



NCCI Holdings, Inc.

Indemnity Benefit Duration, Maximum Weekly Benefits, and Claim Attributes

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Objective

- For the purpose of legislative pricing, we study the cost implications of increases in the maximum weekly indemnity benefit of TTD claims of two recent reforms in Oregon and New Mexico
 - We quantify the direct cost effect (percentage cost increase at original durations) and the indirect cost effect (as caused by increased durations, which are manifestations of increased utilization)
- We focus on increases in the maximum weekly benefit that occur in isolation of other legislative actions that may affect TTD durations
 - This way, we are able to apply an “event study” framework to the legislative reform
 - By comparing observations between pre-reform and post-reform time windows, we are able to quantify the effect of the event

Oregon Senate Bill 485

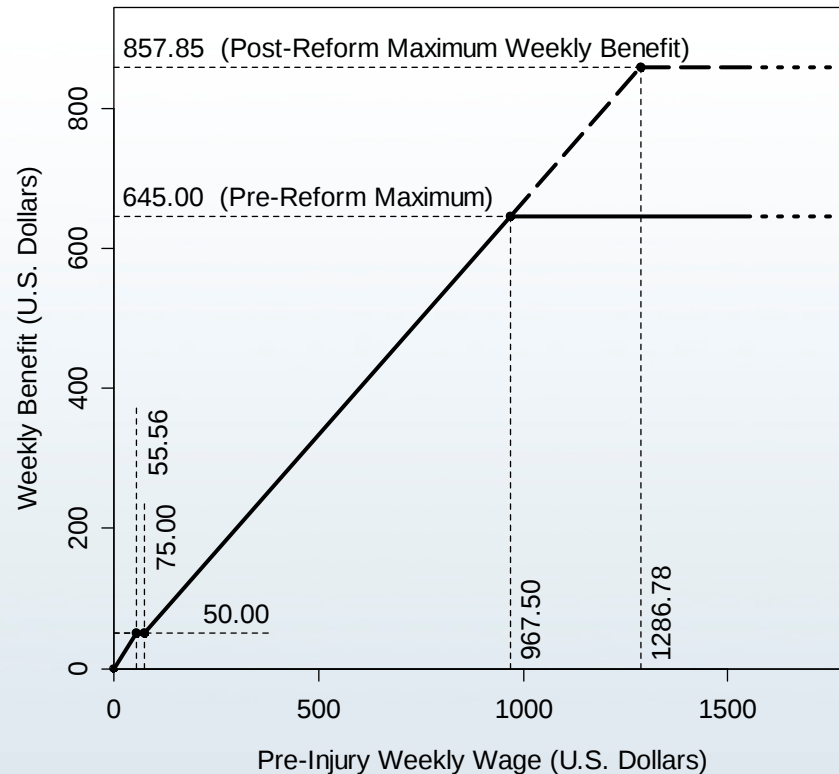
Effective 1/1/2002

- Oregon SB 485 lead to several changes, among which are the following:
 - An increase in the maximum weekly benefit for TTD injuries from 100 percent to 133 percent of the SAWW (State Average Weekly Wage)
 - An increase in the amount of compensation per degree of impairment for both scheduled and non-scheduled PPD injuries
 - A redefinition of “preexisting condition” in a stricter manner; the burden of proof of pre-existing conditions was placed on the employer
 - A change in the benefit calculation for workers with more than one job, and provision for reimbursement to the carrier on behalf of the Workers’ Benefit Fund in these cases
 - Several provisions affecting medical costs only

Oregon TTD Benefits

	Pre - SB 485	Post - SB 485
Rate of compensation	66 $\frac{2}{3}$ percent	66 $\frac{2}{3}$ percent
Minimum weekly benefit	\$50 or 90 percent of wage, whichever is less	\$50 or 90 percent of wage, whichever is less
Maximum weekly benefit	100 percent of SAWW	133 percent SAWW
Maximum Duration	none	none
Waiting period/retroactive period	3/14	3/14
Escalation	Each July 1, by percent increase in SAWW	Each July 1, by percent increase in SAWW

Oregon TTD Benefit Schedule



- The chart displays the benefits schedule on the day the reform took effect (January 1, 2002)
- Up to a pre-injury weekly wage of \$55.56, the weekly benefit equals 90 percent of that weekly wage
- For claimants with a pre-injury weekly wage in excess of \$55.56 but not more than \$75, the average weekly benefit equals \$50
- Claimants with a pre-injury weekly wage in excess of \$75 collect the maximum weekly benefit or two-thirds of the pre-injury weekly wage, whichever is less
- The reform raised the maximum weekly benefit from 100 percent of the state average weekly wage to 133 percent

New Mexico Senate Bill 148

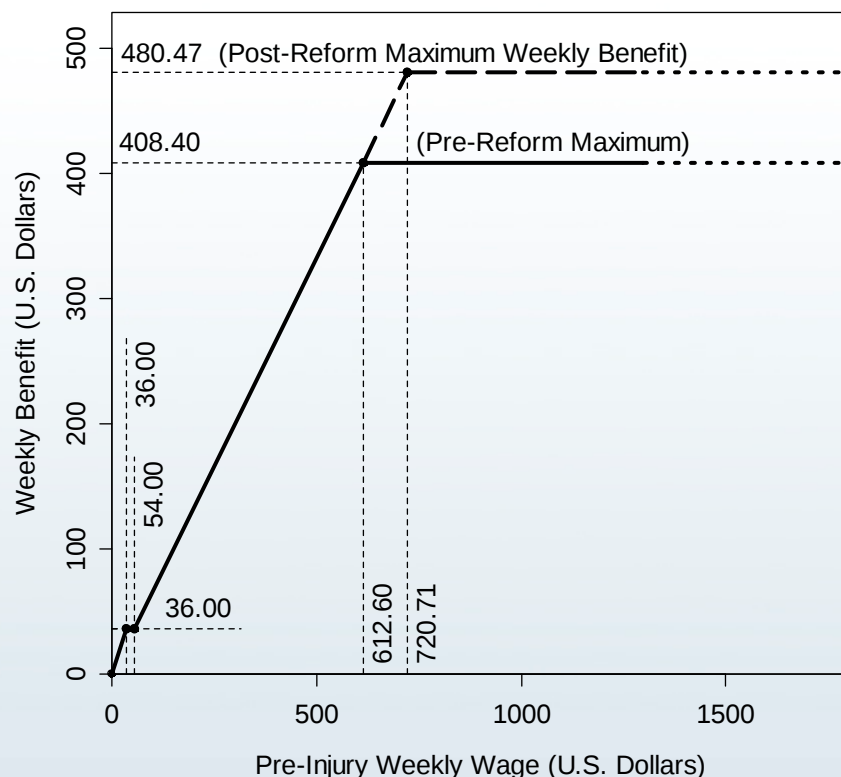
Effective 1 / 1 / 2000

- New Mexico SB 148 lead to several changes, among which are the following:
 - Increase in the maximum weekly benefit for all injuries from 85 percent of the SAWW to 100 percent
 - Increase in the maximum funeral expense from \$3,000 to \$7,500

New Mexico TTD Benefits

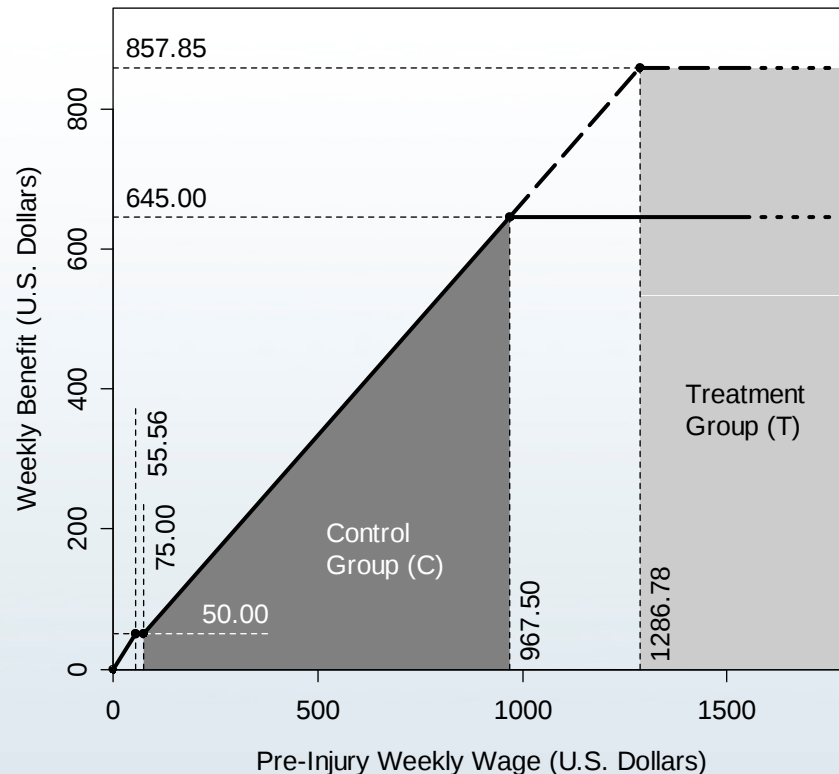
	Pre - SB 148	Post - SB 148
Rate of compensation	66 $\frac{2}{3}$ percent	66 $\frac{2}{3}$ percent
Minimum weekly benefit	\$36, or actual wage if less than the minimum weekly benefit	\$36, or actual wage if less than the minimum weekly benefit
Maximum weekly benefit	85 percent of SAWW	100 percent SAWW
Maximum Duration	700 weeks	700 weeks
Waiting period/retroactive period	7/28	7/28
Escalation	none	none

New Mexico TTD Benefit Schedule



- The chart displays the benefits schedule on the day the reform took effect (January 1, 2000)
- Up to a pre-injury weekly wage of \$36, the weekly benefit equals 100 percent of that weekly wage
- For claimants with a pre-injury weekly wage in excess of \$36 but not more than \$54, the average weekly benefit equals \$36
- Claimants with a pre-injury weekly wage in excess of \$54 collect the maximum weekly benefit or two-thirds of the pre-injury weekly wage, whichever is less
- The reform raised the maximum weekly benefit from 85 percent of the state average weekly wage to 100 percent

Experimental Research Design (OR)



- We quantify for claims of award type TTD, the impact of the benefit change on injury duration in an experimental setting, which differentiates between control and treatment groups, as suggested by Krueger (1990)
- The chart displays the benefits schedule at the time of the Oregon reform (January 1, 2002)
- The control group (C) consists of all claimants whose benefits were not altered by the reform and, at the same time, had a pre-injury weekly wage of at least \$75
- The treatment group (T) comprises all claimants whose benefits were constrained by the legal maximum both before and after the reform

Up to a pre-injury weekly wage of \$55.56, the weekly benefit equals 90 percent of that weekly wage. For claimants with a pre-injury weekly wage in excess of \$55.56 but not more than \$75, the average weekly benefit equals \$50. Claimants with a pre-injury weekly wage in excess of \$75 collect the maximum weekly benefit or two-thirds of the pre-injury weekly wage, whichever is less; the reform raised the maximum weekly benefit from 100 percent of the state average weekly wage to 133 percent

Quantifying the Treatment Effect

- The treatment effect equals the difference in differences in benefit durations:

Treatment effect =

“mean benefit duration in
post-reform **treatment** group”

minus

“mean benefit duration in
pre-reform **treatment** group”

MINUS

“mean benefit duration in
post-reform **control** group”

minus

“mean benefit duration in
pre-reform **control** group”

We assume that the legislative change to the compensation of PPD claims in Oregon does not bear on the injury duration of TTD claims

The Data (OR)

- Claims data were provided by the Oregon Department of Consumer and Business Services upon request
- The time window for the date of injury ranges from January 1, 1999 through December 31, 2004, thus providing 36-month pre- and post-reform periods
- TTD claims are lumped alongside TPD (Temporary Partial Disability) claims into a single award type
- The number of TTD/TPD claim records (before data cleansing) equals 98,311 (or 62.52 percent of the total lost-time claim records)
- All TTD/TPD claims are closed, except for re-opened claims

Data source: Oregon Department of Consumer and Business Services

Aside from the categories None and Unknown, there are four award types:

TTD/TPD, PPD, PTD (Permanent Total Disability), and Fatal

Total number of claim records across all award types collecting lost-time benefits: 157,246

There are 731 claim records (or 0.46 percent of the total) with claims that are flagged "Reopen" or "Reopen NC (New Condition)"

The Data (NM)

- Claims data were provided by the New Mexico Workers' Compensation Administration upon request
- The time window for the date of injury ranges from January 1, 1997 through December 31, 2002, thus providing 36-month pre- and post-reform periods
- The number of TTD claims (before data cleansing) equals 23,382 (or 63.20 percent of the total lost-time claims)
- All TTD claims are closed, except for re-opened claims

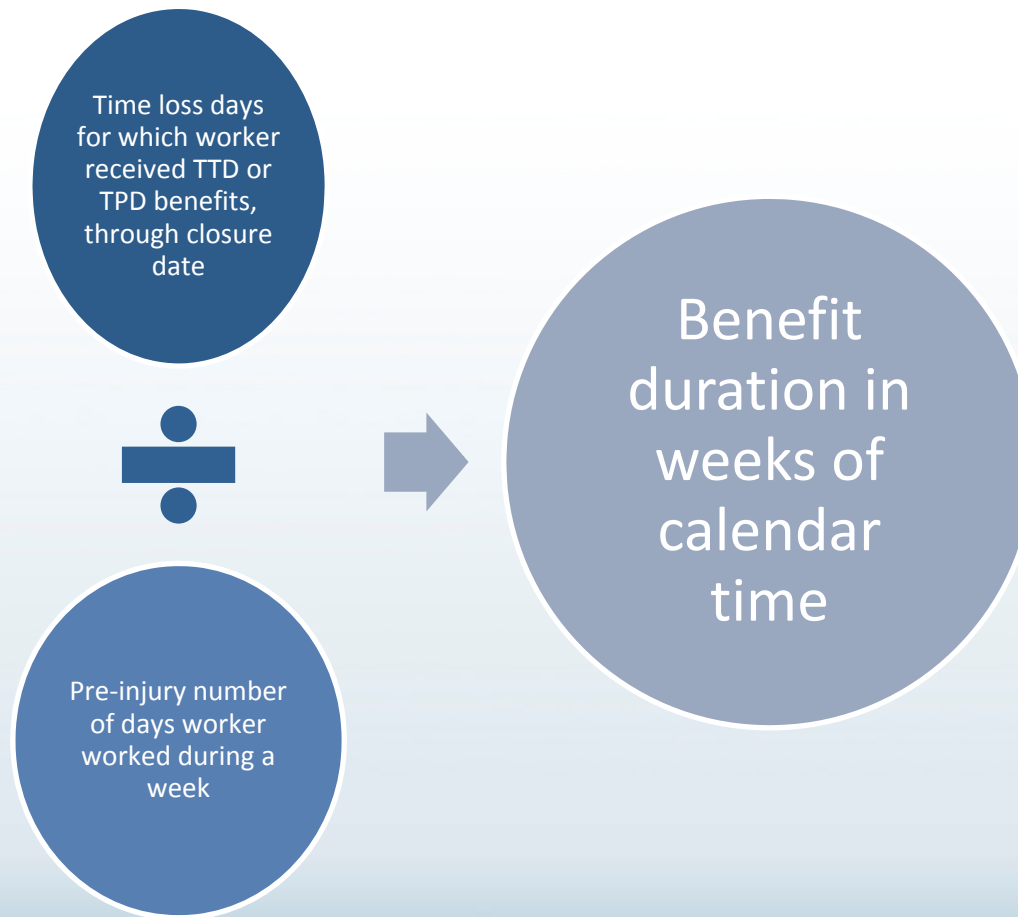
Data source: New Mexico Workers' Compensation Administration

Lost-time claims are identified by positive payments in the categories TTD, TPD, PPD, PTD, "Death," or "Lump sum"

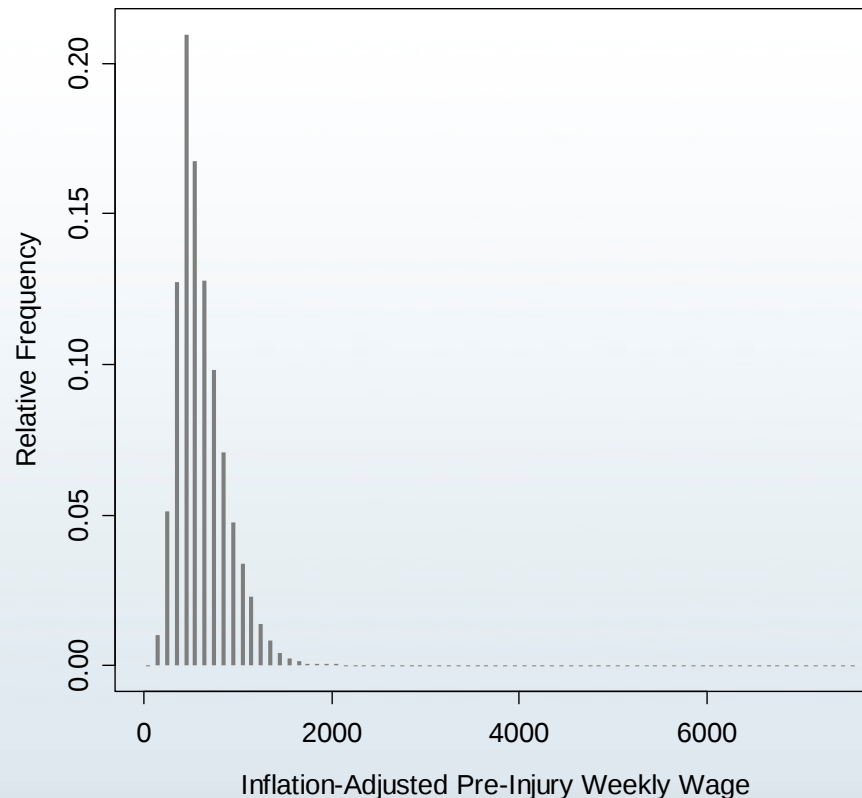
Total number of claims collecting lost-time benefits: 36,997

There are 2,866 claims (or 7.75 percent of the total) that are categorized as "R" ("Reopened") or "X" ("Reopened/Closed")

Quantifying Benefit Duration (OR)



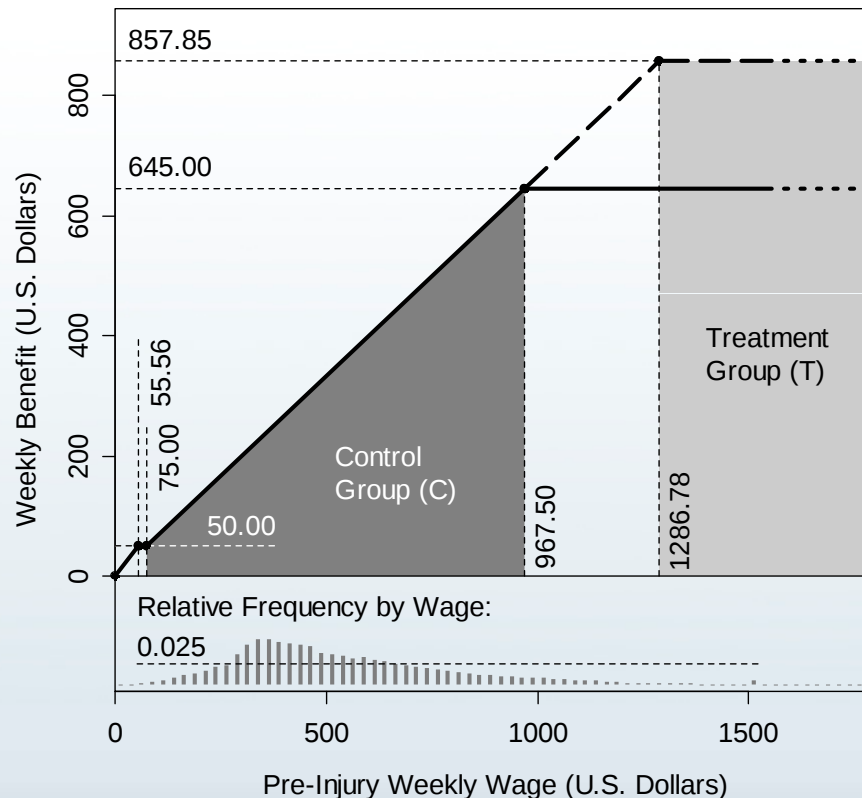
Wage Distribution (OR)



- Histogram of pre-injury weekly wage; bin size: \$100
- The observations of the pre-injury weekly wage displayed in this chart were normalized to the level of the state average weekly wage applicable at the time of the reform
- Minimum: \$3.96
- Median: \$454.02
- Mean: \$516.20
- Maximum: \$7,469.46

Data source: Oregon Department of Consumer and Business Services
NCCI calculations; number of claims (after data cleansing): 53,681

Claim Count by C/T Groups (OR)



- C/T Claim Counts

Count (percent)	Control	Treatment
Pre-reform	27,375 (51.00)	350 (0.65)
Post-reform	22,442 (41.81)	284 (0.53)

- The bin size of the histogram is \$100; there is a residual bin for pre-injury weekly wages of \$1,500 or higher

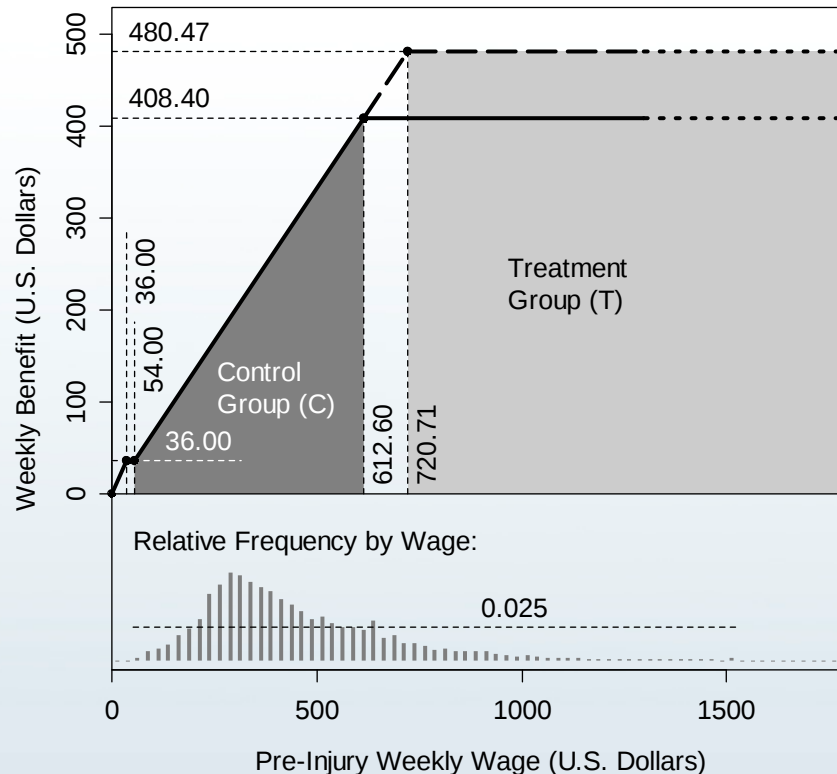
Data source: Oregon Department of Consumer and Business Services

NCCI calculations; number of claims: 53,681 (of which 50,451 fall into the categories Control or Treatment)

Up to a pre-injury weekly wage of \$55.56, the weekly benefit equals 90 percent of that weekly wage. For claimants with a pre-injury weekly wage in excess of \$55.56 but not more than \$75, the average weekly benefit equals \$50. Claimants with a pre-injury weekly wage in excess of \$75 collect the maximum weekly benefit or two-thirds of the pre-injury weekly wage, whichever is less; the reform raised the maximum weekly benefit from 100 percent of the state average weekly wage to 133 percent

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Claim Count by C/T Groups (NM)



- C/T Claim Counts

Count (percent)	Control	Treatment
Pre-reform	5,935 (40.16)	565 (3.82)
Post-reform	6,339 (42.89)	831 (5.62)

- The bin size of the histogram is \$100; there is a residual bin for pre-injury weekly wages of \$1,500 or higher

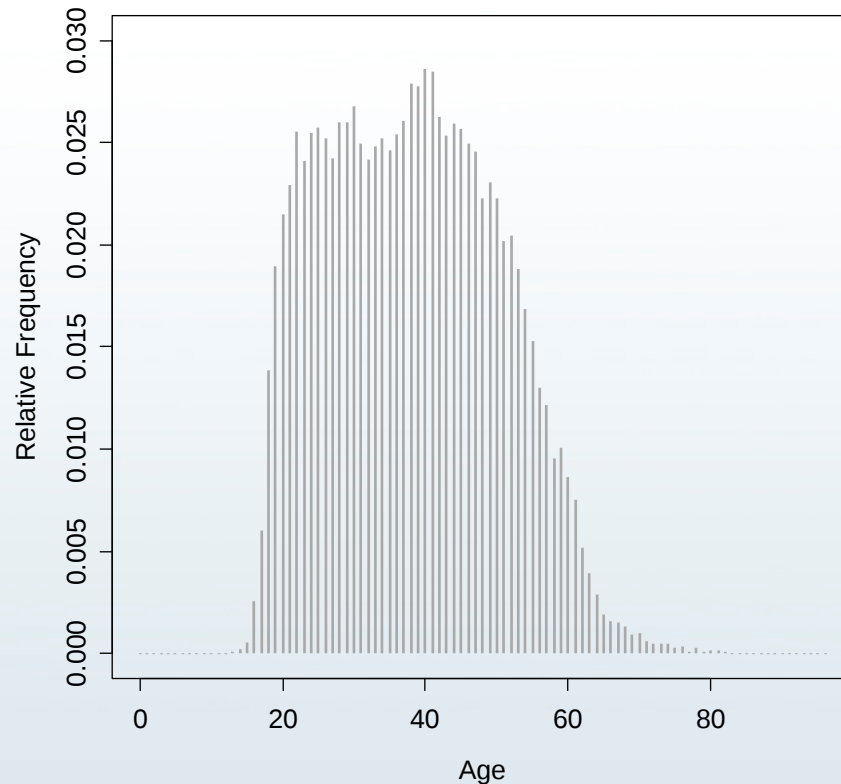
Data source: New Mexico Workers' Compensation Administration

NCCI calculations; number of claims: 14,778 (of which 13,670 fall into the categories Control or Treatment)

Up to a pre-injury weekly wage of \$36, the weekly benefit equals 100 percent of that weekly wage. For claimants with a pre-injury weekly wage in excess of \$36 but not more than \$54, the average weekly benefit equals \$36. Claimants with a pre-injury weekly wage in excess of \$54 collect the maximum weekly benefit or two-thirds of the pre-injury weekly wage, whichever is less; the reform raised the maximum weekly benefit from 85 percent of the state average weekly wage to 100 percent

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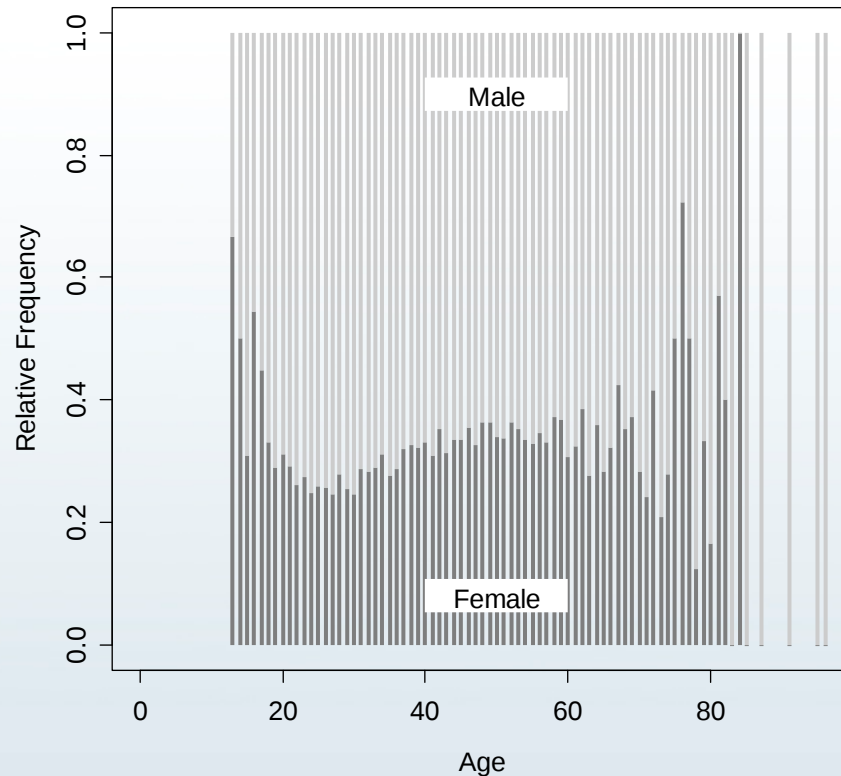
Age Distribution (OR)



- The histogram displays the age distribution in single-year bins
- Minimum age: 13
- Median age: 38
- Mean age: 38.1
- Maximum age: 96

Data source: Oregon Department of Consumer and Business Services
NCCI calculations; number of claims: 53,515 (down from 53,681 due to zero values for age)

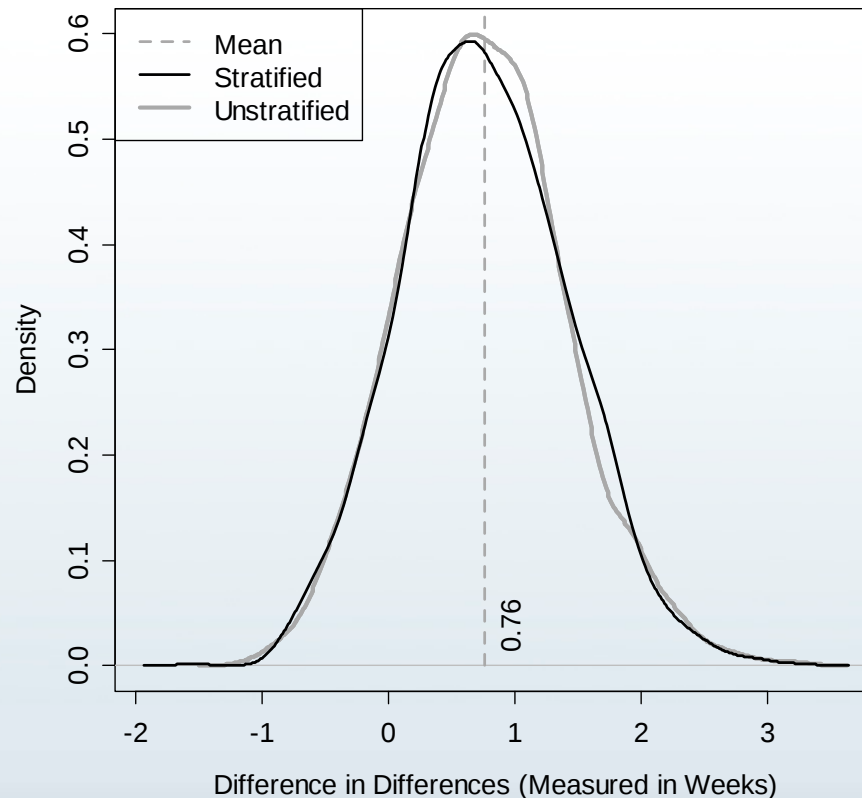
Distribution of Gender by Age (OR)



- The chart displays relative frequencies for gender in single-year age bins
- 68.9 percent of claimants are male

Data source: Oregon Department of Consumer and Business Services
NCCI calculations; number of claims: 53,515 (down from 53,681 due to zero values for age)

Treatment Effect in Weeks (OR)



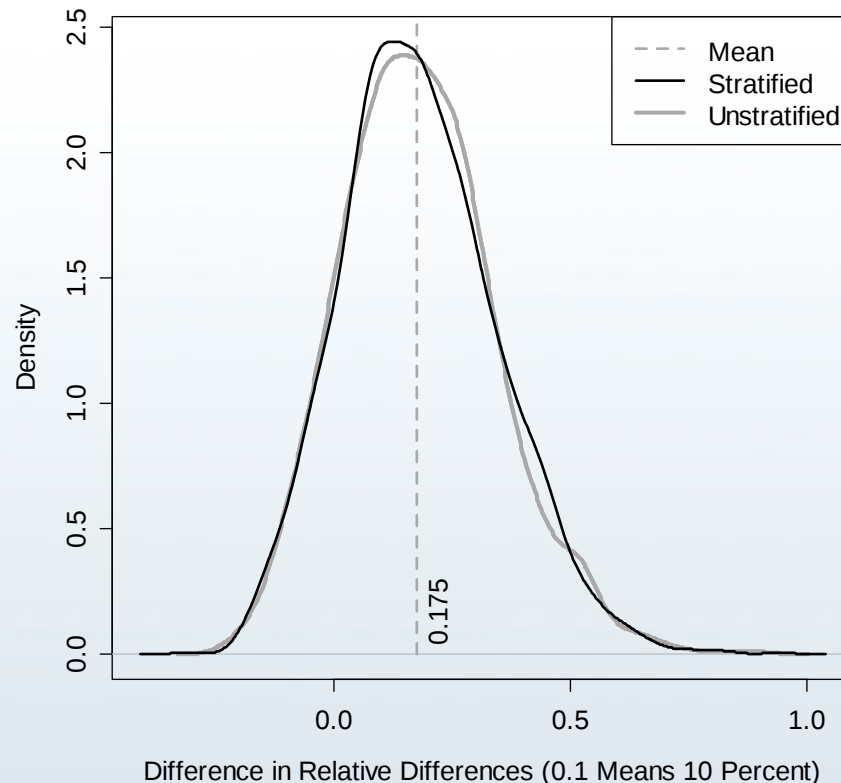
- The treatment effect equals 0.76 weeks in calendar time of benefit duration
- The chart shows stratified and unstratified bootstrap results for 2,000 draws
- The stratified bootstrap draws from the control and treatment groups according to their relative sizes

Data source: Oregon Department of Consumer and Business Services; NCCI calculations

Number of claims: 53,681 (of which 50,451 fall into the categories Control or Treatment and are used to calculate the treatment effect)

Note: Benefit duration is measured in calendar time

Treatment Effect in Percent (OR)



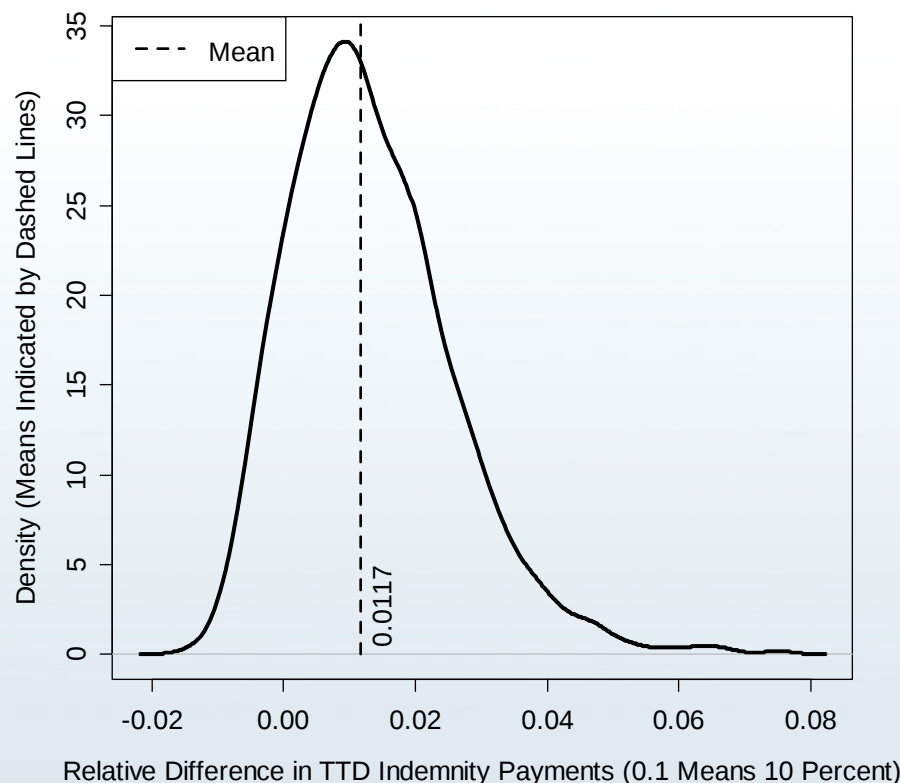
- The treatment effect equals a 17.5 percent increase in benefit duration
- The chart shows stratified and unstratified bootstrap results for 2,000 draws
- The stratified bootstrap draws from the control and treatment groups according to their relative sizes

Data source: Oregon Department of Consumer and Business Services; NCCI calculations

Number of claims: 53,681 (of which 50,451 fall into the categories Control or Treatment and are used to calculate the treatment effect)

Note: Benefit duration is measured in calendar time

Impact of Duration on TTD Payments (OR)



- The effect of the change in the maximum weekly benefit on total indemnity payments within the award category TTD, as caused by increased injury duration, equals 1.17 percent
- Pre-reform indicated indemnity payments of the treatment group were scaled up according to the measured treatment effect
- Pre-reform indicated indemnity payments of the group located between control and treatment groups were also scaled up according to the treatment effect, but here the treatment effect was weighted
 - For a given claim, the weight equals the distance of the applicable pre-injury weekly wage to the left limit of the group's pre-injury weekly wage interval, divided by the distance between right and left limits of this interval
- The benefit payments were normalized to the level of the state average weekly wage applicable at the time of the reform
- The chart shows (stratified) bootstrap results for 2,000 draws

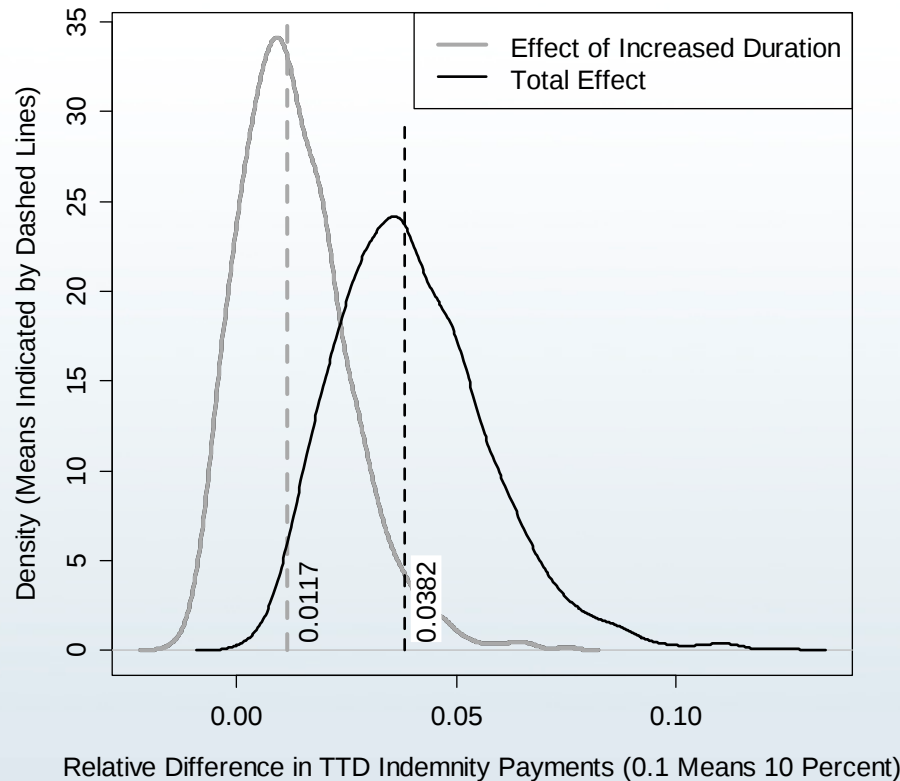
Data source: Oregon Department of Consumer and Business Services; NCCI calculations

Number of claims: 53,681 (of which 50,451 fall into the categories Control or Treatment and are used to calculate the treatment effect)

Note: Benefit durations were translated into injury durations before measuring the treatment effect (all in calendar time). This treatment effect was then applied to the pre-reform durations of the treatment group and, on a pro-rated basis, to the pre-reform durations of the group located between control and treatment groups. Finally, before applying the benefit schedule, these adjusted injury durations were translated back into benefit durations

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Total Impact on TTD Payments (OR)



- The total effect of the change in the maximum weekly benefit on total indemnity payments within the award category TTD equals 3.82 percent
- Pre-reform indicated indemnity payments of the treatment group were scaled up according to the measured treatment effect and the increase in the maximum weekly benefit from 100 percent of the state average weekly wage to 133 percent
- Pre-reform indicated indemnity payments of the group located between control and treatment groups were also scaled up according to the treatment effect and the increase in the maximum weekly benefit, but here these two (multiplicative) effects were weighted
 - For a given claim, the weight equals the distance of the applicable pre-injury weekly wage to the left limit of the group's pre-injury weekly wage interval, divided by the distance between right and left limits of this interval
- The benefit payments were normalized to the level of the state average weekly wage applicable at the time of the reform
- The chart shows (stratified) bootstrap results for 2,000 draws

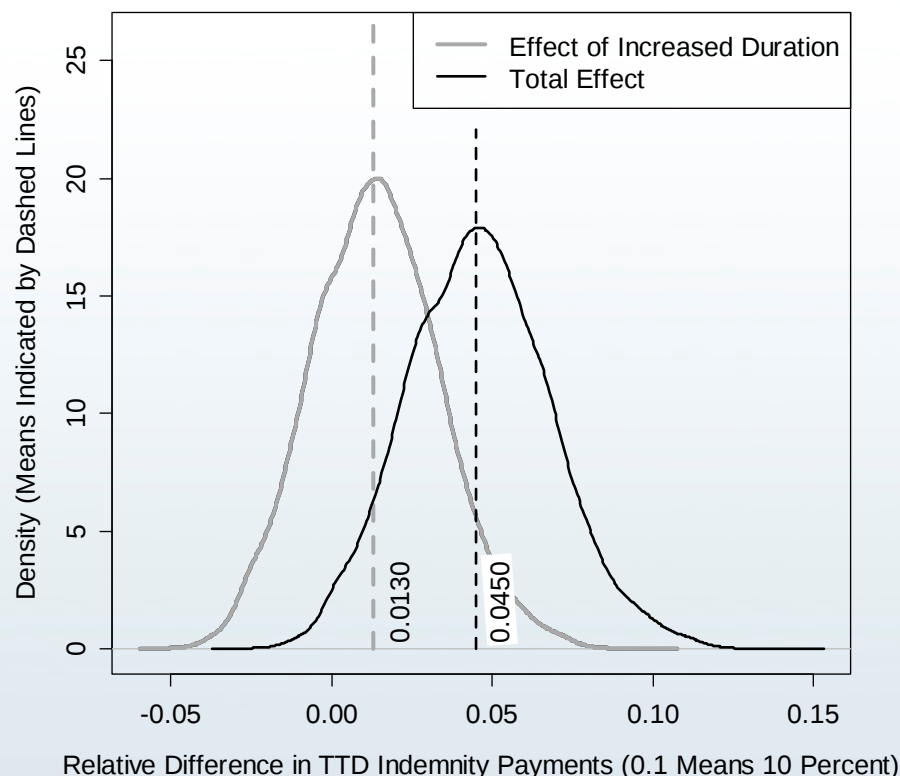
Data source: Oregon Department of Consumer and Business Services; NCCI calculations

Number of claims: 53,681 (of which 50,451 fall into the categories Control or Treatment and are used to calculate the treatment effect)

Note: Benefit durations were translated into injury durations before measuring the treatment effect (all in calendar time). This treatment effect was then applied to the pre-reform durations of the treatment group and, on a pro-rated basis, to the pre-reform durations of the group located between control and treatment groups. Finally, before applying the benefit schedule, these adjusted injury durations were translated back into benefit durations

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Total Impact on TTD Payments (NM)



- The effect of the change in the maximum weekly benefit on total indemnity payments within the award category TTD, as caused by increased injury duration, equals 1.30 percent; the total effect equals 4.50 percent
- Pre-reform indicated indemnity payments of the treatment group were scaled up according to the measured treatment effect and the increase in the maximum weekly benefit from 85 percent of the state average weekly wage to 100 percent
- Pre-reform indicated indemnity payments of the group located between control and treatment groups were also scaled up according to the treatment effect and the increase in the maximum weekly benefit, but here these two (multiplicative) effects were weighted
 - For a given claim, the weight equals the distance of the applicable pre-injury weekly wage to the left limit of the group's pre-injury weekly wage interval, divided by the distance between right and left limits of this interval
- The benefit payments were normalized to the level of the state average weekly wage applicable at the time of the reform
- The chart shows (stratified) bootstrap results for 4,000 draws

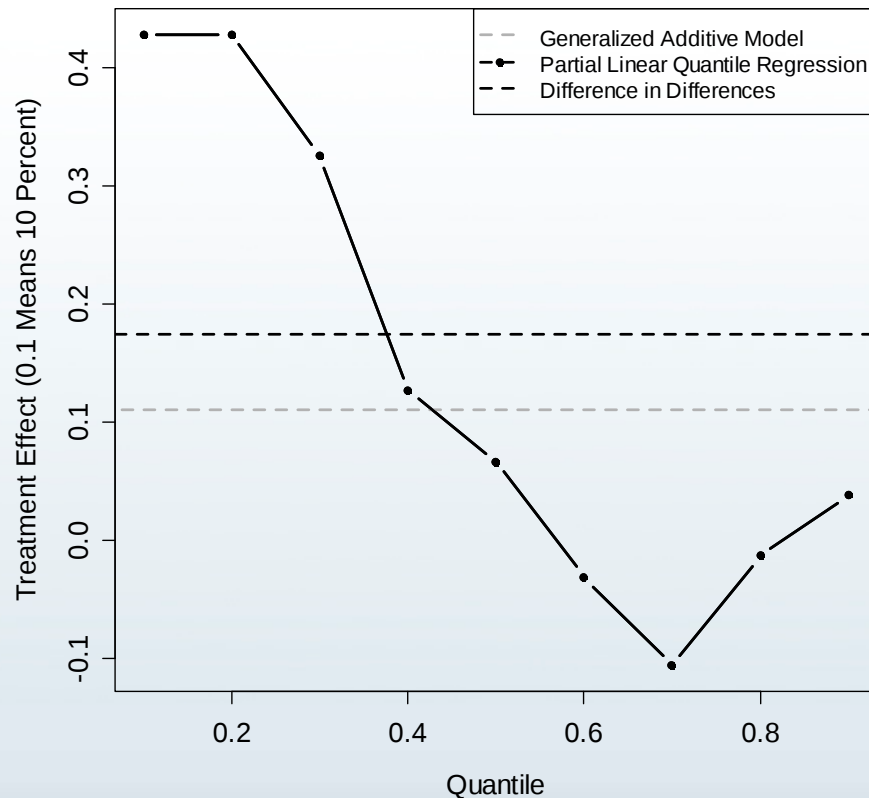
Data source: New Mexico Workers' Compensation Administration

NCCI calculations; number of claims: 14,778 (of which 13,670 fall into the categories Control or Treatment)

Note: Benefit durations were translated into injury durations before measuring the treatment effect (all in calendar time). This treatment effect was then applied to the pre-reform durations of the treatment group and, on a pro-rated basis, to the pre-reform durations of the group located between control and treatment groups. Finally, before applying the benefit schedule, these adjusted injury durations were translated back into benefit durations

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Partial Linear Regression (OR)



- The 17.5 percent increase in the number of weeks obtained using the “difference in differences” approach is verified using a (partial linear) GAM (generalized additive model); age enters the nonparametric component
- The GAM finds a treatment effect of 11.1 percent when controlling for gender and occupation
- Further, using a partial linear quantile regression model (using the same covariates as in the GAM, and age again entering the nonparametric component), it is shown that the treatment effect is largely confined to claims of short duration

Data source: Oregon Department of Consumer and Business Services; NCCI calculations

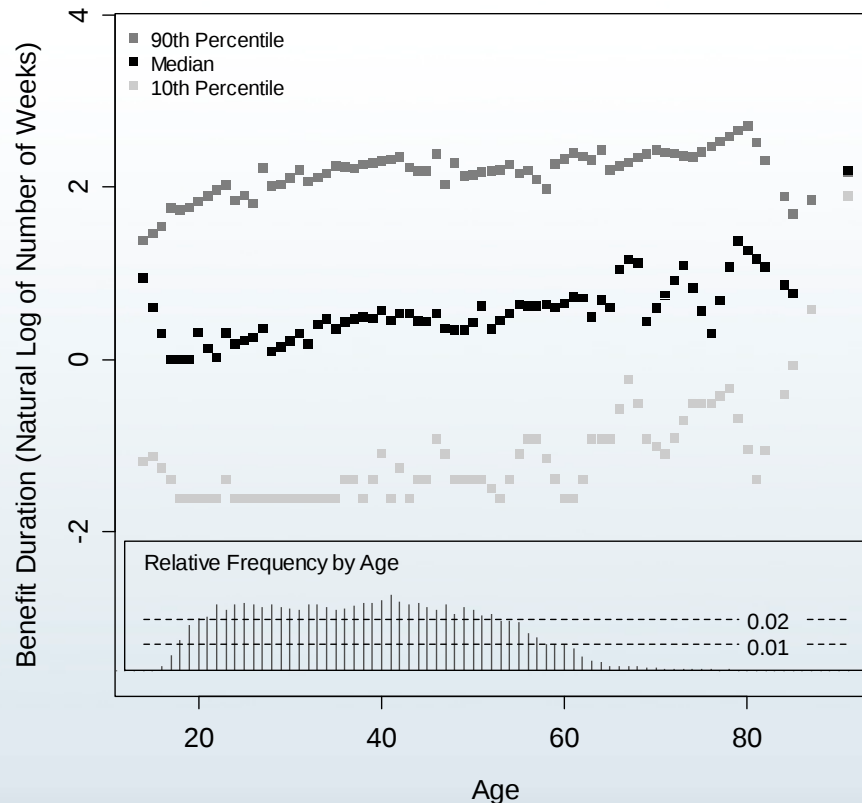
Number of claims: 53,681 (of which 50,451 fall into the categories Control or Treatment and are used in the regression)

The partial linear GAM and quantile regression specifications reads $y_i = x_i \cdot \beta + f(z_i)$, where gender, occupation, and indicator variables for the control and pre-reform treatment groups are the covariates in the parametric component, and age enters the nonparametric component; the reference group is the pre-reform treatment group, occupied in the services industry, and male

Note: Benefit duration is measured in calendar time

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Quantile Regression: Age (OR)



- The chart displays for the post-reform period the effect of age in a partial linear quantile regression model for the 10th, 50th, and 90th percentiles of injury duration
- The covariates consist of year indicator variables (2002 is the reference year), occupation indicator variables, and an indicator variable for the female gender
- For the median, the benefit duration is roughly log-linear in age for the age bracket 20 through 60
- An M estimator delivers a geometric mean rate of growth in benefit duration per year of age of 1.0 percent (or 0.72 percent when this method is applied to the New Mexico data)

Data source: Oregon Department of Consumer and Business Services

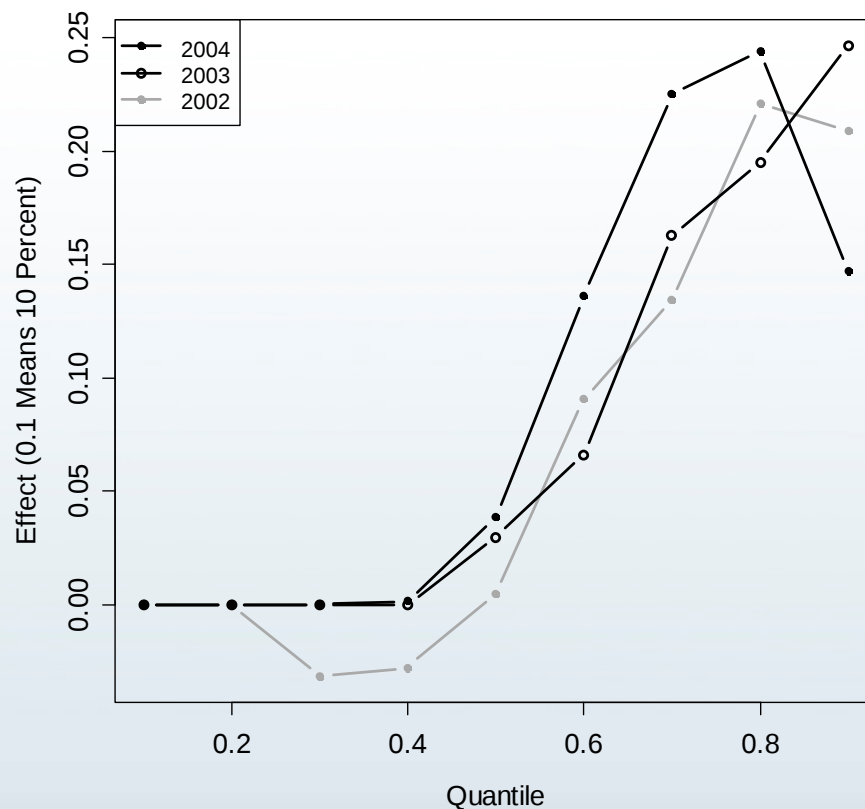
NCCI calculations; number of claims: 24,108 (down from 24,127 post-reform claims due to zero values for age)

The partial linear quantile regression reads $y_i = x_i \cdot \beta + f(z_i)$, where year indicator variables, occupation indicator variables, and a gender indicator variable are the covariates in the parametric component, and age enters the nonparametric component; the reference group sustained an injury in the year 2002, is occupied in the services industry, and is male

Note: Benefit duration is measured in calendar time

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Quantile Regression: Gender (OR)



- The chart displays findings of a partial linear quantile regression model for the 10th, 20th, ..., and 90th percentiles of injury duration
- Displayed is the effect of gender, which enters the parametric component of the partial linear model
- The effect of the female gender is essentially nil up to the 40th percentile
- For claims with extended injury durations, these durations are about 20 percent higher for females than they are for males

Data source: Oregon Department of Consumer and Business Services

NCCI calculations; number of claims: 24,108 (down from 24,127 post-reform claims due to zero values for age)

The partial linear quantile regression, which is run for each post-reform year in isolation, reads $y_i = x_i \cdot \beta + f(z_i)$, where indicator variables for gender and occupation are the covariates in the parametric component, and age enters the nonparametric component; the reference group is occupied in the services industry and male

Note: Benefit duration is measured in calendar time

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Utilization Impact on Claim Frequency (OR)

- An increase in the maximum weekly benefit may give rise not only to longer benefit durations, but also to a higher number of indemnity claims
 - For instance, Gardner (1991) found for Connecticut that a 50 percent increase in the maximum weekly benefit was associated with an increase in the number of indemnity claims of 5 percent
 - Further, Brooks (1998) claims that indemnity frequency increases by 2.6 percent in response to a 10 percent increase in the indemnity benefit level
- Here, no statement can be made with confidence on how the 33 percent increase in the maximum weekly benefit may have affected the claim count in Oregon; this is because the data cleansing algorithms that separate TTD and TPD claims, while improving data quality for the study of duration, may adversely affect the validity of the claims count information
- Further, the reform of interest, which is the increase in the maximum weekly benefit for TTD claims, was accompanied by an increase in compensation for both scheduled and non-scheduled PPD injuries; this change in PPD benefits may also have influenced the incentive to file claims, apart from the increase in the maximum weekly benefit of TTD claims

Oregon and New Mexico in Comparison

- The estimated benefit durations are similar across the two states—see column (5)
- Further, the portion of the total effect that is due to the utilization increase is similar as well—see columns (9) and (10)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Legislative Reform: Percentage increase in maximum weekly benefit	Increase in benefit duration in treatment group (measured in weeks)	Percentage increase in benefit duration in treatment group	Resulting duration/benefit elasticity (column 4, divided by column 2)	Percentage of total cost increase	Percentage points of total cost increase that are due to utilization increase <u>at pre-reform benefit levels</u>	Percentage points of total cost increase that are due to increase in benefits <u>at pre-reform duration levels</u>	Percentage of utilization increase in total cost increase (column 7, divided by column 6)	Percentage of utilization increase in total cost increase (column 6 minus column 8, divided by column 6)
Oregon	33.00	0.76	17.49	0.53	3.82	1.17	2.36	31	38
New Mexico	17.65	0.41	7.64	0.43	4.50	1.30	3.00	29	33

Breaking Down the Total Effect

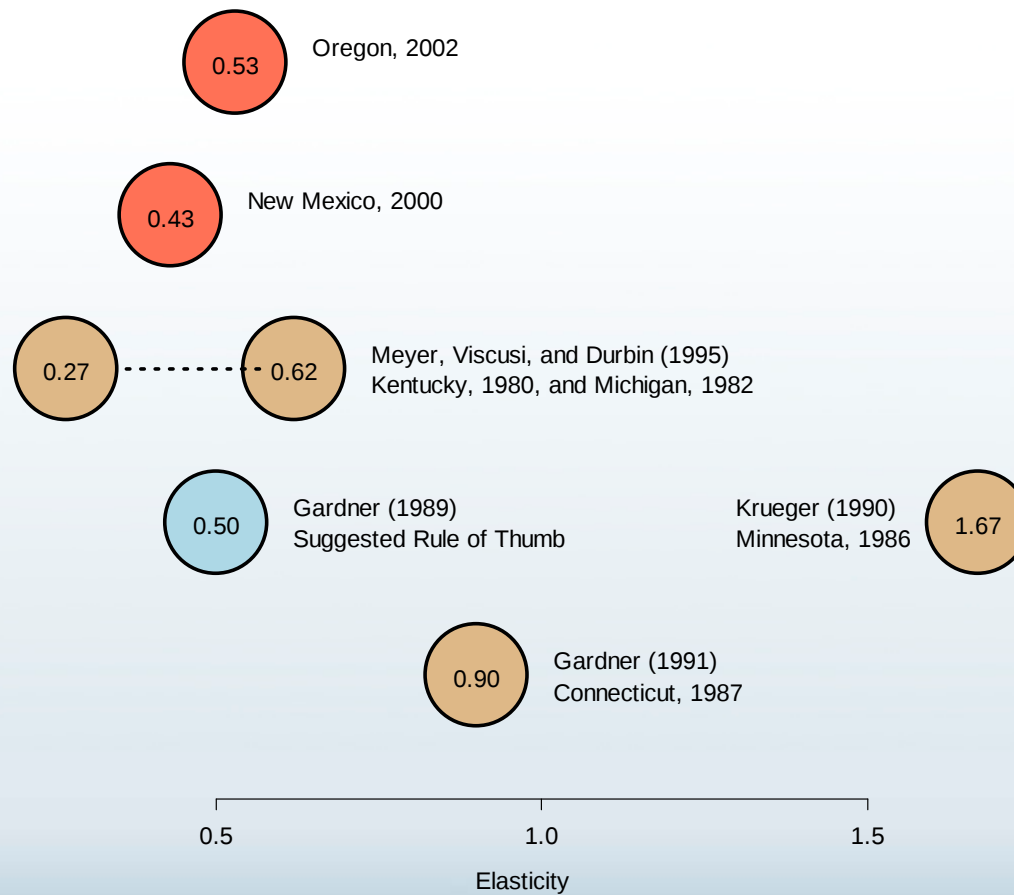
- There are two ways of decomposing the total effect into the direct effect and indirect (i.e., utilization) effect using pre-reform claims data
 - Calculate at the pre-reform benefit schedule the percentage increase in indemnity payments that is due to the treatment effect
 - See column (9) of table on previous slide for the proportion of utilization in the total
 - Alternatively, apply the post-reform benefit schedule to pre-reform durations—the remaining difference to the total effect is due to utilization
 - See column (10) of table on previous slide for the proportion of utilization in the total

Application in Legislative Pricing

- The second way of decomposing the total effect offers a straightforward formula for adjusting the direct effect for the purpose of arriving at the total effect
 - First, apply the post-reform benefit schedule to pre-reform claims at the observed (pre-reform) durations to obtain the direct effect (which equals 2.36 percent for Oregon and 3.00 percent for New Mexico)
 - Then, adjust this direct effect by the proportion of utilization (which, when averaged across Oregon and New Mexico, equals about 35 percent):

$$\text{total effect (percentage increase)} = \frac{\text{direct effect (percentage increase)}}{1 - 0.35}$$

Comparison to Prior Studies



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