The Impact of Catastrophic Cases on Workers Compensation Medical Loss Reserves

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ABSTRACT

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Catastrophic claims (defined as burn injuries, acquired head injuries, spinal cord injuries and multiple trauma injuries) account for less than 1% of all Workers Compensation claims but as much as 20% of total Workers Compensation losses. The ultimate value of a catastrophic claim can be very difficult to predict, with significant increases in case reserves many years after the injury occurred being not uncommon. These claims introduce a high amount of variability to the ultimate medical loss reserve projections when using standard loss development triangle techniques.

This paper focuses on the distorting impact catastrophic claims can have on workers compensation ultimate medical reserve projections and introduces techniques for eliminating this distortion. The issue of the impact of catastrophic claims on ultimate medical loss reserve projections is one that has received relatively little attention explicitly in the actuarial literature, but is one that is important to accurate reserve estimation by accident year.

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Introduction

Catastrophic claims account for less than 1% of all Workers Compensation claims but as much as 20% of total Workers Compensation losses. For the purpose of this paper, the definition of a catastrophic claim follows common industry practice; burn injuries, acquired head injuries, spinal cord injuries and multiple trauma injuries. Catastrophic claims can cost millions of dollars in medical costs and can extend over several decades or more.

The ultimate value of a catastrophic claim can be very difficult to predict early in the life of the claim and often even after many years have passed. As a result, these claims account for a high percentage of the late medical reported as well as paid loss development and a great deal of the variability in the medical loss development triangle and in ultimate loss projections.

Within a company's claims department, these claims call for and receive special case reserving treatment. This was not always so. Over the last 15 or more years, the approaches for managing and case reserving these claims have changed and become more sophisticated. This paper discusses the distortion in medical incurred loss development triangles and ultimate loss projections caused by catastrophic claims and by changes in their case reserve adequacy resulting from industry practices in managing and reserving these claims. It then discusses how this may be affecting the accuracy of loss projections based on incurred loss development and

suggests an alternative tool for dealing with the actuarial issues created by these claims which involves excluding the catastrophic claims entirely from the loss development triangles.

Background

Since the ultimate values of catastrophic claims are more unpredictable than non-catastrophic claims, catastrophic claims cause a great deal of the volatility in incurred and paid loss development factors. There are many factors contributing to the relatively higher unpredictability of catastrophic claims. Difficulties arise in anticipating the impact of medical inflation; foreseeing changes in the condition of the claimant or his or her home care giver(s) combined with the impact any change may have on the future stream of payments; foreseeing future medical advances that may be utilized for the claimant's care and their rising costs; and predicting whether the life expectancy is impaired and, if so, to what extent.

Annual medical payments can exceed $100,000 on these cases, and anticipating future medical inflation can be extremely difficult. Also, the future introduction and utilization of costly medical procedures, apparatuses and drugs may affect future medical payments on catastrophic claims. Regarding life expectancies for the catastrophically injured population, the experts interviewed for this paper did not reach a consensus as to whether these life expectancies are materially lower than the total population. There was a common theme that it depends on the specifics of the case and that the variability of the life expectancies is greater than for the total population.

The injured person's response to and recovery from a severe injury and its treatment are variable and unpredictable, as are subsequent treatment needs and lifespan. Psychosocial factors like the support of and relationship with the spouse and family are important in determining the likely degree of long term institutionalization and the likelihood of any return to home and an independent care situation. The difference between the initial expected and actual lifetime medical, rehabilitation and maintenance costs can be in the millions of dollars for some claims.

The state of the catastrophic claims handling and reserving "art" has evolved significantly since the 70's. That changing state of the "art" is reflected in high medical incurred tail loss development factors in the current observed loss development factors as compared to historical levels. Insurer claim departments and third party claims handling administrators (TPA's) are far more focused on early and proactive intervention and case management of catastrophic medical cases than they were twenty years ago. In addition, they are far more adept at understanding the complex factors that affect the cost of these claims and anticipating their impact on the ultimate cost. Given the greater focus on early accurate measurement of the ultimate cost of catastrophic claims today than in the past, it is reasonable to hypothesize that the paid and reported losses for catastrophic cases will not develop in the same fashion as they did in the past, and the differences may be dramatic.

Case reserves for catastrophic claims were in many cases stair-stepped in the 70's and 80's. That is, often no meaningful attempt was made to project the ultimate cost of catastrophic claims. The impact of this tendency to stair-step catastrophic case reserves is embedded in the loss development factors we rely on today to predict

future loss development. Today, however, insurers, their claims administrators, managed care providers and reinsurers are far more proactive in not only managing catastrophic claims but also in determining realistic projected ultimate values of each catastrophic claim and regularly reviewing their estimates. Many companies and TPA's have claims adjusters or nurse case managers that specialize in catastrophic cases. Third party vendors now exist that deal exclusively with these types of claims. As a result, catastrophic claims are more adequately reserved today than is implied by the historical medical incurred loss development factors. Not only does the inclusion of catastrophic claims cause volatility in the observed development patterns, a significant portion of the historical incurred development caused by catastrophic claims may not be repeated on today's claims.

An Alternative Reserving Tool

One goal of this paper is to increase the awareness of actuaries to the existence and potential impact of catastrophic claims in the historical losses and development patterns. For example, when projecting the ultimate losses for a particular accident year, one needs to be aware of whether there are any catastrophic claims in that year. This should affect the magnitude of the incurred loss development factor applied. The presence of catastrophic claims tends to increase the variability of the ultimate reserve and the risk of material adverse deviation. If a catastrophic claim is present, it is valuable to understand the details of its case reserve derivation: the level of effort put into estimating the case reserve, the life expectancy and medical inflation assumptions used, the catastrophic claim experience of the individual who developed the reserve, the time elapsed since the last review, and in general the likely upsides and downsides from the case manager's perspective. From this

review, the actuary should be able to gain a sense of the variability in the cost estimate, and where it falls in the range of potential outcomes.

Another goal of this paper is to suggest an alternative tool for projecting workers compensation losses that can help identify the distorting impact catastrophic claims are having on reserve projections and that can in many cases provide more accurate projections. The approach is to isolate and restate the loss development patterns to exclude the catastrophic claims, to then develop the non-catastrophic claim losses separately, and to rely on separate existing case specific techniques to estimate the ultimate value on the catastrophic claims.

Excluding the catastrophic claims produces much more stable development patterns and much more stable and smaller medical tail factors. The loss triangle of data exclusive of the catastrophic claims will have most if not all remaining claims with little or no ongoing medical payments after 15 years. Given this greater stability and shorter tail, more accurate projections of ultimate loss for the non-catastrophic claims can be made.

For the remaining catastrophic claims, qualified nurse case managers can perform detailed evaluations of the future cost of these claims called Life Care Plans. These are the best way to estimate the ultimate cost of these claims. The ultimate value of each claim is best estimated individually (as is the payout pattern, which will be needed for cash flow and discounting purposes).

This tool is most valuable in reviewing accident years that are at least two or three years old. Given the nature and severity of catastrophic injuries, they are identified early. However, it is usually not until the early acute phase of the treatment is completed that Life Care Plans are prepared and that the actuary can rely upon individual case reviews.

A claim nurse case manager or claims adjuster with extensive experience with catastrophic claims best develops Life Care Plans. These evaluations consider many factors such as psychosocial and other factors as well as physical factors in making projections of the length of acute care, the likelihood and expected point at which the injured person will be able to return to the home and then to non-supervised status, the point at which medical costs will stabilize, if ever, the maintenance costs once a level of stabilization is reached, the life expectancy, etc.

Because of the difficulty of managing these catastrophic claims, Life Care Plans are frequently created today (although not 10 or 15 years ago). This careful review helps manage the claim more effectively and provide the proper care without spending excessively. It does this by developing a long term plan for the victim's care and treatment, one that often involves frequent communication with the victim's family. Given the detail that goes into a Life Care Plan, inaccuracies in the individual estimates can be identified quickly after a significant change in conditions or treatment plan occurs. Also, these inaccuracies are not contaminating your non-catastrophic claim loss development triangles. Moreover an actuary can work with the developer of a Life Care Plan to develop the high end of the range and low end of

the range of reserve estimates for each of these claims to help in setting ultimate reserves for these claims within the context of setting the aggregate reserves.

Highly experienced catastrophic nurse case managers and claims adjusters are uniquely qualified to put together Life Care Plans, and annual lifetime care cost projections for each catastrophic claim. In putting a Life Care Plan together, the experts consider many factors, including those mentioned above, as well as how people tend to react in these difficult situations and how all these factors interact.

How Is This Different from Limited Loss Development Patterns?

The approach of excluding catastrophic claims from the loss development triangles and separately analyzing the individual catastrophic claims is in some ways similar to projecting losses on a limited per occurrence basis, but it has certain advantages over that approach. It is true that some of the volatility introduced by the inclusion of catastrophic claims in the development patterns can be eliminated using limited loss development patterns, especially in the tail. This is not an adequate solution, however. Using limited loss development factors leaves the concern of projecting losses by year in excess of the limit, and the presence or absence of catastrophic claims, and their volatility, greatly influences the excess losses. Also, the limited loss triangles will still contain the distortion caused by the case reserve strengthening that has occurred on catastrophic claims over the last 25 or so years.

Data Challenges

Obviously, in order to perform this approach it is necessary to identify catastrophic claims and remove them from the entire loss development triangle. Research done

in preparing this paper indicates that each actuary may have to rely on different approaches depending upon how the company's data is coded. For some, the system may have a unique catastrophic claim identifier, in which case this approach is relatively easy to do. If this is not the case, catastrophic claims may have unique claim descriptions such that the claims can be culled out by searching the claim description. The number of these claims is typically small and manageable, even in the largest companies, and each has the attention of the claims department so that a manual process of identifying and removing these claims may be appropriate. Narrowing the search by starting with only claims over, say $250,000 in medical loss can save time in identifying these catastrophic claims, particularly on the older years.

An Example

An example will now be presented to demonstrate the concept of isolating and excluding catastrophic claims from the incurred losses and loss development patterns. This example will demonstrate the increased stability in the development triangles when the catastrophic claims are removed. It demonstrates that more accurate ultimate reserves are derived. It demonstrates that, given that catastrophic claims are reserved far more adequately today than during the time period reflected in the loss development triangles, traditional methods tend to create an upward bias in the loss projections. There may still be years in which the ultimate projections are understated by the traditional approach, namely years where catastrophic claims occurred and there is still potential for significant development on them. In total, however, the traditional approach may be resulting in an overstatement of ultimate losses.

The alternative approach involves separating catastrophic claims from the medical losses and loss development triangles. In the attached exhibits displaying hypothetical reported workers compensation loss development triangles, Appendix 2 represents the loss triangles including the catastrophic claims. Appendix 3 shows the triangles for just the catastrophic claims. Appendix 4 displays the triangles restated to exclude the catastrophic claims.

Once catastrophic claims are excluded, the ultimate losses for the non-catastrophic medical losses can be projected using standard actuarial techniques: loss development, frequency/severity analysis, etc. The actuaries must then review each of the catastrophic claims with the case managers to estimate the probable range of outcomes. This multi-disciplined approach can be valuable not only in informing the actuary of the range of potential costs of the catastrophic claims, but also in educating the case manager of the potential impact of future medical inflation on the cost of the claim.

For the latest few accident years, this alternative approach may not work without adjustment because of the potential for late emerging catastrophic claims, and should be supplemented or modified. Because these catastrophic claims tend to arise from sudden and severe accidents they are usually known relatively quickly, they tend to generate a small pure IBNR component. Nonetheless, there are examples of cases that start out as moderately serious cases and later deteriorate into catastrophic claims. Also, there can be IBNR catastrophic claims due to reporting lags. Finally, for recently occurring catastrophic injuries, enough time may

not have passed to do a Life Care Plan or to reasonably evaluate the ultimate cost of the case.

In order to address this IBNR concern the more recent few accident years can be projected through the traditional method of applying including catastrophic claims loss development factors to including catastrophic claims losses. These loss development factors reflect an average of years with high and low frequency and severity of catastrophic claims.

Another approach is to derive a catastrophic claim emergence pattern so as to measure the expected number of pure IBNR catastrophic claims. These expected claim counts are then multiplied by a catastrophic claim projected average severity to derive an estimate of unreported ultimate catastrophic losses. This average severity should be based on a long term history of catastrophic claim severity. Given the volatility in average severity for these infrequent claims, each year's average severity should be trended to the cost level for the year being estimated, and an average severity should be selected based on a review of the results over a long period of time. The unreported ultimate catastrophic losses are then added to the reported ultimate catastrophic losses (assuming Life Care Plans have been performed on the reported catastrophic claims) and the ultimate losses for non-catastrophic losses.

An example of this approach is shown in Appendices 5, 6, and 7. Appendix 7 shows the catastrophic claim emergence pattern, which indicates that well under one catastrophic claim per accident year is expected to emerge after the end of the first

year. Appendix 6 shows the derivation of the trended average medical costs per catastrophic claim. Appendix 5 combines the expected claim count and severity to determine ultimate loss projections for IBNR claims.

When trending catastrophic medical claim severities, a higher trend rate than the average workers compensation medical trend rate should be used. These claims tend to have a high percentage of ongoing medical cost from long term care and pharmaceuticals, both of which are experiencing (and are expected to continue to experience) higher inflation rates than medical costs on average.

This paper has described an alternative approach to estimating ultimate medical reserves for workers compensation that treats catastrophic claims separately. The results from this alternative approach should be considered relative to results based on traditional methods in light of a number of factors. For example, if the volume of catastrophic claims is relatively consistent from year to year, traditional methods may not work too badly unless case reserve adequacy has changed. If the claims department procedures for handling catastrophic claims have changed over the years (for example if they previously tended to stair step the case reserves), this alternative approach is important to avoid distorted results. If the case managers performing the Life Care Plans lack expertise on catastrophic claims, the accuracy of the alternative approach may be threatened. At a minimum, this alternative approach is useful in sensitivity testing the impact of catastrophic claims on loss development patterns.

Appendix 1 shows the derivation of the results for the standard and alternative approaches. The Summary exhibit compares the results of this alternative approach compared to the standard approach. The overall redundancy in reserves is significant. Again this is caused by the impact of significant case reserve strengthening on catastrophic claims in the standard loss development method. The alternative approach indicates that the significant strengthening that occurred on catastrophic claims in the past will not occur to nearly the same extent and properly removes the distorting impact from the projections.

This example also illustrates that, even if the standard loss development factors were not distorted by non-repeating case reserve strengthening, the development factors, while accurate on average, are not accurate for any year. The years with the catastrophic claims will be understated and the years without the catastrophic claims will be overstated. In practice, there is no reason to think these overages and underages will perfectly "balance" out overall, so this approach improves the overall accuracy in addition to the by-year accuracy.

Summary

This paper is intended to increase the awareness of actuaries of the important role catastrophic claims play in workers compensation reserving. Changes in case management and reserving techniques for catastrophic claims are discussed in the context of the potential for distortion these changes have on ultimate medical loss projections. An alternative approach to developing workers compensation medical losses that deals with this distortion is illustrated. While many other factors have

affected workers compensation loss development factors over time, this approach attempts to isolate and adjust for one important factor.

Summary

Comparison of Results From Alternative Methods
All Figures in Thousands

Acc Yr (1)	Standard (2)	Catastrophic (3)	Difference (4)
1988	21,789	21,912	123
1989	37,638	37,028	-611
1990	31,898	31,255	-643
1991	30,337	30,278	-59
1992	25,470	25,724	254
1993	35,395	35,550	155
1994	27,313	27,134	-179
1995	25,014	24,933	-81
1996	26,102	27,047	945
1997	32,006	29,036	-2,969
1998	35,991	33,055	-2,936
Total ex 97,98	260,957	260,861	-96
Total	328,953	322,952	-6,001

Appendix 1

Derivation of Ultimate Loss Projections From Alternative Methods
All Figures in Thousands

Standard Method				Catastrophic Claims			Excluding Catastrophic Claims			
Acc Yr	Reported Medical Losses as of 12/31/98	Selected Loss Development Factors	Selected Ultimate Medical Losses	Acc Yr	Reported Medical Losses as of 12/31/98	Selected Ultimate Medical Losses	Acc Yr	Reported Medical Losses as of 12/31/98	Selected Loss Development Factors	Selected Ultimate Medical Losses
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1988	20,525	1.062	21,789	1988	0	0	1988	20,525	1.068	21,912
1989	35,278	1.067	37,638	1989	6,000	5,500	1989	29,278	1.077	31,528
1990	29,749	1.072	31,898	1990	4,000	3,500	1990	25,749	1.078	27,755
1991	28,152	1.078	30,337	1991	0	0	1991	28,152	1.076	30,278
1992	23,518	1.083	25,470	1992	3,000	3,500	1992	20,518	1.083	22,224
1993	32,359	1.094	35,395	1993	7,000	8,000	1993	25,359	1.086	27,550
1994	24,481	1.116	27,313	1994	0	0	1994	24,481	1.108	27,134
1995	21,916	1.141	25,014	1995	5,000	6,000	1995	16,916	1.119	18,933
1996	22,096	1.181	26,102	1996	5,000	7,500	1996	17,096	1.143	19,547
1997	25,086	1.276	32,006	1997	0	571	1997	25,086	1.135	28,465
1998	22,568	1.595	35,991	1998	0	2,058	1998	22,568	1.373	30,996

Notes:
(2), (3) from Appendix 2.
(4) = (2) x (3).
(6), (7) selected judgmentally based on author's experience with catastrophic claims and catastrophic claim development.
For 1997 and 1998, see Appendix 5.
(9), (10) from Appendix 4.

Appendix 2

Workers Compensation Reported Medical Losses and Loss Development Factors Including Catastrophic Claims
All Figures in Thousands

Accident	Evaluation Age in Months											
Year	12	24	36	48	60	72	84	96	108	120	132	144
1976												
1977												
1978												
1979												
1980												
1981												
1982												7,725
1983											8,572	8,623
1984										9,516	9,535	9,525
1985									11,939	12,130	12,312	16,166
1986								15,352	15,337	15,367	15,506	16,002
1987							19,479	19,713	19,575	19,183	19,375	19,666
1988						20,697	21,028	20,671	20,609	20,382	20,525	
1989					29,419	29,654	32,234	32,653	32,817	35,278		
1990				27,851	28,241	28,467	28,438	28,495	29,749			
1991			27,580	28,049	27,516	27,571	28,040	28,152				
1992		20,638	21,051	20,819	21,277	23,660	23,518					
1993	25,965	30,743	30,404	32,168	32,007	32,359						
1994	19,713	23,951	23,903	24,190	24,481							
1995	17,962	21,698	21,807	21,916								
1996	17,786	20,845	22,096									
1997	20,069	25,086										

Accident	Age Interval in Months											
Year	12 to 24	24 to 36	36 to 48	48 to 60	60 to 72	72 to 84	84 to 96	96 to 108	108 to 120	120 to 132	132 to 144	144 to 156
1976												
1977												
1978												
1979												
1980												
1981												
1982												1.006
1983											0.999	0.997
1984										1.015	1.313	1.002
1985									1.002	1.009	1.032	0.998
1986								0.993	0.980	1.010	1.015	
1987							0.983	0.997	0.989	1.007		
1988						1.087	1.013	1.005	1.075			
1989					1.008	0.999	1.002	1.044				
1990				0.981	1.002	1.017	1.004					
1991			0.989	1.022	1.112	0.994						
1992		0.989	1.058	0.995	1.011							
1993	1.215	0.998	1.012	1.012								
1994	1.208	1.005	1.005									
1995	1.172	1.060										
1996	1.250											
1997												
	Simple Average of Latest 4											
[1]	1.211	1.013	1.016	1.003	1.033	1.024	1.001	1.010	1.012	1.010	1.090	1.001
	Simple Average of Latest 3											
[3]	1.210	1.021	1.025	1.010	1.042	1.003	1.006	1.015	1.015	1.009	1.120	0.999
	Simple Average of Latest 2											
[4]	1.211	1.033	1.009	1.004	1.062	1.006	1.003	1.025	1.032	1.009	1.024	1.000
	Volume Weighted Average of Latest 5											
[5]	1.213	1.059	1.029	1.022	1.013	1.014	1.011	1.004	1.002	1.001	1.002	1.007
	Selected											
Selected	1.250	1.080	1.035	1.023	1.020	1.010	1.005	1.005	1.005	1.005	1.005	1.005
Dev to Ult	1.595	1.276	1.181	1.141	1.116	1.094	1.083	1.078	1.072	1.067	1.062	1.056

Appendix 2

Workers Compensation Reported Medical Losses and Loss Development Factors Including Catastrophic Claims
All Figures in Thousands

Accident Year	156	168	180	192	204	216	228	240	252	264
1976										
1977										
1978										
1979			4,977	4,992	5,012	5,012	5,268			
1980		6,874	6,956	7,464	7,502	7,464	7,763			
1981	8,197	8,238	8,205	8,386	8,335	8,319				
1982	7,949	8,165	8,661	8,670	8,418					
1983	8,675	8,693	8,736	8,806						
1984	9,497	9,535	9,678							
1985	16,198	16,214								
1986	15,970									
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										

Accident Year	156 to 168	168 to 180	180 to 192	192 to 204	204 to 216	216 to 228	228 to 240	240 to 252	252 to 264	264 to Ult
1976										
1977										
1978				1.004	1.000	1.055				
1979			1.073	1.005	0.995	1.040				
1980		0.996	1.022	0.994	0.996					
1981	1.153	0.945	1.001	0.971						
1982	1.002	1.005	1.008							
1983	1.004	1.015								
1984	1.001									
1985										
1986										
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										

[1]	1.040	0.990	1.026	0.994	0.998	1.048	1.002	1.000	1.000	1.000
[3]	1.002	0.988	1.010	1.003	1.010	1.014	1.002	1.000	1.000	1.000
[4]	1.003	1.010	1.005	1.001	1.008	1.020	1.003	1.000	1.000	1.000
[6]	1.008	0.999	1.009	1.004	1.010	1.013	1.002	1.000	1.000	1.000
Selected	1.005	1.005	1.006	1.005	1.006	1.005	1.005	1.004	1.011	1.000
Dev to Ult	1.051	1.046	1.041	1.035	1.030	1.025	1.020	1.015	1.011	1.035

Appendix 3

Workers Compensation Reported Medical Losses Catastrophic Claims Only
All Figures in Thousands

Accident	Evaluation Age in Months											
Year	12	24	36	48	60	72	84	96	108	120	132	144
1976												
1977												
1978												
1979												
1980												
1981												
1982												1,000
1983											0	0
1984										0	0	0
1985									1,000	1,000	1,000	4,500
1986								0	0	0	0	0
1987							0	0	0	0	0	0
1988						0	0	0	0	0	0	
1989					3,000	3,000	4,500	4,500	4,500	6,000		
1990				2,500	2,500	2,500	2,500	2,500	4,000			
1991			0	0	0	0	0	0				
1992		1,500	1,500	1,500	1,500	3,000	3,000					
1993	4,000	7,000	7,000	7,000	7,000	7,000						
1994	0	0	0	0	0							
1995	4,000	4,750	4,500	5,000								
1996	2,500	3,000	5,000									
1997	0	0										

Appendix 3

Workers Compensation Reported Medical Losses Catastrophic Claims Only
All Figures in Thousands

Accident Year	156	168	180	192	204	216	228	240	252	264
1976										
1977										
1978										
1979			1,200	1,200	1,200	1,200	1,400			
1980		1,000	1,000	1,500	1,500	1,500	1,800			
1981	0	0	0	0	0	0				
1982	1,000	1,800	1,600	1,600	1,500					
1983	0	0	0	0						
1984	0	0	0							
1985	4,500	4,500								
1986	0									
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										

Appendix 4

Workers Compensation Medical Reported Losses and Loss Development Factors Excluding Catastrophic Claims
All Figures in Thousands

Accident	Evaluation Age in Months											
Year	12	24	36	48	60	72	84	96	108	120	132	144
1976												
1977												
1978												
1979												
1980												
1981												
1982												6,725
1983											8,572	8,623
1984										9,516	9,535	9,525
1985									10,939	11,130	11,312	11,666
1986								15,352	15,337	15,367	15,506	16,002
1987							19,479	19,713	19,575	19,183	19,375	19,666
1988						20,697	21,028	20,671	20,609	20,382	20,525	
1989					26,419	26,654	27,734	28,153	28,317	29,278		
1990				25,351	25,741	25,867	25,938	25,995	25,749			
1991			27,580	28,049	27,516	27,571	28,040	28,152				
1992		19,138	19,551	19,319	19,777	20,660	20,518					
1993	21,965	23,743	23,404	25,168	25,007	25,359						
1994	19,713	23,951	23,903	24,190	24,481							
1995	13,962	16,948	17,307	16,916								
1996	15,286	17,845	17,096									
1997	20,069	25,086										

Accident	Age Interval in Months											
Year	12 to 24	24 to 36	36 to 48	48 to 60	60 to 72	72 to 84	84 to 96	96 to 108	108 to 120	120 to 132	132 to 144	144 to 156
1976												
1977												
1978												
1979												
1980												
1981												
1982												1.006
1983											0.999	0.997
1984										1.016	1.001	1.003
1985									1.002	1.009	1.002	0.998
1986								0.993	0.980	1.010	1.015	
1987							0.983	0.997	0.989	1.007		
1988						1.041	1.015	1.006	1.034			
1989					1.009	0.999	1.002	0.991				
1990				0.981	1.002	1.017	1.004					
1991			0.998	1.024	1.045	0.993						
1992		0.986	1.075	0.994	1.014							
1993	1.215	0.998	1.012	1.012								
1994	1.214	1.021	0.977									
1995	1.167	0.958										
1996	1.250											
1997												
	Simple Average of Latest 4											
[1]	1.212	0.991	1.013	1.003	1.017	1.012	1.001	0.997	1.001	1.011	1.019	1.001
	Simple Average of Latest 3											
[3]	1.210	0.992	1.022	1.010	1.020	1.003	1.007	0.998	1.001	1.009	1.026	0.999
	Simple Average of Latest 2											
[4]	1.209	0.980	0.995	1.003	1.029	1.005	1.003	0.998	1.011	1.009	1.024	1.000
	Volume Weighted Average of Latest 5											
[5]	1.213	1.059	1.029	1.022	1.013	1.014	1.011	1.004	1.002	1.001	1.002	1.007
	Selected											
Selected	1.210	0.992	1.022	1.010	1.020	1.003	1.007	0.998	1.001	1.009	1.026	0.999
Dev to Ult	1.373	1.135	1.143	1.119	1.108	1.086	1.083	1.076	1.078	1.077	1.068	1.040

Appendix 4

Workers Compensation Medical Reported Losses and Loss Development Factors Excluding Catastrophic Claims
All Figures in Thousands

Accident Year	156	168	180	192	204	216	228	240	252	264
1976										
1977										
1978										
1979			3,777	3,792	3,812	3,812	3,888			
1980		5,874	5,956	5,964	6,002	5,964	5,963			
1981	8,197	8,238	8,205	8,386	8,335	8,319				
1982	6,949	7,365	7,061	7,070	6,918					
1983	8,675	8,693	8,736	8,806						
1984	9,497	9,535	9,678							
1985	11,698	11,714								
1986	15,970									
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										

Accident Year	156 to 168	168 to 180	180 to 192	192 to 204	204 to 216	216 to 228	228 to 240	240 to 252	252 to 264	264 to Ult
1976										
1977										
1978				1.005	1.000	1.020				
1979			1.001	1.006	0.994	1.000				
1980		0.996	1.022	0.994	0.998					
1981	1.060	0.959	1.001	0.979						
1982	1.002	1.005	1.008							
1983	1.004	1.015								
1984	1.001									
1985										
1986										
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										
[1]	1.017	0.994	1.008	0.996	0.997	1.010	1.002	1.000	1.000	1.000
[3]	1.002	0.993	1.010	1.003	1.010	1.014	1.002	1.000	1.000	1.000
[4]	1.003	1.010	1.005	1.001	1.008	1.020	1.003	1.000	1.000	1.000
[5]	1.008	0.999	1.009	1.004	1.010	1.013	1.002	1.000	1.000	1.000
Selected	1.002	0.993	1.010	1.003	1.010	1.014	1.002	1.000	1.005	1.000
Dev to Ult	1.041	1.039	1.046	1.035	1.032	1.021	1.007	1.005	1.005	1.000

Appendix 5

Derivation of Ultimate Catastrophic Medical Losses for Accident Years 1997 and 1998

Acc Yr	Expected Number of Catastrophic Claims	Average Severity (000)	Selected Ultimate Catastrophic Medical Losses (000)
(1)	(2)	(3)	(4)
1997	0.111	5,140	571
1998	0.374	5,500	2,058

Notes:
(2) from Appendix 7, Cumulative Row
(3) from Appendix 6
(4) = (2) x (3)

Appendix 6

Derivation of Average Medical Cost per Catastrophic Case

Acc Yr (1)	Ultimate Number of Catastrophic Claims (2)	Ultimate Medical Loss on Catastrophic Claims (000) (3)	Catastrophic Medical Severity Index (4)	Trended Medical Loss on Catastrophic Claims (000) (5)	Average Cost per Catastrophic Claim Trended To 1998 (6)
1978	0	0	1.000	0	0
1979	0	0	1.110	0	0
1980	2	1,800	1.232	8,782	4,391
1981	0	0	1.368	0	0
1982	1	1,500	1.518	5,939	5,939
1983	0	0	1.685	0	0
1984	0	0	1.870	0	0
1985	2	4,500	2.076	13,029	6,514
1986	0	0	2.305	0	0
1987	0	0	2.558	0	0
1988	0	0	2.839	0	0
1989	2	5,500	3.152	10,490	5,245
1990	1	3,500	3.498	6,014	6,014
1991	0	0	3.743	0	0
1992	1	3,500	4.005	5,253	5,253
1993	2	8,000	4.286	11,220	5,610
1994	0	0	4.586	0	0
1995	2	6,000	4.907	7,350	3,675
1996	1	7,500	5.250	8,587	8,587
1997			5.618		
1998			6.011		
Total	14	41,800		76,663	5,476
Selected					5,500

Medical Inflation Rate from 1982 to 1990	11.0%
Medical Inflation Rate from 1990 to 1998	7.0%

Appendix 7

Workers Compensation Reported Catastrophic Claim Count Emergence

Accident	Evaluation Age in Months											
Year	12	24	36	48	60	72	84	96	108	120	132	144
1976												
1977												
1978												
1979	1	1	2	2	2	2	2	2	2	2	2	2
1980	1	2	2	2	2	2	2	2	2	2	2	2
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	1	1	1	1	1	1	1	1	1	1	1	1
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	1	2	2	2	2	2	2	2	2	2	2	2
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	
1989	1	2	2	2	2	2	2	2	2	2		
1990	0	0	1	1	1	1	1	1	1			
1991	0	0	0	0	0	0	0	0				
1992	1	1	1	1	1	1	1					
1993	1	2	2	2	2	2						
1994	0	0	0	0	0							
1995	1	2	2	2								
1996	1	1	1									
1997	0	0										

Accident	Age Interval in Months											
Year	12 to 24	24 to 36	36 to 48	48 to 60	60 to 72	72 to 84	84 to 96	96 to 108	108 to 120	120 to 132	132 to 144	144 to 156
1976												
1977												
1978	0	1	0	0	0	0	0	0	0	0	0	0
1979	1	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	1	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	
1987	0	0	0	0	0	0	0	0	0	0		
1988	1	0	0	0	0	0	0	0	0			
1989	0	1	0	0	0	0	0	0				
1990	0	0	0	0	0	0	0					
1991	0	0	0	0	0	0						
1992	1	0	0	0	0							
1993	0	0	0	0								
1994	1	0	0									
1995	0	0										
1996	0											
1997												
	All Year Average											
[1]	0.263	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Selected											
Selected	0.263	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cumulative	0.374	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Appendix 7

Workers Compensation Reported Catastrophic Claim Count Emergence

Accident Year	156	168	180	192	204	216	228	240	252	264
1976										
1977										
1978										
1979	2	2	2	2	2	2	2			
1980	2	2	2	2	2	2	2			
1981	0	0	0	0	0	0				
1982	1	1	1	1	1					
1983	0	0	0	0						
1984	0	0	0							
1985	2	2								
1986	0									
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										

Accident Year	156 to 168	168 to 180	180 to 192	192 to 204	204 to 216	216 to 228	228 to 240	240 to 252	252 to 264	264 to Ult
1976										
1977										
1978	0	0	0	0	0	0				
1979	0	0	0	0	0	0				
1980	0	0	0	0	0					
1981	0	0	0	0						
1982	0	0	0							
1983	0	0								
1984	0									
1985										
1986										
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995										
1996										
1997										

[1]	0.000	0.000	0.000	0.000	0.000	0.000
Selected	0.000	0.000	0.000	0.000	0.000	0.000
Cumulative	0.000	0.000	0.000	0.000	0.000	0.000