



# Workers Compensation and the Aging Workforce

There is widespread concern about the potential adverse impact on workers compensation loss costs as the “baby boomers” postpone retirement and accelerate the aging of the workforce. In this study, NCCI has examined this issue and offers some surprising and yet reassuring conclusions.<sup>1</sup>

The paper starts by confirming that the share of older workers is increasing. The analysis then looks at differences in the components of loss costs—frequency (injury rates per worker) and severity—across age groups. The factors that account for the observed differences in severities between older and younger workers are then identified. The analysis concludes by comparing the combined effects of frequency and severity—that is, costs per worker.

## KEY FINDINGS

- In terms of costs per worker, the major difference among age groups occurs between the 25 to 34 and the 35 to 44 age groups. All groups of workers age 35 to 64 appear to have similar costs per worker. These are reassuring findings in that an aging workforce may have a less negative impact on costs per worker than originally thought.
- The long-standing tenet that younger workers have much higher injury rates is no longer true. Therefore, differences in costs by age in recent years primarily reflect differences in severities since differences in frequency by age have virtually disappeared.
- Differences in leading types of injuries are a major factor in differences in severity by age. Older workers tend to have more rotator cuff and knee injuries while younger workers have more back and ankle sprains.
- On the indemnity side, higher wages are a key factor leading to higher costs for older workers.
- For medical, more treatments per claim are a material factor.

## Older Workers Account for an Increasing Share of the US Workforce

As seen in Exhibit 1, workers 45 and older account for an increasing share of the US workforce. In particular, the share of workers 55 to 64 has been growing steadily, while the share of workers 45 to 54 has seen a modest increase. The share of workers 65 and older is growing but remains small, from about 3% in 2000 to still less than 5% in 2010. Cumulatively, the 45 and older share increased from 34% in 2000 to 42% in 2010.

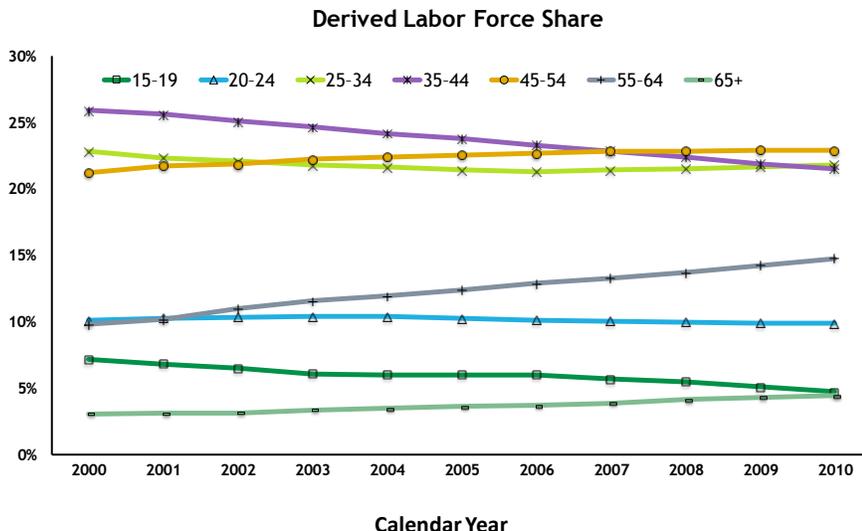
If the shares of older workers are increasing, the shares of younger workers must be decreasing. This is most evident for workers 35 to 44.

<sup>1</sup> Previous NCCI studies related to the aging workforce include *Thinking About an Aging Workforce—Potential Impact on Workers Compensation*, published in May 2005, *Age as a Driver of Frequency and Severity*, published in December 2006, and *Claims Characteristics of Workers Aged 65 and Older*, published in January 2010 on [ncci.com](http://ncci.com).

This study will primarily focus on data for the age cohorts comprising the core workforce, ages 20 to 64. Since they each represent less than 5% of the labor force and their data is more volatile, data for the youngest (16 to 19)<sup>2</sup> and oldest (65+) cohorts is excluded from the graphs in the main body of this paper. However, select exhibits containing data for those age cohorts are found in Appendix A.

**Exhibit 1**

## Workers 45 and Older Account for an Increasing Share of the US Workforce



Source: Based on labor force participation rates from the Bureau of Labor Statistics and population estimates from the Bureau of the Census obtained from Moody's Economy.com. For the youngest age cohort, labor force participation data is available for 16-19 and population for 15-19 so applied the 16-19 percentage to the 15-19 population.

<sup>2</sup> For the youngest age cohort in Exhibit 1, labor force participation data is available for 16 to 19 and population for 15 to 19, so the 16 to 19 labor force participation rate was applied to the 15 to 19 population. The estimate is labeled 15-19 in Exhibit 1. Exhibits in Appendix A showing injury rate and severity data for the youngest cohort are based on data for 16 to 19.

### Frequency<sup>3</sup>—Steady Declines Since the Mid-1990s With Age Group Differences Largely Eliminated

Exhibit 2 shows the decline in frequency from 1994 to 2009 as measured by incidence rates relative to full-time equivalent (i.e., 40 hours per week) workers.<sup>4</sup> Frequencies are shown for age groups comprising the core workforce (20 to 64) individually, and for all workers 16 and older combined.

There are two key observations from Exhibit 2. First, the decline in frequency has occurred for all age groups. Second, the marked differences among age groups in the early 1990s had largely disappeared by 2009. That is, the long-standing tenet that younger workers have much higher injury rates is no longer true.

Exhibit 2 also includes the observed injury rates for the 20 to 24 and 55 to 64 age cohorts at the beginning and end of the period. In 1994, the incidence rate for 20 to 24 year olds was 300 per 10,000 full-time equivalent workers while the rate for the 55 to 64 age cohort was 200. In 2009, those numbers were almost the same at 97 and 93, respectively. The age cohort with the lowest incidence rate in 2009 was actually the 25 to 34 year olds with 87 injuries and illnesses per 10,000 full-time equivalent workers.

Exhibit 3 shows an alternative way to look at injury rates showing each group relative to the frequency for all workers 16 and older. In 1994, the injury rate for the 20 to 24 age group was 26% greater than the rate for all workers; by 2009 this difference had fallen to 5%. The injury rate for workers 55 to 64 was 16% lower than frequency for all workers in 1994, but 1% higher in 2009. The differences clearly have narrowed.

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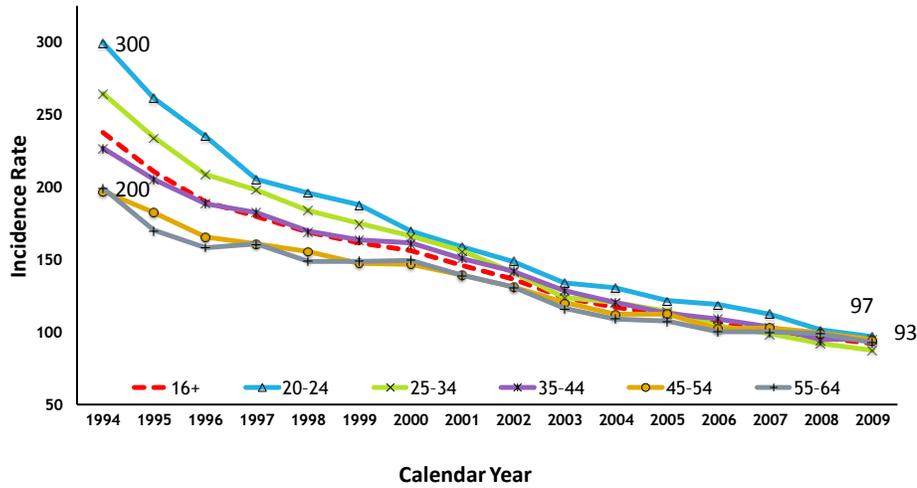
<sup>3</sup> Workers compensation data does not provide enough detail to estimate frequency by age group. Therefore, this study uses data from the Bureau of Labor Statistics (BLS), which does provide this information. Technically, frequency as used in this paper measures injury and illness rates relative to full-time workers and is a somewhat different measure of frequency than that used in workers compensation, which measures claims relative to premium or some comparable workers compensation exposure base. As indicated in NCCI's 2010 State of the Line presentation, at an aggregate level, workers compensation frequency and BLS injury rates exhibit reassuringly virtually identical patterns at least since 1980.

<sup>4</sup> In this analysis, we are using derived incidence rates based on BLS injury and illness case data. Although the BLS began releasing incidence rate data by age in 2006, the derived rates allow us to include additional years of history, going back to 1994. Conclusions are the same using both data sets. BLS data for injuries and illnesses are for the total United States.

Exhibit 2

## Frequency Has Fallen Across All Age Groups and Differences by Age Have Narrowed

Derived Injury and Illness Incidence Rates Involving Days Away From Work per 10,000 FTE Workers



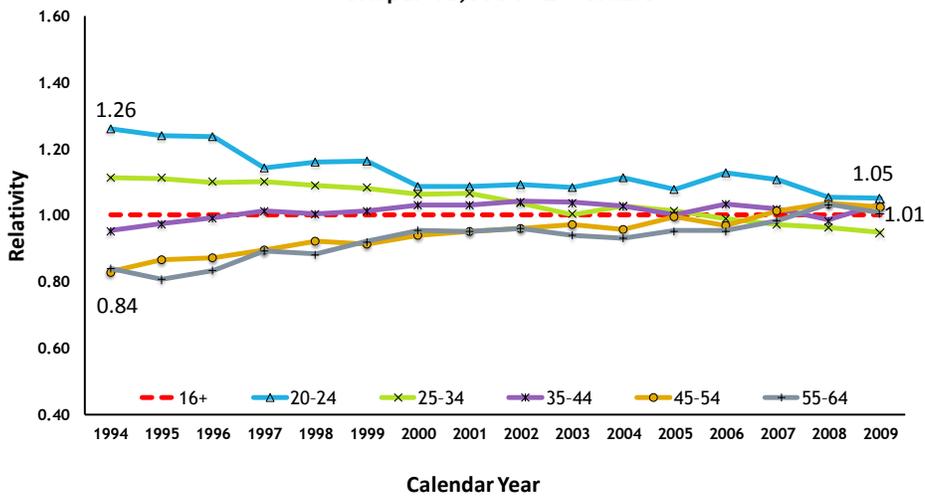
FTE= Full-Time Equivalent

Source: Derived by NCCI using data from the Bureau of Labor Statistics

Exhibit 3

## Differences in Frequency by Age Are Much Smaller

Relativities of Derived Injury and Illness Incidence Rates Involving Days Away From Work per 10,000 FTE Workers



FTE= Full-Time Equivalent

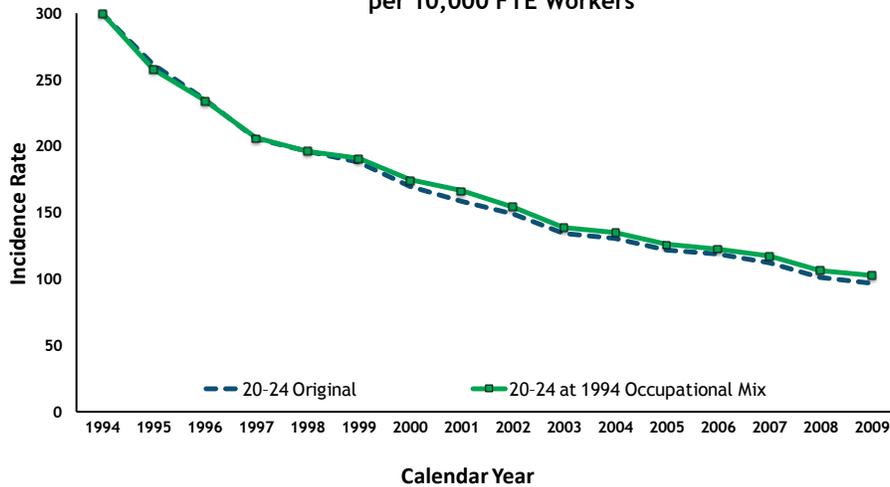
Source: Derived by NCCI using data from the Bureau of Labor Statistics

### Are Changes in Occupational Mix a Factor?

One likely question is whether the narrowing is due to a change in the types of jobs held by younger workers over the period. This can be examined by estimating what the injury rates would have been if the occupational mix remained unchanged from 1994 through 2009. Exhibits 4 and 5 reestimate the injury rates holding the occupational mix constant at the 1994 mix. Exhibit 4 shows that changes in occupational mix are not a material factor in workers 20 to 24. That is, the injury rate for 20- to 24-year-olds would have been almost the same if the occupational mix remained constant at the 1994 levels. Exhibit 5 shows that there is also virtually no difference for workers 55 to 64. In fact, all age groups showed similar results. Therefore, changes in occupational mix have not had a material impact on the narrowing of frequency across age cohorts. Occupational mix may have changed, but all occupations are much safer.

**Exhibit 4**

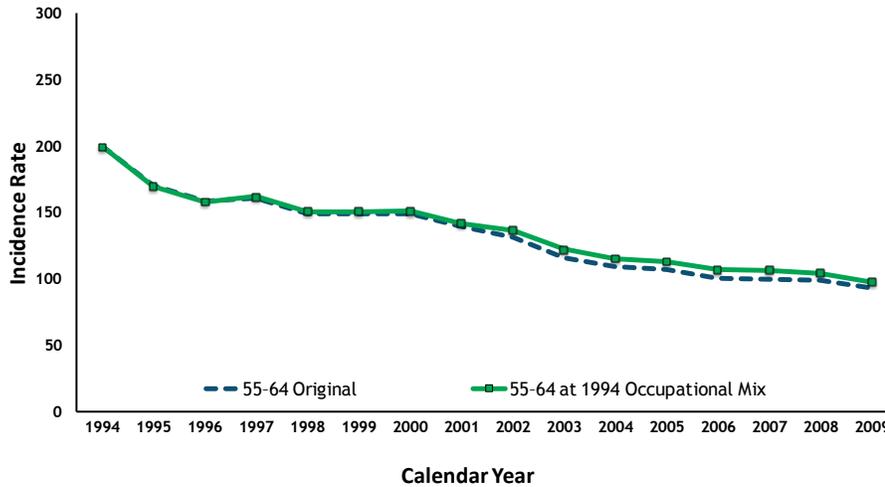
### The Workplace Keeps Getting Safer Change in Occupational Mix—Not a Material Factor Derived Injury and Illness Incidence Rates Involving Days Away From Work per 10,000 FTE Workers



FTE= Full-Time Equivalent  
Using the 1994 occupational mix to control.  
Source: Derived by NCCI using data from the Bureau of Labor Statistics

Exhibit 5

**The Workplace Keeps Getting Safer**  
**Change in Occupational Mix—Not a Material Factor**  
 Derived Injury and Illness Incidence Rates Involving Days Away From Work  
 per 10,000 FTE Workers



FTE= Full-Time Equivalent  
 Using the 1994 occupational mix to control.  
 Source: Derived by NCCI using data from the Bureau of Labor Statistics

**Severity—Claims of Older Workers Cost More, but Relative Differences Are Largely Unchanged**

As shown above, differences in injury rates by age cohort have diminished, suggesting that major differences in total costs across age groups would reflect differences in severity. In this section, we look at differences in indemnity and medical severity by age cohort using NCCI Detailed Claim Information (DCI) data.<sup>5</sup> Overall, the data shows that both indemnity and medical severity have exhibited steady increases over time with severity for older claimants costing more.

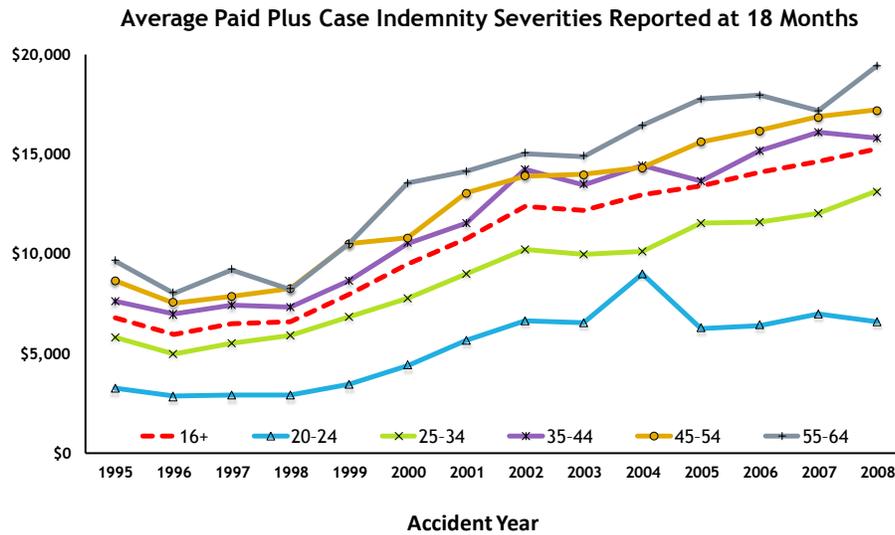
<sup>5</sup> Severity data in this section is from NCCI’s Call for Detailed Claim Information. This data contains specific information on workers compensation lost-time claims. DCI data reporting is mandatory for carriers that contribute at least 0.1% of the total statewide standard earned premium for Calendar Year 1999 and have anticipated annual DCI claim volume for all states greater than or equal to 60 claims. The claims selected for submission are based on both primary and stratified sampling processes to ensure that enough DCI claims are reported to support statistical analyses of the costs and characteristics of indemnity claims.

**Indemnity Severity**

Exhibit 6 contains indemnity severity data by age cohort.<sup>6</sup> Indemnity severity has been increasing over time for all age groups and severity typically is higher for the older age cohorts. Exhibit 6 highlights that the major differences are between workers 34 and younger and 35 and older. Severities for workers 34 and younger are below average while severities for workers 35 and older are above average. In addition, the differences among the three age cohorts for workers 35 and older are rather modest.

**Exhibit 6**

**Indemnity Severity Increases by Age Have Continued**



Source: NCCI DCI Data

<sup>6</sup> “Paid plus case” in the severity exhibits is a term to reflect the sum of the estimated ultimate costs of individual claims. It includes payments to date plus claim-specific estimates of all future payments on claims not yet closed. Severities reported at 18 months are used to strike a balance between being consistent across time periods and including as many years as possible in the analysis. However, since there could be more development on claims for older workers due to longer healing periods, this could be underestimating the relative costs of claims for older workers. More detail on potential differences on alternative measures of claim costs is shown in Appendix B. Graphs do not include data for CA, DE, ND, OH, TX, WA, WV, or WY.

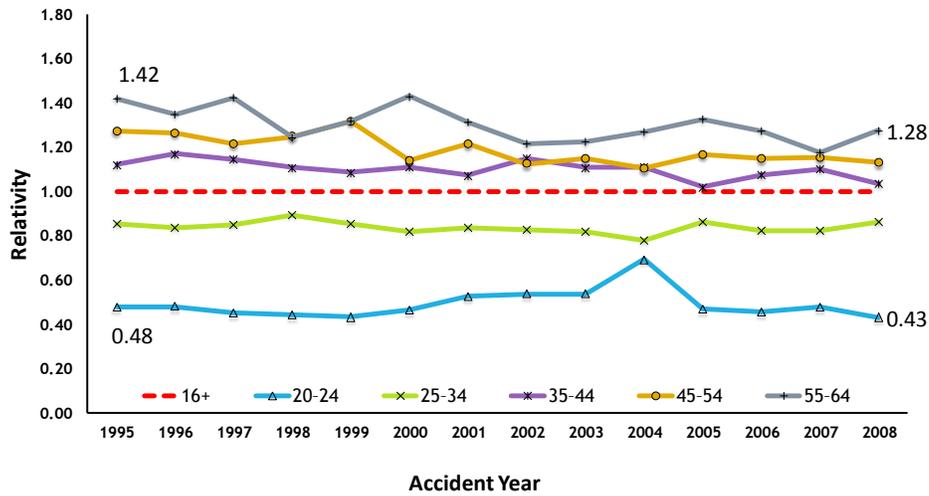
Exhibit 7 shows indemnity severity for each age group relative to the indemnity severity for all workers 16 and older. Again, this clearly illustrates that the major differences are between the workers 34 and younger and workers 35 and older and that the differences in the three cohorts aged 35 to 64 are modest.

Exhibit 7 also shows that the relative differences in indemnity severity by age have continued. Indemnity severity for the 55 to 64 age cohort was 42% above average in 1995 and 28% above average in 2008. Meanwhile, indemnity severity for the 20 to 24 age group was 52% below average in 1995 and 57% below average in 2008.

**Exhibit 7**

**Relative Differences in Indemnity Severity by Age Have Continued**

Relativities of Average Paid Plus Case Indemnity Severities Reported at 18 Months



Source: NCCI DCI Data

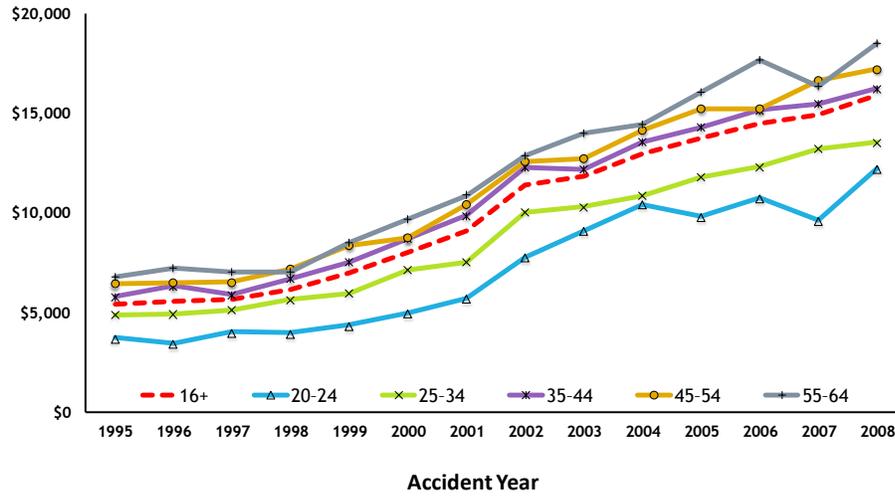
**Medical Severity**

Exhibits 8 and 9 contain the same information as Exhibits 6 and 7, but for medical severity. DCI data in Exhibit 8 clearly shows that medical severity increases across age groups and has been steadily trending upward over time. Again for medical, severities for workers 34 and younger are below average while severities for workers 35 and older are above average, and there are only small differences among the three cohorts for workers 35 to 64.

**Exhibit 8**

**Medical Severity Increases by Age  
Have Continued**

Average Paid Plus Case Medical Severities on Lost-Time Claims Reported at 18 Months



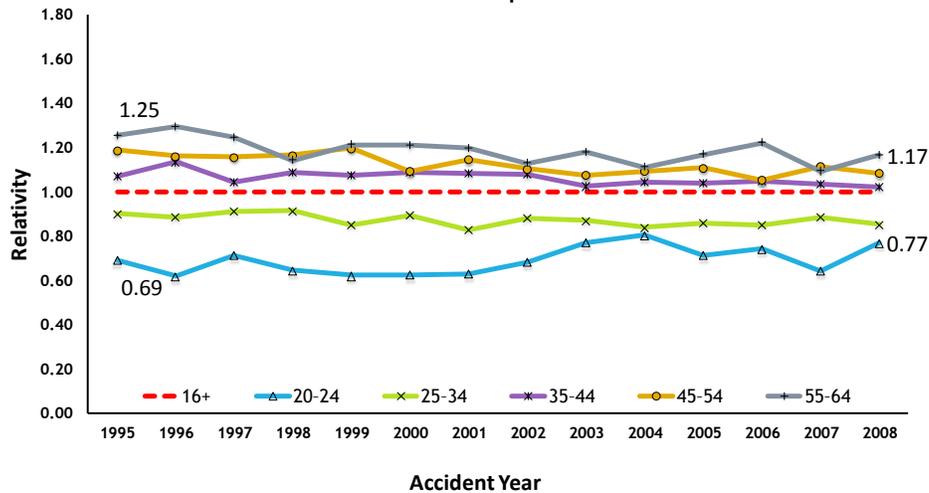
Source: NCCI DCI Data

Exhibit 9 shows medical severity for each age group relative to the medical severity for all workers 16 and older. As with indemnity severity, the relative differences in medical severity by age have continued, although the differences have narrowed somewhat. Medical severity for the 55 to 64 age cohort was 25% above average in 1995 and 17% above average in 2008. Meanwhile, medical severity for the 20 to 24 age group was 31% below average in 1995 and 23% below average in 2008.

Exhibit 9

## Relative Differences in Medical Severity by Age Have Continued

Relativities of Average Paid Plus Case Medical Severities on Lost-Time Claims Reported at 18 Months



Source: NCCI DCI Data

### Accounting for Differences in Severity Between Older and Younger Workers

In this section, we look at what might account for the observed differences in severity between younger and older workers. A simple “model” of claim costs was used to identify and quantify the factors that explained the overall difference. 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.

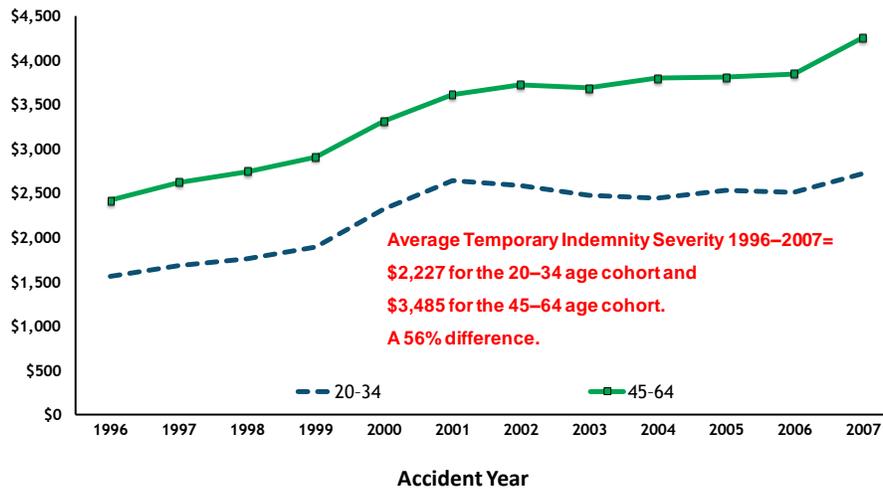
It is important to note that the severities in this section are based on a separate data source than the previous section; thus, the calculations differ in several ways. These calculations use paid data for lost-time claims closed within 24 months of date of injury.<sup>7</sup> Only claims receiving temporary benefits where we can estimate duration are included in the analysis. For those claims that also received permanent benefits, only the individual temporary payments<sup>8</sup> are used to calculate severity and duration for each claim. 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 differences between older and younger workers.<sup>9</sup> For this comparison, younger workers are defined as those aged 20 to 34 and older workers are defined as 45 to 64.<sup>10</sup> The analysis covers data from 1996 through 2007.

Exhibits 10 and 11 show that for these claims, severity for the older age cohort was more than 50% higher than for the younger age cohort for both indemnity and medical. Severity for older workers was 56% higher than for younger workers for indemnity and 51% higher for medical.<sup>11</sup> The following analysis will account for the factors contributing to these observed differences between severity for older and younger workers.

**Exhibit 10**

## Indemnity Severity Was More Than 50% Higher for Older Workers

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



Source: NCCI

<sup>7</sup> This analysis is based on data licensed to NCCI by insurers for purposes of this study for the 11 accident years from 1996 to 2007. 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. For more details on this, see Appendix B, which contains information on the losses not included in this analysis.

<sup>8</sup> Both temporary total and temporary partial payments are included.

<sup>9</sup> Appendix B contains information on the losses not included in the analysis and shows that similar relationships hold between older and younger workers.

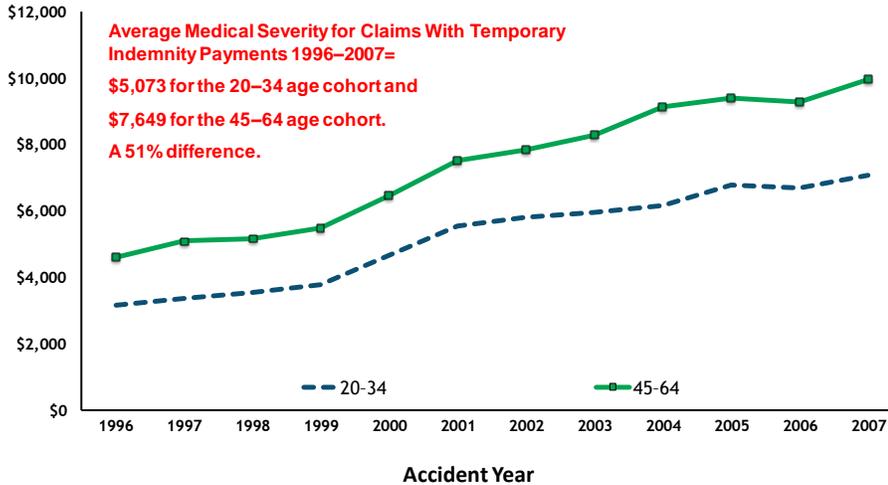
<sup>10</sup> See Appendix C for a graph showing the labor force participation rates for these two age cohorts from 1996 to 2007.

<sup>11</sup> For comparison, similar calculations were performed using Detailed Claim Information (DCI) data from the previous section. Using that data, severity for older workers was also more than 50% higher than for younger workers. For indemnity the difference was 79% and for medical it was 54%. The larger difference found using DCI is probably due to the fact that the data was not limited to closed claims.

Exhibit 11

## Medical Severity Was More Than 50% Higher for Older Workers

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



Source: NCCI

### Accounting for Differences in the Mix of Injuries

The first step is to look at the mix of injuries to see if there is a systematic difference in the types of injuries sustained by older workers relative to younger ones and, if so, to see how this contributes to differences in severity.

Exhibits 12 and 13 show the top 10 primary diagnoses for lost-time claims with temporary payments in terms of the number of claims from 1996 to 2007. Each diagnosis also includes a severity index (for indemnity in Exhibit 12 and medical in Exhibit 13), which indicates the relative cost for such injuries. The left column contains the top 10 injury diagnoses for younger workers, aged 20 to 34, while the right column contains the top 10 injury diagnoses for older workers, aged 45 to 64. Six of the top 10 diagnoses are present for both age cohorts, but four (highlighted in red) are different. Older workers are more likely to experience rotator cuff and knee injuries and lower back nerve pain (lumbosacral neuritis) while younger workers are more likely to have sprains and lower back pain. As shown by the severity indexes, the rotator cuff, knee injuries, and lower back nerve pain in the top 10 for older workers have above average severity while the sprains and lower back pain in the top 10 for younger workers have below average severity for both indemnity (Exhibit 12) and medical (Exhibit 13).<sup>12</sup>

<sup>12</sup> The severity index is the ratio of paid temporary indemnity or medical severity for that diagnosis and age cohort to average paid temporary indemnity or medical severity for all claims.

Exhibit 12

**Diagnosis Mix and Indemnity Severity Index Differences**  
 Top 10 Claim Diagnoses for Lost-Time Claims With Temporary Payments That Closed Within  
 24 Months of Date of Injury, Accident Years 1996-2007

	Ages 20–34		Ages 45–64	
	Diagnosis and Indemnity Severity Index		Diagnosis and Indemnity Severity Index	
1	Sprain Lumbar Region	0.32	Sprain Rotator Cuff	2.98
2	Lower Leg Injury, not otherwise specified	0.62	Unilateral Inguinal Hernia	0.49
3	Sprain of Ankle, not otherwise specified	0.21	Carpal Tunnel Syndrome	1.64
4	Unilateral Inguinal Hernia	0.38	Tear Medial Cartilage/Meniscus of Knee	1.75
5	Cervicalgia	1.07	Lower Leg Injury, not otherwise specified	1.01
6	Lumbar Disc Displacement	2.21	Sprain Lumbar Region	0.43
7	Carpal Tunnel Syndrome	1.31	Cervicalgia	1.89
8	Lumbago	0.50	Rotator Cuff Syndrome, unspecified	2.38
9	Sprain Lumbosacral	0.25	Lumbar Disc Displacement	2.83
10	Sprain of Neck	0.38	Lumbosacral Neuritis, not otherwise specified	2.19

The severity index is the ratio of paid temporary indemnity severity for that diagnosis and age cohort to average paid temporary indemnity severity for all claims.

Source: NCCI

Exhibit 13

**Diagnosis Mix and Medical Severity Index Differences**  
 Top 10 Claim Diagnoses for Lost-Time Claims With Temporary Payments That Closed Within  
 24 Months of Date of Injury, Accident Years 1996-2007

	Ages 20–34		Ages 45–64	
	Diagnosis and Medical Severity Index		Diagnosis and Medical Severity Index	
1	Sprain Lumbar Region	0.30	Sprain Rotator Cuff	2.66
2	Lower Leg Injury, not otherwise specified	0.72	Unilateral Inguinal Hernia	0.94
3	Sprain of Ankle, not otherwise specified	0.20	Carpal Tunnel Syndrome	1.28
4	Unilateral Inguinal Hernia	0.83	Tear Medial Cartilage/Meniscus of Knee	1.69
5	Cervicalgia	0.99	Lower Leg Injury, not otherwise specified	0.93
6	Lumbar Disc Displacement	1.75	Sprain Lumbar Region	0.36
7	Carpal Tunnel Syndrome	1.15	Cervicalgia	1.48
8	Lumbago	0.47	Rotator Cuff Syndrome, unspecified	2.18
9	Sprain Lumbosacral	0.25	Lumbar Disc Displacement	1.92
10	Sprain of Neck	0.38	Lumbosacral Neuritis, not otherwise specified	1.58

The severity index is the ratio of paid medical severity for that diagnosis and age cohort to average paid medical severity for all claims.

Source: NCCI

Exhibit 14 shows that the differences in diagnosis mix (across all injuries, not just those in the top 10 shown above) account for more than 25 percentage points of the differences in severity between older and younger workers. That is, about half of the differences in severity can be accounted for by the differences in the leading types of injuries sustained by each age group. For indemnity, of the 56% difference in paid temporary indemnity severity between older and younger workers, 26%, or almost half (a 46% share), can be attributed to the more severe injuries experienced by older workers. For medical, 28% (a 55% share) of the 51% difference in paid medical severity on claims with temporary payments is due to the difference in the mix of injuries between older and younger workers.<sup>13</sup>

**Exhibit 14**

**Difference in Indemnity and Medical Severity by Age  
Approximately Half Due to Types of Injuries (Mix)**

**Paid Temporary Indemnity Severities and Paid Medical Severities on Claims With Temporary Payments Lost-Time Claims Closed Within 24 Months of Date of Injury, Accident Years 1996–2007**

	Indemnity 45–64 vs. 20–34		Medical 45–64 vs. 20–34	
	Difference	Share	Difference	Share
Total	56%	100%	51%	100%
Due to Diagnosis Mix	26%	46%	28%	55%
Due to Number of Treatments or Duration				
Due to Price and Other Factors				

Source: NCCI

**Accounting for Differences in Quantity**

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

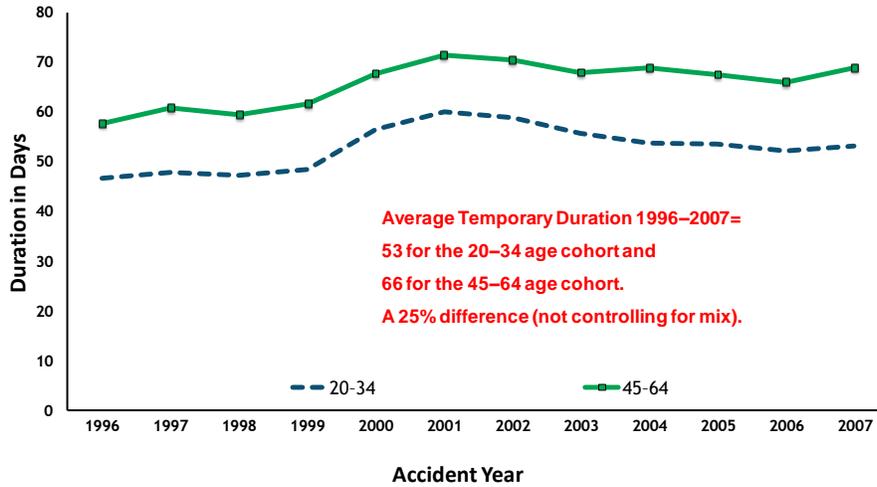
For indemnity, we measure the differences in quantity by the duration of temporary payments. Exhibits 15 and 16 show the differences in durations between older and younger workers. Exhibit 15 shows the data as reported with an average difference in durations of 25% over the 1996 to 2007 period. However, most of the observed difference reflects the impact of differences in injury mix discussed above. After adjusting for mix (which is already captured in the previous calculations for the impact of mix), the difference in durations between older and younger workers is quite modest, averaging 7 percentage points over the period (Exhibit 16).

<sup>13</sup> The contribution of the change in diagnosis mix is estimated by calculating what severity for older workers would have been using the mix of injuries for younger workers and what severity for younger workers would have been using the mix of injuries for older workers. In these calculations, diagnosis mix for all injuries is used, not just the top 10 shown above as an illustration. When holding mix constant, the difference in indemnity severity was 30%. Therefore, the 26% due to changes in diagnosis mix is calculated by subtracting the 30% difference in severity after controlling for changes in mix from the 56% difference without controlling for change in mix. The difference in medical severity was 23% when holding mix constant, so the 28% due to changes in diagnosis mix is calculated by subtracting the 23% from 51%.

Exhibit 15

## Average Duration for Temporary Payments as Reported

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

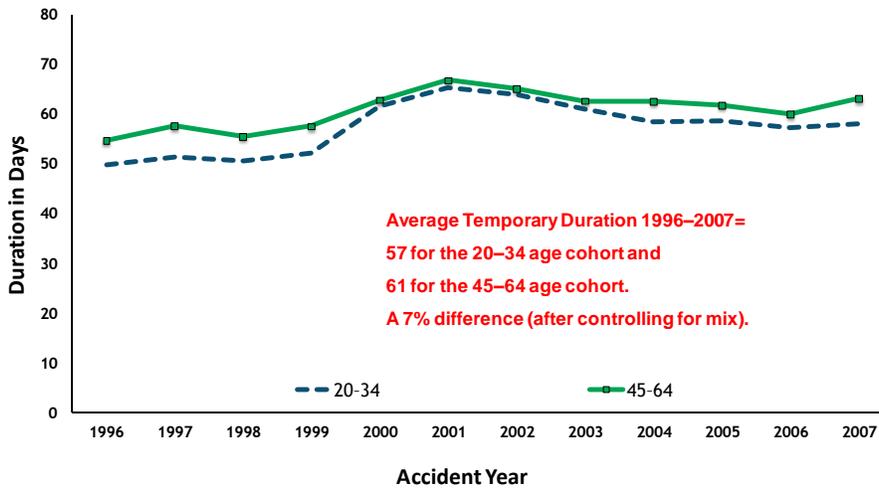


Source: NCCI

Exhibit 16

## 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



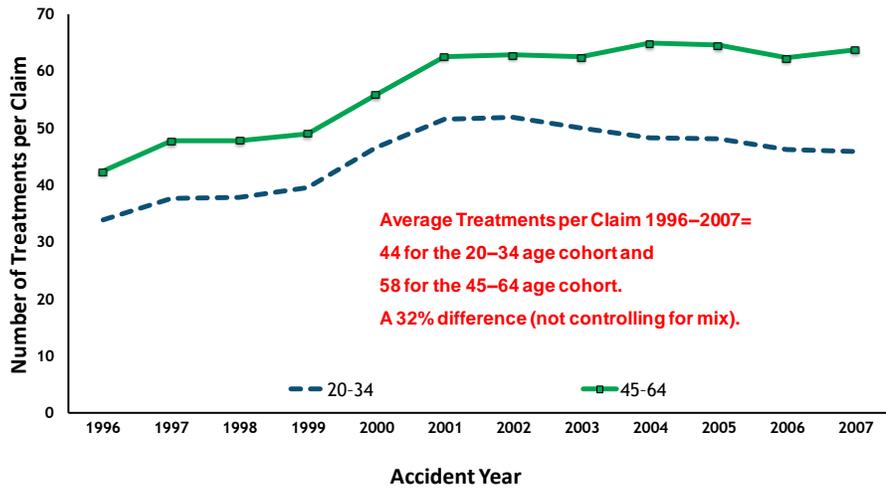
Source: NCCI

For medical, we measure quantity differences by the number of medical treatments per claim. Exhibits 17 and 18 show the differences in treatments per claim between older and younger workers. Exhibit 17 shows the data as reported with an average difference in treatments per claim of 32% over the 1996 to 2007 period. Here again, a good portion of the observed difference reflects the impact of differences in injury mix. After adjusting for mix, the difference in treatments per claim between older and younger workers is 14 percentage points over the period (Exhibit 18).

**Exhibit 17**

**Average Number of Treatments per Claim as Reported**

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

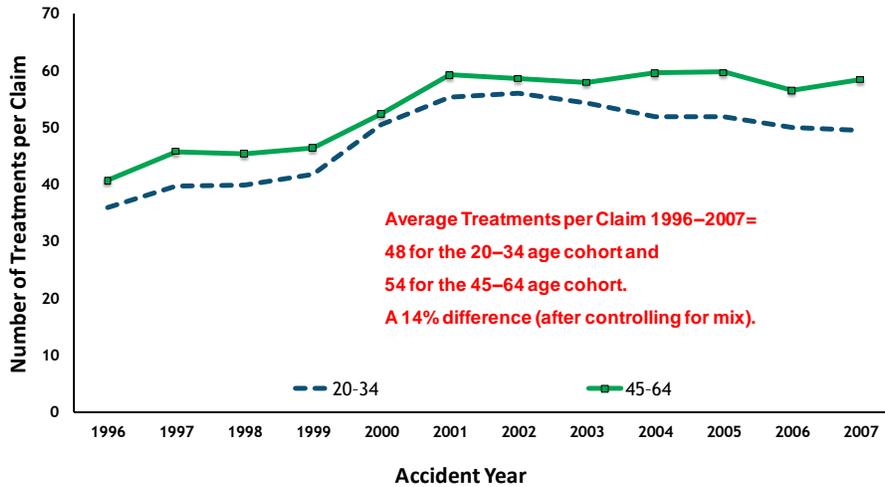


Source: NCCI

Exhibit 18

## 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

Exhibit 19 shows the contribution of these differences in duration and treatments per claim to the overall severity difference between older and younger workers. Differences in duration have only a modest impact while differences in treatments per claim have a more material impact. After accounting for differences in the mix of injuries, 8%<sup>14</sup> (or just a 14% share) of the 56% difference in indemnity severity between older and younger workers can be attributed to the difference in duration. For medical, 15%<sup>15</sup> (or a 29% share) of the 51% difference in severity between older and younger workers can be attributed to the difference in treatments per claim after controlling for differences in diagnosis mix.

<sup>14</sup> For technical reasons (see footnote 16), the 7% difference in durations after controlling for mix converts to 8 percentage points in the analysis of contributions to the differences in indemnity severity.

<sup>15</sup> For technical reasons (see footnote 16), the 14% difference in treatments per claim after controlling for mix converts to 15 percentage points of the differences in medical severity.

Exhibit 19

**Difference in Indemnity and Medical Severity by Age  
Modest Impact for Duration;  
Material Impact for Treatments per Claim**

**Paid Temporary Indemnity Severities and Paid Medical  
Severities on Claims With Temporary Payments  
Lost-Time Claims Closed Within 24 Months of Date of Injury,  
Accident Years 1996–2007**

	Indemnity 45–64 vs. 20–34		Medical 45–64 vs. 20–34	
	Difference	Share	Difference	Share
Total	56%	100%	51%	100%
Due to Diagnosis Mix	26%	46%	28%	55%
Due to Number of Treatments or Duration	8%	14%	15%	29%
Due to Price and Other Factors				

Source: NCCI

**Accounting for Differences in “Price”**

The remaining factor is “price.” In the case of indemnity, this is measured by the average daily temporary benefit payment. For medical costs, “price” is measured by the average cost or payment per billed medical treatment.<sup>16</sup>

Exhibits 20 and 21 show the difference between older and younger workers in daily indemnity benefit payments for the temporary portion of claims. Exhibit 20 shows that before controlling for mix, there was a 26% difference over the period. Differences in average weekly wages are a key factor in determining differences in daily indemnity benefit payments. In this analysis, the average weekly wage was 31% higher for older workers over the period.<sup>17</sup> Controlling for differences in the mix of injuries had little impact on differences in the average cost per day. As seen in Exhibit 21, after adjusting for differences in mix, the average daily benefit payment was still 21% higher for older workers. This indicates that there was little correlation between benefit levels and the types of injuries sustained.

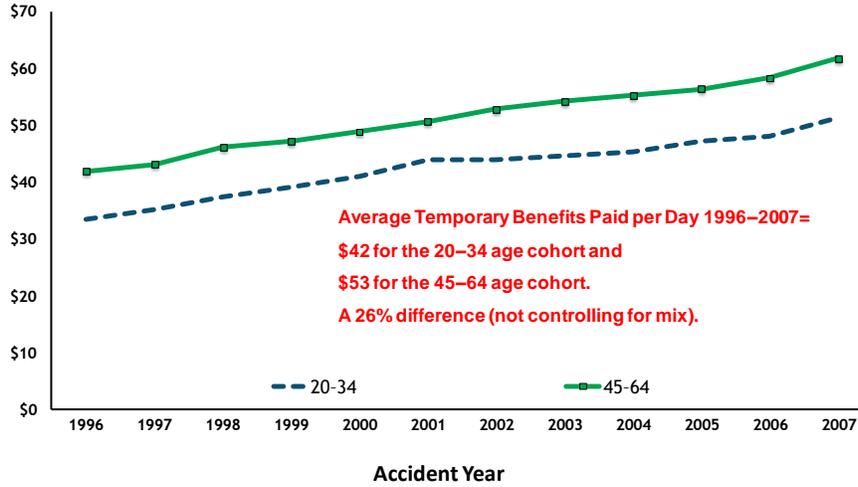
<sup>16</sup> The portion due to the change in quantity and the change in price is calculated using the average duration and the average cost per day for indemnity and the average treatments per claim and the average cost per treatment for medical. All calculations are performed after controlling for 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.

<sup>17</sup> The chart in Appendix D indicates this.

Exhibit 20

### Average Temporary Benefits Paid per Day as Reported

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

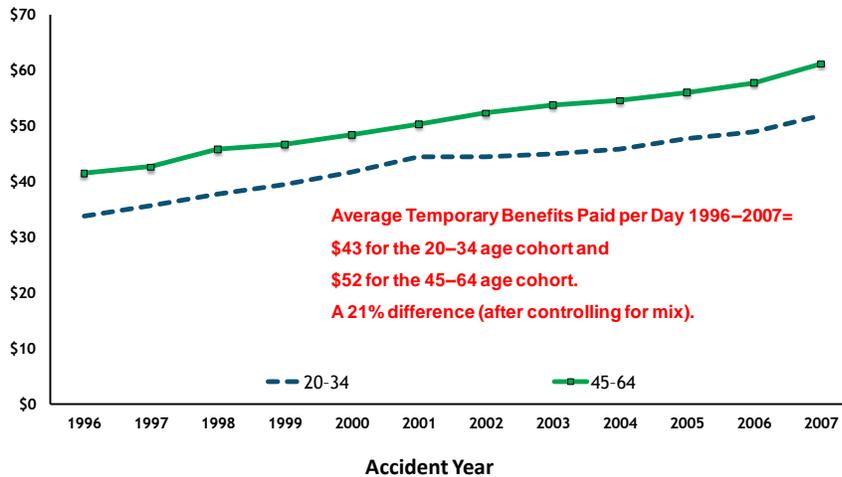


Source: NCCI

Exhibit 21

### Average Temporary Benefits Paid per Day After Controlling for Mix

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



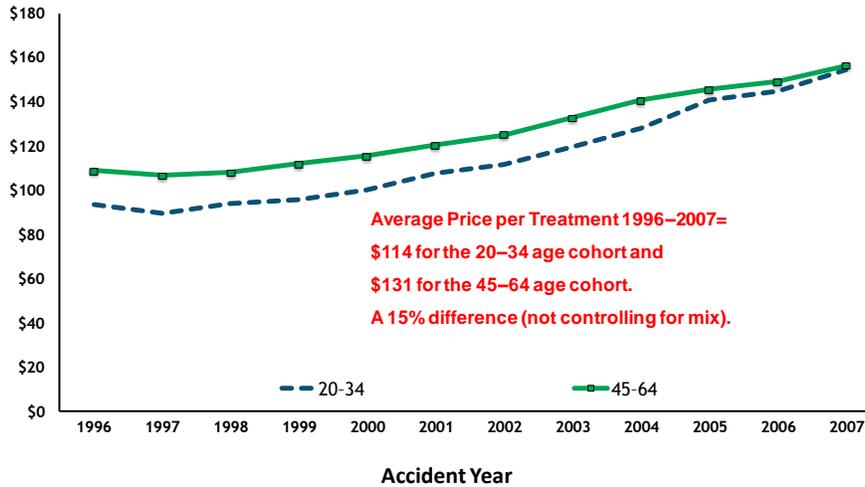
Source: NCCI

Exhibit 22 shows that before controlling for mix, the difference in cost per medical treatment was 15% higher for older workers on average, although the difference largely disappeared by the end of the period. About half of the observed difference is linked to differences in the mix of injuries as seen in Exhibit 23. After controlling for mix, the difference in cost per treatment was only 8%<sup>18</sup> higher for older workers, and again, any remaining differences seem to have largely disappeared by the end of the period.

**Exhibit 22**

## Average Cost per Treatment as Reported

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



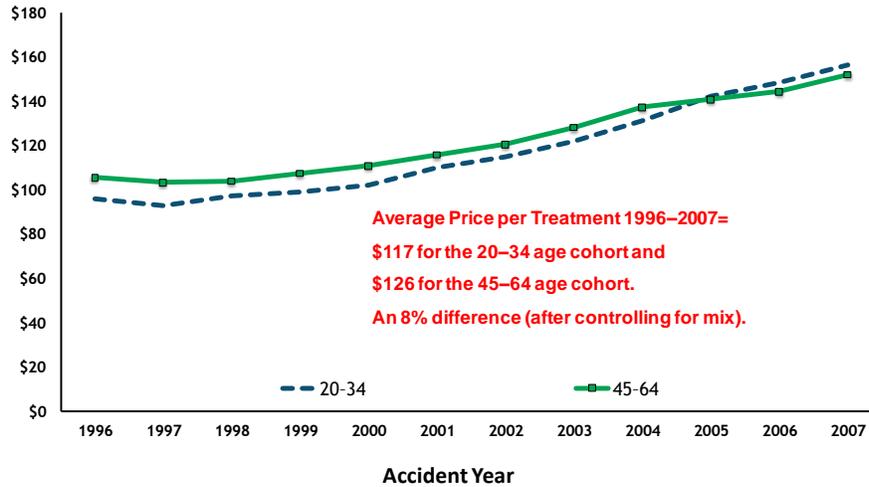
Source: NCCI

<sup>18</sup> After controlling for diagnosis mix, the remaining difference in price per treatment between older and younger workers could be attributed to a difference in the mix of treatments between older and younger workers for the same diagnosis.

Exhibit 23

### Average Cost per Treatment After Controlling for Mix

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



Source: NCCI

Exhibit 24 shows the contribution of these differences in price (daily benefit payments and cost per treatment) to the overall severity difference between older and younger workers after adjusting for differences in the mix of injuries. Price, in the form of differences in daily indemnity benefit payments, was a significant factor in the difference in indemnity severity over the period, accounting for 22%<sup>19</sup> of the 56% difference in severity, or a 39% share. On the one hand, older workers tend to be paid more, and therefore, their indemnity benefit payments are higher. On the other hand, price differences as measured by average cost per billed medical treatment appear to be only a minor factor accounting for 8% of the 51% difference in medical severity, or a 16% share.

<sup>19</sup> For technical reasons (see footnote 16), the 21% difference in benefit payments per day after controlling for mix converts to 22 percentage points in the analysis of contributions to the differences in indemnity severity.

Exhibit 24

**Difference in Indemnity and Medical Severity by Age  
Significant Impact for Wages and Benefit Levels;  
Modest Impact for Cost per Treatment**

**Paid Temporary Indemnity Severities and Paid Medical  
Severities on Claims With Temporary Payments  
Lost-Time Claims Closed Within 24 Months of Date of Injury,  
Accident Years 1996–2007**

	Indemnity 45–64 vs. 20–34		Medical 45–64 vs. 20–34	
	Difference	Share	Difference	Share
Total	56%	100%	51%	100%
Due to Diagnosis Mix	26%	46%	28%	55%
Due to Number of Treatments or Duration	8%	14%	15%	29%
Due to Price and Other Factors	22%	39%	8%	16%

Source: NCCI

In summary, differences in the mix of injuries account for about half of the differences between older and younger workers in both indemnity and medical severity. In addition, higher daily benefit payments, largely reflecting differences in average weekly wages, is a key driver for indemnity. For medical, the greater number of billed medical treatments per claim is a more significant driver than price.

**Costs per Full-Time Equivalent Workers—Differences Are Primarily Due to Differences in Severity**

Costs per worker as used in this paper is not strictly comparable to loss costs commonly used in workers compensation discussions.<sup>20</sup> For workers compensation, the differences in loss costs, or the combined impact of frequency and severity, are the ultimate bottom-line consideration. Using BLS and DCI data (for frequency and severity, respectively), this section examines indemnity, medical, and total costs per full-time workers by age cohort. As discussed in previous sections, differences in frequency (injury rates) by age have diminished while differences in severity by age have continued. Therefore, the differences in costs per worker for the more recent years are primarily due to the continued differences by age in severity.

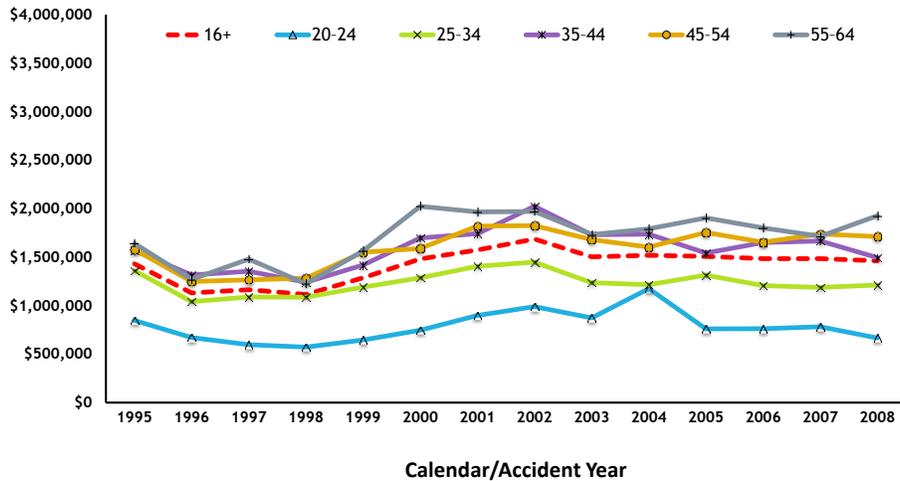
<sup>20</sup> “Loss costs” has a specific meaning in workers compensation typically reflecting claim costs relative to a measure of premium or payroll. The measure reported here is the product of severity per claim times BLS injury and illness rates and is used to compare relative costs per full-time equivalent workers across age groups.

Exhibits 25, 26, and 27 contain indemnity, medical, and total costs per 10,000 FTE workers, respectively, and show that all three increased for older age groups.<sup>21</sup> They also show that there is very little difference in costs per worker for the three age groups that comprise 35- to 64-year-olds. In addition, there has been little change from year to year since 2003 reflecting declining frequency and offsetting increasing severity.

**Exhibit 25**

**Differences in Indemnity Costs/Worker by Age Have Continued Due to Differences in Severity**

Average Paid Plus Case Indemnity Losses per 10,000 FTE Workers Reported at 18 Months



FTE= Full-Time Equivalent

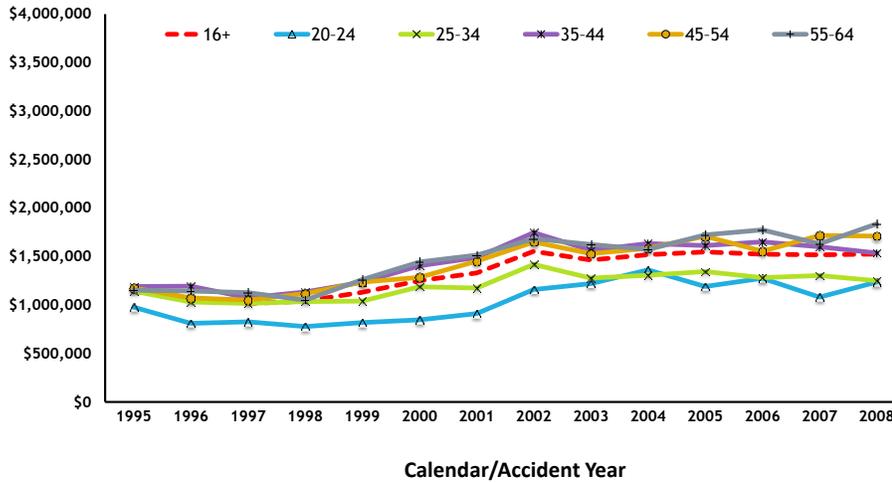
Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

<sup>21</sup> Appendix A contains costs per 10,000 FTE workers for the youngest and oldest age cohorts.

Exhibit 26

## Differences in Medical Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Medical Losses per 10,000 FTE Workers Reported at 18 Months



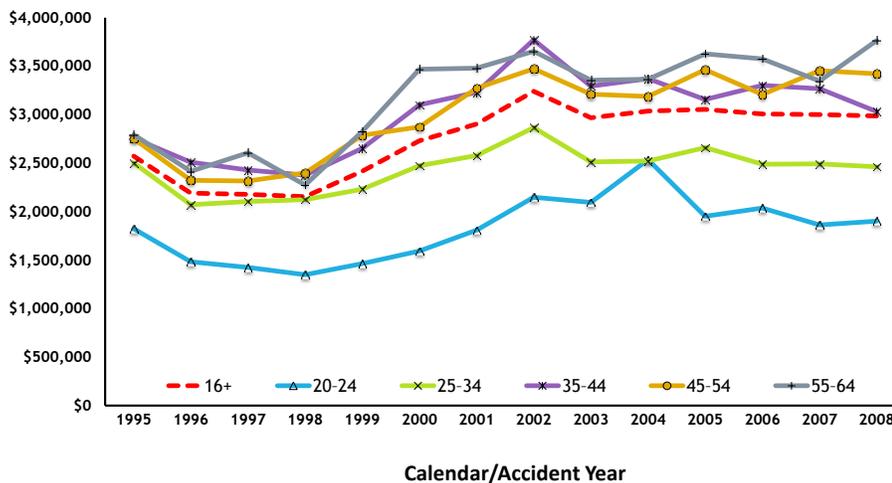
FTE= Full-Time Equivalent

Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

Exhibit 27

## Differences in Total Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Total Losses per 10,000 FTE Workers Reported at 18 Months



FTE= Full-Time Equivalent

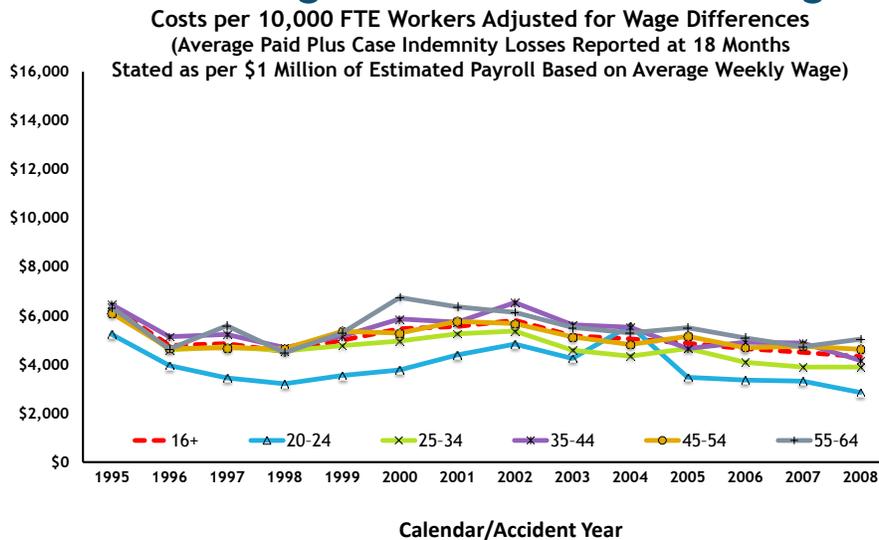
Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

### Costs per 10,000 FTE Workers Adjusted for Differences in Average Wages by Age

From a workers compensation perspective, cost differences by age are offset at least to some extent by the impact on premium of wage differences by age cohort. In this section, we take that impact into account by adjusting the costs per 10,000 FTE workers from the previous section for average weekly wage differences by age.<sup>22</sup> Exhibits 28, 29, and 30 contain these adjusted indemnity, medical, and total costs, respectively, reported at 18 months, and are stated as losses per \$1 million of estimated payroll.<sup>23</sup> It is important to note that this is not the same as loss costs per reported payroll. The exhibits show that after adjusting for wages, even the minor differences between the age cohorts shown above shrink further. In addition, particularly for medical, the 25 to 34 age cohort that was previously below average now moves up to be more in line with the 35 to 64 age cohorts.<sup>24</sup>

Exhibit 28

## Indemnity Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

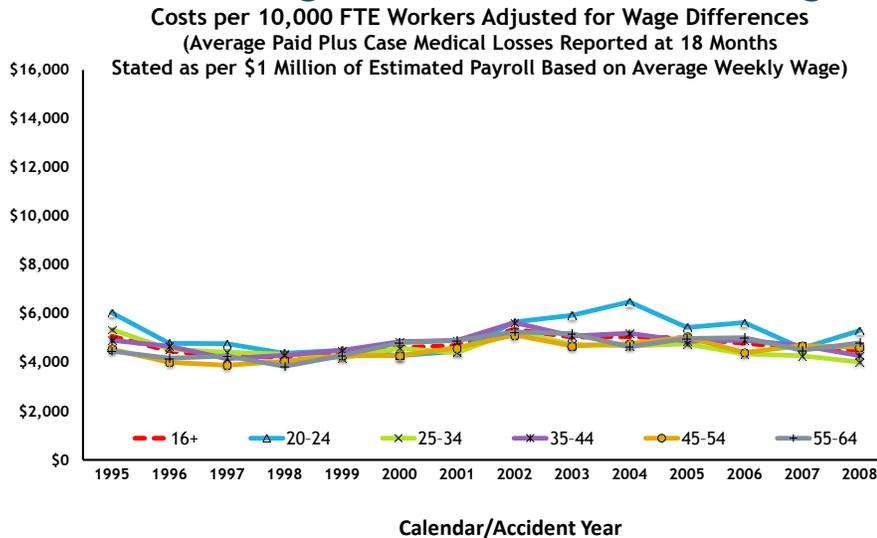
<sup>22</sup> See Exhibit D1 in Appendix D as an example reflecting differences in average weekly wages by age cohort, although the adjustment in this section uses data for more detailed age cohorts from NCCI’s DCI database.

<sup>23</sup> This is an approximation calculated by dividing the costs per 10,000 FTE workers by an estimate of the average weekly wages of the cohort. Algebraically, this is equivalent to multiplying the number of workers by the average weekly wage to get an estimate of total weekly wages or “payroll” by cohort. Average weekly wages were also multiplied by 52 to convert the loss cost estimate to an annual figure. Finally, the result was multiplied by 1,000,000 and divided by 10,000 to restate the estimate in terms of \$1 million dollars of payroll.

<sup>24</sup> Appendix A contains costs per 10,000 FTE workers adjusted for wage differences by age for the youngest and oldest age cohorts.

Exhibit 29

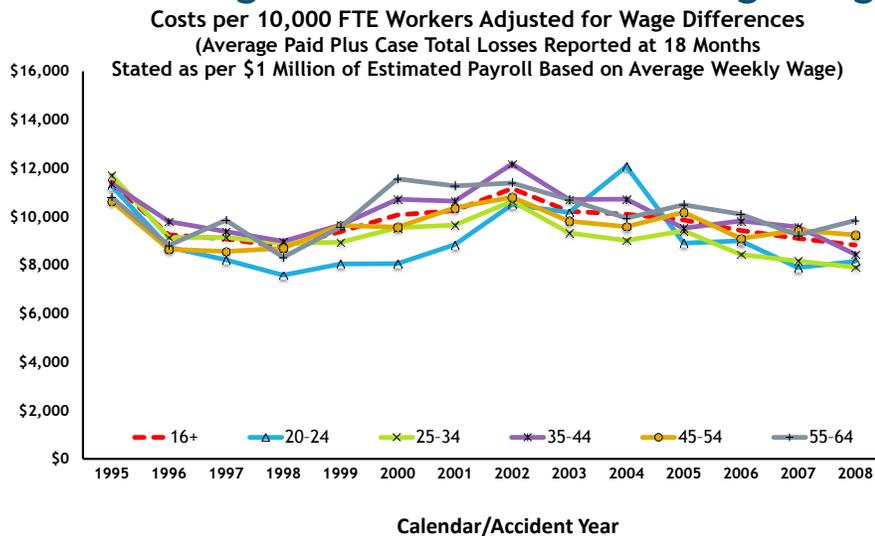
## Medical Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

Exhibit 30

## Total Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

## Conclusion

Older workers generally tend to have higher costs per worker, but “older” seems to start with age 35, with all groups of workers aged 35 to 64 having similar costs per worker. Workers 20 to 24 have markedly lower severities and costs per worker and workers 25 to 34 fall in the middle.

Differences in injury rates by age group have largely disappeared. Remaining differences in costs per worker by age primarily reflect differences in severities. Severity for older workers is roughly 50% higher than for younger workers with variation in the mix of injuries accounting for half this difference. Higher wages and benefits are a key factor for differences in indemnity severity while more treatments per claim are a material factor for medical severity.

In addition, from a workers compensation perspective, the higher costs are offset at least to some extent by the higher premium due to higher wages of older workers. Overall, the findings can be viewed as reassuring, in that an aging workforce may have less negative impact on loss costs than originally thought. NCCI will continue to closely monitor these effects in the future.

**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.

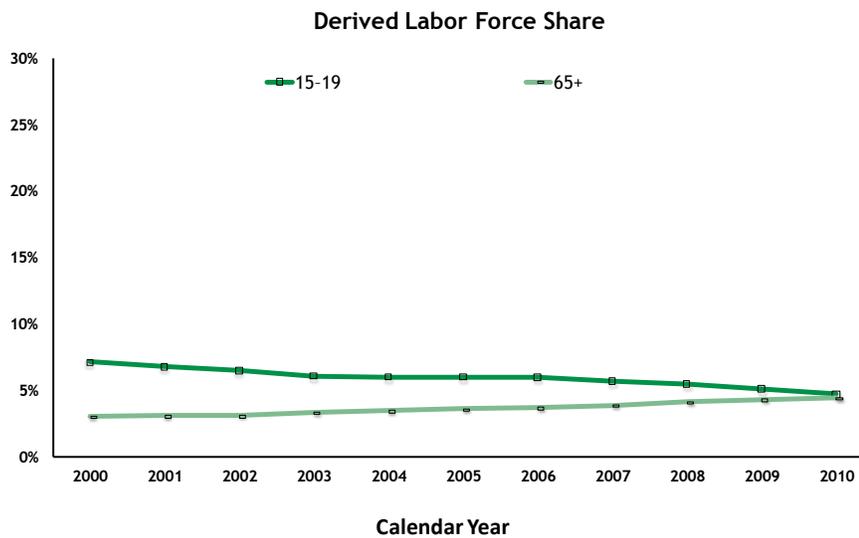
## APPENDIX A

### Data for the Youngest and Oldest Age Cohorts

NCCI published a study titled *Claims Characteristics of Workers Aged 65 and Older* in January 2010. In this study, we have primarily focused on the core workforce, aged 20 to 64, since the youngest and oldest age cohorts each make up less than a 5% share of the labor force as seen in Exhibit A1. However, this appendix contains graphs for injury rates, severity, and costs per worker that include the data for the 16 to 19 and 65 and older age cohorts.<sup>25</sup>

#### Exhibit A1

### The Youngest and Oldest Age Cohorts Each Account for Less Than 5% of the US Workforce



Source: Based on labor force participation rates from the Bureau of Labor Statistics and population estimates from the Bureau of Census obtained from Moody's Economy.com. For the youngest age cohort, labor force participation data is available for 16-19 and population for 15-19 so applied the 16-19 percentage to the 15-19 population.

<sup>25</sup> Selection bias impacts these studies, particularly for the extreme age cohorts. For example, people in the youngest age cohorts are likely either working part-time or not going to college. In the past, younger workers were more likely to have physical-labor entry-level jobs and sustain minor back strains. For the oldest cohort, in the past it was likely that the healthier workers worked past age 65. However, with lower home and 401k values, some less healthy workers may now be putting off retirement. But this could also be going in the other direction; some workers in the 55 to 64 age cohort who wanted to keep working have lost their jobs, so they have retired. Therefore, the net impact is unclear. The apparent favorable experience of the older cohort may partially reflect this bias as might the improving frequency of the youngest group.

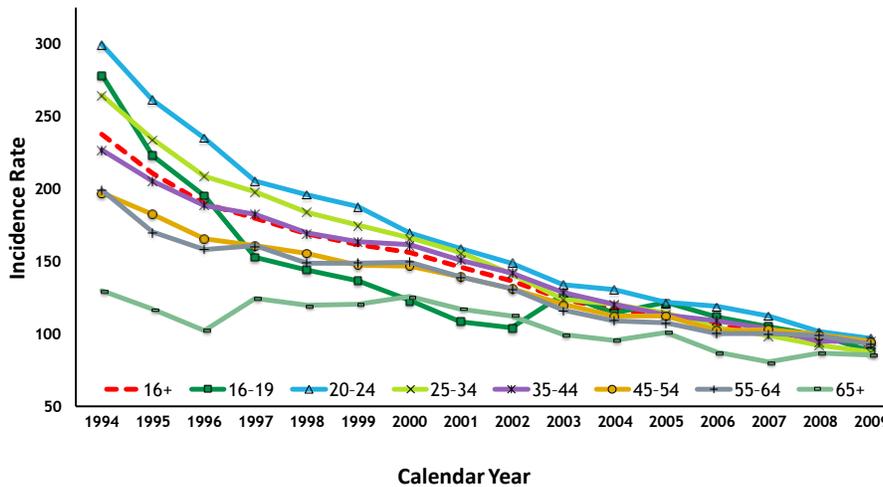
## Frequency

Exhibits A2 and A3 contain graphs of frequency (injury rates per worker) comparable to those shown in the body of this paper that include data for the youngest and oldest age cohorts. As with the age groups comprising the core workforce, frequency for these age cohorts has also declined, and the differences have also narrowed. Removing the core workforce age cohorts in Exhibit A3 highlights the volatility of the data for the 16 to 19 age cohort, moving from above average, to below average, to average over the period.

### Exhibit A2

## Frequency Has Fallen Across All Age Groups and Differences by Age Have Narrowed

Derived Injury and Illness Incidence Rates Involving Days Away From Work per 10,000 FTE Workers



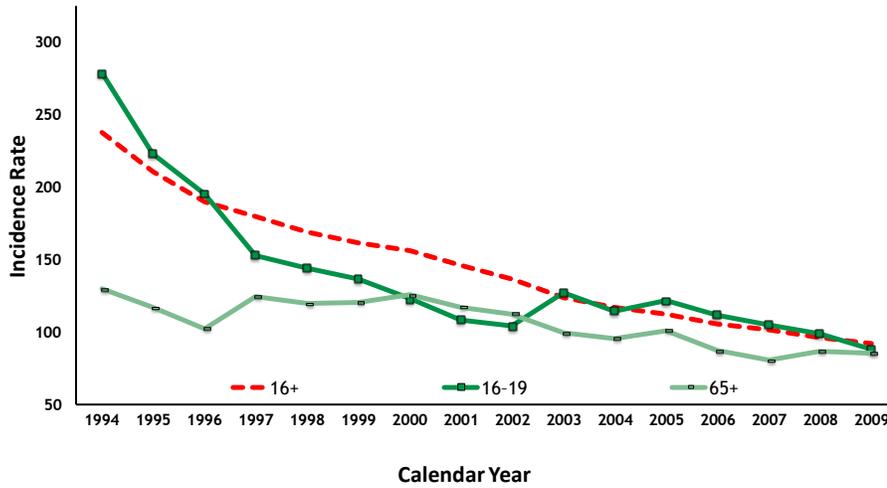
FTE= Full-Time Equivalent

Source: Derived by NCCI using data from the Bureau of Labor Statistics

Exhibit A3

## Frequency Has Fallen Across All Age Groups and Differences by Age Have Narrowed

Derived Injury and Illness Incidence Rates Involving Days Away From Work per 10,000 FTE Workers



FTE= Full-Time Equivalent

Source: Derived by NCCI using data from the Bureau of Labor Statistics

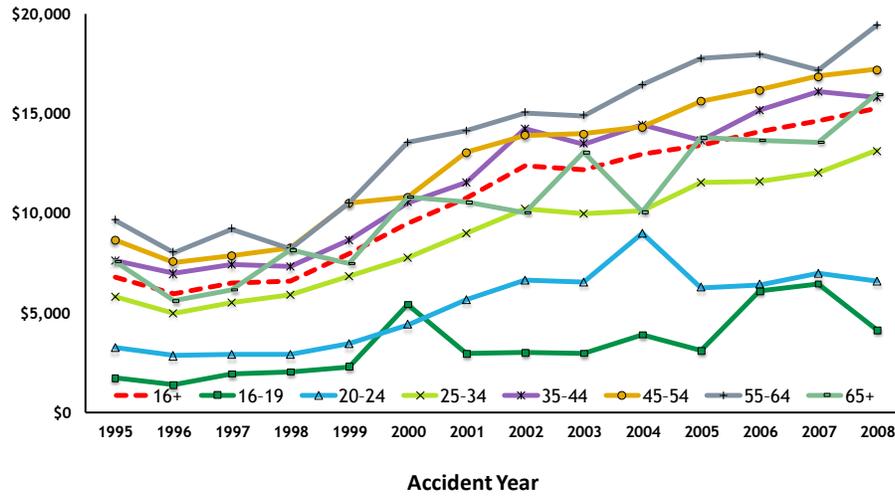
### Indemnity Severity

Exhibit A4 shows indemnity severity for all age cohorts. Indemnity severity for the oldest cohort (65+) is about average and below that of the other older cohorts (35 and over) due to lower average wages for this cohort. Exhibit A5 removes the core workforce age cohorts, making it easy to see that indemnity severity for the oldest age cohort is about average.

Exhibit A4

## Indemnity Severity Increases by Age Have Continued

Average Paid Plus Case Indemnity Severities Reported at 18 Months

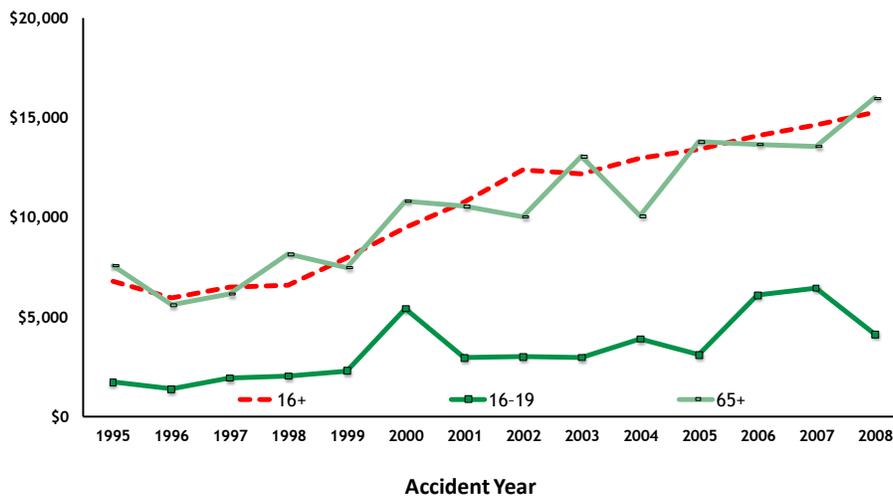


Source: NCCI DCI Data

Exhibit A5

## Indemnity Severity Increases by Age Have Continued

Average Paid Plus Case Indemnity Severities Reported at 18 Months



Source: NCCI DCI Data

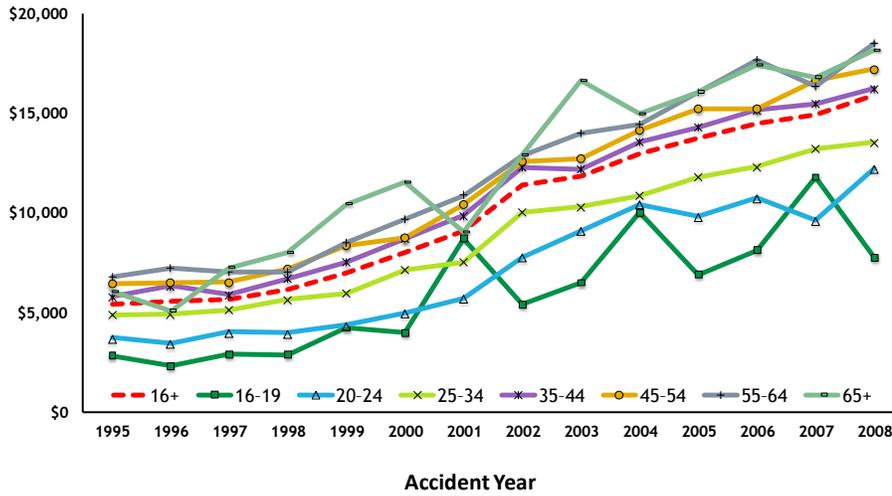
## Medical Severity

There is a common belief among many that because of poorer health and longer healing times, medical severity among the oldest workers is likely much greater than among younger workers. However, although there are some wide swings from year to year, medical severity for workers 65 and older does not seem much different from older workers (35 plus) generally, as seen in Exhibit A6. Exhibit A7 shows only the oldest and youngest cohorts, again highlighting the volatility in the data.

Exhibit A6

### Medical Severity Increases by Age Have Continued

Average Paid Plus Case Medical Severities on Lost-Time Claims Reported at 18 Months

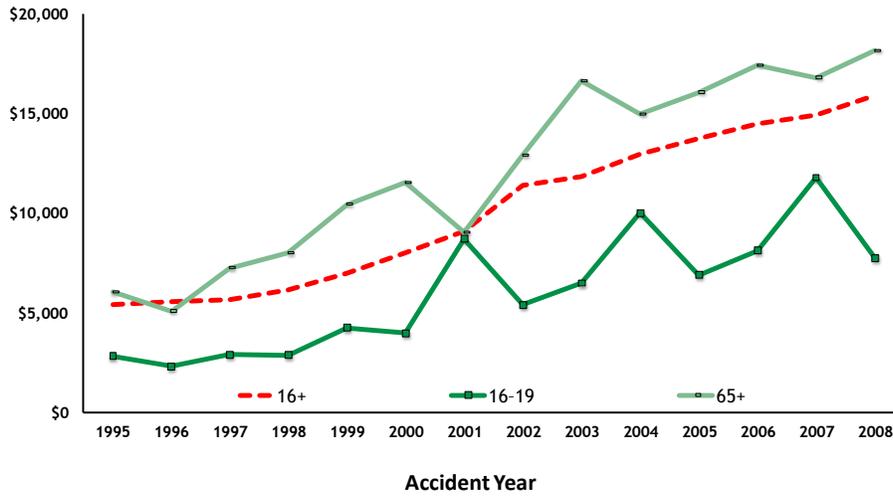


Source: NCCI DCI Data

Exhibit A7

## Medical Severity Increases by Age Have Continued

Average Paid Plus Case Medical Severities on Lost-Time Claims Reported at 18 Months



Source: NCCI DCI Data

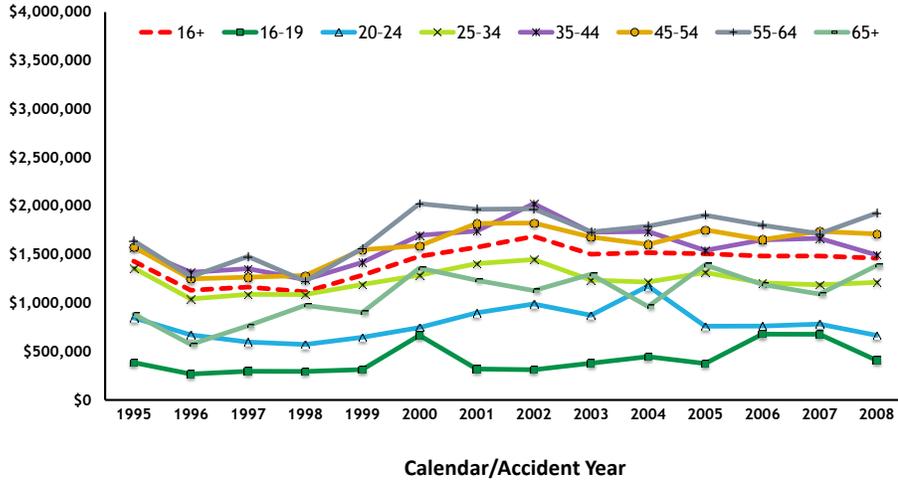
### Costs per 10,000 FTE Workers

Indemnity costs per worker increase for older age groups (up to age 64), but indemnity costs for the 65 and older age group are below average (Exhibits A8 and A9). Indemnity costs per worker for the oldest age cohort (65+) are below average due primarily to below-average frequency; in addition, severity for this oldest age group is close to the overall average.

Exhibit A8

## Differences in Indemnity Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Indemnity Losses per 10,000 FTE Workers Reported at 18 Months



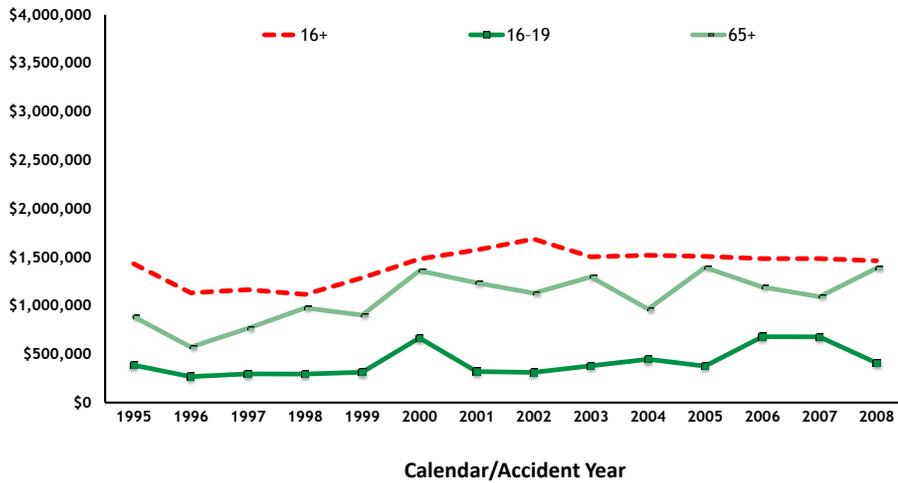
FTE= Full-Time Equivalent

Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

Exhibit A9

## Differences in Indemnity Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Indemnity Losses per 10,000 FTE Workers Reported at 18 Months



FTE= Full-Time Equivalent

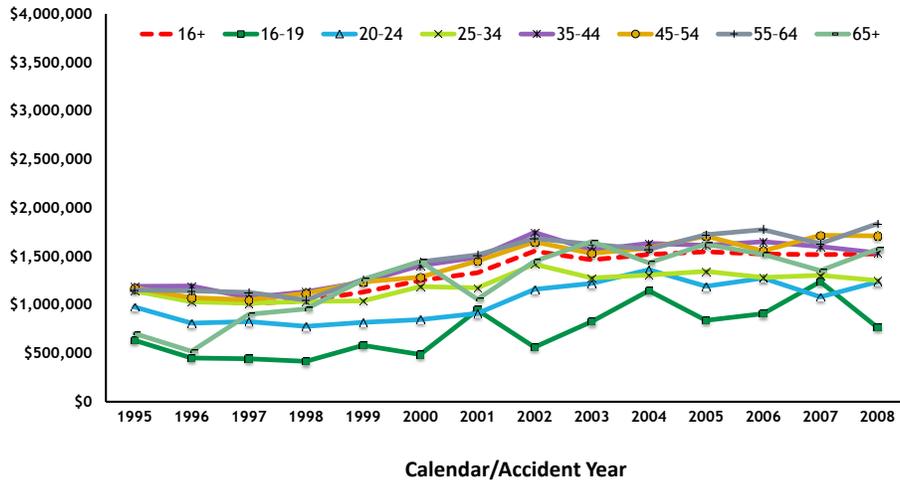
Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

Medical costs per worker also increase for older age groups up to age 64, but medical costs for the 65 and older age group are about average (Exhibits A10 and A11). Medical costs for the oldest age cohort (65+) are about average due to offsetting below-average frequency and above-average severity.

**Exhibit A10**

## Differences in Medical Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Medical Losses per 10,000 FTE Workers Reported at 18 Months



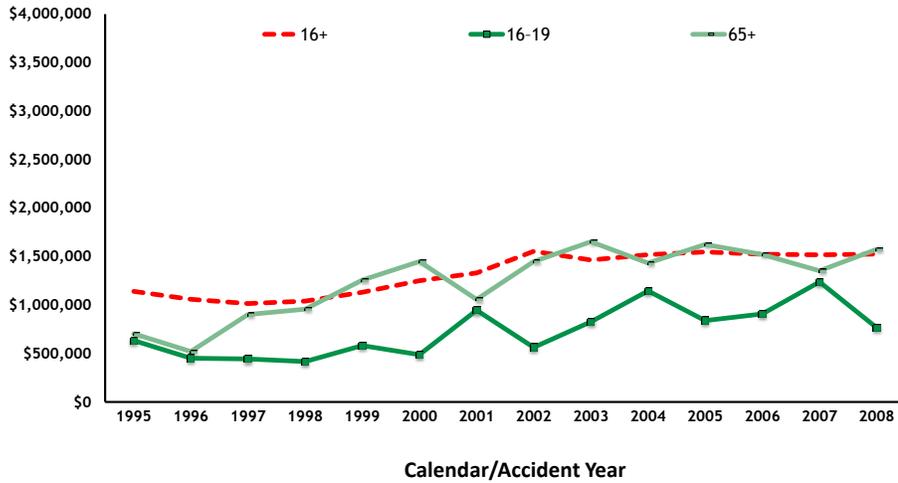
FTE= Full-Time Equivalent

Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

Exhibit A11

## Differences in Medical Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Medical Losses per 10,000 FTE Workers Reported at 18 Months



FTE= Full-Time Equivalent

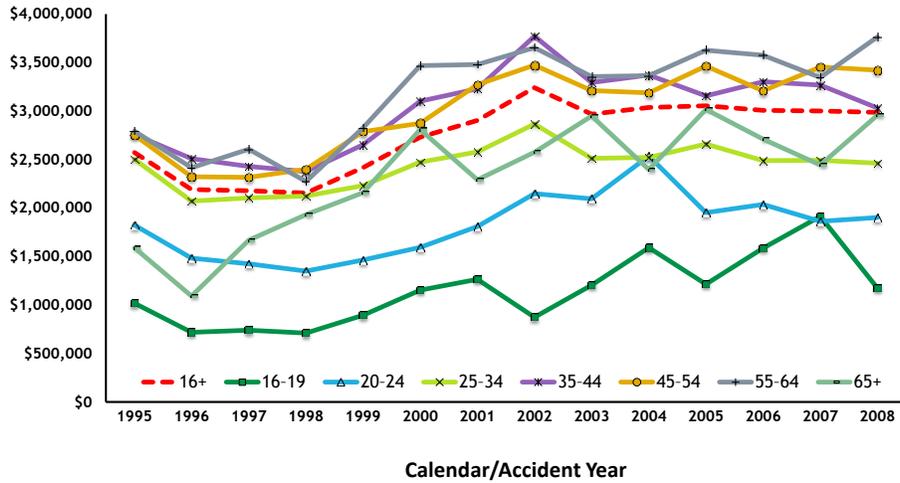
Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

Exhibits A12 and A13 show that total costs per worker for the youngest and oldest age cohorts are quite volatile, with the oldest age cohort (65+) being below average.

Exhibit A12

## Differences in Total Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Total Losses per 10,000 FTE Workers Reported at 18 Months



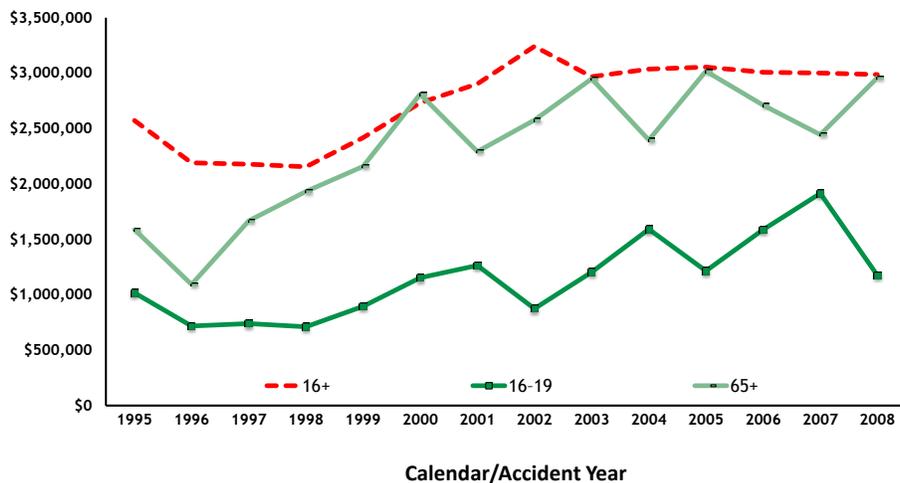
FTE= Full-Time Equivalent

Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

Exhibit A13

## Differences in Total Costs/Worker by Age Have Continued Due to Differences in Severity

Average Paid Plus Case Total Losses per 10,000 FTE Workers Reported at 18 Months



FTE= Full-Time Equivalent

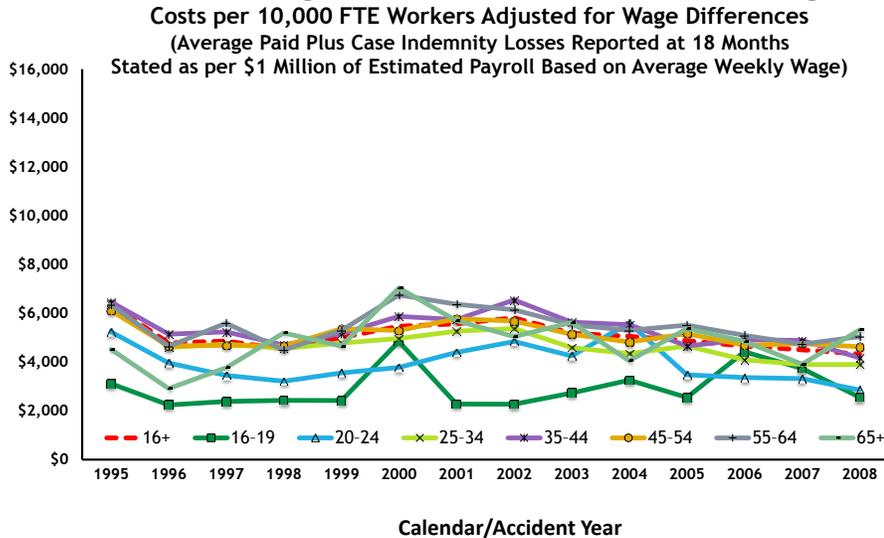
Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the Bureau of Labor Statistics for frequency.

### Costs per 10,000 FTE Workers Adjusted for Differences in Average Wages by Age

As with costs per worker, costs after adjusting for wage differences are more volatile for both the youngest and oldest age cohorts. However, cost differences among the age cohorts shrink further after accounting for wage differences by age, with indemnity costs for the 65 and over group being about average and very similar to the other age cohorts (see Exhibits A14 and A15).

Exhibit A14

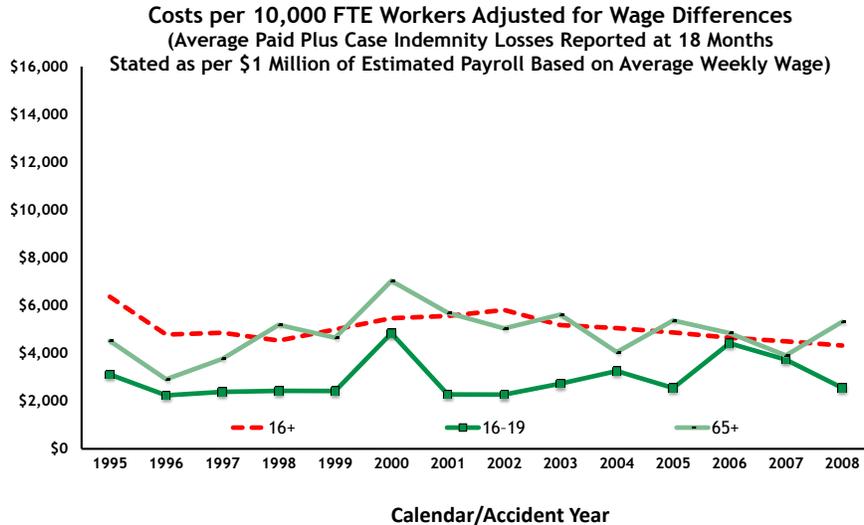
## Indemnity Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

Exhibit A15

## Indemnity Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages

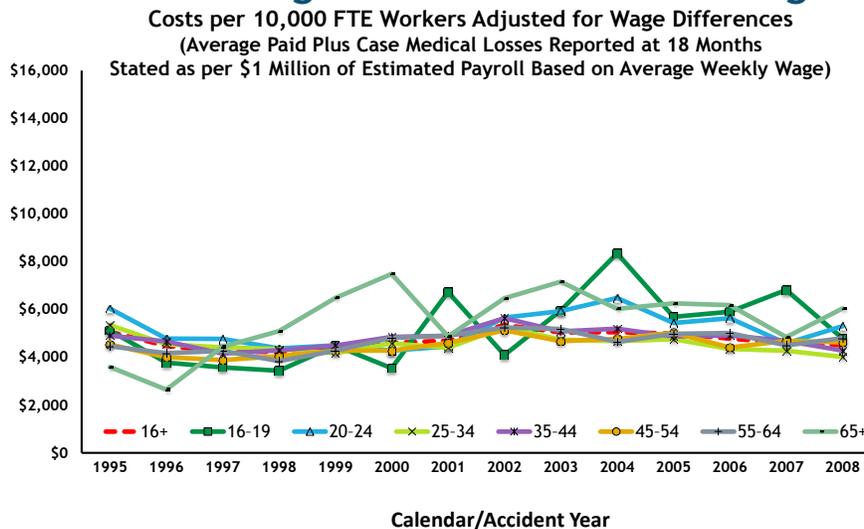


Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

Differences in medical costs also shrink after adjusting for wage differences. Both the youngest and oldest age cohorts are above average in the latest years (see Exhibits A16 and A17).

Exhibit A16

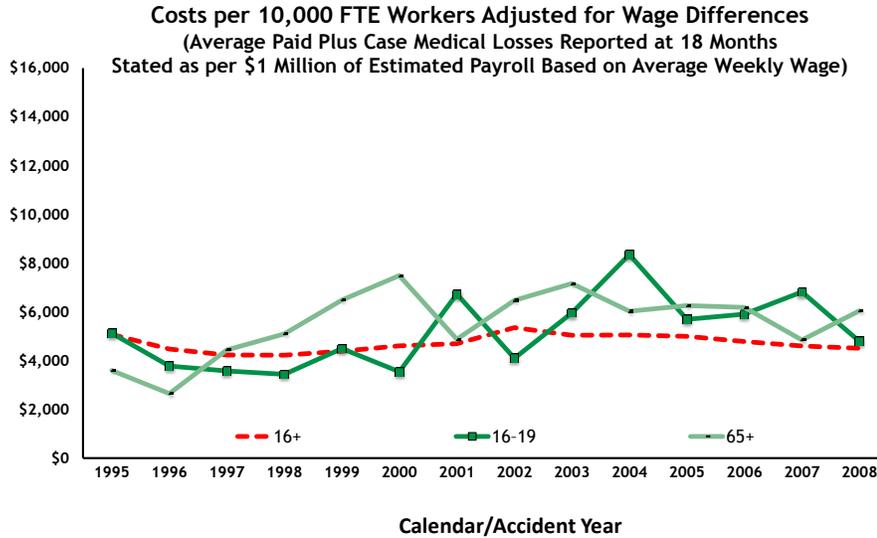
## Medical Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

Exhibit A17

## Medical Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages

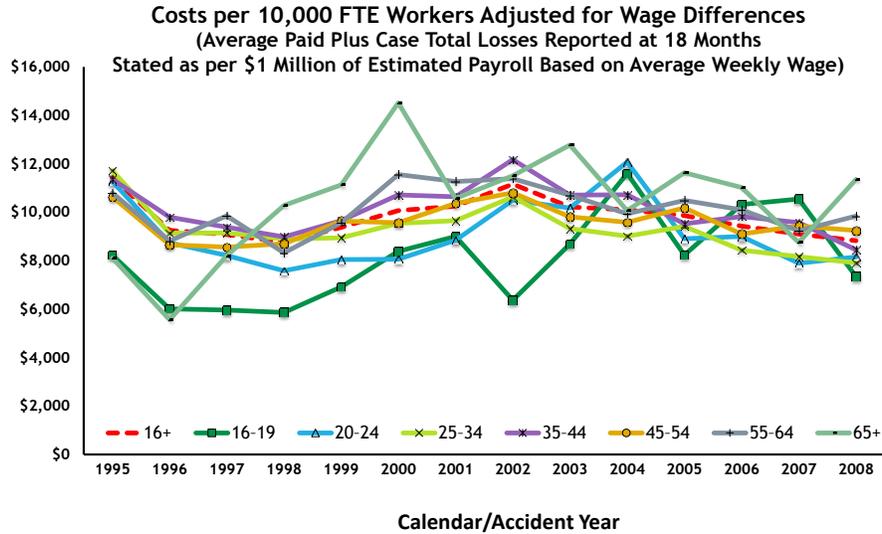


Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

Total costs after adjusting for wages are quite volatile for both the youngest and oldest age cohorts, but overall differences by age are less after accounting for wage differences (see Exhibits A18 and A19).

Exhibit A18

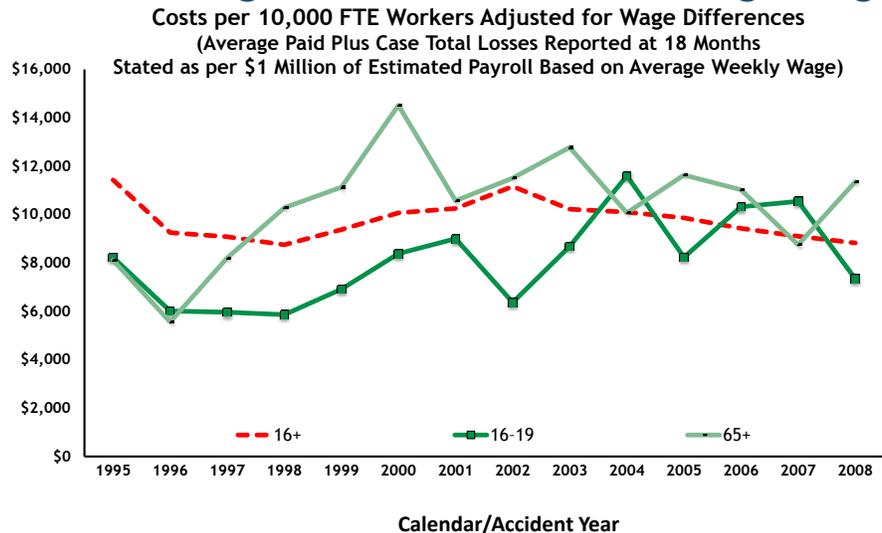
## Total Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

Exhibit A19

## Total Cost Differences by Age Shrink Further When Accounting for Differences in Average Wages



Source: Calculated by NCCI by multiplying NCCI DCI data for severity and incidence rates involving days away from work derived by NCCI using data from the BLS for frequency. Converted from losses per 10,000 FTE workers to losses per \$1 million of estimated payroll by dividing loss costs per 10,000 FTE workers by average weekly wages by age cohort from NCCI DCI data. Weekly wages were multiplied by 52 to obtain an annual estimate. The result was multiplied by 1,000,000 and divided by 10,000.

## APPENDIX B

### Losses Not Included in Contribution Analysis Section

Exhibit B1 shows that for younger workers, 68% of lost-time claims at 60 months are temporary claims and those temporary claims cover 23% of indemnity losses and 32% of medical losses at 60 months. For older workers, 52% of lost-time claims at 60 months are temporary and they cover 17% of indemnity losses and 25% of medical losses at 60 months. The second row shows what share of the temporary claims and losses at 60 months are closed at 24 months. For younger workers, 90% of the temporary claims at 60 months are closed at 24 months, covering 68% of the indemnity losses and 70% of the medical losses. For older workers, 84% of the temporary claims at 60 months are closed at 24 months, covering 57% of indemnity losses and 60% of medical losses.

**Exhibit B1**

	Claims	Claims	Indemnity	Indemnity	Medical	Medical
	20–34	45–64	Paid	Paid	Paid	Paid
	20–34	45–64	20–34	45–64	20–34	45–64
Share of total lost time at 60 months that is temporary	68%	52%	23%	17%	32%	25%
Share of temporary at 60 months that is closed at 24 months	90%	84%	68%	57%	70%	60%

The analysis in this paper to account for differences in severity between older and younger workers is based on claims closed within 24 months of date of injury with temporary payments where duration could be calculated.<sup>26</sup> Exhibit B2 shows that temporary claims at 24 months make up a 73% share of total claims at 24 months for younger workers and a 61% share for older workers. The share of temporary claims closed at 24 months to all temporary claims at 24 months is 84% for younger workers and 72% for older workers. The shares are high for both younger and older workers.

**Exhibit B2**

	Age 20–34	Age 45–64
Percent of temporary claims at 24 months to total claims at 24 months	73%	61%
Percent of temporary claims closed at 24 months to all temporary claims at 24 months	84%	72%

For medical, the losses used in the analysis represent 68% of total medical paid losses on claims closed within 24 months of date of injury for younger workers and 64% for older workers. For comparison, the contribution analysis was performed for all claims closed within 24 months and for claims closed within 24 months where duration could not be calculated. Exhibit B3 compares the results and indicates that the distributions of the components are roughly comparable. For example, diagnosis mix accounts for 55% of the difference between older and younger workers using claims where duration is available as reported in the body of this paper.<sup>27</sup> It is very similar for claims without duration (53%) and for all claims (55%). The same is true for the portions due to utilization and price.

<sup>26</sup> To the extent that comparable analysis was possible on other categories of claims, the differences between the younger and older cohorts were consistent with the findings using the more clearly defined temporary claims closed at 24 months.

<sup>27</sup> Results for claims with duration were reported in the body of this paper to be consistent with the claims used for the indemnity portion of the contribution analysis.

**Exhibit B3**

	Claims Closed Within 24 Months With Duration		Claims Closed Within 24 Months Without Duration		All Claims Closed Within 24 Months	
	Difference	Share	Difference	Share	Difference	Share
Medical Severity						
Severity Difference 45–64 vs. 20–34	51%	100%	43%	100%	47%	100%
Due to diagnosis mix	28%	55%	23%	53%	26%	55%
Due to utilization (treatments per claim)	15%	29%	15%	35%	15%	32%
Due to price	8%	16%	5%	12%	7%	15%

For indemnity, the losses used in the contribution analysis (temporary payments on claims closed within 24 months where duration could be calculated) represent 36% of total indemnity paid losses on claims closed within 24 months for younger workers and 30% for older workers. Exhibit B4 shows the distributions of losses and the difference between older and younger workers for losses included and not included in the contribution analysis. The losses not included are still limited to claims closed within 24 months. As seen in the first section of the table, the indemnity losses included in the analysis were 100% temporary payments with severity for older workers 57%<sup>28</sup> higher than for younger workers. The majority of losses on claims closed within 24 months that were not included in the analysis are permanent partial disability payments, making up over half for both younger and older workers. Temporary payments where duration could not be calculated make up about a fifth. Severity is higher for older workers than for younger workers for all categories, as seen in the far-right column and, on average, is 54% higher.

The difference for permanent partial disability payments is somewhat lower than for the other categories at 30%. Although duration is not available, so a full contribution cannot be performed, an analysis could still be performed on strictly the permanent partial losses to determine the impact of the change in diagnosis mix on the difference in permanent partial severity between older and younger workers. The analysis found that, of the 30% difference, diagnosis mix accounted for 8%, or just over a quarter of the difference. Therefore, diagnosis mix does not have as big of an impact on the difference in permanent partial severity as it did on the temporary payments reported in the body of this paper where diagnosis mix accounted for just under half the difference in severity. This suggests that there is less diversity among age cohorts in the diagnoses resulting in permanent partial injuries.

<sup>28</sup> The difference here is 57% because this calculation includes lump-sum payments while the difference reported in the contribution analysis in the body of the paper is 56% because it did not include lump-sum payments.

Exhibit B4

Comparison of Injury Categories for Losses on Claims Closed Within 24 Months of Date of Injury That Are Not Included in the Contribution Analysis

Distribution of Losses and Severity Difference Older Over Younger	Share of Total Younger	Share of Total Older	Relative Severity Older Over Younger
<b>Indemnity Losses Included in Contribution Analysis</b>	36%	30%	
<b>Indemnity Losses NOT Included in Contribution Analysis</b>	64%	70%	
<b>Indemnity Losses Included in Contribution Analysis</b>			
Temporary Disability	100%	100%	57%
<b>Indemnity Losses NOT Included in Contribution Analysis</b>			
Permanent Partial Disability	55%	58%	30%
Permanent Total Disability	0%	0%	5%
Temporary Disability	20%	17%	60%
Attorney	9%	8%	77%
Supplemental Benefits	0%	0%	80%
Other Indemnity	15%	15%	63%
Vocational Rehabilitation	1%	1%	28%
Lump Sum			53%
<b>Total losses NOT included</b>	100%	100%	54%

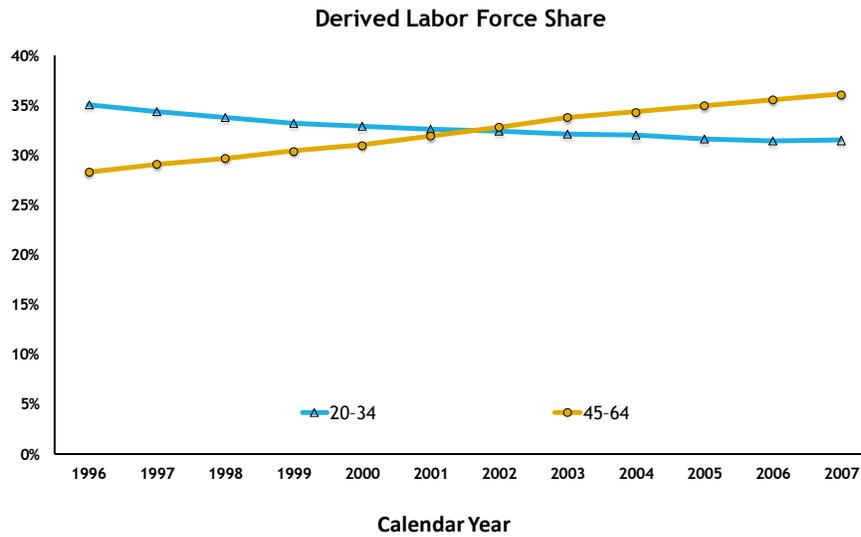
## APPENDIX C

### Labor Force Shares for Age Cohorts and Years in Contribution Analysis

Exhibit C1 shows the labor force shares for the age cohorts (20 to 34 and 45 to 64) and years (1996 to 2007) included in the contribution analysis. Over this period, the share for the 45 to 64 age group increased from 28% to 36% while the share for the 20 to 34 age group decreased from 35% to 31%.

Exhibit C1

### Workers 45 and Older Account for an Increasing Share of the US Workforce



Source: Based on labor force participation rates from the Bureau of Labor Statistics and population estimates from the Bureau of Census obtained from Moody's Economy.com .

## APPENDIX D

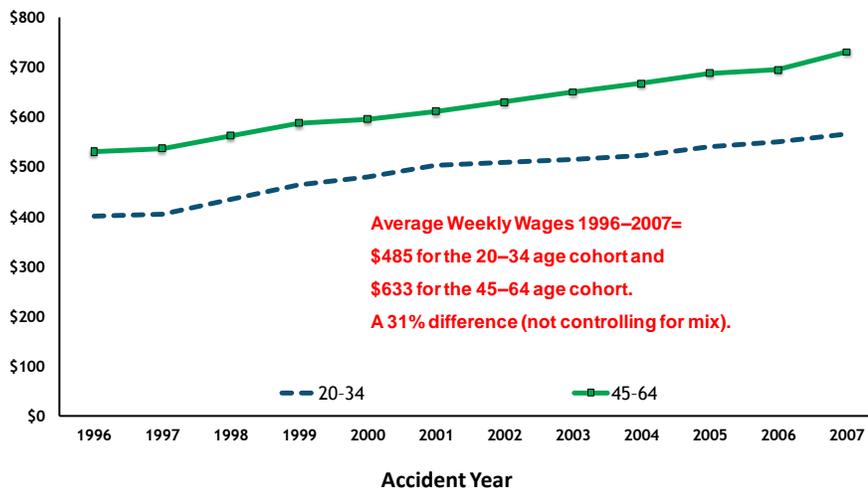
### Average Weekly Wages on Claims in Contribution Analysis

Exhibit D1 contains average weekly wages as reported on claims examined in the contribution analysis in this paper. Differences in average weekly wages would be a key factor in determining differences in daily indemnity benefit payments. In this analysis, average weekly wages were 31 percentage points higher for older workers over the period.

#### Exhibit D1

### Average Weekly Wages as Reported

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



Source: NCCI

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