

**TITLE: EVALUATING WORKERS COMPENSATION TRENDS USING DATA
 BY TYPE OF DISABILITY**

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ABSTRACT: In some states, workers compensation trends have reached proportions which are viewed skeptically, at best, by regulators and others. The task of determining the magnitude of the trend and demonstrating the accuracy of the trend calculation can be significantly eased if trends are analyzed by type of disability. This paper shows two examples of the manner in which trends are analyzed in that fashion: first for a company with a detailed data base and then for a company with the simpler type of data that is available from many companies.

There was a time when there was no need to consider loss trends in setting workers compensation rates. Premiums were based on payroll, and increases in payroll were sufficient to cover expected increases in medical and indemnity loss costs. Now, payroll growth is generally insufficient to cover expected loss cost increases, and trend procedures based on developed policy year loss experience are used to measure and project loss cost increases in excess of payroll generated premium growth.

In some states, the loss trend in excess of premium trend is so large that skeptics refuse to accept that such trends, even if reflective of the past, are legitimate for estimating future costs. Even if the trends are accepted, further understanding of the factors which drive those cost increases are necessary for more accurate rate setting and for establishing priorities and estimating the effects of reforms of the workers compensation system.

One of the tools for providing better understanding of the trend process is the analysis of trends by type of disability. In this paper we show two examples of the use of experience by type of disability to analyze the factors underlying the trends in loss costs and better predict rate level requirements. The first example, referred to as State X/Company X, is based on more detailed data than that which is generally available. The second example, referred to as State Y/Company Y shows how the trend concepts can be applied to the much less detailed data available from a relatively new insurer.

Both examples are based on actual experience, but since the experience is confidential it has been disguised in ways which do not affect the significance of this paper

We brush lightly over any ratemaking considerations other than trending, because our primary interest in this paper is in the trending process.

COMPANY X

STATE X

DATA

The data for this analysis is from a single state. The workers compensation insurer has a significant market share in this state. The data is available for a period of over 20 accident years. Data is available for the usual five types of disability: fatal (F), permanent total (PTD), permanent partial (PPD), temporary total (TTD), and medical

only (MO). For each type of disability the data was further subdivided into three types of payments: medical payments, time loss payments and award payments. Since award payments apply only to F, PTD and PPD claims, and since time loss payments do not apply to MO claims, there are twelve categories of data in all. For each of the twelve types of data, we have claim payments and claim counts.

SUMMARY

To analyze the trends with this extensive data set, we proceed as described below. Please note that our procedure is described in greater detail later in this paper.

CLAIM FREQUENCY

1. We calculate the company's total number of claims for all disability types combined for historical periods.
(Exhibit I sheet 1)
2. The actual data shows little overall trend in frequency per worker from year to year. Therefore, without loss of significant detail we show a total number of claims for each year of 10,000.
3. We calculate the company's number of claims by type of disability for historical periods.
(Exhibit I sheets 2-7)
4. The distribution of claims by type of injury is observed to be changing over time. There is an increasing portion of PPD claims and a decreasing portion of TTD and MO claims.
(Exhibit 2)
5. We trend the change in PPD relative claim frequency. The increase in PPD claims is offset by a reduction in TTD and MO claims frequency, consistent with the actual data.
(Exhibit 3)

Since the comparatively expensive PPD claims are increasing in relative frequency while the comparatively less expensive TTD and MO claims are decreasing in relative frequency, the trend in distribution of claims by type of disability produces a trend in total claim severity in addition to whatever other severity trends might exist.

CLAIM SEVERITY

6. We compile historical indices for the factors which we anticipate will affect claim severity by type of payment and type of injury as follows:
 - a. State average wage.
 - b. Benefit level changes other than changes in maximum and minimum benefits triggered by changes in the state average wage.
 - c. CPI medical costs for the state.

In addition, the cost per claim for MO claims proves to be a useful index for medical payments per claim on medical costs for the four other types of disability.
(Exhibit 4)

7. Claim severity is developed for each of the twelve categories of type of disability and type of payment and for each historical period.
(Exhibits 5 and 6)
8. A regression analysis on medical costs per claim, shows that the CPI-medical index understated the trend in medical costs on MO claims by 3% per year.
(Exhibit 5 sheet 1)

The trend in medical costs on MO claims, however, is closely correlated with the trend in medical costs on all types of disability.
(Exhibit 5 sheets 2-5)

9. A regression analysis demonstrates that time loss and award payments can be modeled closely by the state average wage and benefit change indices.
(Exhibits 5 and 6)
10. Claim severity is projected in a two stage process:
 - a. Accident year 1987 claim severity is based on either (1) a development approach (for fast payment categories) or (2) an average of prior years claim severity on 1987 cost levels (for slower payment categories).
 - b. Policy year 1989 claim severity equals 1987 claim severity trended 10% per year for medical (3% more than assumed 7% trend in medical CPI), and 5% for indemnity (assuming

5% growth in state average wage and no benefit changes).

A comparison of accident year 1987 pure premiums (frequency times severity) to policy year 1989 pure premiums gives the indicated trend rate, the objective of this analysis.

We also calculate policy year 1989 pure premiums assuming the accident year 1987 relative frequency distribution remains unchanged. This calculation allows us to separate the overall severity trend into the following two components: (1) change in relative frequency distribution and (2) change in severity by type of disability.
(Exhibit 7)

The analysis summarized above is described in greater detail in the sections below.

CLAIM FREQUENCY ANALYSIS

Exhibit I Sheets 1-7 show the projection of ultimate claims in total (sheet 1) and by type of disability (sheets 2-6) for the five types of injury (fatal, permanent total, permanent partial, temporary total and medical-only), and for claims with no payment (sheet 7). Grand total claims refers to total claims closed with payment.

On sheet 1, the total number of claims are normalized to 10,000 for all accident years. This is equivalent to assuming no trend in claims frequency per worker. The data shows that the total number of claims is subject to a fast reporting pattern. Slow reporting patterns for workers compensation claim counts generally arise only when reopened claims are not separated from new claims.

The reporting patterns for claims by type of injury varies widely, as shown on Exhibit I, Sheets 2-5. On one hand, MO and TTD claims are reported quickly. For those categories, as well as for claims closed with no payment, the claim count development is sometimes downward (showing % reported over 100%) because claims originally reported in one of those categories become more serious and are reclassified as claims in a more serious disability category, e.g. MO to TTD or TTD to PPD.

On the other hand, 75% of PTD claims are not awarded for six years after the end of the accident year. Barely 10% of PPD claims are awarded during the accident year, and only 60% are awarded 12 months after the end of the accident year.

For the quickly reported MO, TTD, and F claims, the frequency for all accident years is based on the development process. For PTD and PPD claims, claim frequency in recent years is based on an average of historical frequency data rather than development results. For PTD claims, the frequency for 1984-1987 is based on the average frequency for the prior mature eight years. For PPD claims the frequency for the latest two years is based on the regression shown in Exhibit 3.

Exhibit 2 summarizes the frequency of claims by type of disability by year. The remarkable feature of this information is the dramatic increase in PPD frequency over the last eight years.

Exhibit 3 shows the method used to project the PPD claim frequency to policy year 1989. We use a linear regression of the distribution of such claims over the 1978-1985 period which covers the time from the start of the upward trend (1978) through the latest available reliable development point (1985). The increase in PPD claims is projected to result in a reduction in TTD and MO claims. For other types of claims the distribution by type of injury is assumed to remain at the level projected for the last experience year.

CLAIM SEVERITY ANALYSIS

In the claim severity portion of this analysis we have two major tasks: (1) to project the ultimate cost of claims by type of disability for historical periods, and (2) to identify cost indices which were predictive in the past, and therefore, usable in projecting future costs.

Exhibit 4, sheet 1 shows the cost indices which prove sufficient to accomplish task 2. These were wage level, benefit changes, medical CPI and medical cost per claim on MO claims. Exhibit 4, sheet 2 converts changes in annual cost indices to cumulative claim cost indices using 1987 as a base year. With respect to the use of the MO medical cost as a cost indicator, we realize that it may seem undesirable to use a workers compensation severity component to predict other workers compensation costs. On the other hand, we have two observations:

1. The MO medical cost is a very fast developing claim cost, so that information from recent accident years is available and can be meaningfully developed to ultimate.
2. The MO index can be modeled as an increment on expected CPI-medical over a short period needed for ratemaking beyond the experience period.

Exhibits 5 and 6 show the projection of the average medical claim costs by type of disability. Incurred loss data for the company was not particularly reliable, so the historical data is based on a paid loss development approach. The development factors required for recent years are rather large so development projections could be unreliable. Therefore, except for a few fast developing disability categories, the regressions used to test cost indices do not include immature experience periods. Claim severities for accident year 1987 are based on averages of severities from prior years adjusted to 1987 cost levels. Exhibits 5 and 6 indicate the manner in which the averages were calculated.

The analysis of claim severity by type of disability is discussed below.

MO CLAIMS-MEDICAL COSTS

Exhibit 5, Sheet 1 shows the severity of MO claims. The development period for MO claims is short. Within 24 months, the payment pattern on MO claims is nearly complete.

The trend in severity of MO claims is compared to changes in the state CPI-medical index. The regression analysis at the bottom of Exhibit 5, Sheet compares time to the logarithm of the MO claim cost adjusted to current levels using the CPI medical trend as the current cost factor. The result is a good correlation coefficient ($R^2=.919$) but a residual trend of 2.9% per year, (the X-coefficient). Thus, CPI-medical understates MO medical trend by about 3% per year.

This difference between workers compensation medical trend and CPI medical is to be expected since CPI medical is based on a fixed basket of medical services and does not include increases in intensity of services by health care providers. Workers compensation medical includes the cost of improvements in medical technology (cat scans instead of X-rays, for example) as well as increases, if any, due to increases in the intensity of services provided by health care providers.

OTHER CLAIMS - MEDICAL COSTS

For disability types other than MO, the trends in medical cost severity were compared to the trends in MO medical costs. On these exhibits, historical medical costs per claim are adjusted to current cost level using the MO cost per claim as the current cost factor.

The adjusted costs per claim generally appear to be stable over time, as we would expect if the MO medical costs accurately adjust medical cost for other disability types to

the current level. To test this observation the logarithm of these costs per claim (for sufficiently mature experience periods) at current cost level were regressed against time. The results are shown in the regression table at the bottom of the exhibits. The x-coefficient is small and generally not significantly different from zero. Thus, as desired, there is no significant trend over time in the claim costs at current cost level. The low R^2 value indicates that most of the variance around the horizontal regression line is random, as desired.

For disability categories other than a few fast developing categories, claim severities for accident year 1987 are based on averages of severities from prior years adjusted to 1987 cost levels. Exhibits 5 and 6 indicate the manner in which the averages were calculated.

Two adjustments to the method for selecting accident year 1987 costs were considered and rejected, primarily for simplicity. The trends in medical costs on PPD claims for the recent several years appeared to be somewhat lower than expected based on the cost index. This could be the result of a changing distribution of types of PPD claims. Since the PPD frequency nearly doubled over the past several years, it is not unlikely that claims with less severe real injuries and lower medical costs are more prevalent.

On the other hand, the trend in PTD medical costs appear to be higher than expected in recent periods. Since the portion of PTD claims had been declining, this could be the reverse of the effect discussed for PPD claims.

CLAIM SEVERITY-TIME LOSS AND AWARDS

For indemnity costs, Exhibit 6 shows the same type of analysis as Exhibit 5. The cost index used to adjust claim costs to current level consists of wage loss and benefit change indices shown on Exhibit 4. As with medical costs, the regression on claim costs at current cost levels shows no residual trend.

Years prior to 1974 were not used in the regression analysis or in the estimate of accident year 1987 severity. In 1973 a change in the definition of permanency increased the frequency of permanent claims and had effects on the severity of claims which are not readily reflected in the cost indices.

TREND CALCULATION

Exhibit 7 shows the calculation of pure premiums for accident year 1987 and policy year 1989 based on the trended frequencies from Exhibit 2 and the trended severities from Exhibits 5 and 6. The annual trend is 11.8% in losses and

6.5% in losses net of expected payroll growth. If the frequency distribution had remained fixed at the 1987 level, the trend net of expected payroll growth would be only 2.6%.

COMPANY Y STATE Y

This insurer has three years of experience on State Y and has no reliable loss development data for that state. The insurer classified reported claims by expected ultimate type of disability (F, PTD, PPD, TTD and MO) as required for NCCI-type unit statistical reporting. Our approach begins as follows:

1. Develop Company Y total number of claims (all types of disability combined) using Company Y claim count development data.
2. Develop Company Y ultimate number of claims by type of disability using NCCI USP development data by type of injury.
3. Calculate relative claim frequencies for each year for each type of disability.

For both Company Y and for the industry, the claim frequency for PPD claims appears to be rising, with an offsetting decline in TTD and/or MO claims. Exhibit 8 shows the claim distribution by type of injury for the entire State Y for policy years 1977 through 1984 taken from the NCCI Statistical Bulletin, and our projected claim frequency for Company Y for accident years 1984 through 1986. Company Y's claim frequency figures appear to be right in line with State Y claim frequency figures.

The combined set of frequencies is used to project claim frequencies for policy year 1988. For each type of disability, policy year 1988 frequency was judgmentally selected after considering linear regression on (1) policy years 1977-1983 and accident years 1984-1986 and (2) policy years 1981-1983 and accident years 1984-1986. (Details are not shown in this paper.) Our estimates are shown in Exhibit 8.

CLAIMS SEVERITY

To develop claim severities by injury type, we computed ultimate average loss amounts by injury type for medical loss and indemnity loss separately for policy years 1977 through 1984 using industry Unit Stat Plan data for State Y.

To project these average severities for future policy years, we regressed these ultimate severities to compute an annual trend rate by injury type. However, the fits were not very good and led us to judgmentally select an annual trend rate of 5% for the indemnity average loss amounts and an annual trend rate of 10% for the medical average loss amounts. These trends are consistent with the results of the State X analysis.

Policy years 1986 and 1988 severities were calculated by applying the selected trend rates to the developed industry Unit Stat Plan data for policy year 1984.

Our projected claim severities for medical loss and indemnity loss by injury type for policy years 1986 and 1988 are shown in Exhibit 9. Using the claim frequencies, we computed an average severity for all injury types combined.

PURE PREMIUMS TRENDS

To compute the indicated pure premium increase from 1986 to 1988, we made the following assumptions:

1. The number of claims per worker does not change from 1986 to 1988.
2. Salaries are increasing 5% annually, so that premiums will increase 5% even without a rate change.

As shown in Exhibit 9, we computed the indicated two year pure premium increase of 11.3% by taking the ratio of the projected average severity for policy years 1988 and 1986, indemnity and medical combined, and then dividing this ratio by a factor of $(1.05)^2$ to account for anticipated payroll increase due to rising salaries. The indicated annual increase in pure premiums is 5.5%.

To isolate the impact of the changing claim frequencies, we recomputed the indicated pure premium change using the same frequency by injury type for policy 1988 as we projected for policy year 1986. The indicated pure premium change is reduced to an annual change of 1.5%, when the mix in claims by type of injury does not change. Therefore, one can conclude that most of the indicated pure premium increase is attributable to the change in the distribution of claims by type of disability.

CONCLUSION

The example of both Company X and Company Y illustrate the value of analyzing workers compensation loss costs by type of disability in the determination of pure premiums. In

both instances the indicated pure premium trend net of payroll increases was significantly greater than that implied by the medical and indemnity claim severity trend, without any change in the distribution of claims by type of disability.

State X Company X
Projection of Ultimate Number of Claims
All Types of Disability Combined

(1)	(2)	(3)	(4)
<u>Year</u>	<u>Grand Total Claim Count as of 12/87*</u>	<u>Grand Total Ultimate Claim Count*</u>	<u>Percent of Total</u>
1966	10000	10,000	100%
1967	10000	10,000	100%
1968	10000	10,000	100%
1969	10000	10,000	100%
1970	10000	10,000	100%
1971	10000	10,000	100%
1972	10000	10,000	100%
1973	9999	10,000	100%
1974	9999	10,000	100%
1975	9999	10,000	100%
1976	9999	10,000	100%
1977	9999	10,000	100%
1978	9999	10,000	100%
1979	9999	10,000	100%
1980	9998	10,000	100%
1981	9997	10,000	100%
1982	9991	10,000	100%
1983	9987	10,000	100%
1984	9981	10,000	100%
1985	9960	10,000	100%
1986	9903	10,000	100%
1987	8038	10,000	100%

* Excludes "Close No Payment" claims

State X Company X
Projection of Ultimate Number of Claims
Fatal Claims

(1)	(2)	(3)	(4)	(5)
<u>Year</u>	<u>Fatal Claim Count as of 12/87</u>	<u>% Reported</u>	<u>Fatal Ultimate Claim Count</u>	<u>Percent of Total</u>
1966	16	100.0%	16	0.16%
1967	16	100.0%	16	0.16%
1968	14	100.0%	14	0.14%
1969	14	100.0%	14	0.14%
1970	15	100.0%	15	0.15%
1971	15	100.0%	15	0.15%
1972	15	100.0%	15	0.15%
1973	14	100.0%	14	0.14%
1974	12	100.0%	12	0.12%
1975	10	100.0%	10	0.10%
1976	11	99.9%	11	0.11%
1977	10	99.8%	10	0.10%
1978	9	99.7%	9	0.09%
1979	9	99.4%	9	0.09%
1980	6	99.4%	6	0.06%
1981	6	98.7%	6	0.06%
1982	7	98.7%	7	0.07%
1983	8	99.7%	8	0.08%
1984	7	99.7%	7	0.07%
1985	7	99.7%	7	0.07%
1986	7	95.4%	7	0.07%
1987	4	61.2%	7	0.07%

State X Company X
Projection of Ultimate Number of Claims
Permanent Total Claims

(1)	(2)	(3)	(4)	(5)
<u>Year</u>	Permanent Total Claim Count as of 12/87	<u>% Reported</u>	Permanent Total Ultimate Claim Count	Percent of <u>Total</u>
1966	27	100.0%	27	0.27%
1967	22	100.0%	22	0.22%
1968	26	99.7%	26	0.26%
1969	35	99.4%	35	0.35%
1970	32	99.1%	32	0.32%
1971	35	98.8%	35	0.35%
1972	29	98.5%	29	0.29%
1973	30	98.0%	31	0.31%
1974	25	97.4%	26	0.26%
1975	26	96.8%	27	0.27%
1976	20	96.0%	21	0.21%
1977	15	94.6%	16	0.16%
1978	11	92.7%	12	0.12%
1979	12	88.6%	13	0.13%
1980	12	83.2%	14	0.14%
1981	11	75.6%	15	0.15%
1982	14	65.2%	22	0.22%
1983	8	48.6%	17	0.17%
1984	5	32.4%	16	0.16% (1)
1985	2	15.0%	16	0.16% (1)
1986	1	4.6%	16	0.16% (1)
1987	0	1.3%	16	0.16% (1)

(1) Average of 1976–1983.

Law change in 1974 affected definition of permanent total. Assume 1976–1983 reflects current law level. For comparison, average 1980–1983 is .17%.

State X Company X
Projection of Ultimate Number of Claims
Permanent Partial Claims

(1)	(2)	(3)	(4)	(5)
<u>Year</u>	<u>Permanent Partial Claim Count as of 12/87</u>	<u>% Reported</u>	<u>Permanent Partial Ultimate Claim Count</u>	<u>Percent of Total</u>
1966	606	100.0%	606	6.06%
1967	615	100.0%	615	6.15%
1968	579	100.0%	579	5.79%
1969	566	100.0%	566	5.66%
1970	590	100.0%	590	5.90%
1971	606	100.0%	606	6.06%
1972	642	100.0%	642	6.42%
1973	613	100.0%	613	6.13%
1974	639	100.0%	639	6.39%
1975	683	100.0%	683	6.83%
1976	654	99.9%	654	6.54%
1977	604	99.9%	605	6.05%
1978	583	99.9%	584	5.84%
1979	583	99.8%	584	5.84%
1980	633	99.7%	635	6.35%
1981	677	99.3%	682	6.82%
1982	743	98.6%	753	7.53%
1983	807	97.1%	831	8.31%
1984	819	94.0%	872	8.72%
1985	819	86.2%	950	9.50%
1986	606	60.1%	1,009	10.09% (1)
1987	114	10.6%	1,073	10.73% (1)

(1) From Exhibit 3

**State X Company X
Projection of Ultimate Number of Claims
Temporary Total**

(1)	(2)	(3)	(4)	(5)
<u>Year</u>	<u>Temporary Total Claim Count as of 12/87</u>	<u>% Reported</u>	<u>Temporary Total Ultimate Claim Count</u>	<u>Percent of Total</u>
1966	1,694	100.0%	1,694	16.94%
1967	1,712	100.0%	1,712	17.12%
1968	1,720	100.0%	1,720	17.20%
1969	1,791	100.0%	1,791	17.91%
1970	1,752	100.0%	1,752	17.52%
1971	1,720	100.0%	1,720	17.20%
1972	1,722	100.0%	1,722	17.22%
1973	1,731	100.0%	1,731	17.31%
1974	1,894	100.0%	1,894	18.94%
1975	1,928	100.0%	1,928	19.28%
1976	1,996	100.0%	1,996	19.96%
1977	2,063	100.0%	2,063	20.63%
1978	1,984	100.0%	1,983	19.83%
1979	1,905	100.1%	1,904	19.04%
1980	1,909	100.1%	1,907	19.07%
1981	1,833	100.2%	1,829	18.29%
1982	1,768	100.4%	1,761	17.61%
1983	1,858	100.9%	1,842	18.42%
1984	1,886	102.0%	1,849	18.49%
1985	1,913	104.9%	1,823	18.23%
1986	2,145	115.7%	1,854	18.54%
1987	2,313	127.1%	1,819	18.19%

The percent reported is over 100 for the recent accident years because claims originally reported in this category become more serious and are reclassified into a more serious disability category, e.g. MO to TTD, TTD to PPD, or close no payment to MO.

State X Company X
Projection of Ultimate Number of Claims
Medical Only

(1)	(2)	(3)	(4)	(5)
<u>Year</u>	<u>Medical Claim Count as of 12/87</u>	<u>% Reported</u>	<u>Medical Ultimate Claim Count</u>	<u>Percent of Total</u>
1966	7,657	100.0%	7,657	76.57%
1967	7,635	100.0%	7,635	76.35%
1968	7,661	100.0%	7,661	76.61%
1969	7,594	100.0%	7,594	75.94%
1970	7,611	100.0%	7,611	76.11%
1971	7,624	100.0%	7,624	76.24%
1972	7,592	100.0%	7,592	75.92%
1973	7,611	100.0%	7,611	76.11%
1974	7,429	100.0%	7,429	74.29%
1975	7,352	100.0%	7,352	73.52%
1976	7,318	100.0%	7,318	73.18%
1977	7,306	100.0%	7,306	73.06%
1978	7,412	100.0%	7,412	74.12%
1979	7,490	100.0%	7,490	74.90%
1980	7,438	100.0%	7,438	74.38%
1981	7,469	100.0%	7,468	74.68%
1982	7,459	100.0%	7,457	74.57%
1983	7,306	100.1%	7,302	73.02%
1984	7,264	100.1%	7,256	72.56%
1985	7,219	100.2%	7,204	72.04%
1986	7,145	100.4%	7,114	71.14%
1987	5,607	79.1%	7,085	70.85%

The percent reported is over 100 for the recent accident years because claims originally reported in this category become more serious and are reclassified into a more serious disability category, e.g. MO to TTD, TTD to PPD, or close no payment to MO.

State X Company X
Projection of Ultimate Number of Claims
Close No Payment Claims

(1)	(2)	(3)	(4)	(5)
<u>Year</u>	<u>Closed No Payment Claim Count as of 12/87</u>	<u>% Reported</u>	<u>Closed No Payment Ultimate Claim Count</u>	<u>Percent of Total</u>
1966	202	100.0%	202	2.02%
1967	150	99.7%	150	1.50%
1968	397	99.4%	399	3.99%
1969	272	99.3%	274	2.74%
1970	547	99.1%	552	5.52%
1971	675	99.1%	681	6.81%
1972	707	99.1%	714	7.14%
1973	735	99.0%	742	7.42%
1974	801	99.0%	809	8.09%
1975	773	99.0%	781	7.81%
1976	832	99.0%	841	8.41%
1977	892	98.9%	902	9.02%
1978	948	98.9%	959	9.59%
1979	954	98.8%	966	9.66%
1980	969	98.7%	981	9.81%
1981	981	98.6%	995	9.95%
1982	959	98.4%	974	9.74%
1983	907	98.2%	924	9.24%
1984	903	97.9%	922	9.22%
1985	962	97.9%	982	9.82%
1986	881	98.7%	892	8.92%
1987	1,946	220.9%	881	8.81%

The percent reported is over 100 for the recent accident years because claims originally reported in this category become more serious and are reclassified into a more serious disability category, e.g. MO to TTD, TTD to PPD, or close no payment to MO.

Note: Grand Total claims are net close-no-payment claims.

Company X State X Claim Frequency Distribution

	(1)	(2)	(3)	(4)	(5)	(6)
<u>Year</u>	<u>Fatal</u>	<u>Permanent Total</u>	<u>Permanent Partial</u>	<u>Temporary Total</u>	<u>Medical Only</u>	<u>Total</u>
1966	0.16%	0.27%	6.06%	16.94%	76.57%	100.00%
1967	0.16%	0.22%	6.15%	17.12%	76.35%	100.00%
1968	0.14%	0.26%	5.79%	17.20%	76.61%	100.00%
1969	0.14%	0.35%	5.66%	17.91%	75.94%	100.00%
1970	0.15%	0.32%	5.90%	17.52%	76.11%	100.00%
1971	0.15%	0.35%	6.06%	17.20%	76.24%	100.00%
1972	0.15%	0.29%	6.42%	17.22%	75.92%	100.00%
1973	0.14%	0.31%	6.13%	17.31%	76.11%	100.00%
1974	0.12%	0.26%	6.39%	18.94%	74.29%	100.00%
1975	0.10%	0.27%	6.83%	19.28%	73.52%	100.00%
1976	0.11%	0.21%	6.54%	19.96%	73.18%	100.00%
1977	0.10%	0.16%	6.05%	20.63%	73.06%	100.00%
1978	0.09%	0.12%	5.84%	19.83%	74.12%	100.00%
1979	0.09%	0.13%	5.84%	19.04%	74.90%	100.00%
1980	0.06%	0.14%	6.35%	19.07%	74.38%	100.00%
1981	0.06%	0.15%	6.82%	18.29%	74.68%	100.00%
1982	0.07%	0.22%	7.53%	17.61%	74.57%	100.00%
1983	0.08%	0.17%	8.31%	18.42%	73.02%	100.00%
1984	0.07%	0.16%	8.72%	18.49%	72.56%	100.00%
1985	0.07%	0.16%	9.50%	18.23%	72.04%	100.00%
1986	0.07%	0.16%	10.09%	18.54%	71.14%	100.00%
1987	0.07%	0.16%	10.73%	18.19%	70.85%	100.00%

State X Company X Changes in PPD Frequency

<u>Acc</u> <u>Year</u>	<u>PPD Frequency</u>	
	<u>Actual</u>	<u>Fitted</u>
1978	5.84	5.01
1979	5.84	5.65
1980	6.35	6.28
1981	6.82	6.92
1982	7.53	7.55
1983	8.31	8.19
1984	8.72	8.82
1985	9.50	9.46
1986	10.09	10.09
1987	10.73	10.73
1988		11.36
1989 (AY)		12.00
1989 (PY)		12.32

Regression Output:

Constant	6.28
Std Err of Y Est	0.10
R Squared	0.99
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s)	0.64
Std Err of Coef.	0.02

State X Company X CHANGE IN ANNUAL COST INDICES

ACC YEAR	WAGE INDEX	----BENEFIT INDICES----			MEDICAL CPI	MEDICAL WC
		TIME LOSS	PPD AWARD	PTD AWARD		
1967	6.0%	6.0%	0.0%	6.0%	4.0%	13.1%
1968	6.0%	6.0%	0.0%	6.0%	9.2%	3.6%
1969	6.0%	35.4%	0.0%	6.0%	7.5%	6.2%
1970	6.0%	6.0%	0.0%	6.0%	8.5%	3.4%
1971	6.0%	26.5%	13.6%	6.0%	7.0%	13.2%
1972	6.0%	6.0%	12.0%	6.0%	8.0%	10.2%
1973	6.0%	28.7%	0.0%	196.1%	4.0%	5.7%
1974	6.0%	10.1%	0.0%	6.0%	4.0%	13.6%
1975	6.0%	17.3%	0.0%	63.4%	8.0%	12.7%
1976	8.3%	8.3%	0.0%	8.3%	14.0%	16.0%
1977	9.5%	9.5%	5.4%	9.5%	10.0%	9.0%
1978	4.9%	4.9%	15.2%	4.9%	10.2%	11.0%
1979	7.8%	7.8%	4.4%	7.8%	8.3%	11.7%
1980	8.1%	8.1%	4.2%	8.1%	12.8%	15.5%
1981	9.8%	9.8%	1.4%	9.8%	14.2%	23.1%
1982	6.2%	6.2%	6.7%	6.2%	11.6%	14.7%
1983	3.8%	3.8%	0.0%	3.8%	6.8%	15.0%
1984	2.5%	2.5%	0.0%	2.5%	5.1%	10.1%
1985	3.2%	3.2%	3.1%	3.2%	5.8%	11.9%
1986	3.0%	3.0%	9.1%	3.0%	7.3%	8.4%
1987	3.0%	3.0%	10.0%	3.0%	4.5%	7.4%

Notes (1) State average wage used for wage index 1976–1987.
6% used for wage index prior to 1976

(2) Benefit change from NCCI calculations by type of injury. Benefit indices include wage changes plus benefit changes other than change in maximum and minimum benefit following increase in state average wage.

(3) TTD index applies to all time loss payments (F,PTD,PPD, and TTD).

(4) PT award index used for F claims.

**State X Company X
CUMULATIVE CLAIM COST INDEXES**

<u>ACC YEAR</u>	<u>WAGE INDEX</u>	----BENEFIT INDICES----			<u>MEDICAL CPI</u>	<u>MEDICAL WC</u>
		<u>TTD</u>	<u>PPD AWARD</u>	<u>PT AWARD</u>		
1966	0.300	0.141	0.444	0.070	0.195	0.109
1967	0.318	0.150	0.444	0.074	0.203	0.124
1968	0.337	0.159	0.444	0.078	0.222	0.128
1969	0.358	0.215	0.444	0.083	0.238	0.136
1970	0.379	0.228	0.444	0.088	0.259	0.141
1971	0.402	0.288	0.505	0.093	0.277	0.159
1972	0.426	0.305	0.566	0.099	0.299	0.175
1973	0.452	0.393	0.566	0.293	0.311	0.185
1974	0.479	0.432	0.566	0.311	0.323	0.210
1975	0.507	0.507	0.566	0.507	0.349	0.237
1976	0.550	0.550	0.566	0.550	0.398	0.275
1977	0.602	0.602	0.596	0.602	0.438	0.300
1978	0.631	0.631	0.687	0.631	0.482	0.333
1979	0.681	0.681	0.717	0.681	0.522	0.372
1980	0.736	0.736	0.747	0.736	0.589	0.429
1981	0.808	0.808	0.758	0.808	0.673	0.529
1982	0.858	0.858	0.808	0.858	0.751	0.606
1983	0.891	0.891	0.808	0.891	0.802	0.697
1984	0.913	0.913	0.808	0.913	0.843	0.768
1985	0.942	0.942	0.833	0.942	0.892	0.859
1986	0.971	0.971	0.909	0.971	0.957	0.931
1987	1.000	1.000	1.000	1.000	1.000	1.000

State X Company X
PROJECTION OF MEDICAL CLAIM SEVERITY
MEDICAL-ONLY CLAIMS

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	\$1,170	1.005	\$1,176	41,544	28	0.195	\$145
1967	1,217	1.005	1,224	38,201	32	0.203	158
1968	1,379	1.005	1,386	41,776	33	0.222	150
1969	1,542	1.002	1,546	43,854	35	0.238	148
1970	1,512	1.003	1,516	41,619	36	0.259	141
1971	1,820	1.003	1,825	44,263	41	0.277	149
1972	2,186	1.002	2,190	48,205	45	0.299	152
1973	2,331	1.004	2,340	48,739	48	0.311	154
1974	2,546	1.004	2,556	46,879	55	0.323	169
1975	2,728	1.005	2,742	44,628	61	0.349	176
1976	3,447	1.006	3,468	48,664	71	0.398	179
1977	3,977	1.007	4,005	51,563	78	0.438	177
1978	4,769	1.009	4,814	55,811	86	0.482	179
1979	5,314	1.012	5,379	55,839	96	0.522	184
1980	5,129	1.015	5,205	46,786	111	0.589	189
1981	5,298	1.019	5,398	39,413	137	0.673	203
1982	5,248	1.026	5,384	34,279	157	0.751	209
1983	5,829	1.034	6,030	33,390	181	0.802	225
1984	6,366	1.050	6,682	33,594	199	0.843	236
1985	6,620	1.074	7,110	31,952	223	0.892	250
1986	7,015	1.136	7,971	33,045	241	0.957	252
1987	5,215	1.750	9,127	35,223	259	1.000	259 (1)
1988							
1989 (3)							329 (2)

22 Point Regression Output:

Constant	4.873
Std Err of Y Est	0.057
R Squared	0.919
No. of Observations	22.000
Degrees of Freedom	20.000
X Coefficient(s)	0.029
Std Err of Coef.	0.002

(1) Development result

(2) 1987 trended 10% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

State X Company X
PROJECTION OF MEDICAL CLAIM SEVERITY
FATAL CLAIMS

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG@ CURRENT COST
1966	97	1.000	97	88	1,099	0.109	\$10,057
1967	89	1.000	89	83	1,071	0.124	8,664
1968	134	1.000	134	80	1,674	0.128	13,071
1969	156	1.000	156	85	1,838	0.136	13,510
1970	128	1.000	128	89	1,444	0.141	10,266
1971	108	1.000	108	93	1,157	0.159	7,271
1972	64	1.000	64	105	605	0.175	3,449
1973	162	1.000	162	102	1,586	0.185	8,563
1974	230	1.000	230	86	2,675	0.210	12,710
1975	64	1.000	64	71	898	0.237	3,788
1976	262	1.000	262	81	3,234	0.275	11,758
1977	263	1.000	263	80	3,292	0.300	10,981
1978	443	1.000	443	73	6,075	0.333	18,250
1979	54	1.000	54	78	692	0.372	1,861
1980	156	1.005	157	44	3,574	0.429	8,323
1981	92	1.136	104	38	2,746	0.529	5,196
1982	314	1.136	356	40	8,905	0.606	14,691
1983	89	1.102	98	42	2,324	0.697	3,334
1984	95	1.105	105	36	2,927	0.768	3,813
1985	197	1.094	215	33	6,524	0.859	7,597
1986	734	1.192	875	35	25,011	0.931	26,866
1987	289	2.027	585	40	14,619	1.000	14,619 (1)
1988							
1989 (3)							12,613 (2)

22 Point Regression Output:

Constant	9.073
Std Err of Y Est	0.665
R Squared	0.002
No. of Observations	22.000
Degrees of Freedom	20.000
X Coefficient(s)	-0.004
Std Err of Coef.	0.022

(1) From development result

(2) Average for all years trended 10% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

State X Company X
PROJECTION OF MEDICAL CLAIM SEVERITY
PERMANENT TOTAL DISABILITY CLAIMS

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	2,677	1.680	4,497	150	29,981	0.109	\$274,351
1967	2,940	1.717	5,048	113	44,672	0.124	361,384
1968	3,983	1.792	7,136	149	47,894	0.128	374,044
1969	4,141	1.903	7,879	210	37,518	0.136	275,776
1970	3,638	2.021	7,352	189	38,899	0.141	276,641
1971	4,294	2.152	9,240	224	41,252	0.159	259,178
1972	3,520	2.298	8,090	204	39,659	0.175	226,202
1973	4,647	2.468	11,472	223	51,443	0.185	277,684
1974	4,067	2.668	10,853	187	58,036	0.210	275,790
1975	4,563	2.855	13,029	187	69,673	0.237	293,811
1976	3,557	3.106	11,049	156	70,829	0.275	257,516
1977	3,364	3.433	11,546	127	90,916	0.300	303,293
1978	2,592	3.821	9,905	91	108,843	0.333	326,974
1979	3,789	4.439	16,822	111	151,551	0.372	407,643
1980	2,680	5.327	14,275	95	150,263	0.429	349,956
1981	2,115	6.473	13,687	86	159,156	0.529	301,119
1982	3,262	8.059	26,286	120	219,050	0.606	
1983	2,737	12.450	34,075	131	260,114	0.697	
1984	1,881	20.917	39,351	133	295,875	0.768	
1985	850	51.455	43,754	128	341,830	0.859	
1986	255	199.646	50,898	133	382,688	0.931	
1987	0	1497.34	60,708	143	424,532	1.000	314,512 (1)
1988							
1989 (3)							399,134 (2)

16 Point Regression Output:	
Constant	12.548
Std Err of Y Est	0.158
R Squared	0.047
No. of Observations	16.000
Degrees of Freedom	14.000
X Coefficient(s)	0.007
Std Err of Coef.	0.009

- (1) Average 1974-1981
- (2) 1987 trended 10% for 2.5 years to reach policy year 1989 levels
- (3) 1989 is a policy year

State X Company X
PROJECTION OF MEDICAL CLAIM SEVERITY
PERMANENT PARTIAL DISABILITY CLAIMS

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	\$4,135	1.114	\$4,606	3,375	\$1,365	0.109	\$12,489
1967	4,301	1.121	4,820	3,140	1,535	0.124	12,417
1968	5,502	1.133	6,234	3,327	1,874	0.128	14,634
1969	6,201	1.147	7,114	3,391	2,098	0.136	15,421
1970	6,986	1.165	8,141	3,476	2,342	0.141	16,657
1971	8,995	1.187	10,674	3,863	2,763	0.159	17,361
1972	11,286	1.203	13,575	4,497	3,019	0.175	17,218
1973	12,036	1.221	14,701	4,345	3,384	0.185	18,264
1974	16,315	1.241	20,250	4,525	4,475	0.210	21,266
1975	17,322	1.263	21,872	4,635	4,719	0.237	19,899
1976	21,783	1.283	27,956	4,914	5,689	0.275	20,684
1977	22,828	1.312	29,950	4,865	6,156	0.300	20,537
1978	25,643	1.346	34,511	5,053	6,830	0.333	20,517
1979	27,825	1.386	38,572	5,004	7,708	0.372	20,734
1980	27,582	1.444	39,822	4,593	8,670	0.429	20,192
1981	25,444	1.519	38,648	4,147	9,320	0.529	17,632
1982	25,058	1.613	40,406	3,969	10,180	0.606	16,796
1983	26,613	1.763	46,922	4,340	10,812	0.697	15,513
1984	27,101	2.019	54,711	4,602	11,888	0.768	15,487
1985	24,408	2.624		4,791		0.859	
1986	15,124	5.293		5,445		0.931	
1987	2,076	52.935		6,396		1.000	15,932 (1)
1988							
1989 (3)							20,219 (3)

19 Point Regression Output:

Constant	9.623
Std Err of Y Est	0.151
R Squared	0.220
No. of Observations	19.000
Degrees of Freedom	17.000
X Coefficient(s)	0.014
Std Err of Coef.	0.006

(1) Average for 1982-1984

(2) 1987 trended 10% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

State X Company X
PROJECTION OF MEDICAL CLAIM SEVERITY
TEMPORARY TOTAL DISABILITY CLAIMS

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	1,482	1.000	1,482	9,441	157	0.109	\$1,437
1967	1,560	1.000	1,560	8,738	179	0.124	1,444
1968	1,813	1.000	1,813	9,892	183	0.128	1,432
1969	2,307	1.000	2,307	10,728	215	0.136	1,581
1970	2,142	1.003	2,148	10,327	208	0.141	1,479
1971	2,314	1.011	2,340	10,964	213	0.159	1,341
1972	2,867	1.016	2,912	12,066	241	0.175	1,377
1973	2,968	1.021	3,030	12,281	247	0.185	1,332
1974	3,700	1.021	3,779	13,415	282	0.210	1,339
1975	4,383	1.022	4,481	13,093	342	0.237	1,443
1976	5,499	1.024	5,633	14,994	376	0.275	1,366
1977	6,700	1.029	6,893	16,612	415	0.300	1,384
1978	7,724	1.030	7,959	17,147	464	0.333	1,394
1979	8,807	1.019	8,975	16,300	551	0.372	1,481
1980	8,504	1.019	8,667	13,816	627	0.429	1,461
1981	7,946	0.999	7,936	11,134	713	0.529	1,349
1982	8,149	1.004	8,179	9,312	878	0.606	1,449
1983	9,851	0.954	9,394	9,644	974	0.697	1,398
1984	10,603	0.901	9,555	9,808	974	0.768	1,269
1985	15,355	0.758	11,636	9,355	1,244	0.859	1,448
1986	21,970	0.598	13,137	9,879	1,330	0.931	1,428
1987	16,866	0.945	15,934	10,376	1,536	1.000	1,401 (1)
1988							
1989 (3)							1,790 (2)

22 Point Regression Output:

Constant	7.261
Std Err of Y Est	0.051
R Squared	0.004
No. of Observations	22.000
Degrees of Freedom	20.000
X Coefficient(s)	-0.001
Std Err of Coef.	0.002

(1) Average 1974-1986

(2) Average for all years trended 10% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

**State X Company X
Projection of Indemnity claim severity
Fatal Claims–Time Loss Benefit**

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	8	1.0000	8	88	93	0.141	660
1967	32	1.0000	0	83	391	0.150	2,607
1968	15	1.0000	15	80	187	0.159	1,176
1969	32	1.0000	32	85	381	0.215	1,772
1970	12	1.0000	12	89	138	0.228	605
1971	31	1.0000	31	93	335	0.288	1,163
1972	14	1.0000	15	105	139	0.305	456
1973	80	1.0000	80	102	784	0.393	1,995
1974	39	1.0000	39	86	448	0.432	1,037
1975	16	1.0000	16	71	220	0.507	434
1976	66	1.0000	66	81	819	0.550	1,489
1977	62	1.0000	62	80	778	0.602	1,292
1978	29	1.0000	29	73	395	0.631	626
1979	1	1.0000	1	78	7	0.681	10
1980	4	1.0000	4	44	91	0.736	124
1981	6	1.0000	6	38	170	0.808	210
1982	14	1.0000	14	40	342	0.858	399
1983	3	0.9900	3	42	74	0.891	83
1984	2	0.9603	2	36	46	0.913	50
1985	13	0.9603	13	33	381	0.942	404
1986	7	1.9206	14	35	388	0.971	400
1987	8	6.7221	54	23	2,330	1.000	505 (1)
1988							
1989 (3)							570 (2)

21 Point Regression Output:

Constant	7.704
Std Err of Y Est	1.107
R Squared	0.400
No. of Observations	20.000
Degrees of Freedom	18.000
X Coefficient(s)	-0.149
Std Err of Coef.	0.043

- (1) 1974–1986 average
- (2) 1987 trended 5% for 2.5 years to reach policy year 1989 level
- (3) 1989 is a policy year

**State X Company X
Projection of Indemnity claim severity
Fatal Claims–Awards**

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	1,528	1.2500	1,910	88	21,707	0.444	48,890
1967	1,497	1.2688	1,900	83	22,888	0.444	51,550
1968	1,293	1.2941	1,674	80	20,921	0.444	47,119
1969	1,680	1.3200	2,218	85	26,092	0.444	58,766
1970	1,538	1.3596	2,091	89	23,498	0.444	52,923
1971	2,004	1.4045	2,815	93	30,269	0.505	59,939
1972	2,334	1.4536	3,394	105	32,321	0.566	57,104
1973	2,746	1.5118	4,152	102	40,704	0.566	71,915
1974	3,534	1.5722	5,556	86	64,606	0.566	114,145
1975	3,350	1.6351	5,478	71	77,156	0.566	136,318
1976	3,194	1.7447	5,573	81	68,800	0.566	121,555
1977	3,603	1.8755	6,758	80	84,475	0.596	141,737
1978	2,870	2.0256	5,814	73	79,640	0.687	115,924
1979	2,807	2.2079	6,198	78	79,465	0.717	110,830
1980	1,452	2.4176	3,511	44	79,787	0.747	106,810
1981	1,297	2.7319	3,544	38	93,267	0.758	123,044
1982	1,359	3.1281	4,252	40	106,292	0.808	131,550
1983	1,409	3.6911	5,201	42	123,832	0.808	
1984	931	4.5770	4,259	36	118,309	0.808	
1985	786	5.8585	4,607	33	139,604	0.833	
1986	444	9.4147	4,181	35	119,471	0.909	
1987	84	33.8928	2,858	23	124,258	1.000	122,435 (1)
1988							
1989 (3)							138,318 (2)

9 Point Regression Output:

Constant	11.764
Std Err of Y Est	0.102
R Squared	0.013
No. of Observations	9.000
Degrees of Freedom	7.000
X Coefficient(s)	-0.004
Std Err of Coef.	0.013

(1) 1974–1982 average

(2) 1987 trended 5% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

**State X Company X
Projection of Indemnity claim severity
PTD Claims--Time Loss Benefits**

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	838	1.0120	848	150	5,652	0.141	40,085
1967	665	1.0140	674	113	5,964	0.150	39,760
1968	850	1.0171	864	149	5,800	0.159	36,478
1969	1,209	1.0242	1,238	210	5,896	0.215	27,423
1970	1,255	1.0314	1,295	189	6,851	0.228	30,048
1971	1,507	1.0417	1,570	224	7,010	0.288	24,340
1972	1,652	1.0521	1,738	204	8,522	0.305	27,941
1973	1,910	1.0626	2,030	223	9,105	0.393	23,168
1974	2,072	1.0828	2,244	187	11,999	0.432	27,775
1975	2,813	1.1045	3,107	187	16,616	0.507	32,773
1976	2,601	1.1431	2,973	156	19,058	0.550	34,651
1977	2,367	1.1980	2,836	127	22,332	0.602	37,096
1978	1,977	1.2723	2,515	91	27,642	0.631	43,807
1979	2,222	1.4135	3,141	111	28,297	0.681	41,552
1980	2,143	1.6326	3,499	95	36,835	0.736	50,048
1981	1,979	2.0733	4,104	86	47,721	0.808	59,061
1982	1,897	2.7783	5,269	120	43,909	0.858	51,176
1983	806	4.7787	3,854	101	38,154	0.891	
1984	645	8.9600	5,779	111	52,063	0.913	
1985	335	28.6719	9,592	103	93,131	0.942	
1986	97	139.9190	13,614	107	127,232	0.971	
1987	0	139.9190	14,504	114	127,232	1.000	41,993 (1)
1988							
1989 (3)							47,441 (2)

9 Point Regression Output:

Constant	9.523
Std Err of Y Est	0.076
R Squared	0.914
No. of Observations	9.000
Degrees of Freedom	7.000
X Coefficient(s)	0.084
Std Err of Coef.	0.010

(1) 1974-1982 average

(2) 1987 trended 5% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

**State X Company X
Projection of Indemnity claim severity
PTD Claims–Awards**

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	2,677	1.4500	3,881	150	25,876	0.070	369,657
1967	2,940	1.5080	4,421	113	39,125	0.074	528,716
1968	3,983	1.5728	6,265	149	42,045	0.078	539,038
1969	4,141	1.6468	6,819	210	32,471	0.083	391,217
1970	3,638	1.7340	6,309	189	33,381	0.088	379,330
1971	4,294	1.8294	7,855	224	35,068	0.093	377,075
1972	3,520	1.9447	6,845	204	33,556	0.099	338,949
1973	4,647	2.0711	9,625	223	43,162	0.293	147,311
1974	4,067	2.2243	9,046	187	48,377	0.311	155,553
1975	4,563	2.4201	11,043	187	59,055	0.507	116,479
1976	3,557	2.6548	9,443	156	60,532	0.550	110,058
1977	3,364	2.9681	9,984	127	78,612	0.602	130,585
1978	2,592	3.3747	8,749	91	96,142	0.631	152,365
1979	3,789	3.9552	14,987	111	135,019	0.681	198,266
1980	2,679	4.7304	12,675	95	133,426	0.736	181,285
1981	2,115	5.8988	12,474	86	145,044	0.808	179,510
1982	3,042	7.9044	24,044	120	200,366	0.858	
1983	960	12.1095	11,631	101	115,154	0.891	
1984	1,456	25.2483	37,124	111	334,450	0.913	
1985	921	78.2699	72,065	103	699,660	0.942	
1986	33	381.9570	12,459	107	116,443	0.971	
1987	0	381.9570	35,979	114	315,602	1.000	153,013 (1)
1988							
1989 (3)							172,862 (2)

8 Point Regression Output:

Constant	11.154
Std Err of Y Est	0.168
R Squared	0.481
No. of Observations	8.000
Degrees of Freedom	6.000
X Coefficient(s)	0.061
Std Err of Coef.	0.026

- (1) 1974–1981 average
- (2) 1987 trended 5% for 2.5 years to reach policy year 1989 level
- (3) 1989 is a policy year

**State X Company X
Projection of Indemnity claim severity
PPD Claims–Time Loss Benefits**

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	3,695	1.0040	3,709	3,375	1,099	0.141	7,794
1967	3,301	1.0045	3,316	3,140	1,056	0.150	7,040
1968	4,101	1.0051	4,122	3,327	1,239	0.159	7,792
1969	5,147	1.0058	5,178	3,391	1,527	0.215	7,102
1970	5,815	1.0066	5,854	3,476	1,684	0.228	7,386
1971	7,195	1.0075	7,247	3,863	1,876	0.288	6,514
1972	9,271	1.0085	9,349	4,497	2,079	0.305	6,816
1973	11,340	1.0100	11,453	4,345	2,636	0.393	6,707
1974	17,974	1.0116	18,181	4,525	4,018	0.432	9,301
1975	20,944	1.0131	21,219	4,635	4,578	0.507	9,030
1976	26,869	1.0161	27,302	4,914	5,556	0.550	10,102
1977	27,152	1.0197	27,687	4,865	5,691	0.602	9,453
1978	30,101	1.0299	31,000	5,053	6,135	0.631	9,723
1979	32,132	1.0453	33,587	5,004	6,712	0.681	9,856
1980	30,579	1.0683	32,670	4,593	7,113	0.736	9,664
1981	27,778	1.1110	30,862	4,147	7,442	0.808	9,210
1982	25,477	1.1666	29,720	3,969	7,488	0.858	8,727
1983	25,853	1.2599	32,572	4,340	7,505	0.891	8,423
1984	27,745	1.4426	40,028	4,602	8,698	0.913	9,527
1985	22,887	1.8898	43,253	4,791	9,028	0.942	9,584
1986	13,363	3.8552	51,515	5,445	9,461	0.971	
1987	1,337	43.5641	58,242	6,396	9,106	1.000	9,383 (1)
1988							
1989 (3)							10,601 (2)

12 Point Regression Output:

Constant	9.198
Std Err of Y Est	0.053
R Squared	0.064
No. of Observations	12.000
Degrees of Freedom	10.000
X Coefficient(s)	-0.004
Std Err of Coef.	0.004

- (1) 1974–1985 average
- (2) 1987 trended 5% for 2.5 years to reach policy year 1989 level
- (3) 1989 is a policy year

State X Company X
Projection of Indemnity claim severity
PPD Claims–Awards

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	5,292	1.0100	5,346	3,375	1,584	0.444	3,568
1967	5,556	1.0100	5,611	3,140	1,787	0.444	4,025
1968	7,410	1.0101	7,486	3,327	2,250	0.444	5,068
1969	7,845	1.0104	7,928	3,391	2,338	0.444	5,266
1970	8,461	1.0109	8,554	3,476	2,461	0.444	5,543
1971	10,925	1.0116	11,052	3,863	2,861	0.505	5,665
1972	13,928	1.0116	14,089	4,497	3,133	0.566	5,535
1973	14,469	1.0125	14,651	4,345	3,372	0.566	5,958
1974	16,683	1.0131	16,901	4,525	3,735	0.566	6,599
1975	16,159	1.0133	16,375	4,635	3,533	0.566	6,242
1976	18,121	1.0134	18,364	4,914	3,737	0.566	6,602
1977	18,377	1.0148	18,648	4,865	3,833	0.596	6,431
1978	21,584	1.0153	21,915	5,053	4,337	0.687	6,313
1979	21,862	1.0248	22,403	5,004	4,477	0.717	6,244
1980	19,561	1.0386	20,315	4,593	4,423	0.747	5,921
1981	18,890	1.0636	20,092	4,147	4,845	0.758	6,392
1982	19,211	1.1061	21,250	3,969	5,354	0.808	6,626
1983	19,865	1.1835	23,510	4,340	5,417	0.808	6,704
1984	19,887	1.3137	26,126	4,602	5,677	0.808	7,026
1985	17,216	1.6382	28,205	4,791	5,887	0.833	7,067
1986	11,618	3.0471	35,403	5,445	6,502	0.909	
1987	1,719	24.3767	41,913	6,396	6,553	1.000	6,514 (1)
1988							
1989 (3)							7,359 (2)

12 Point Regression Output:

Constant	8.676
Std Err of Y Est	0.045
R Squared	0.264
No. of Observations	12.000
Degrees of Freedom	10.000
X Coefficient(s)	0.007
Std Err of Coef.	0.004

(1) 1974–1985 average

(2) 1987 trended 5% for 2.5 years to reach policy year 1989 level

(3) 1989 is a policy year

State X Company X
Projection of Indemnity claim severity
TTD Claims–Time Loss Benefits

ACC YEAR	PAID TO DATE (000)	FACTOR TO ULT	ULT PAID (000)	# CLAIMS	AVG CLAIM	COST INDEX	AVG @ CURRENT COST
1966	1,343	1.0000	479	3,375	142	0.141	1,007
1967	1,303	1.0000	468	3,140	149	0.150	993
1968	1,441	1.0000	486	3,327	146	0.159	918
1969	1,774	1.0000	560	3,391	165	0.215	767
1970	1,996	1.0000	671	3,476	193	0.228	846
1971	2,301	1.0000	811	3,863	210	0.288	729
1972	2,841	1.0000	1,057	4,497	235	0.305	770
1973	3,310	1.0001	1,173	4,345	270	0.393	687
1974	4,669	1.0001	1,575	4,525	348	0.432	806
1975	5,820	1.0001	2,063	4,635	445	0.507	878
1976	7,946	0.9991	2,604	4,914	530	0.550	964
1977	9,645	0.9999	2,827	4,865	581	0.602	965
1978	10,569	0.9979	3,108	5,053	615	0.631	975
1979	11,171	0.9889	3,393	5,004	678	0.681	996
1980	10,027	0.9850	3,284	4,593	715	0.736	971
1981	8,732	0.9603	3,123	4,147	753	0.808	932
1982	7,983	0.9565	3,255	3,969	820	0.858	956
1983	9,266	0.8895	3,711	4,340	855	0.891	960
1984	10,084	0.8095	3,829	4,602	832	0.913	911
1985	13,949	0.6395	4,571	4,791	954	0.942	1,013
1986	20,099	0.4796	5,314	5,445	976	0.971	1,005
1987	16,339	0.6379	6,428	6,396	1,005	1.000	1,005 (1)
1988							
1989 (3)							1,135 (2)

22 Point Regression Output:

Constant	6.715
Std Err of Y Est	0.106
R Squared	0.210
No. of Observations	22.000
Degrees of Freedom	20.000
X Coefficient(s)	0.008
Std Err of Coef.	0.004

- (1) Development result
- (2) 1987 trended 5% for 2.5 years to reach policy year 1989 level
- (3) 1989 is a policy year

State X Company X

Calculation of Indicated Trend

Exhibit 7

(1) Type of Disability	(2) Type of Payment	(3a) (3b) Accident Year 1987		(4a) (4b) Policy Year 1989	
		Severity	Frequency	Severity	Frequency
Fatal	Award	122,435	-	138,318	-
	Time Loss	505	-	570	-
	Medical	14,619	-	12,613	-
	Total	137,559	.07%	151,501	.07%
Permanent Total	Award	153,013	-	172,862	-
	Time Loss	41,993	-	47,441	-
	Medical	314,512	-	399,134	-
	Total	509,518	.16%	619,437	.16%
Permanent Partial	Award	6,514	-	7,359	-
	Time Loss	9,383	-	10,601	-
	Medical	15,932	-	20,219	-
	Total	31,829	10.73%	38,179	12.32%
Temporary Total			-		-
	Time Loss	1,005	-	1,135	-
	Medical	1,401	-	1,790	-
	Total	2,406	18.19%	2,925	17.40%
Medical Only	Medical	259	70.85%	329	70.05%
Total	Total	4,948	100.00%	6,540	100.00%
	Trend				32.2%
	Annual Trend				11.8%
	Annual Trend net of 5% payroll growth				6.5%

Source

Frequency – Exhibits 2 & 3

Severity Medical – Exhibit 5

Severity Indemnity – Exhibit 6

One half of the increase in PPD frequency from AY 1987 to PY 1989 is assumed to result from a decrease in the temporary total frequency. The other half is assumed to result from a decrease in medical only frequency.

$$(12.32-10.73)/2=0.795 \quad 17.40=18.19-0.79 \quad 70.05=70.85-0.80$$

Claim Frequency Company Y

Type of Disability	Industry Claim Distribution * State Y								Company Y Claim Distribution State Y		
	Policy Year								Accident Year		
	1977	1978	1979	1980	1981	1982	1983	1984	1984	1985	1986
Fatal	0.09%	0.07%	0.06%	0.09%	0.06%	0.06%	0.05%	0.05%	0.38%	0.11%	0.10%
Permanent Total	0.13%	0.09%	0.09%	0.10%	0.07%	0.06%	0.04%	0.01%	0.00%	0.00%	0.08%
Permanent Partial	4.48%	4.41%	4.93%	5.03%	5.20%	5.44%	5.86%	6.35%	6.44%	7.05%	8.84%
Temporary Total	21.09%	21.18%	22.08%	22.98%	22.05%	22.19%	22.23%	21.29%	21.59%	19.55%	19.71%
Medical Only	74.21%	74.25%	72.84%	71.81%	72.61%	72.26%	71.82%	72.3%	71.59%	73.29%	71.27%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Type of Disability	Projected Policy Year 1986	Projected Policy Year 1988
Fatal	.11%	.11%
Permanent Total	.08%	.08%
Permanent Partial	8.50%	9.40%
Temporary Total	19.81%	18.36%
Medical Only	71.5%	72.05%
Total	100%	100%

For each type of disability, policy year 1988 frequency was judgmentally selected after considering linear regression on (1) policy years 1977-1983 and accident years 1984-1986 and (2) policy years 1981-1983 and accident years 1984-1986. Details are not shown in this paper.

* From NCCI Statistical Bulletin

State Y Company Y Indicated Pure Premium Change

Policy Year	Disability Type	Frequency	Severity		
			Indemnity	Medical	Total
1986	Fatal	0.11%	187,704	8,230	195,934
	PT	0.08	93,226	61,047	154,273
	PP	8.5	40,205	16,723	56,928
	TT	19.81	1,551	1,327	2,878
	Med Only	71.5	0	188	188
	Total	100.00%	4,006	1,877	5,883
1988	Fatal	0.11%	206,943	9,958	216,901
	PT	0.08	102,781	73,867	176,648
	PP	9.4	44,326	20,235	64,561
	TT	18.36	1,710	1,606	3,316
	Med Only	72.05	0	228	228
	Total	100.00%	4,790	2,431	7,221

Average Severity 1988 / Average Severity 1986 / $1.05^2 = 1.113$

Indicated Pure Premium Change: 11.3%

Implied Annual Change: 5.5%

Notes:

- (1) It is assumed that the average of claims per worker does not change from 1986 to 1988 and that salaries are increased 5% per year
- (2) 1988 average severity with 1986 distribution by injury type is 6,688 implying an annual trend rate, net of payroll growth, equal to only 1.5%
- (3) Policy year 1986 severities were calculated by applying a respective 5% and 10% trend rate to developed industry Unit Stat Plan data for policy year 1984, indemnity and medical losses separately, by injury type.

