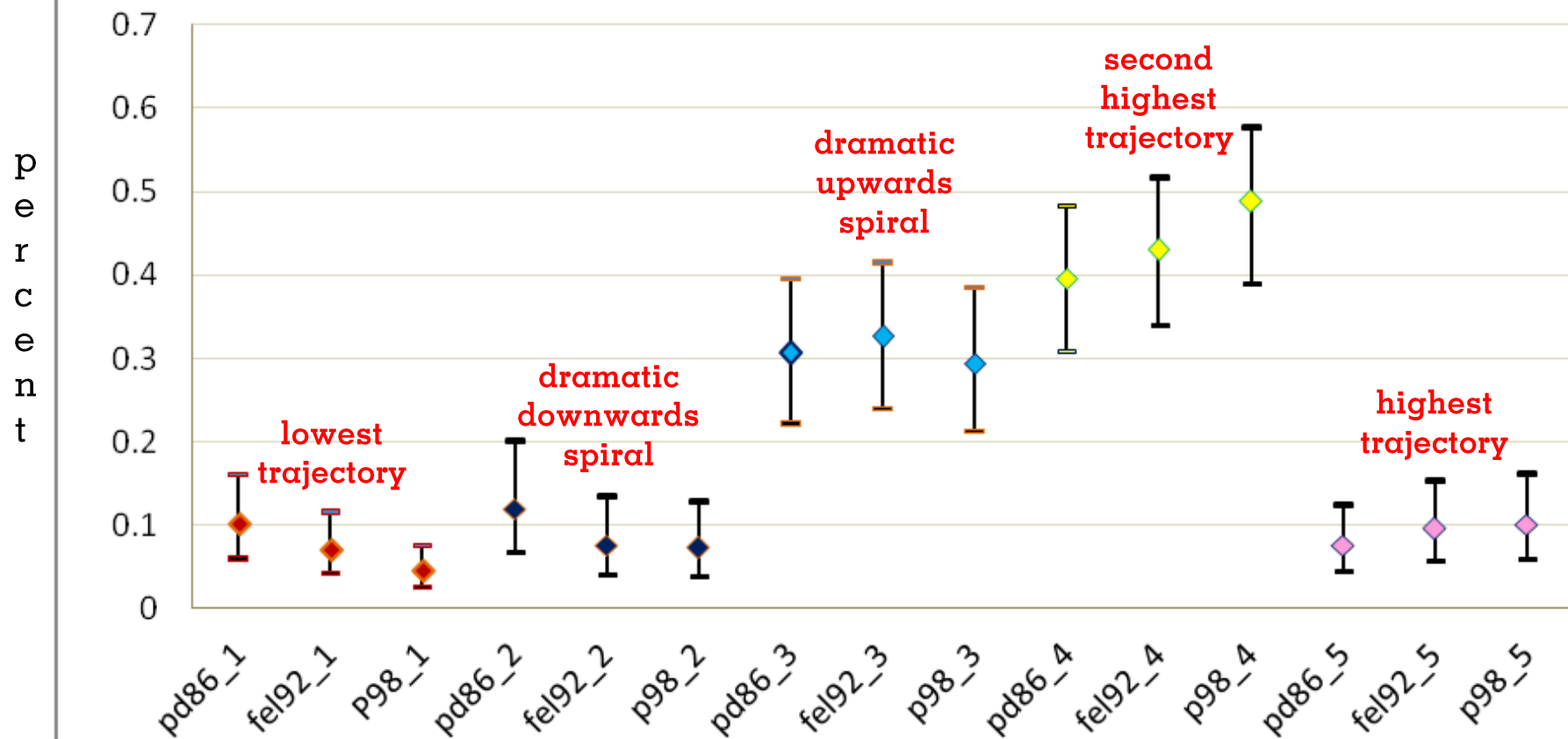
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is the largest sub-strata

second highest trajectory

lowest trajectory

dramatic upwards spiral

dramatic downwards spiral

highest trajectory

percent

x-axis labels: pd86_1, fel92_1, p98_1, pd86_2, fel92_2, p98_2, pd86_3, fel92_3, p98_3, pd86_4, fel92_4, p98_4, pd86_5, fel92_5, p98_5

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 betweeen **10% to 20%**
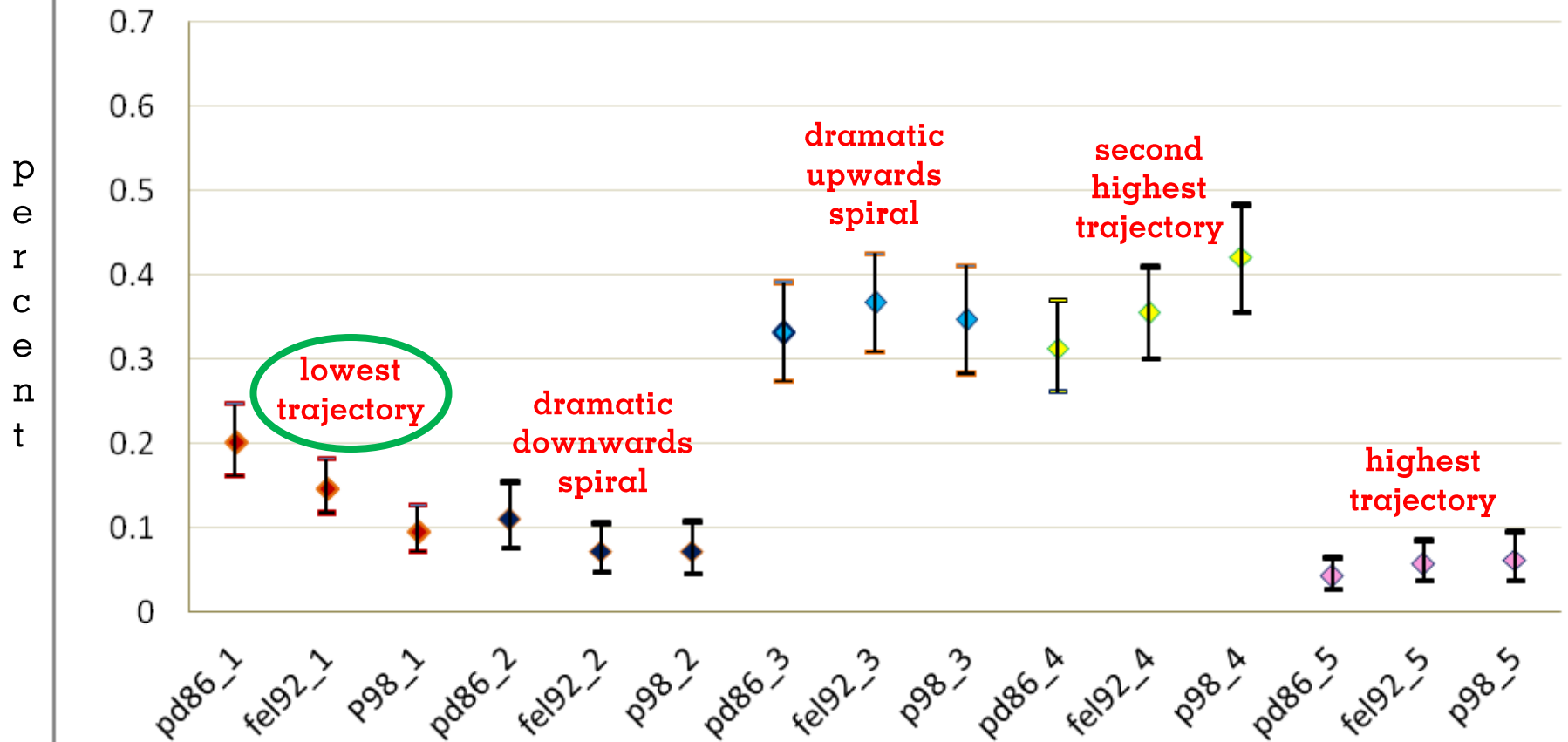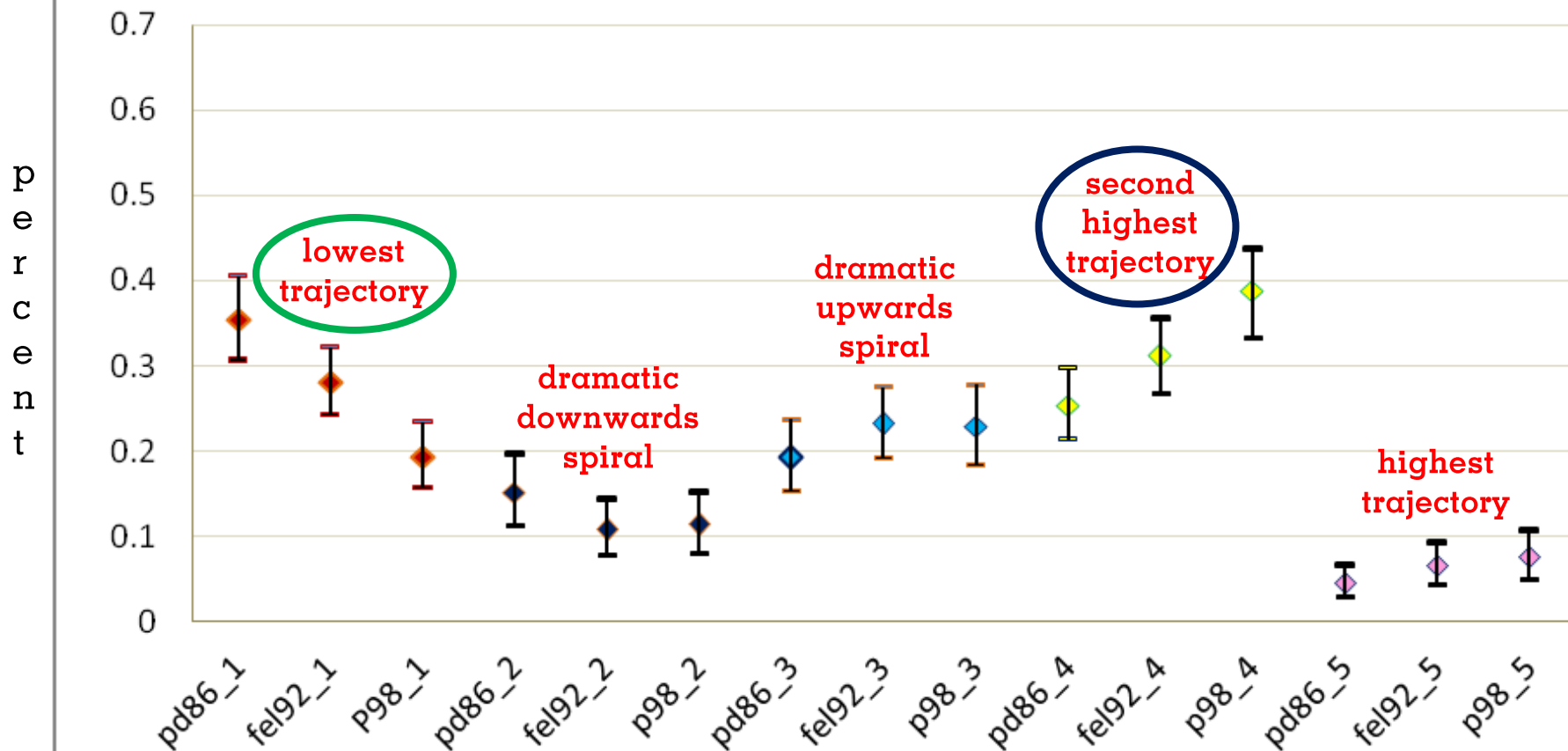
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