

Using Predictive Modeling to Investigate the Underlying Claims Process

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Casualty Loss Reserve Seminar

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Investigating the Claims Process

- Actuaries have a responsibility to consider the nature of unpaid claims as well as changes to the claims process when establishing reserve estimates
 - The nature of unpaid claims reserves considers line of business, coverage, geography
 - Changes in the claims process have traditionally been determined by discussions with claims personnel or unusual patterns in the data
 - Analytics can help you uncover important aspects of the nature of claims and changes in the claims process that are not obvious from the data or discussion with claims
 - Analytics will also help quantify the impact on reserve estimates
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Actuarial Standard of Practice No. 43

Section 3.5 – Nature of Unpaid Claims

- Actuary should have understanding of nature of claims being estimated
 - Relevant and material to the estimate
 - Examples
 - Coverage
 - Conditions that make a claim more or less likely or the cost more or less severe
 - Underlying claim adjustment process
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Actuarial Standard of Practice No. 43

Section 3.6.6 – External Conditions

- Actuary should consider relevant external conditions
 - Generally known by qualified actuaries in the same practice area
 - Likely to have a material impact
 - Not required to have detailed knowledge of or consider all possible external conditions
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Actuarial Standard of Practice No. 43

Section 3.6.7 – Changing Conditions

- Actuary should consider significant changes in conditions
 - Regarding to claims, losses, or exposures
 - Insufficiently reflected in experience data or assumptions
 - “...can arise from circumstances particular to the entity or from external factors affecting others within the industry.”
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Actuarial Standard of Practice No. 43

Section 3.6.7 – Changing Conditions

- How should the actuary determine if there have been known, significant changes?
 - “...consider obtaining supporting information from the principal...”
 - “...rely on their representations...”
 - “...unless, in the actuary’s professional judgment, they appear to be unreasonable.”
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Nature of Unpaid Claims

- Reserve development generally determined by line of business, coverage
 - Reserve methods consider paid, incurred, and case loss development methods
 - Are there other characteristics of a claim that affect its development?
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External and Changing Conditions

- External conditions
 - Changes in the economy
 - Regulatory actions
 - Judicial decisions
 - Political changes
 - Social forces
 - Company specific changes
 - Reinsurance program
 - Claim payments
 - Claim reserving
 - Claim distribution
 - Service provider coding and billing
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Rely on the Principal?


- Has a vested interest in the results
- May not be aware of any issues
- May not volunteer information if not specifically asked

What do you do if you decide that the principal's representations are unreasonable?

What about "unknown" changes?

What if different claims types are being impacted differently?

Using Analytics to Investigate Underlying Claims Process

- Detailed claim data will give the actuary a better understanding of the underlying claims
 - Determine how certain claim characteristics affect claim development
 - Uncover the impact of the claims process on reserve estimates
 - How does this understanding impact the ultimate claim estimate?
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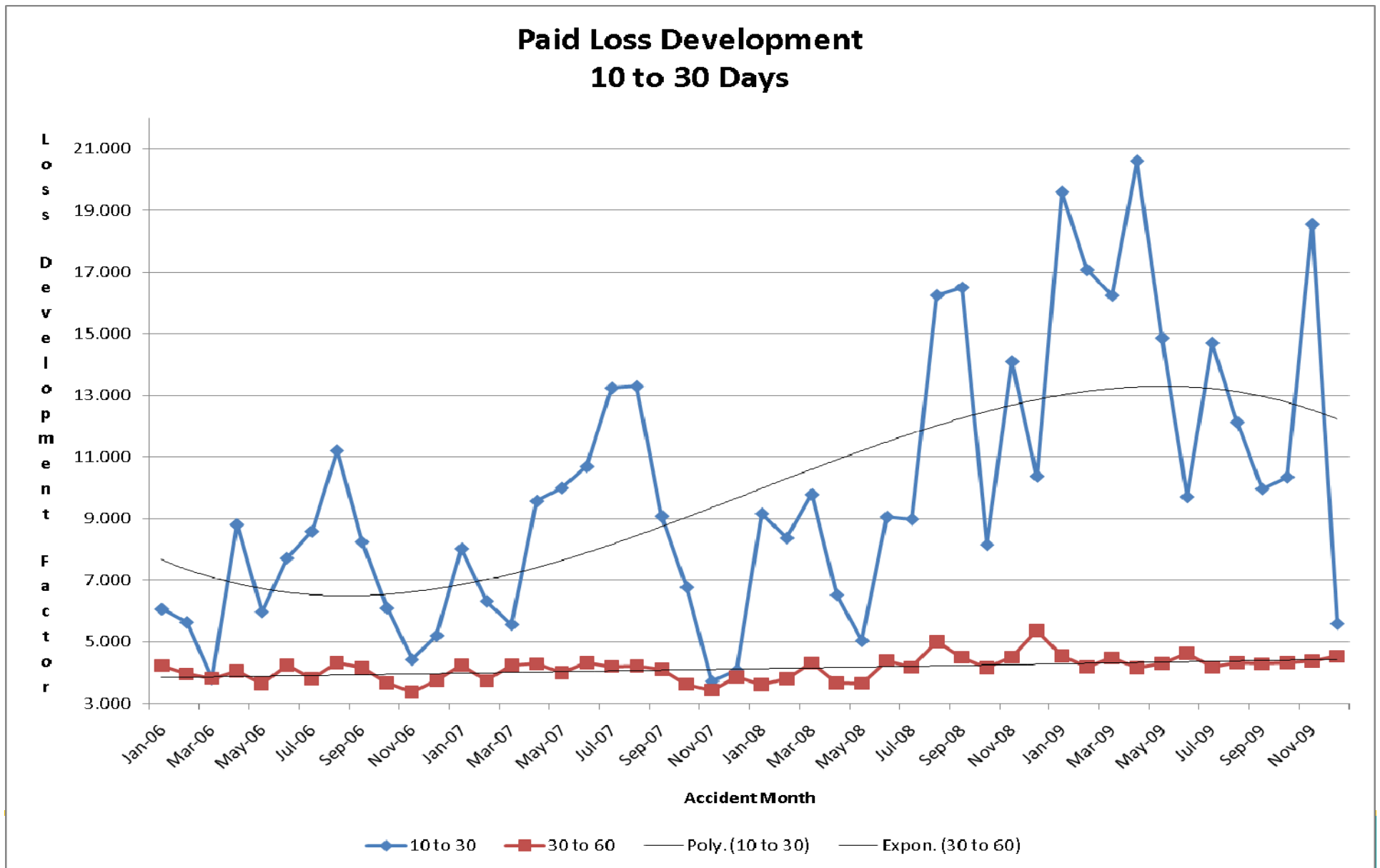
Data Needed

- Detailed claim characteristics
 - Accident details
 - Characteristics of claimant
 - Injury description
 - Employer characteristics
 - Claim timing (occurrence, report)
 - Financial information
 - Payment transactions
 - Reserve change details
 - Paid and incurred summarized at shorter claim intervals
 - By type of loss (medical, indemnity, etc.)
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Example Data

- Characteristics
 - Worker's compensation data
 - Medical and indemnity claims
 - Paid and incurred losses at varying time intervals from 10 days to 3 years
 - Investigation
 - Overall paid and incurred development
 - Development by time period
 - Development by risk characteristics
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Paid Loss Development



Paid Loss Development

- Increasing development before 60 days for more recent accident years
- Speed up in early claim payments?

Accident Year	Number of Claims	10 Days	30 days	60 days	6 months	1 year	2 years	3 years	
2006	103,562	2,410,296	14,959,720	58,715,344	212,441,149	333,851,286	466,434,958	549,205,929	
2007	101,990	2,185,133	15,564,013	62,654,537	227,670,610	353,790,723	498,985,520	588,769,986	
2008	96,346	1,631,589	14,559,546	61,370,046	229,327,632	360,922,957	513,238,534		
2009	89,209	1,261,484	15,755,371	68,642,210	239,112,751	372,792,306			
Accident Year			6 months to 1 year						
			10 to 30	30 to 60	60 to 6 months	1 to 2 years	2 to 3 years		
2006			6.207	3.925	3.618	1.572	1.397	1.177	
2007			7.123	4.026	3.634	1.554	1.410	1.180	
2008			8.924	4.215	3.737	1.574	1.422		
2009			12.490	4.357	3.483	1.559			

Incurred Loss Development

Incurred Loss Development

Accident Year	10 to 30	30 to 60	60 to 6 months	6 months to 1 year	1 to 2 years	2 to 3 years
2006	2.274	1.486	1.759	1.321	1.257	1.116
2007	2.521	1.495	1.730	1.297	1.285	1.114
2008	2.422	1.510	1.805	1.306	1.243	
2009	2.420	1.510	1.763	1.312		

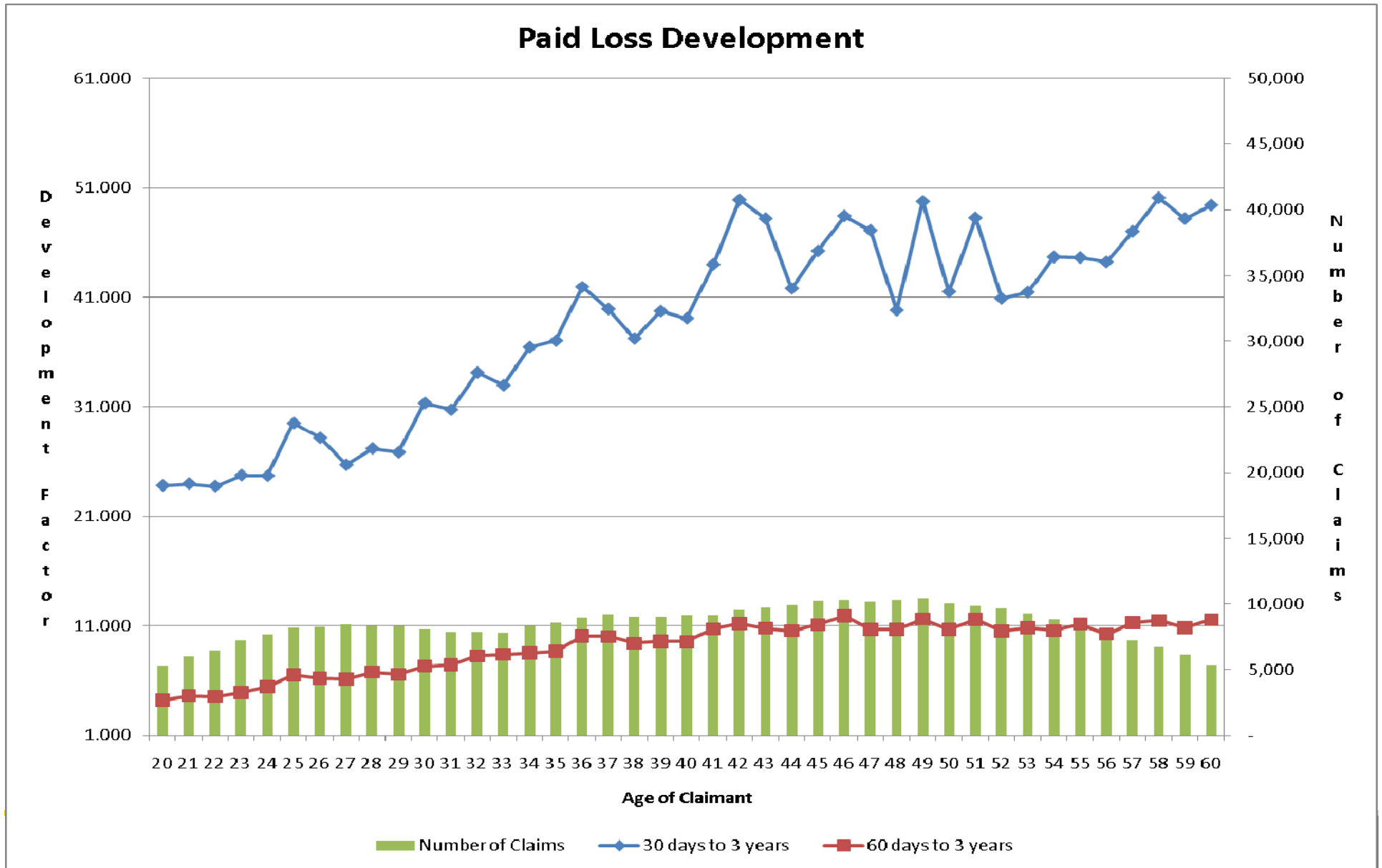
Incurred Loss Development - Indemnity

Accident Year	10 to 30	30 to 60	60 to 6 months	6 months to 1 year	1 to 2 years	2 to 3 years
2006	2.441	1.509	1.917	1.377	1.295	1.130
2007	2.824	1.537	1.906	1.346	1.323	1.126
2008	2.744	1.573	2.037	1.354	1.276	
2009	2.800	1.591	1.989	1.362		

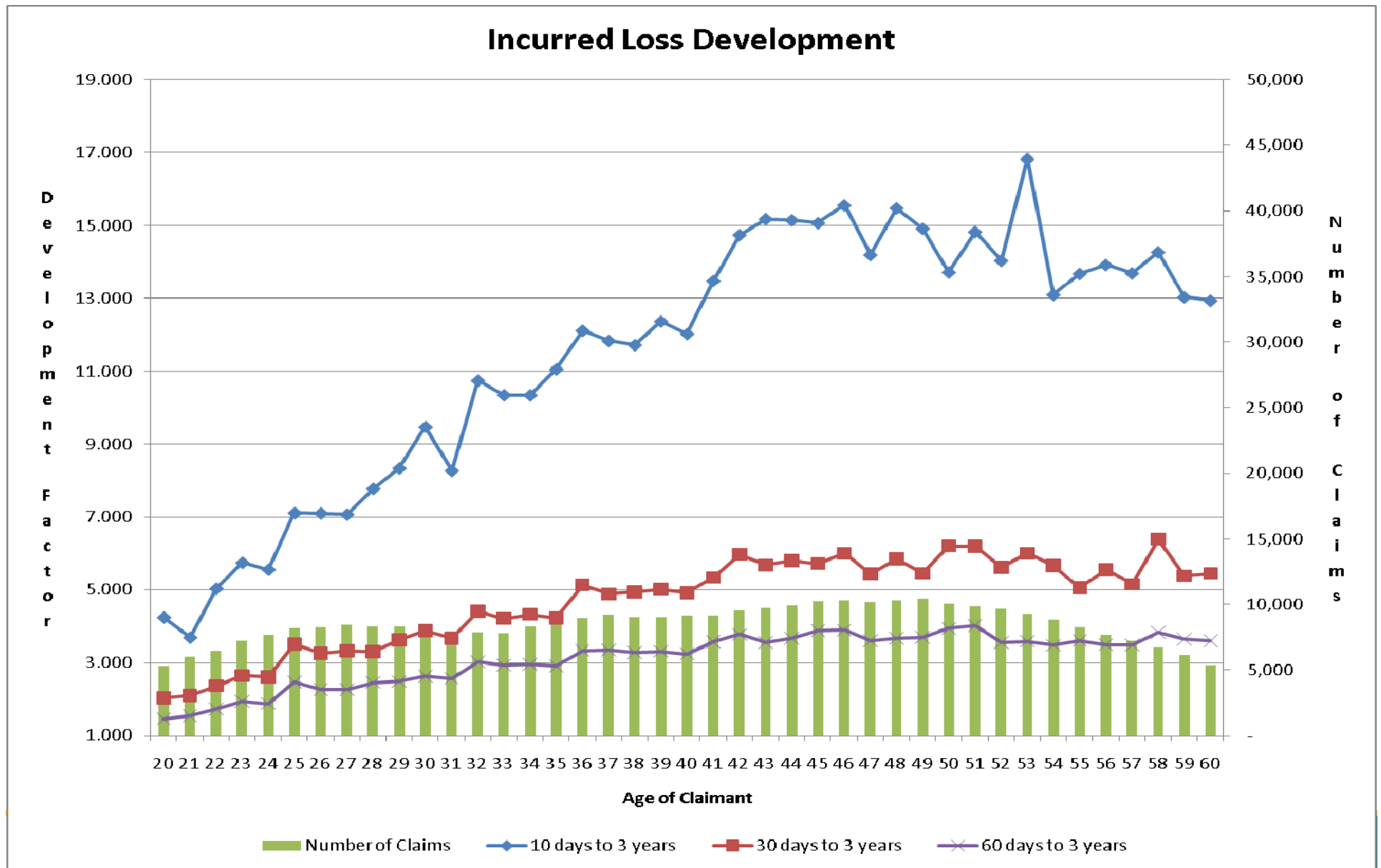
Incurred Loss Development - Medical

Accident Year	10 to 30	30 to 60	60 to 6 months	6 months to 1 year	1 to 2 years	2 to 3 years
2006	1.890	1.420	1.261	1.049	1.016	1.008
2007	1.928	1.377	1.165	1.037	1.027	1.004
2008	1.861	1.347	1.110	1.038	1.012	
2009	1.799	1.307	1.063	1.020		

Paid LDF's by Age of Claimant



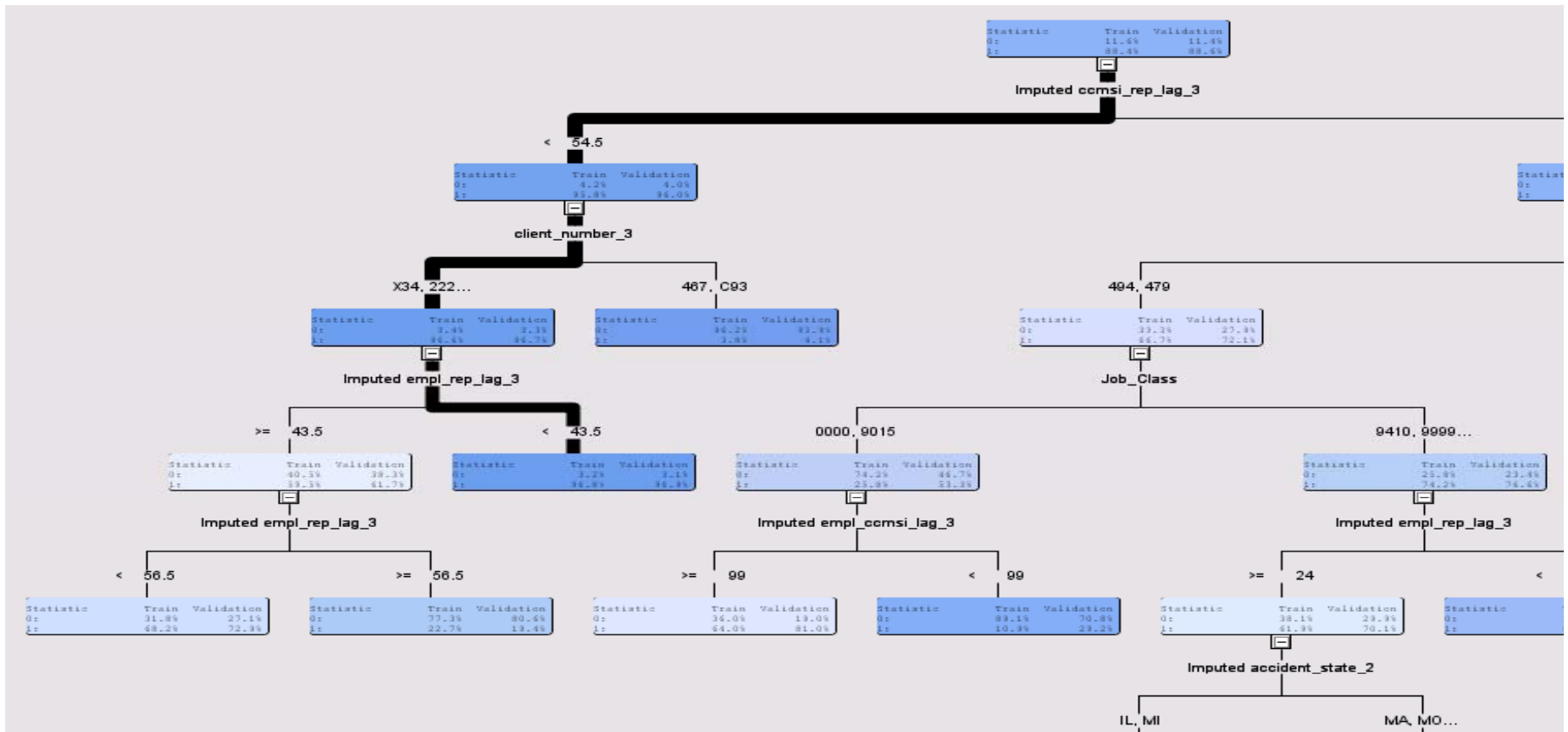
Incurred LDF's by Age of Claimant



Specific Modeling Considerations

- Data
 - Continue to group claims by accident period
 - Summarize paid and incurred by time since reported
 - Want to understand how the claim develops once the company knows about it
- Modeling
 - Develop predictive model for each stage of development
 - Utilize multiple techniques
 - Likelihood of paid/incurred greater than 0
 - Claim value given that it is greater than 0
- Analysis
 - How are the claim characteristics that drive greater development?
 - How does the relative importance of the claim characteristic change over time?
 - Are there changes in incurred and paid development patterns that have occurred over accident period?
 - Are different development patterns affecting my ultimate estimates?

Probability That Incurred Amount = 0



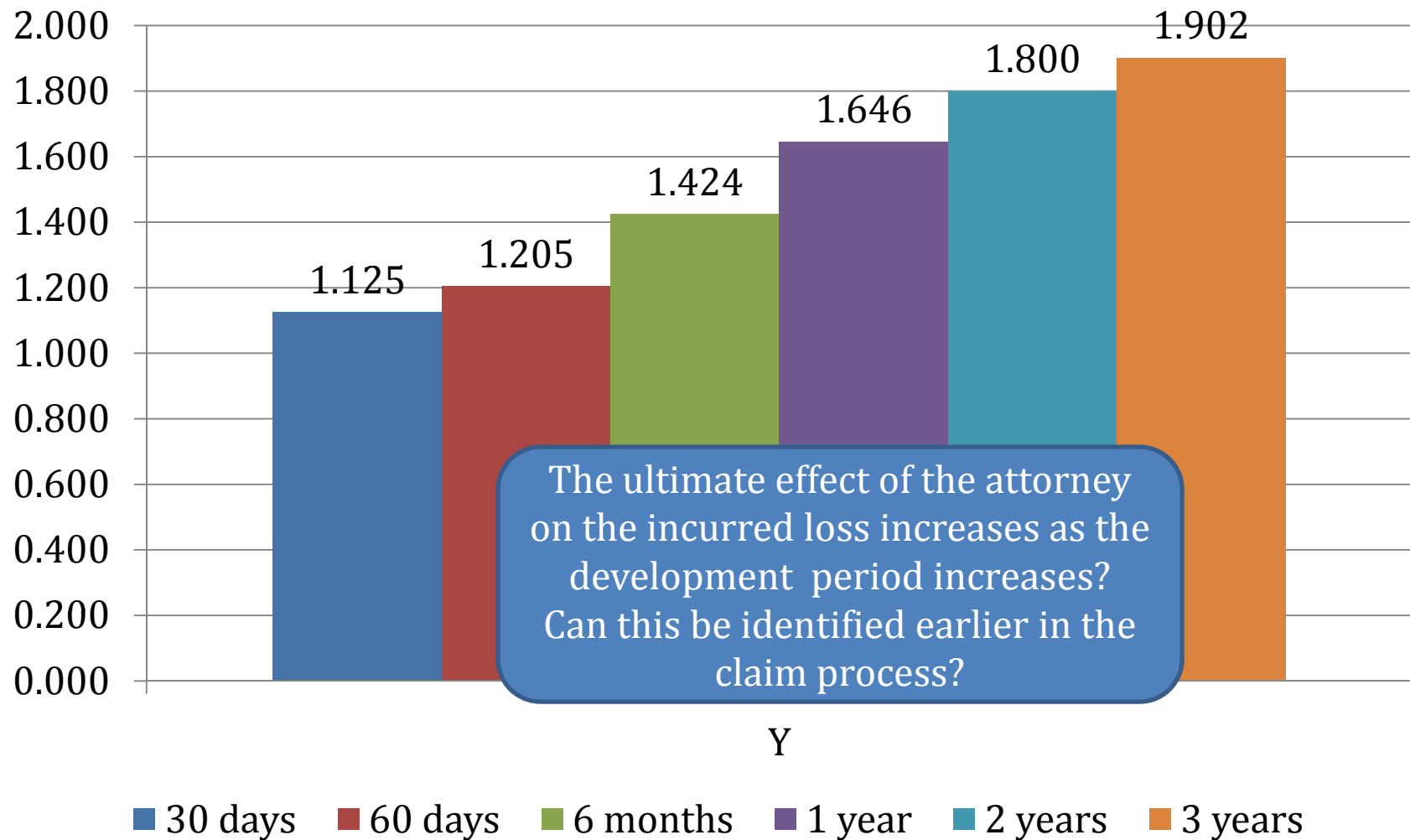
- Are there certain characteristics of the claim that are present when the incurred is 0?
- How is this changing over time?

Significance of Claim Characteristics

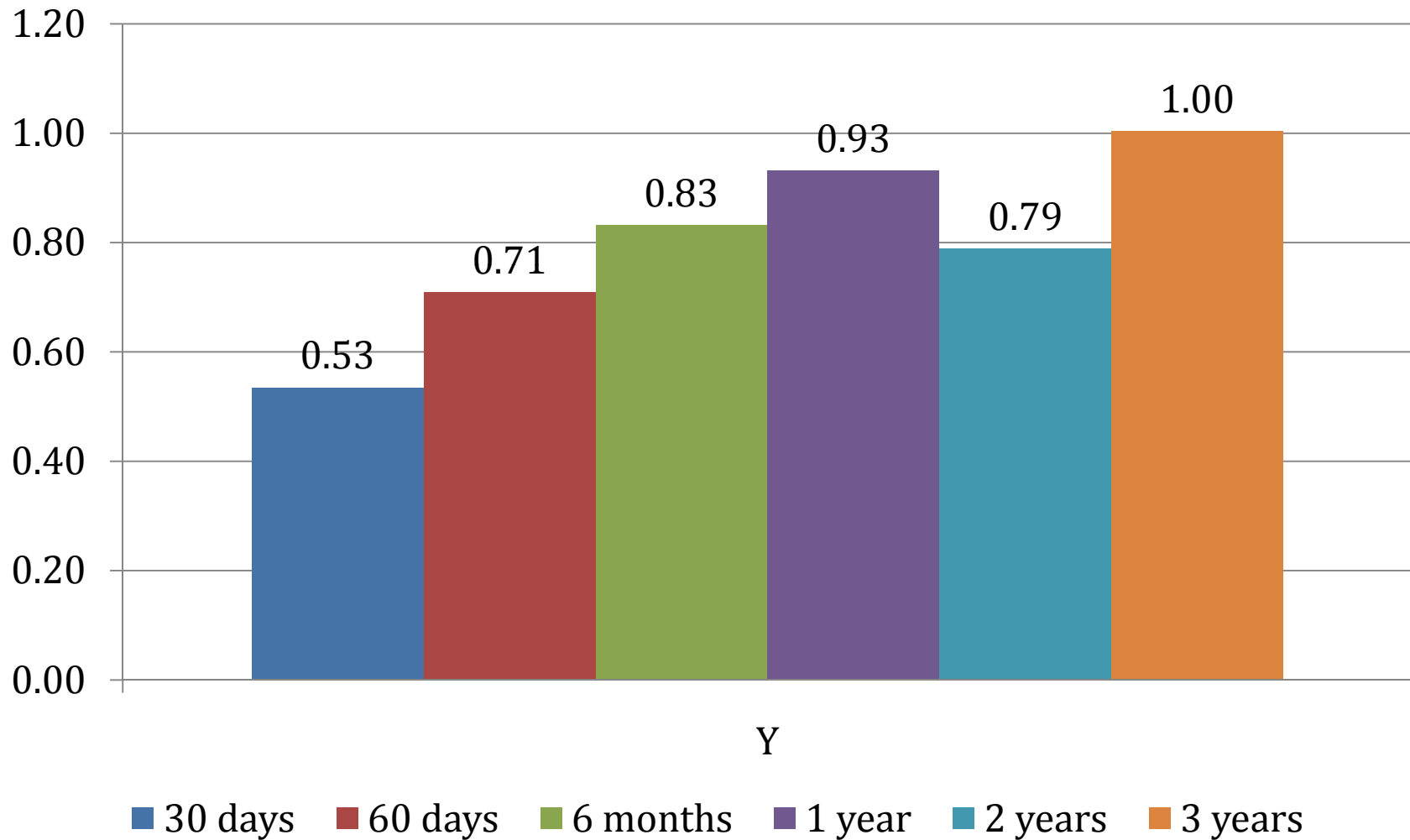
Claim Characteristic	30 days	60 days	6 months	1 year	2 years	3 years
Claimant represented by Attorney	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Company hired Defense Attorney	67.9%	0.1%	0.0%	0.0%	0.0%	0.0%
Attorney Involvement	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Industry	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Marital Status	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Reporting Lag to Insurer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Age of Claimant	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Reporting Lag of Employer to Insurer	6.5%	35.5%	8.9%	1.4%	0.0%	0.0%
Reporting Lag of Claimant to Employer	0.0%	1.6%	5.9%	1.6%	0.2%	0.0%
Employee Tenure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Body Part Injured	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Loss Cause Code	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Loss Type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Prior Idemnity Claims	15.6%	6.4%	0.5%	0.5%	0.1%	0.1%
Prior Medical Claims	88.1%	39.8%	12.6%	0.0%	0.0%	0.0%
Reopened?	0.0%	0.0%	46.2%	0.0%	0.0%	0.0%
Witness	1.1%	0.6%	11.5%	62.6%	35.0%	46.2%

Is there information that is being given too much weight?
Does the formula case reserve need to be revisited?

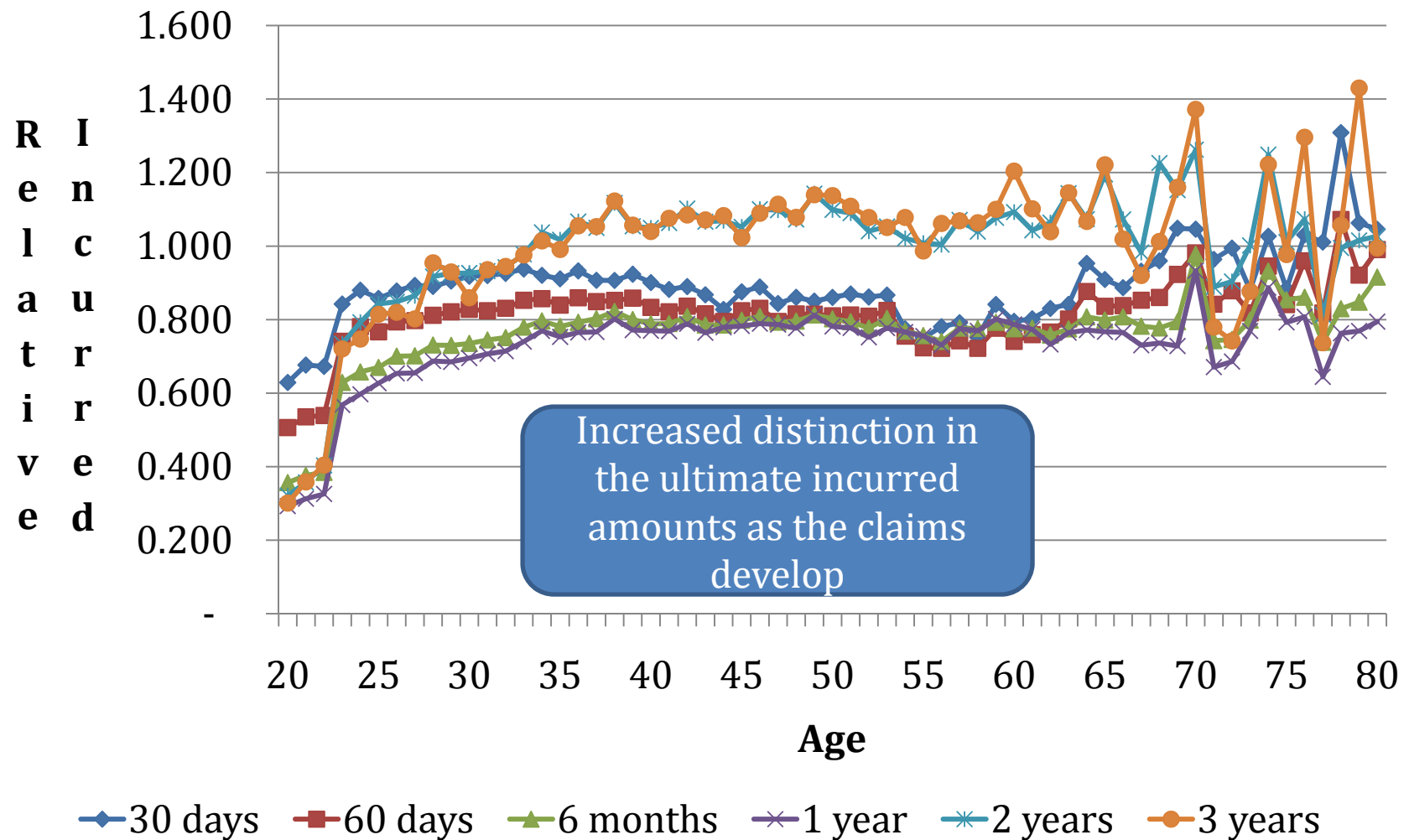
Shift in Parameters Defense Attorney



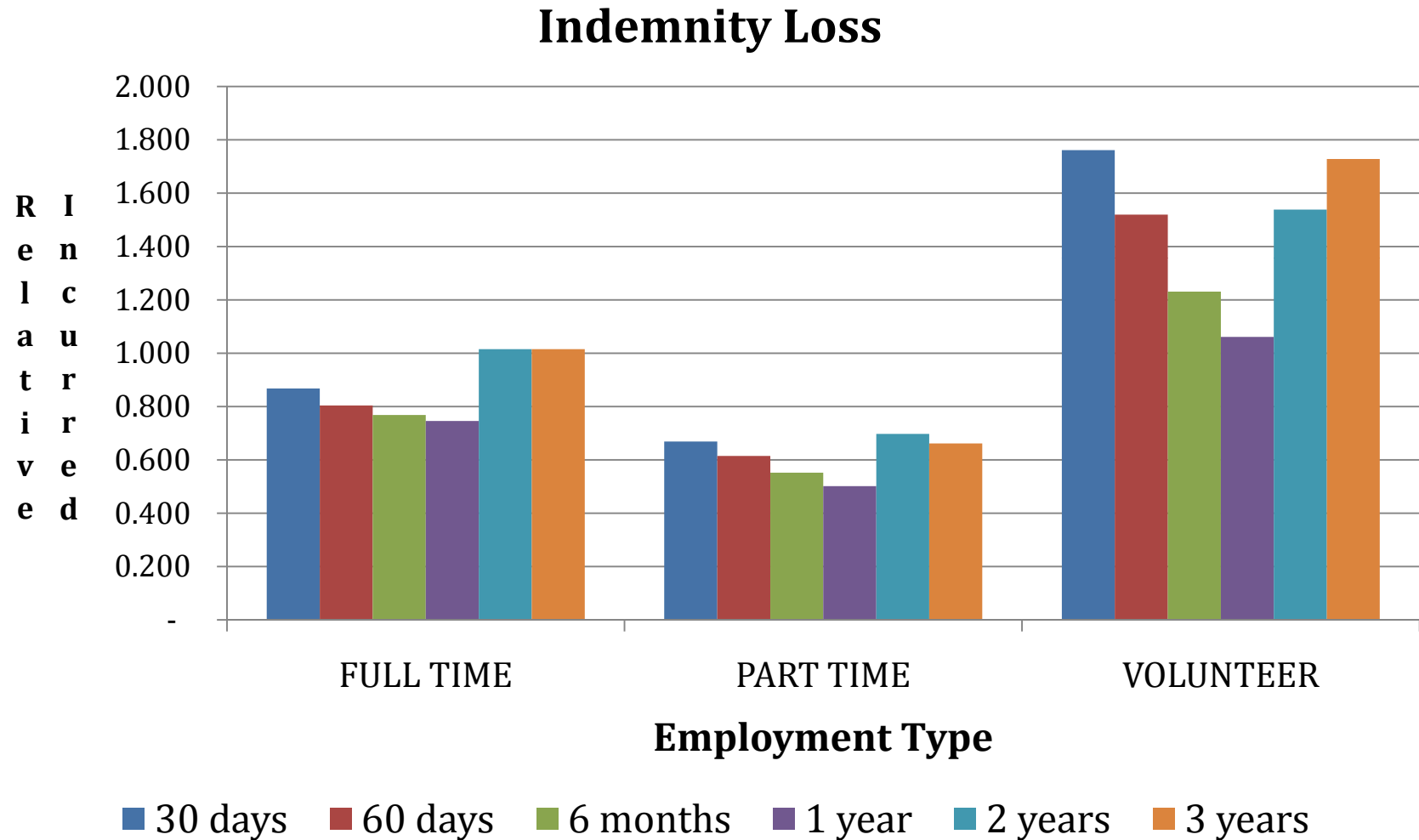
Shift in Parameters Shoulder Injury



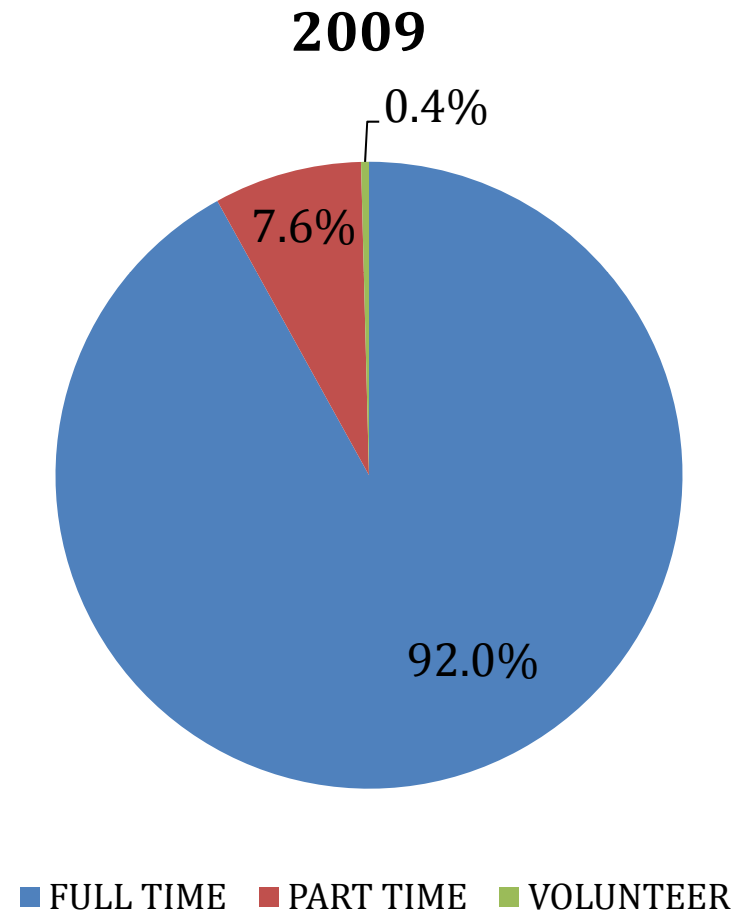
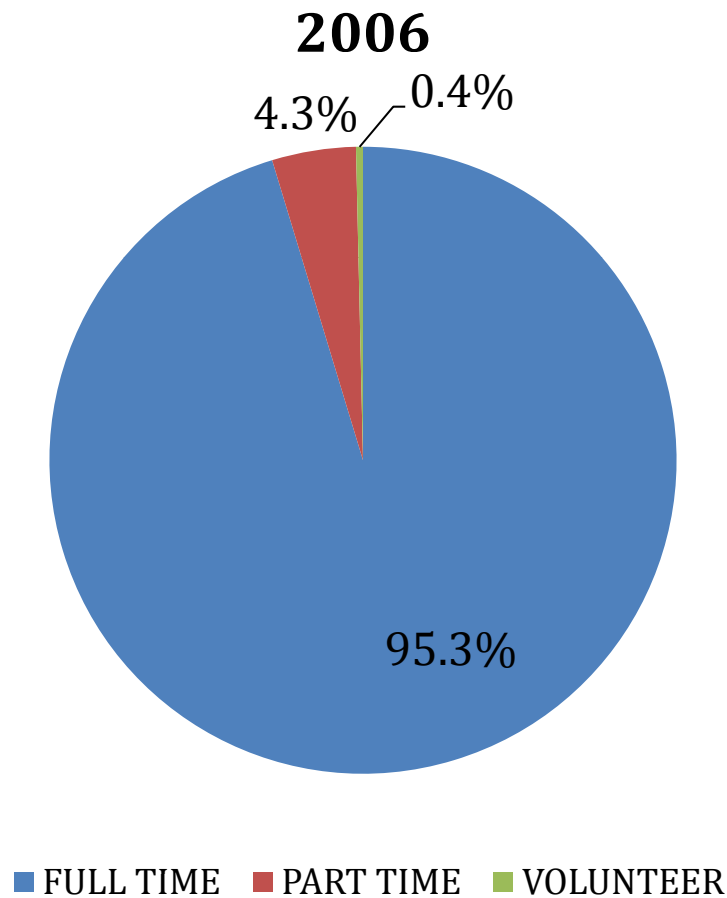
Relative Average Predicted Incurred by Age



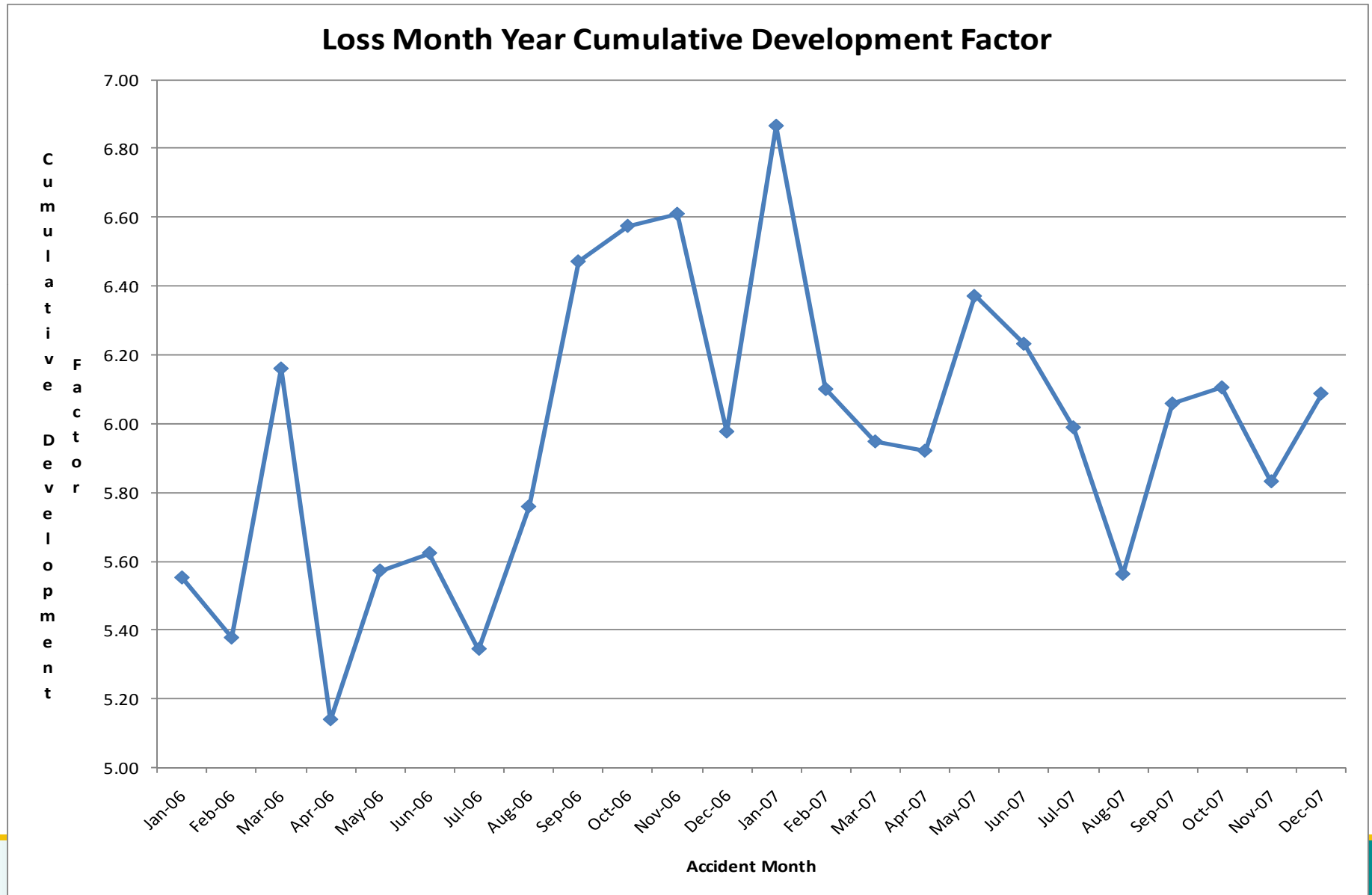
Relative Average Predicted Incurred by Employment



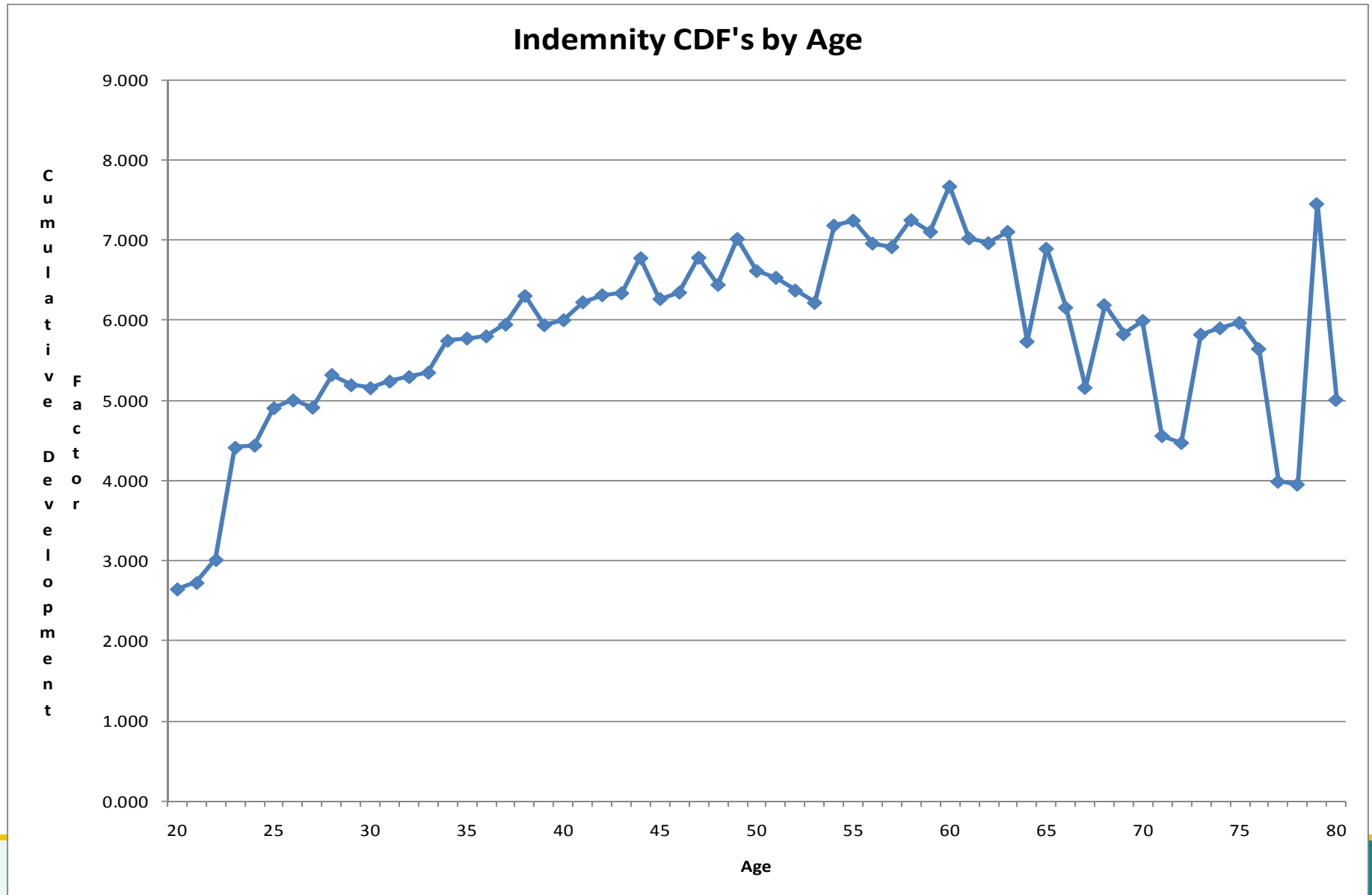
Change in Employment Distribution



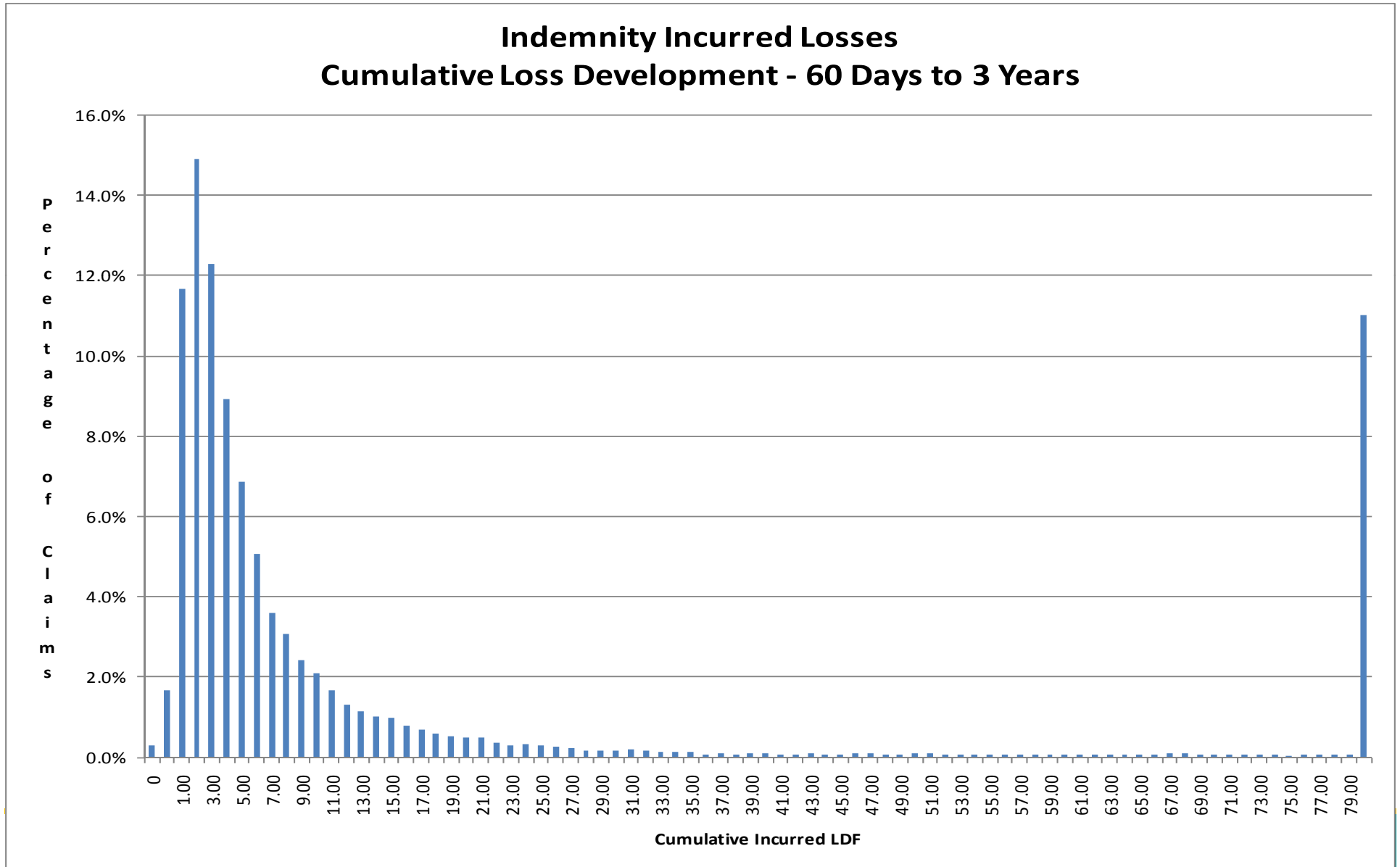
Indemnity CDF



Indemnity CDF



Distribution of Incurred CDF's



Applications

- Claims
 - What elements of a claim are important in determining ultimate settlement value?
 - Are there considerations that are being given too much/too little weight in the incurred estimate?
 - Is there information on the claim that should be gathered sooner?
 - Actuary
 - Investigate changes and anomalies in the development patterns
 - Use the analytics to help quantify distributional and development changes
 - Provide a validation of the projected ultimate incurred loss for a body of claims
 - Analyze impact of proposed or expected shocks to the claim settlement process
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