

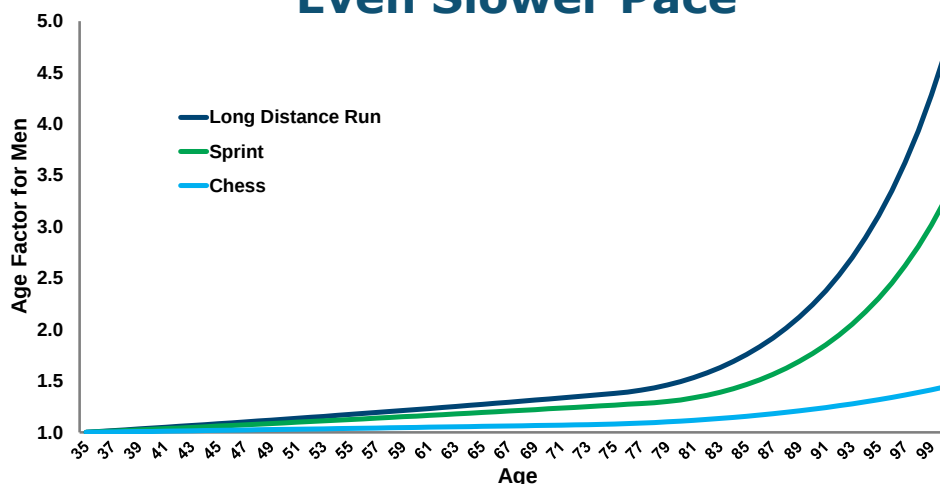


Workers Compensation and the Aging Workforce: Is 35 the New “Older” Worker?

In his study, “Estimated Age Effects in Athletic Events and Chess,” Ray Fair¹ found that both physical and mental performance deteriorates with age, but the rate of deterioration is far less dramatic than many think. Exhibit 1 is taken from that study and indicates that sprinting deteriorates more slowly than physical performance involving endurance, such as long distance running, and that mental performance, such as playing chess, deteriorates at an even slower pace. For example, the age factor for age 65 for Long Distance Run, the category with the fastest deterioration, is 1.27, meaning that the deterioration rate is only 27% over the 30 years from age 35 to age 65. Over those same 30 years, the deterioration rate is 19% for Sprint and only 6% for Chess.² Fair notes that “people may differ in how they read [Exhibit 1], but I am struck by how small the deterioration rates are ... Given these numbers, societies may have been too pessimistic about losses from aging for individuals who stay healthy and fit.”³ The analysis presented in this paper, based on workers compensation data, supports Fair’s conclusion.

Exhibit 1

Performance of Sprinting Deteriorates Slower Than Long Distance Running and Chess Performance Deteriorates at an Even Slower Pace



Source: Fair, Ray C. “Estimated Age Effects in Athletic Events and Chess,” *Experimental Aging Research*, 33: 37–57, 2007.

¹ Fair, Ray C., “Estimated Age Effects in Athletic Events and Chess,” *Experimental Aging Research*, 33: 37–57, 2007.

² Age factors for Long Distance Runs and Sprints are based on the best-ever performance by age, so are measured for very fit people who are running races at all ages. In terms of mental activity, age factors for Chess are not based on a US or world record, but are based on the best rating by age among chess ratings for about 50,000 players, downloaded from the World Chess Federation website.

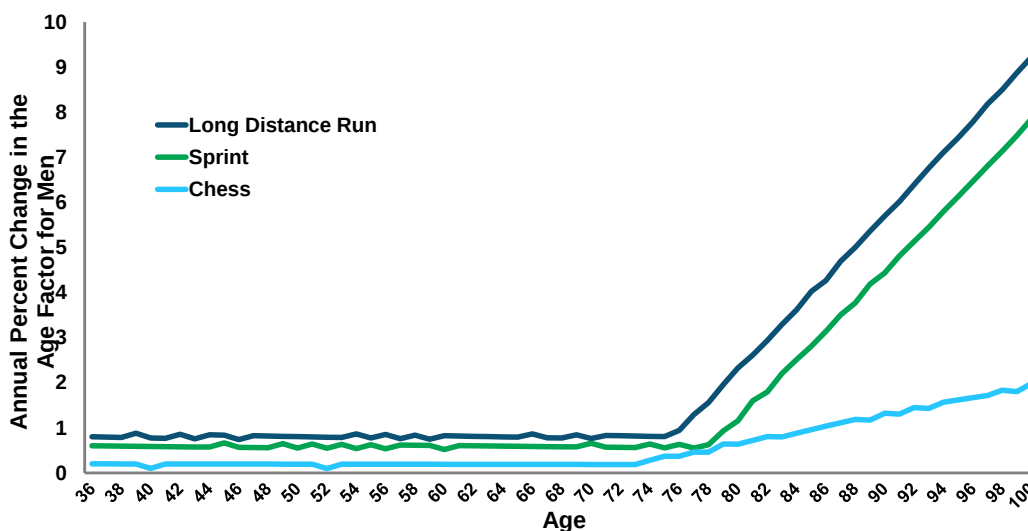
³ Fair, Ray C., *Predicting Presidential Elections and Other Things*, p. 116, 2002.

Exhibit 2 graphs the annual percent changes in the age factors shown in Exhibit 1. It reinforces the point that the annual rate of age-related deterioration for Long Distance Run, Sprint, and Chess is very small and gradual for ages up until the mid- to late-70s. Deterioration rates don't really accelerate until age 80 and beyond.

Exhibit 2

Age-Related Deterioration Is Small and Gradual Until Age 80

Annual Percent Change In Age Factors for Men



Source: Fair, Ray C. "Estimated Age Effects in Athletic Events and Chess," *Experimental Aging Research*, 33: 37–57, 2007.

Fair's findings raise the question, "Are older workers now younger?" In 2011, NCCI published a study on the aging workforce, which concluded that, on average, costs for workers aged 35 and older tend to be quite similar; in contrast, they are higher than the average costs for workers aged 16 to 34.⁴ In addition, from a workers compensation perspective, the higher costs are largely offset by the higher premium due to higher wages of older workers. Overall, the findings can be viewed as reassuring, in that an aging workforce appears to have a far less negative impact on workers compensation claim costs than might have been thought.

This study extends the 2011 NCCI analysis and finds additional similarities between the 35-and-older-age cohorts. The paper starts by comparing the share of claims by diagnosis and age cohort resulting from permanent partial, temporary total, and medical-only injuries. It goes on to identify the factors that account for the observed increases in severities over time for various age cohorts. The analysis concludes by examining safety and loss control programs related to the aging workforce.

Key Observations

- For a range of specific diagnoses, the shares by type of workplace injury (i.e., temporary total, permanent partial, and medical only) are remarkably comparable across age cohorts. For example, the shares of claims due to "sprain of neck" that were temporary total injuries are virtually identical for both younger and older workers.
- The factors accounting for increases in severity (referred to as mix, quantity, and price⁵) over two time periods (1996/97 to 2000/01 and 2001/02 to 2007/08⁶) are relatively similar across age cohorts.

⁴ See "Workers Compensation and the Aging Workforce," published in December 2011 on ncci.com.

⁵ As discussed later, "price times quantity = total costs," and "mix" refers to differences in the types of injuries.

⁶ In this report, averages of the start and end periods are used. For example, 1996/97 refers to an average of 1996 and 1997.

The accident year period 1996/97 includes data on claims for injuries that occurred from January 1, 1996 to December 31, 1997.

- For all age cohorts, changes in the mix of leading diagnoses account for a marginal share of the increase in severity for both periods, but the impact is slightly larger in the late 1990s than in the 2000s.
- Injuries due to high severity diagnoses have historically been more common for older workers, but those high severity diagnoses are now becoming common in younger-age cohorts as well.
- “Quantity” is more important for all age cohorts in the late 1990s when both duration (number of days with indemnity payments) and number of treatments per claim were increasing.
- “Price” (i.e., daily indemnity benefit payments and cost per medical treatment) is a more significant factor across age cohorts in the 2000s, primarily because duration and treatments per claim fell.
- Employers are implementing safety and loss control programs to address the aging of the workforce.

The Distribution of Claims by Diagnosis and Injury Type Are Similar for Younger and Older Workers

There is a general sense that, for any type of injury or illness, an older person is likely to have greater physical problems and take longer to heal. Therefore, one question worth investigating, using workers compensation data, is whether there are significant differences in the types of injuries (i.e., permanent partial, temporary total, and medical only) sustained by younger and older workers.

The Data

In this section, the 15 most common diagnosis codes, based on the total of permanent partial, temporary total, and medical-only claim counts across Accident Years 1996–2008, were selected for both the younger- and older-age groups.⁷ The data used in this portion of the study is limited to payments on claims closed at 24 months; it also excludes the small number of fatal and permanent total claims. Ten of the top 15 diagnoses for each of the two age cohorts are the same, resulting in a total of 20 diagnosis codes for the two groups combined. These 20 diagnosis codes are displayed in Exhibit 3. The diagnosis codes in the table are sorted by claim count ranking for the younger-age cohort, so the top 15 diagnoses for the younger-age cohort are the first 15 shown. The ten diagnosis codes in the top 15 common for both age cohorts are highlighted in red, and those in green are in the top 15 only for the younger-age cohort. The 5 diagnosis codes in blue at the bottom of the table are the 5 that appear among the top 15 only for the older-age cohort.

Exhibit 3 also contains the share of claims by diagnosis and for all 20 leading diagnoses. For example, the top diagnosis code for both the younger- and older-age cohorts is “open wound of finger.” The share of 5.8% for the younger cohort is calculated by dividing the number of open wound of finger claims for those aged 20–34 by all claims for those aged 20–34. Similarly, the share of 3.5% for the older cohort is calculated by dividing the number of open wound of finger claims for those aged 45–64 by all claims for those aged 45–64.⁸

The total severity index is defined as total indemnity and medical severity for each diagnosis for both age cohorts combined, divided by total indemnity and medical severity across all diagnoses for both age cohorts combined; it is a measure of the relative severity of each diagnosis. A severity index of 1.0 for a given diagnosis means that its severity is equal to the average severity across all diagnoses for both age cohorts. Therefore, open wound of finger has well-below-average severity—with an index of 0.1—while sprain rotator cuff has well-above-average severity—with an index of 5.1.

The Findings

For those diagnosis codes that do not overlap, older workers are more likely to have higher-cost rotator cuff and knee injuries while younger workers are more likely to have lower-cost back sprains. The diagnosis codes that are much more common for older workers tend to be more expensive, with total severity indexes that are well above average. For example, the total severity index is 3.8 for rotator cuff syndrome, 5.1 for sprain rotator cuff, and 4.1 for tear medial cartilage meniscus of knee. However, we will see later in this paper that those types of injuries have become more common for younger-aged workers when we look at the rankings over time.

These 20 leading diagnoses account for a little more than a quarter of all claims for both the younger- and older-age cohorts as seen in the last row of the table (28% of claims for the younger-age cohort and 27% of claims for the older-age cohort). Open wound of finger is the diagnosis with the largest difference in the shares for older and younger workers, but the difference is only 2.3 percentage points. The shares for all other diagnoses are even more similar between the younger- and older-age cohorts, differing by less than 1 percentage point. The shares of claims from Exhibit 3 are shown in Exhibit 4 and highlight visually the similarity between the two age groups.

⁷ In this section of the paper, younger is defined as ages 20 to 34 and older as ages 45 to 64.

⁸ All claims refer to the total of medical only, temporary total, and permanent partial. Fatal and permanent total claims are excluded from the calculations.

Exhibit 3

Most Common Diagnoses In Terms of Number of Claims By Age Cohorts

Closed Claims Valued at 24 Months

AY 1996-2008

Diagnosis	Total Severity Index	Ranking		Share of Claims	
		Ages 20-34	Ages 45-64	Ages 20-34	Ages 45-64
OPEN WND FINGER/S COMP	0.1	1	1	5.8	3.5
SPRAIN LUMBAR REGION	0.4	2	2	3.6	2.9
SPRAIN OF ANKLE NOS	0.3	3	11	1.8	1.1
OPEN WOUND HAND/S COMP	0.1	4	12	1.8	1.1
LOWER LEG INJURY NOS	0.9	5	7	1.5	1.4
SPRAIN SHOULDER/ARM NOS	0.5	6	5	1.4	1.4
SPRAIN OF NECK	0.6	7	8	1.3	1.3
LUMBAGO	1.1	8	9	1.3	1.3
PAIN IN LIMB	0.8	9	6	1.2	1.3
SPRAIN THORACIC REGION	0.3	10	33	1.1	0.5
SPRAIN OF WRIST NOS	0.3	11	21	1.1	0.7
SPRAIN LUMBOSACRAL	0.4	12	18	1.0	0.9
CERVICALGIA	2.9	13	4	1.0	1.6
SUPERFICIAL INJ CORNEA	0.1	14	23	1.0	0.7
CONTUSION FACE/SCALP/NCK	0.2	15	17	0.9	0.9
SPRAIN OF KNEE & LEG NOS	0.4	17	14	0.8	1.0
CARPAL TUNNEL SYNDROME	2.4	19	3	0.8	1.7
ROTATOR CUFF SYND NOS	3.8	44	13	0.4	1.0
SPRAIN ROTATOR CUFF	5.1	47	10	0.3	1.2
TEAR MED MENISC KNEE CUR	4.1	52	15	0.3	0.9
Total Share For These Diagnoses				28.4	26.6

Source: NCCI

The total severity index is total indemnity and medical severity for each diagnosis for both age cohorts combined divided by total indemnity and medical severity across all diagnoses for both age cohorts combined.

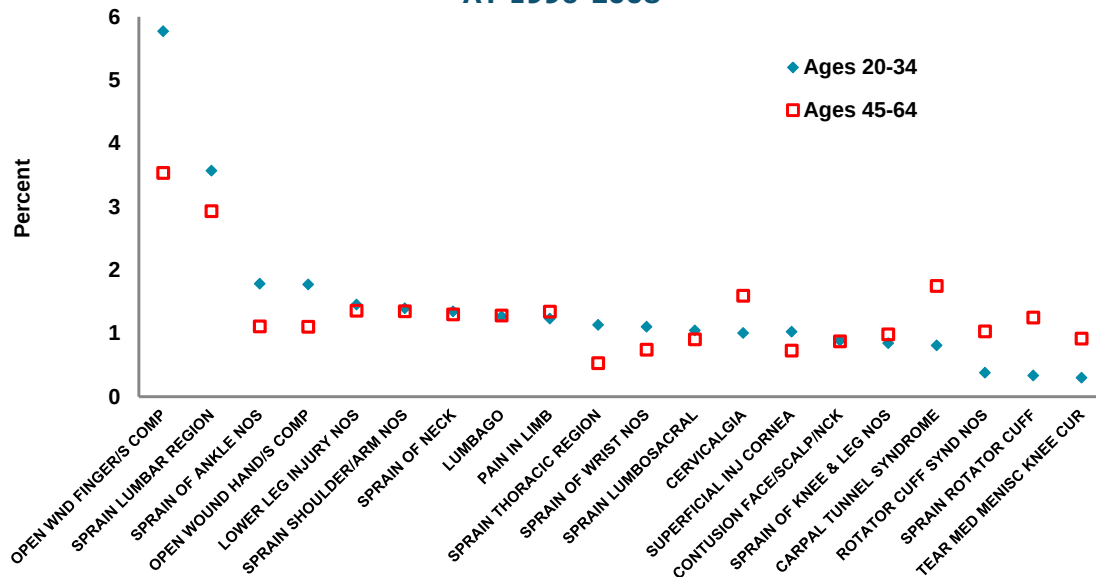
Rankings are based on the number of permanent partial, temporary total, and medical-only claims for that diagnosis and age group. Fatal and permanent total claims are excluded.

Diagnoses in red are in the top 15 for both the younger and older age cohorts, green are in the top 15 only for the younger age group, and blue are in the top 15 only for the older age cohort.

Exhibit 4

Share of Number of Claims For The Most Common Diagnoses By Age Cohorts

Closed Claims Valued at 24 Months
AY 1996-2008



Source: NCCI

For each diagnosis, the graph shows the share of all permanent partial, temporary total, and medical-only claims for that age group. Fatal and permanent total claims are excluded.

Although the distribution of diagnoses is remarkably similar between the two age cohorts, there is some speculation that for any specific diagnosis, older workers are more likely to sustain higher-cost permanent injuries. The results in Exhibits 5A, 5B, and 5C indicate that this is not a major factor. Exhibit 5A contains the 5 diagnoses in the top 15 only for the younger-age cohort, Exhibit 5B shows the 10 in common for both the younger- and older-age cohorts, and Exhibit 5C contains the 5 in the top 15 only for the older-age cohort. The exhibits show the shares of these claims for a given diagnosis and age cohort that are temporary total, permanent partial, and medical only. Each diagnosis code contains two bars: the left, brightly colored bar contains data for the younger cohort, ages 20–34, and the right, faintly colored bar is for the older cohort, ages 45–64. Therefore, the values for each bar add to 100%. For example, for “sprain thoracic region” for younger workers, the temporary total share is 11%, the permanent partial share is 2%, and the medical-only share is 87% (see the first bar in Exhibit 5A).

Exhibits 5A, 5B, and 5C show that for a given diagnosis, the shares by injury type are very similar between the age cohorts. In particular, the shares that are temporary total (in blue at the bottom of each chart and labeled TT) are virtually identical for the two age cohorts for all the diagnosis codes across all three graphs. The shares that are permanent partial (in the middle in red/pink and labeled PP) are also very similar for both age cohorts for most of the diagnosis codes, particularly those shown in Exhibits 5A and 5B. The most apparent differences are seen in Exhibit 5C, where the shares of older-worker claims that are permanent partial are materially higher for four of the five diagnoses. These are the higher-severity diagnoses that are in the top 15 for older workers, but not for younger. They include carpal tunnel syndrome, rotator cuff syndrome, rotator cuff sprain, and tear of the medial cartilage/meniscus of the knee. The higher permanent partial shares for older workers for three of these four diagnosis codes in Exhibit 5C are offset by lower medical-only shares (in green at the top of the chart). These are carpal tunnel and the two rotator cuff injuries.⁹ For the other diagnoses, the shares for medical only are also very similar for both age cohorts.¹⁰ The key observation is that for a given diagnosis, on average, an injury sustained by an older worker is no more likely to result in a TT or PP claim than for a younger worker.

⁹ The knee injury has a lower temporary total share.

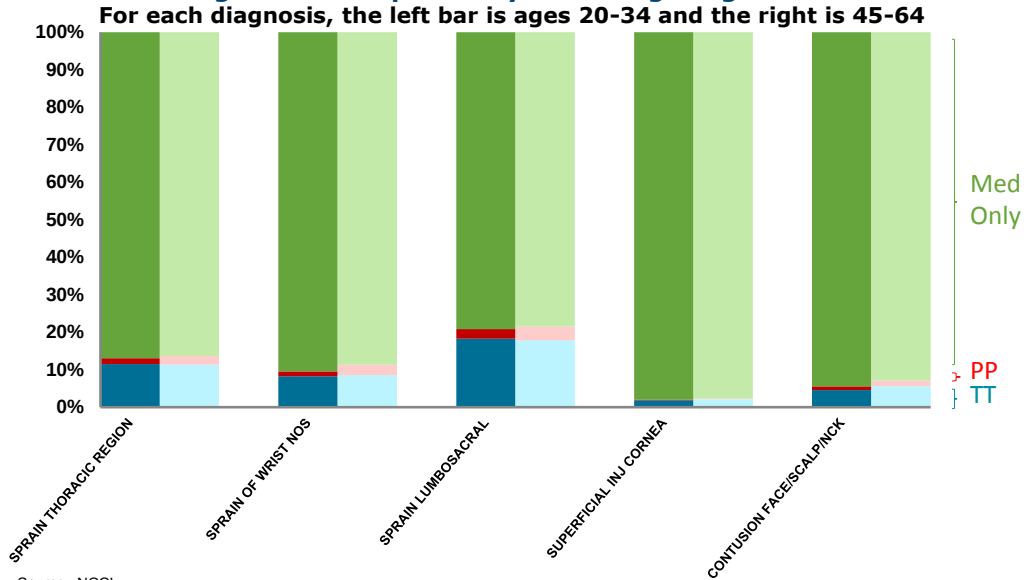
¹⁰ Closed claims valued at 24 months are used in this section to be more consistent with what is used in the next section. Results are comparable using all claims at 24 months.

Exhibit 5A

Share of Claims By Injury Type For Each Diagnosis and Age Cohort

Closed Claims Valued at 24 Months for AYs 1996-2008

Diagnoses In Top 15 Only for Younger Age Cohort



Source: NCCI

The graph shows the share of all temporary total, permanent partial, and medical-only claims for that diagnosis and age group that is temporary total, permanent partial, or medical-only. Fatal and permanent total claims are excluded.

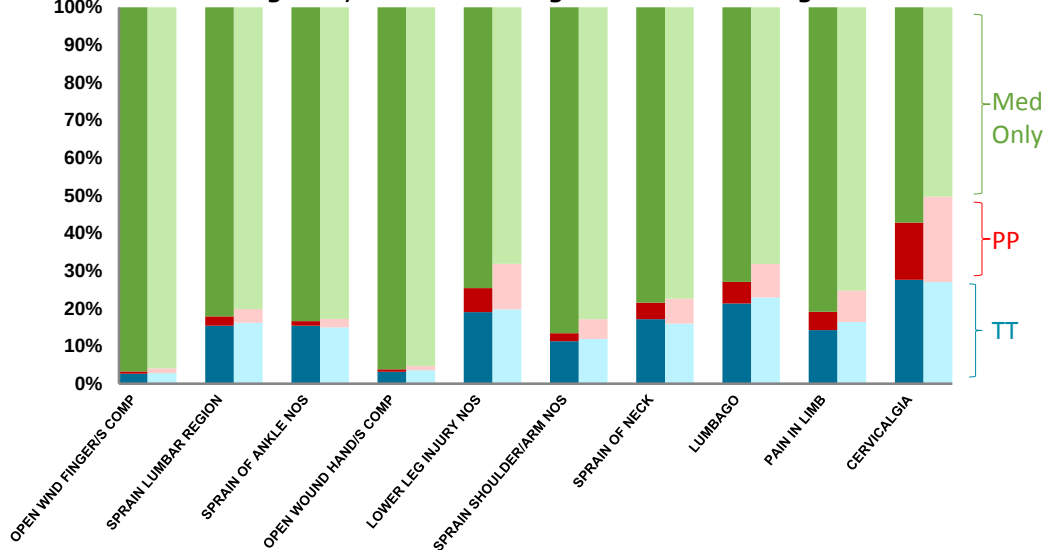
Exhibit 5B

Share of Claims By Injury Type For Each Diagnosis and Age Cohort

Closed Claims Valued at 24 Months for AYs 1996-2008

Diagnoses In Top 15 for Both Younger and Older Age Cohorts

For each diagnosis, the left bar is ages 20-34 and the right is 45-64



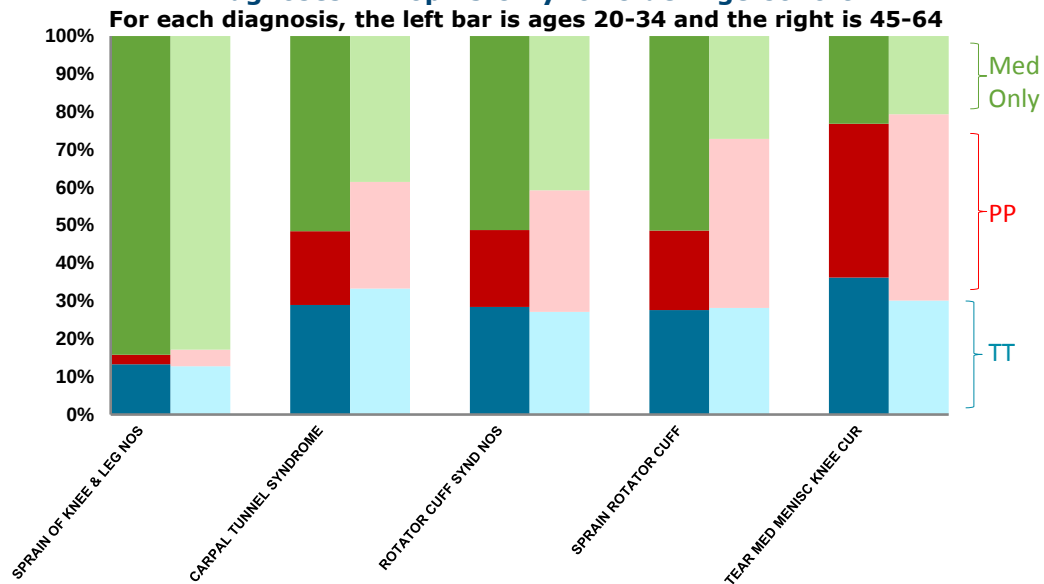
Source: NCCI

The graph shows the share of all temporary total, permanent partial, and medical-only claims for that diagnosis and age group that is temporary total, permanent partial, or medical-only. Fatal and permanent total claims are excluded.

Exhibit 5C

Share of Claims By Injury Type For Each Diagnosis and Age Cohort

Closed Claims Valued at 24 Months for AYs 1996-2008
Diagnoses In Top 15 Only for Older Age Cohort



Source: NCCI

The graph shows the share of all temporary total, permanent partial, and medical-only claims for that diagnosis and age group that is temporary total, permanent partial, or medical-only. Fatal and permanent total claims are excluded.

Accounting for Increases in Severity Over Time by Age Cohort

In the previous aging study, we quantified the differences in severity between younger and older workers due to mix, quantity, and price. Other previous research has also looked at the contribution of mix, quantity, and price to increases in severity over various time periods.¹¹ Here we do a similar contribution analysis on the changes in severity over time and by detailed age cohorts.

A simple “model” of claim costs is used to identify and quantify the factors that explain the overall difference or change. The model of claim costs is defined as follows:

$$\text{Cost} = \text{Price} \times \text{Utilization}$$

where utilization consists of both quantity and mix. We examined the impacts of:

- **Mix**—Differences in diagnosis mix
- **Quantity**—Differences in duration of temporary benefits for indemnity and differences in the average number of treatments per claim for medical
- **Price**—Differences in the average cost per day of benefit payments for indemnity and differences in the average cost of billed treatments for medical.

¹¹ See “Significant Changes in the Factors Driving Medical Severity 1996–2001 vs. 2001–2006, An Update to Measuring the Factors Driving Medical Severity: Price, Utilization, Mix,” published in July 2010 on ncci.com and “The Relationship Between Medical Utilization and Indemnity Claim Severity, Comparing the Factors Driving Medical and Indemnity Severity,” published in February 2011 on ncci.com.

The Data

It is important to note that the severities in this section use paid data for lost-time claims closed within 24 months of date of injury, whereas the previous section was not limited to lost-time claims. Moreover, only claims receiving temporary benefits, where we can estimate duration, are included in the analysis.¹² For those claims that also received permanent benefits, only the individual temporary payments¹³ are used to calculate severity and duration for each claim. The analysis covers data from 1996 through 2008.

The Findings

Exhibits 6 and 7 show the increases in indemnity and medical severity for two time periods¹⁴ (1996/97 to 2000/01 and 2001/02 to 2007/08¹⁵) by detailed age cohort.¹⁶ In interpreting the percentages for these exhibits, as well as in the ones that follow, note that the first period comprises four years while the second period comprises six years.

The spread between indemnity severity increases by age cohort was much smaller in the 2000s than in the late 1990s. Increases in indemnity severity by age cohort ranged from 31% to 62% from 1996/97 to 2000/01 and from 8% to 20% from 2001/02 to 2007/08. Workers in the older-age cohorts had the smallest severity increases in the late 1990s period, but the largest in the 2000s.

The spread between medical severity increases by age cohort was also much smaller in the 2000s than in the late 1990s. Medical severity increases by age cohort ranged from 36% to 60% from 1996/97 to 2000/01 and from 25% to 37% from 2001/02 to 2007/08. As with indemnity, workers in the older-age cohorts had the smallest severity increases in the late 1990s period, but the largest in the 2000s.

The following analysis will account for the factors contributing to these increases for the two time periods by age cohort.

Exhibit 6

Older Workers Had the Smallest Indemnity Severity Increases In The 1990s, but the Largest In The 2000s

Changes in Paid Temporary Indemnity Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Groups	Indemnity Severity Changes	
	1996/97 to 2000/01	2001/02 to 2007/08
20-24	62%	11%
25-34	52%	8%
35-44	46%	16%
45-54	41%	20%
55-64	31%	16%

Source: NCCI

¹² This analysis is based on data licensed to NCCI by insurers for purposes of this study for the 13 accident years from 1996 to 2008. The analysis in this section does not include data for CA, DE, MA, MI, MN, ND, NJ, NY, OH, PA, WA, WI, WV, or WY. The analysis deliberately limited this detailed investigation to claims closed within 24 months of date of injury to have all claims on a consistent time period. This allows a detailed comparison of a subset of workers compensation claims. However, it could introduce some bias since older workers would likely have more claims open past the 24-month mark. Appendix B of the last aging workforce research brief published in December 2011 addresses these issues and contains information on the losses not included in the analysis. It shows that while this is just a subset of total severity, it is sufficiently robust to allow us to examine some of the expected drivers of the changes in severity.

¹³ Both temporary total and temporary partial payments are included.

¹⁴ Two time periods were used due to a change in the growth rates of treatments per claim and duration (the measures of quantity) during the early 2000s.

¹⁵ In this report, averages of the start and end periods are used. For example, 1996/97 refers to an average of 1996 and 1997.

The accident year period 1996/97 includes data on claims for injuries that occurred from January 1, 1996 to December 31, 1997.

¹⁶ The detailed age cohorts examined in this section of the paper are 20–24, 25–34, 35–44, 45–54, and 55–64.

Exhibit 7

Older Workers Had the Smallest Medical Severity Increases In The 1990s, but the Largest In The 2000s

Changes in Paid Medical Severities on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Groups	Medical Severity Changes	
	1996/97 to 2000/01	2001/02 to 2007/08
20-24	60%	30%
25-34	55%	27%
35-44	48%	25%
45-54	48%	37%
55-64	36%	32%

Source: NCCI

Older Workers Have More Costly Injuries, but Now Those Injuries Are Becoming More Prominent for Younger-Aged Workers

As seen in Exhibit 3, historically there has been a difference in the types of injuries sustained by older workers relative to younger ones; older workers are more likely to experience more costly rotator cuff and knee injuries while younger workers are more likely to have less costly back sprains. Looking at the changes in mix over time, we have also found a shift to the more expensive rotator cuff and knee injuries. It is likely that part of this shift was due to the increase in the share of older workers in the workforce. However, in this section, we see that those more expensive types of injuries are becoming more prominent even for younger-aged workers.

The Data

The exhibits in this section include rankings on claims with temporary payments for lost-time claims closed within 24 months of date of injury. This is consistent with the data used to account for increases in severity based on mix, quantity, and price. Exhibits 8, 9, and 10 show rankings in terms of the number of claims by year and age cohort for three types of injuries: rotator cuff syndrome, rotator cuff sprain, and tear of medial cartilage/meniscus of knee. Note that these rankings are not strictly comparable to those shown in Exhibit 3, which reflected permanent partial, temporary total, and medical-only claims.

The Findings

The rankings in Exhibits 8, 9, and 10 are highlighted in red when they are in the top 10. All three exhibits show that as time went by, rotator cuff and knee injuries entered the top 10 for younger-aged workers, and rankings within age cohorts became higher. It has been suggested that a sedentary lifestyle, which reduces blood flow to muscles and joints, is likely a factor in causing the relative increases in knee and rotator cuff injuries in younger people.¹⁷

- Exhibit 8 shows that in 1996/97, rotator cuff syndrome was in the top 10 only for the 55–64 age cohort. By 2000–2002, it was in the top ten for all age cohorts 45 and older, and by 2007/08 it was also in the top 10 for 35 and older. It is also approaching the top 10 for the 25–34 age cohort, ranking 12th in 2007/08.
- Rotator cuff sprain was in the top 10 in 1996/97 for all age groups 45 and older and for all groups 35 and older for all the later years, as seen in Exhibit 9. For 45–54 it had a ranking of 6 in 1996/97 and 2000/01, 5 in 2001/02, and moved to first in 2007/08. The ranking for 35–44 moved from 10th in 2000/01 to 8th in 2001/02 to 7th in 2007/08. It is also approaching the top 10 for the 25–34 age cohort, with a ranking of 13 in 2007/08.
- Tear of medial cartilage meniscus of knee was in the top 10 for all age groups 35 and older in 1996/97 (Exhibit 10). Starting in 2000/01 it was number 10 for 25–34, and it moved higher in the rankings for the other age cohorts over time. It is also approaching the top 10 for the 20–24 age cohort, with a ranking of 12 in 2007/08.

¹⁷ Michael Cortese at NCCI's 2012 *Annual Issues Symposium*, "Elderly and Still Employed: Implications of an Aging Workforce."

Exhibit 8

In 2007/2008 Rotator Cuff Syndrome Ranked In the Top 10 for Ages 35 and Older, But Only For Ages 55 to 64 in 1996/1997

Rankings of Rotator Cuff Syndrome By Number of Claims on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Accident Years	20-24	25-34	35-44	45-54	55-64
1996/1997	32	20	15	11	10
2000/2001	24	16	12	9	7
2001/2002	23	15	12	9	7
2007/2008	21	12	10	8	6

Source: NCCI

Exhibit 9

Beginning in 2000/2001 Sprain Rotator Cuff Ranked In the Top 10 for Ages 35 and Older

Rankings of Sprain Rotator Cuff By Number of Claims on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Accident Years	20-24	25-34	35-44	45-54	55-64
1996/1997	24	19	13	6	2
2000/2001	20	15	10	6	1
2001/2002	21	16	8	5	1
2007/2008	29	13	7	1	1

Source: NCCI

Exhibit 10

Beginning in 2000/2001, Tear Medial Cartilage/Meniscus of Knee Ranked In The Top 10 For Ages 25 and Older

Rankings of Tear Medial Cartilage/Meniscus of Knee By Number of Claims on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Accident Years	20-24	25-34	35-44	45-54	55-64
1996/1997	27	12	8	7	7
2000/2001	18	10	7	5	4
2001/2002	17	10	7	4	4
2007/2008	12	10	4	2	2

Source: NCCI

Accounting for Differences in the Mix of Injuries

Previous research has found that differences in mix (i.e., the share of claims by diagnosis) accounted for half the differences in severity between older and younger workers. Earlier research also showed that changes in mix had a larger impact on changes in severity in the last half of the 1990s than in the 2000s for all ages combined.

Exhibits 11 and 12 show the contribution of changes in mix to the overall changes in severity for two time periods by age cohort. For all age cohorts for indemnity and all but one age cohort for medical, changes in mix had a larger impact on changes in severity in the late 1990s than in the 2000s. For example, the portion of the indemnity severity increase due to mix was a few percentage points higher for all age cohorts in the late 1990s than in the 2000s. For medical, mix accounted for about 20% of the severity increase in the 1990s and less than 14% in the 2000s. The exception for medical is the 55–64 age cohort, where the share due to changes in mix accounted for a quarter of the increase in medical severity in the 2000s, higher than the 21% share in the late 1990s.

Exhibit 11

Changes in Indemnity Severity Due to Diagnosis Mix by Age—Mix Generally More Important in Late 1990s than 2000s

Paid Temporary Indemnity Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Indemnity Severity Changes Due to Diagnosis Mix			
	1996/97 to 2000/01		2001/02 to 2007/08	
	Change	Share of Total Change	Change	Share of Total Change
20-24	9%	14%	1%	6%
25-34	9%	17%	-1%	-11%
35-44	7%	16%	2%	13%
45-54	7%	17%	3%	14%
55-64	7%	23%	3%	21%

Source: NCCI

Exhibit 12

Changes in Medical Severity Due to Diagnosis Mix by Age—Mix Generally More Important in Late 1990s than 2000s

Paid Medical Severities on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Medical Severity Changes Due to Diagnosis Mix			
	1996/97 to 2000/01		2001/02 to 2007/08	
	Change	Share of Total Change	Change	Share of Total Change
20-24	12%	20%	4%	13%
25-34	10%	19%	2%	7%
35-44	9%	19%	4%	14%
45-54	9%	18%	5%	13%
55-64	8%	21%	8%	25%

Source: NCCI

Accounting for Differences in Quantity

The next piece of the model estimates the portion of the severity changes due to changes in the quantity component of utilization.

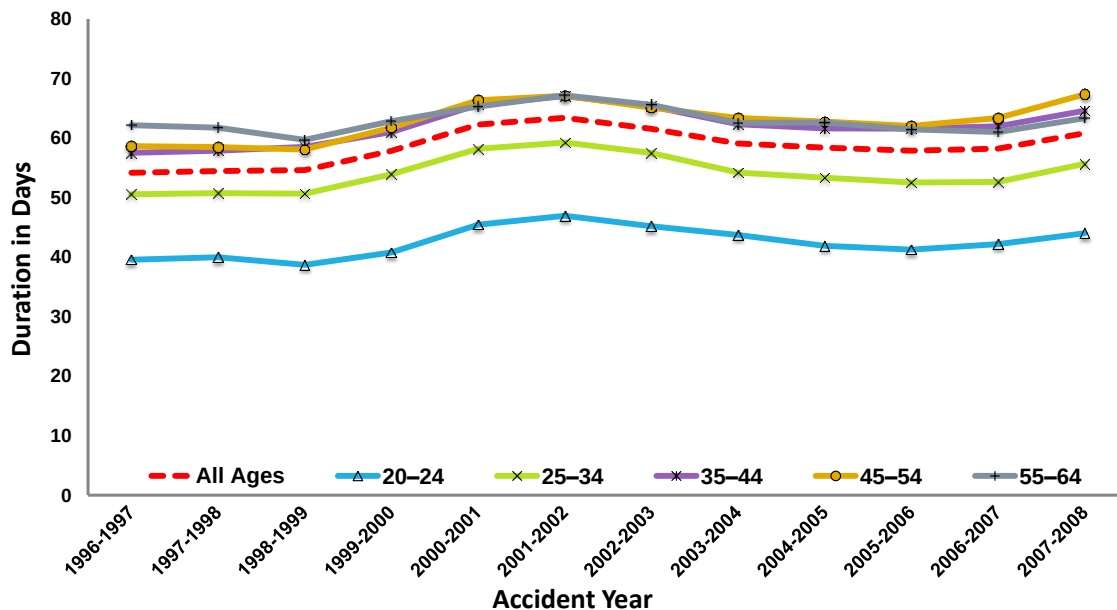
For indemnity, we measure quantity by the duration of temporary disability payments. Exhibit 13 shows that after adjusting for changes in mix, duration over time is quite similar for all age cohorts 35 and older. Duration increases with age, but those 35 and older are very close to each other. Duration for all ages and age cohorts increased from 1996/97 until about 2001/02, then fell until 2005/06 before increasing again during the Great Recession.¹⁸

For medical, quantity is measured by the number of treatments per claim.¹⁹ Exhibit 14 shows the average number of medical treatments per claim over time and by age cohort after adjusting for changes in mix. Again, the number of medical treatments increases with age, but the results are similar for 35 and older. Treatments per claim exhibited a similar pattern to duration, rising until about 2001/02, falling until about 2006/07, and then rising again.

Exhibit 13

Average Duration for Temporary Payments After Controlling for Differences in Injury Mix

Lost-Time Claims With Temporary Payments
Closed Within 24 Months of Date of Injury



Source: NCCI

All ages includes those 16 and older, including 65 and over.

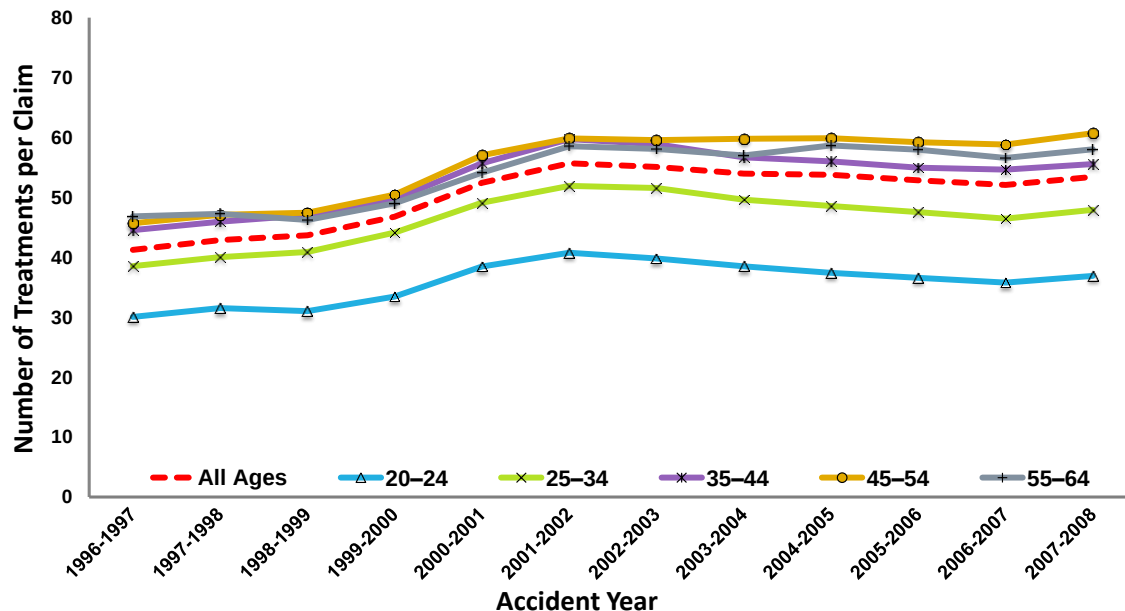
¹⁸ See “Workers Compensation Temporary Total Disability Indemnity Benefit Duration—2012 Update,” published on ncci.com, for more information on benefit duration.

¹⁹ Number of treatments is essentially the number of detailed billed medical services or transactions associated with a claim.

Exhibit 14

Average Number of Treatments per Claim After Controlling for Differences in Injury Mix

Lost-Time Claims With Temporary Payments
Closed Within 24 Months of Date of Injury



Source: NCCI

All ages includes those 16 and older, including 65 and over.

Exhibits 15 and 16 show the contribution of changes in the measure of quantity (duration for indemnity and treatments per claim for medical) to the overall changes in severity for the two time periods by age cohort.²⁰ For both indemnity and medical, changes in quantity generally account for a larger share of the severity increases in the late 1990s than in the 2000s. For all age cohorts, the portion of the indemnity severity increase due to duration was about a third in the late 1990s, but with the decline in duration in the 2000s, had a negative impact on the severity increase during that period. For medical, treatments per claim accounted for more than half of the severity increase in the 1990s and again had a negative impact for most age cohorts in the 2000s. Both duration and treatments per claim actually fell during the economic recovery in the second period, making the contributions of price the key driver of severity in the 2000s, as we will see in the next section.

²⁰ The portion due to the change in quantity and the change in price is calculated using the average duration and the average cost per day for indemnity and the average treatments per claim and the average cost per treatment for medical. All calculations are performed after controlling for the change in diagnosis mix. The difference in severity after controlling for diagnosis mix is allocated using this formula: (change in price times quantity) plus (change in quantity times price) plus (change in price times change in quantity). The portion due to the change in price times the change in quantity is then allocated to the individual pieces (price and quantity) based on the shares of each. The calculation is done two ways (ending period minus beginning period and beginning period minus ending period), and the final result is the geometric average of the two.

Exhibit 15

Changes in Indemnity Severity Due to Duration by Age—Quantity More Important in Late 1990s Than 2000s

Paid Temporary Indemnity Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Indemnity Severity Changes Due to Duration			
	1996/97 to 2000/01		2001/02 to 2007/08	
	Change	Share of Total Change	Change	Share of Total Change
20-24	21%	33%	-9%	-83%
25-34	18%	36%	-7%	-92%
35-44	17%	37%	-6%	-36%
45-54	15%	38%	-1%	-7%
55-64	9%	28%	-9%	-59%

Source: NCCI

Exhibit 16

Changes in Medical Severity Due to Treatments per Claim by Age—Quantity More Important in Late 1990s Than 2000s

Paid Medical Severities on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Medical Severity Changes Due to Treatments per Claim			
	1996/97 to 2000/01		2001/02 to 2007/08	
	Change	Share of Total Change	Change	Share of Total Change
20-24	34%	57%	-13%	-44%
25-34	31%	56%	-10%	-36%
35-44	28%	58%	-9%	-34%
45-54	28%	58%	0.5%	1%
55-64	19%	52%	-3%	-9%

Source: NCCI

Accounting for Differences in Price

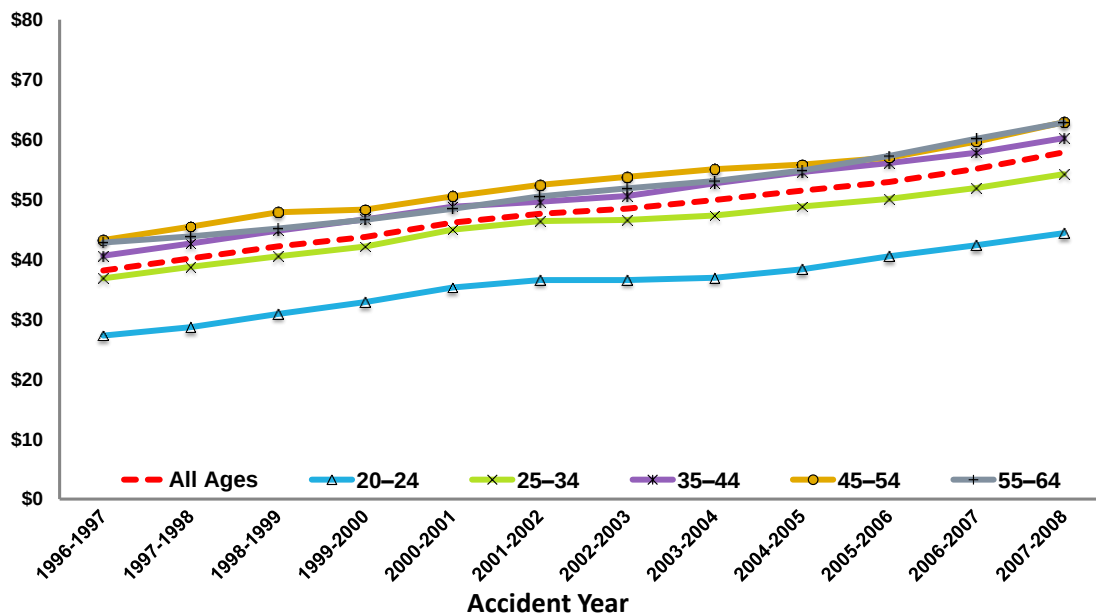
The remaining factor to evaluate is price. In the case of indemnity, this is measured by the average daily temporary benefit payment (Exhibit 17). Again, this increases with age, and those 35 and older are very close to each other. Average temporary benefit payments per day increased over the entire period.

For medical costs, price is measured by the average cost or payment per billed medical treatment (Exhibit 18). This measure also increases with age and is similar across all age cohorts.

Exhibit 17

Average Temporary Benefits Paid per Day After Controlling for Mix

Lost-Time Claims With Temporary Payments
Closed Within 24 Months of Date of Injury



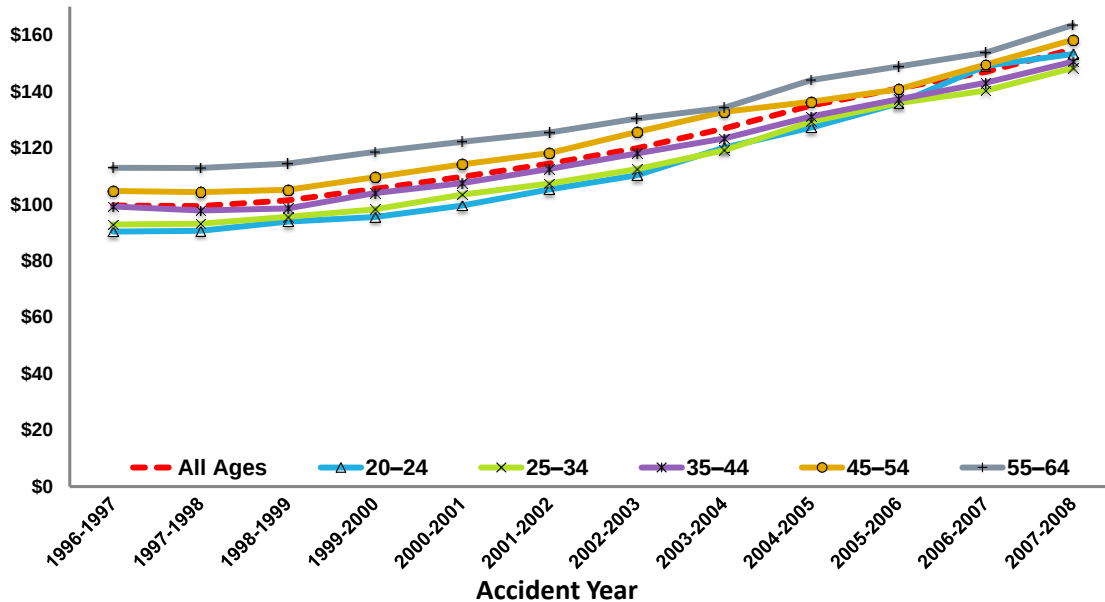
Source: NCCI

All ages includes those 16 and older, including 65 and over.

Exhibit 18

Average Cost per Treatment After Controlling for Mix

Lost-Time Claims With Temporary Payments
Closed Within 24 Months of Date of Injury



Source: NCCI

All ages includes those 16 and older, including 65 and over.

Exhibits 19 and 20 show the contribution of changes in the measure of price (average benefits paid per day for indemnity and cost per medical treatment for medical) to the overall changes in severity for two time periods by age cohort.

For both indemnity and medical, changes in price account for a larger share of the severity increases in the 2000s than in the late 1990s. For several of the age cohorts in the 2000s, the portion of the severity increases for both indemnity and medical due to price was more than 100% due to the negative impact of the decline in quantity discussed previously.

Exhibit 19

Changes in Indemnity Severity Due to Price per Day by Age—Price More Significant in 2000s Than Late 1990s

Paid Temporary Indemnity Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Indemnity Severity Changes Due to Temporary Benefits Paid per Day			
	1996/97 to 2000/01		2001/02 to 2007/08	
	Change	Share of Total Change	Change	Share of Total Change
20-24	33%	53%	20%	179%
25-34	24%	47%	17%	203%
35-44	22%	46%	20%	124%
45-54	18%	45%	19%	93%
55-64	15%	49%	22%	139%

Source: NCCI

Exhibit 20

Changes in Medical Severity Due to Price per Treatment by Age—Price More Significant in 2000s Than Late 1990s

Paid Medical Severities on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Medical Severity Changes Due to Price per Treatment			
	1996/97 to 2000/01		2001/02 to 2007/08	
	Change	Share of Total Change	Change	Share of Total Change
20-24	14%	23%	40%	133%
25-34	14%	25%	35%	130%
35-44	11%	22%	30%	121%
45-54	12%	24%	32%	86%
55-64	10%	27%	27%	84%

Source: NCCI

To summarize this section, the contributions of mix, quantity, and price to increases in indemnity and medical severity over two time periods are fairly similar across age cohorts. Exhibits 21 and 22 summarize the “shares of total change” columns from the previous exhibits for mix, quantity, and price, for indemnity and medical, respectively. For all age cohorts, changes in the mix of injuries account for a marginal share of the increase in severity for both periods, but the impact is slightly larger in the late 1990s than 2000s. Quantity is more important for all age cohorts in the late 1990s when duration and treatments per claim were increasing. Price is a much more significant factor across age cohorts in the 2000s, as duration and treatments per claim fell.

Exhibit 21

Contributions of Mix, Quantity, and Price to Increases in Indemnity Severity Are Similar Across Age Cohorts

Paid Temporary Indemnity Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Share of Total Indemnity Severity Change					
	1996/97 to 2000/01			2001/02 to 2007/08		
	Mix (Diagnoses)	Quantity (Duration)	Price (Benefit Payments)	Mix (Diagnoses)	Quantity (Duration)	Price (Benefit Payments)
20-24	14%	33%	53%	6%	-83%	179%
25-34	17%	36%	47%	-11%	-92%	203%
35-44	16%	37%	46%	13%	-36%	124%
45-54	17%	38%	45%	14%	-7%	93%
55-64	23%	28%	49%	21%	-59%	139%

Source: NCCI

Exhibit 22

Contributions of Mix, Quantity, and Price to Increases in Medical Severity Are Similar Across Age Cohorts

Paid Medical Severities on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Share of Total Medical Severity Change					
	1996/97 to 2000/01			2001/02 to 2007/08		
	Mix (Diagnoses)	Quantity (Number of Treatments)	Price (Price per Treatment)	Mix (Diagnoses)	Quantity (Number of Treatments)	Price (Price per Treatment)
20-24	20%	57%	23%	13%	-44%	133%
25-34	19%	56%	25%	7%	-36%	130%
35-44	19%	58%	22%	14%	-34%	121%
45-54	18%	58%	24%	13%	1%	86%
55-64	21%	52%	27%	25%	-9%	84%

Source: NCCI

Exhibits 23 and 24 summarize the changes in severity from the previous exhibits for mix, quantity, and price. They also offer some insight into the drivers behind the much larger increases in indemnity and medical severity for the younger-age cohorts during the earlier time period. Exhibit 23 shows that for indemnity, the large severity increases for the younger-age groups were due to larger increases in price (benefit levels). For example, the increase in severity due to price for the 20–24 age cohort was 33% from 1996/97 to 2000/01 compared with 15% for the 55–64 age group during the same period.²¹ Increases due to quantity (duration) were also somewhat larger for the younger-age cohorts than for the older groups.

For medical, Exhibit 24 shows that the large severity increases for the younger-age groups from 1996/97 to 2000/01 were primarily due to larger increases in quantity (number of treatments per claim). Quantity accounted for a 34% increase in severity for the 20–24 age group in the late 1990s versus 19% for the 55–64 age cohort.

Exhibit 23

Indemnity Severity Grew More for the Younger Age Groups in the Early Period Primarily Due to Price

Paid Temporary Indemnity Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Components of Indemnity Severity Change							
	1996/97 to 2000/01				2001/02 to 2007/08			
	Mix (Diagnoses)	Quantity (Duration)	Price (Benefit Payments)	Total	Mix (Diagnoses)	Quantity (Duration)	Price (Benefit Payments)	Total
20-24	9%	21%	33%	62%	1%	-9%	20%	11%
25-34	9%	18%	24%	52%	-1%	-7%	17%	8%
35-44	7%	17%	22%	46%	2%	-6%	20%	16%
45-54	7%	15%	18%	41%	3%	-1%	19%	20%
55-64	7%	9%	15%	31%	3%	-9%	22%	16%

Source: NCCI

²¹ The US Bureau of Labor Statistics' publication entitled "Highlights of Women's Earnings in 2010" has data on earnings by age cohort for both genders. The rate of growth in earnings was higher for younger workers than for older workers in the first time period, which is consistent with the higher rates of growth in benefits.

Exhibit 24

Medical Severity Grew More for the Younger Age Groups in the Early Period Primarily Due to Quantity

Paid Medical Severities on Claims With Temporary Payments For Lost-Time Claims Closed Within 24 Months of Date of Injury

Age Cohorts	Components of Medical Severity Change							
	1996/97 to 2000/01				2001/02 to 2007/08			
	Mix (Diagnoses)	Quantity (Number of Treatments)	Price (Price per Treatment)	Total	Mix (Diagnoses)	Quantity (Number of Treatments)	Price (Price per Treatment)	Total
20-24	12%	34%	14%	60%	4%	-13%	40%	30%
25-34	10%	31%	14%	55%	2%	-10%	35%	27%
35-44	9%	28%	11%	48%	4%	-9%	30%	25%
45-54	9%	28%	12%	48%	5%	0.5%	32%	37%
55-64	8%	19%	10%	36%	8%	-3%	27%	32%

Source: NCCI

Encouraging Older Workers to Remain on the Job

In spite of the perceived workers compensation and healthcare exposure, employers are seeking to retain older workers. First, the workers compensation exposure is not nearly as great as many have feared. Second, employers are making special efforts to accommodate the needs of older workers. Some of these were highlighted in a recent article in *The Wall Street Journal*.²² For example, some companies have changed the configuration of work areas to reduce kneeling and twisting. Vulcan Materials Company has moved water tanks from the top of delivery trucks to the side to make them easier to fill and has reduced the weight of chutes used for concrete. Duke Energy Corporation offers a stretching program for workers before their shift begins, and Harley Davidson has trainers available with ice for aches and pains between shifts.

Conclusion

There is growing evidence that an aging workforce has a far less negative impact on workers compensation claim costs than might have been thought. Fair's study cites age-related deterioration rates that are slow and gradual up until age 80. The NCCI study on the aging workforce published in 2011 concluded that costs for workers in the 35-and-older-age cohorts tend to be quite similar, although higher than costs for workers in the under-age-35 cohorts. The higher costs are largely offset by higher premiums due to higher wages of older workers.

This study provides further evidence of similarities between younger and older workers. The distribution of diagnoses is remarkably similar, and there is little difference by age in the share of permanent partial claims across a range of leading diagnoses. We also found similar contributions to overall severity due to changes in mix, quantity, and price by age cohort. Older workers have more costly injuries, but now those injuries are becoming more prominent for younger-aged workers. Duration, treatments per claim, benefits paid per day, and costs per treatment are all very similar for workers in the 35 and older-age cohorts and they are higher than for workers in the under-age-35 cohorts.

As the workforce ages, employers are making efforts to encourage older workers to remain on the job by implementing safety and loss control programs to reduce injuries for older workers. These programs are also likely to improve overall productivity and benefit workers of all ages.

Acknowledgements: The authors would like to thank Nathan Beaven and Chun Shyong of NCCI's Actuarial and Economic Services Division for their contributions to this research study.

²² "Keeping Boomers Fit for Work," *The Wall Street Journal*, December 28, 2011.

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