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September 1, 2024 California Retrospective Rating Plan Technical Documentation

Actuarial Research

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About the Workers' Compensation Insurance Rating Bureau of California (WCIRB)

The WCIRB is California's trusted, objective provider of actuarially-based information and research, advisory pure premium rates and educational services integral to a healthy California workers' compensation system.

As a licensed rating organization and the California Insurance Commissioner's designated statistical agent, the WCIRB performs a number of functions, including collection of premium and loss data on every workers' compensation insurance policy, examination of policy documents, inspections of insured businesses and test audits of insurer payroll audits and claims classification. This data is used to advise the Insurance Commissioner and other stakeholders of the costs of providing workers' compensation benefits.

The WCIRB, organized in 1915, is a California unincorporated, private, nonprofit association comprised of all companies licensed to transact workers' compensation insurance in California and has over 400 member companies. No state money is used to fund its operations.

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Introduction

This technical document describes the underlying data, assumptions and methodologies used to develop the advisory parameters of the September 1, 2024 California Retrospective Rating Plan. This document was developed for actuaries and practitioners who have a working knowledge of retrospective rating and want to better understand the development of California's advisory parameters. These parameters include loss elimination ratios, tables of insurance charges, and hazard group assignments. Parameters are developed for both a pure loss basis and for a loss and allocated loss adjustment expense (ALAE) basis.

This document is organized as follows:

1. Development of the database from which the September 1, 2024 parameters for the California Retrospective Rating Plan were developed, including descriptions of the starting database and the adjustments made to this database, such as benefit on-level factors and trend adjustments

2. Development of losses from a Unit Statistical Report (USR) level to ultimate level

3. Development of loss elimination ratios (LERs) from ultimate losses on a per claim basis

4. Conversion of claim-based LERs to occurrence-based LERs

5. Development of hazard group assignments

6. Development of a second, parallel set of parameters that reflects both loss *and* ALAE

Finally, the appendices discuss major issues reviewed during this retro development cycle and past major issues for which we regularly receive questions.

Throughout the document, changes to prior methodologies are noted.

The goal of the 2024 retro parameter updates are to provide retro parameters that best reflect the ultimate disposition of workers compensation claims for policies written during the September 1, 2024 policy period. These parameters are developed from historical data that was selected to provide the best starting values to develop the retro parameters and the best methods to adjust the historical data to projected September 1, 2024 ultimate settlement values using the available data, with reliance on as few assumptions as necessary, and with statistical support when possible. When assumptions are required, they are disclosed so that the practitioner is aware of their use.

The methods selected take into consideration a number of key issues in adjusting losses from historical to future values. These issues include the realistic dispersion of individual claim loss development; the correlation of loss development patterns with size of loss; the correlation between the development patterns of a claim's medical and indemnity components; and the potential for the serial correlation of loss development patterns. Initial steps have been taken to address the conditionality of development given cumulative payments to date. Incurred-but-not-reported (IBNR) claims, claim re-openings, and additional development on claims reported closed in the starting database have been recognized.

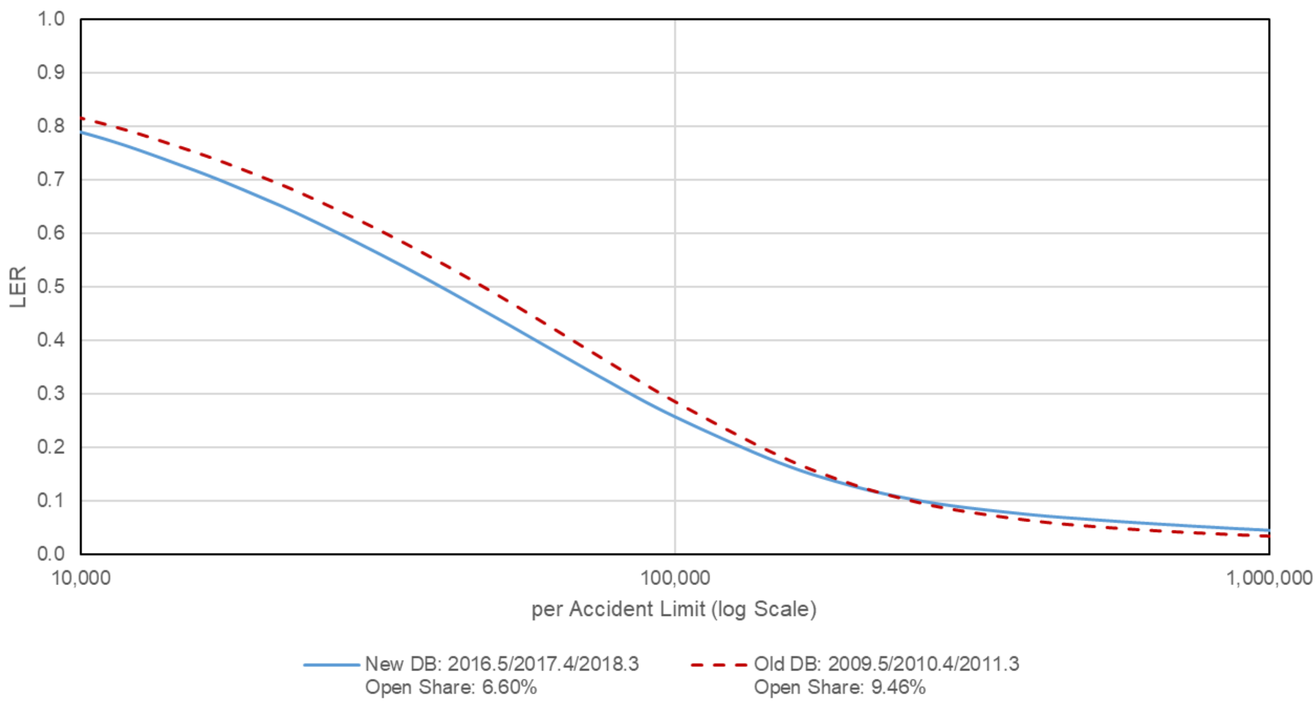
Technical questions or feedback are welcomed and may be directed to ActuarialResearch@wcirb.com.

The Historical Starting Database

The retro database is developed from recent policy years of unit statistical report (USR) data of sufficient maturity. Policy years at first and second report levels of maturity have generally been found not to be of sufficient maturity to serve as the basis for retro database development. The starting database underlying the September 1, 2024 parameters includes policy years 2016 at fifth report level; 2017 at fourth report level; and 2018 at third report level. The prior parameters were developed from policy years 2009 at fifth report level; 2010 at fourth report level; and 2011 at third report level. There were significant changes to the unadjusted (raw data) loss elimination ratios (LERs) from the prior starting database to the new database. These changes are largely attributed to changes in the claim closing rate.

Graph 1 shows the LERs by accident limit for the current and prior starting databases before any adjustments. That is, these are the loss elimination ratios at USR for the report levels noted above before any adjustments for trend, benefit on-leveling or loss development.

Graph 1: Unadjusted Starting Database Loss Elimination Ratios



Changing dynamics in claim closing rates led to significant changes in the unadjusted starting database. In particular, faster closing rates in the updated starting database led to lower LERs at lower limits. This dynamic manifests up to per accident limits of $250,000, where LERs are greater in the updated starting database. This suggests that changes in claim closing patterns were most material for smaller claims. The increases in the updated starting database LERs maximize at the $1,000,000 per accident limit. Increases in LER would be expected due to inflation. Additionally, studies have shown an increasing share of extremely large claims at early report levels[1] which would also lead to LER increases.

From the Unit Statistical data, the starting database included each claim's incurred and cumulative paid indemnity and medical component values; the accident date; the type of injury; the insurer; the reported open or closed status of the claim; the California catastrophe code, if any; the part of body, cause of accident, and nature of injury codes; and the classification. The claim volume of the starting database was 1,233,987. Approximately 6.6% of the claims

[1] https://www.wcirb.com/sites/default/files/documents/country-wide_mega-claims-report-2020-bureauready.pdf

were open in the starting database. Each claim was simulated 100 times. 32,989 closed claims were simulated to reopen.

Three adjustments are generally made to the claim values of the starting database to transform them into the ultimate settlement values. First are adjustments to reflect claim development to ultimate settlement values, or loss development. Second are adjustments to reflect the changes in benefit levels from the starting years to those of the projection policy year. Third are adjustments to reflect the change in claim cost levels, or trend, from the years of the starting database to the projection policy year.

For the September 1, 2024 retro, benefit on-leveling, trend and off-balance were applied after loss development. The adjustments for benefit on-leveling, trend and off-balance are discussed below. In typical years, these adjustments are straightforward scalars applied *after* the adjustment for loss development. They are applied after as, if they were applied before, then the data underlying the loss development methodology would also need to be adjusted to a trended and on-leveled basis.[2] This would add a step to the process that has not been judged to have a material benefit.

Number of Calendar Years of Open Claim Development

The adjustment for loss development is complex and entails development of a supplementary database and the application of a stochastic simulation model. Realistic modeling of loss development is at the heart of the retrospective rating database in that it captures the stochastic nature of the aging of workers' compensation claims. The data used to model loss development for the September 1, 2024 Retro was collected in the WCIRB California's *Long-Term Loss Development Survey* (the Surveys), which collect information on open claims for calendar year-ends 2000 through 2022. In developing retro databases prior to the 2019 plan, only the most recent Survey's data, capturing three calendar years of development were used. WCIRB research supports *the use of as many years as currently available*. It was observed that loss development tended to be higher or lower for short periods of calendar year time. When a retro database was developed that might reflect loss development that was substantially higher or lower than that expected over the longer term, then the resulting ultimate settlement values were correspondingly higher or lower. For this reason, the WCIRB now uses all available calendar years from which to develop the observation of loss development by size and age. The WCIRB recognizes that at some point, the oldest calendar years of observed development may no longer be relevant for expectations of future development patterns and the WCIRB will evaluate older calendar years' development for its appropriateness in projecting future development patterns.

[2] Occasionally, circumstances require that benefit level adjustments are made *before* the loss development process. This occurred in developing the 2008 retro. To see why, imagine that there are only two kinds of claims, small and large, and that small and large claims develop differently. Reforms to the permanent disability schedule in 2005 resulted in an expectation that many claims that would previously have been large would now be small *and* that these claims would now be expected to develop as small claims. If this benefit level adjustment had been made to claims after the development adjustment, then certain post-reform small claims would have been developed as large claims.

Long-Term Loss Development Survey

California's Long-Term Loss Development Survey collects year-end claim values for the most recent four years for *all* claims that were open at any time during the three-year period between the first and last of the four year-ends *and* for which Unit Statistical Reports are no longer required.[3] The claim values collected include paid and incurred amounts for indemnity and medical and paid amounts for ALAE. The claim number, accident year and injury type are also collected.

Audits and Reasonableness

Numerous checks were performed to ensure the data reported was reliable. Each insurer's data was examined to verify that its volume, in terms of both claim counts and dollars, was reasonable in relation to the insurer's USR and Financial Call submissions. The reconciliation was done for the largest insurer groups individually. Data for the remaining smaller insurers was aggregated and analyzed as a group.

Each insurer's Survey submission was reviewed individually. Each year, a number of claims are selected to query for additional information as a means of auditing the Survey for data quality purposes and to enhance our understanding before building the stochastic claim development model. The WCIRB makes use of information in its Medical Data Call (MDC) to understand claims before querying insurers. The claims selected generally include a sampling of claims that look as if they may have been misreported. Claims selected to enhance understanding generally include a sampling of claims with the most material catastrophic development, again, when not explained by information available in MDC.

The data reported to the WCIRB through the survey represented nearly 99% of the expected population. (The expected population excludes data lost by insurer insolvencies.) The final survey database represented development observations on roughly 117,000 claims.

A key subset of Survey claims are those that can be successfully matched to their original unit statistical reports. These claims are important to validating results and to testing different alternative approaches to modeling loss development. Observations accounting for approximately 71% of the usable Survey data, by loss, were successfully matched to their original unit statistical reports. This means that about 71% of total survey data, by loss, was both usable and matched to USR.

Serial Correlation of Development among Ages

One particular analysis conducted on the matched subset was to test for the presence of serial correlation of development among ages. The simulation model assumes that all development is independent across time (serially uncorrelated). Past studies have found no evidence of serial correlation of development within Surveys. The matched development data of all available Surveys was combined to test for the correlation of developments over 21 consecutive calendar years. As with past studies, no evidence of material serial correlation was found. Nevertheless, this continues to be a due diligence check before simulating.

[3] As the primary intent of the Survey is to collect information on post-USR loss development, the number of claims subject to reporting under the Survey is effectively for claims post 10th report level for future years.

Stochastic Loss Development Methodology—Survey and Simulation

The general approach to loss development is to simulate claim development from USR through closure by creating a detailed model of the life of a claim and then to parameterize this model with the empirical observations of development patterns acquired from the Surveys. The stochastic nature of the model recognizes that the aging process may take many different paths. New with this update, each claim is simulated *100 times* to provide an adequate volume for capturing the stochastic nature of loss development and for cross-validation at more refined levels. The volume of simulations prior to 2019, 5, was sufficient for aggregate results. But beginning with the 2019 update, more refined artifacts, such as insurer subsets and the distributions of simulated values by size and age *by hazard group* have been produced. These more refined artifacts required increasing the volume of simulations. Staff also evaluated whether more years forming the starting database was warranted for the greater level of refinement, but this was not found to be necessary.

All development is based on Monte Carlo simulation using the empirically-derived parameters.

A claim has reached the end of its life when, after developing or aging year-to-year, it finally closes, never to reopen. A realistic modeling of this aging process with the available data requires slight definitional changes from those typically used in practice.

Claim Components and the Open-Closed Dichotomy
At USR, insurers report that claims are open or closed. Open implies that an insurer expects that future payments beyond cumulative paid-to-date are probable or possible. In the modeling, open development is bounded from below by the cumulative paid. That is, except in unusual circumstances, an open claim cannot develop below its cumulative paid-to-date. Closed implies future payments are not expected and that paid equals incurred. Closed claims, therefore, are not expected to develop downwards, even if reopened.

Only when a claim is truly closed do we know its ultimate settlement value. Unfortunately, the claim status reported at USR is only an estimate and, moreover, practices in classifying claims as open or closed vary widely by insurer. Further, insurer practices in handling the indemnity and medical components of claims vary. In particular, many insurers settle the indemnity component of a claim earlier than the medical component. Aggregating the data of insurers with disparate classification and handling practices and then applying the development patterns of the aggregate to this data required defining open and closed for the simulation model slightly differently from the definitions used in practice.

First, for the simulation model, the open or closed status applies not to a claim as a whole but to a claim's indemnity and medical components independently. Only when both components are closed is the claim closed in the sense employed by insurers and the USR. Secondly, the simulation model relies on an effective closure definition to simulate a component's closure at ultimate. *Effective closure* is defined as paid-to-date equals incurred at the present and all subsequent ages. Effective closure introduces a common definition for the open/closed status for all ages beyond USR. However, through ages for which USR data is available the USR claim status is used.[4]

To understand the importance of recognizing the independent handling of claim components, consider the indemnity component of a hypothetical claim on which the medical component remains open throughout. The insurer settles the indemnity component early in the life of the claim by a Stipulated Finding and Award for $50,000 and, therefore, reasonably expects no further indemnity development. The claim's indemnity paid and incurred are both $50,000. For the simulation model, the indemnity component is considered effectively closed even if from the insurer's perspective the claim is open. In the simulation, this indemnity component will *not* be developed further. Had the indemnity component been modeled as open, then additional development, which is highly unlikely, might be simulated. The independent settlement of the indemnity component earlier in the life of a claim than the medical component is a common practice in California. The model does not allow for closure of the medical component before the indemnity component.

The simulation model's open and effectively closed definitions by component also facilitate the normalization of the open/closed classification across insurers. Note that the component closing rates of the simulation are *not* the claim

[4] With the advent of additional report levels, the use of the effective closure status through USR ages is being monitored.

closing rates of insurers. Further, the claim closing rates implied by the simulation are less than insurer closing rates as they substantially exclude, by use of hindsight, insurers' apparent closure observations that later reopen.

Simulating the Life of a Claim
A claim is aged through its life by developing each component from age to age while the medical or both components remain open. At each age, a claim is developed to the next age by generating random numbers that select development factors, or link ratios, that develop the open component(s) to the next age. Development factors include unity link ratios and closed components are handled by selecting a unity development factor. Components are aged until closed or 1,200 months, whichever event comes first.[5] Closing rates for the oldest claims, for which the volume of observations was sparse, were modeled as a function of age to provide for increasing closing rates as claims mature.

Within the category of open development there are two kinds of development corresponding to unique events in the life of a claim. *Closing*, or the first instance of cumulative paid equaling incurred, is unique not only because the component's status is changed from open to closed, but also because closing developments have been observed to be distinct from other open development. In particular, closing developments are more peaked, clustered about unity, than other open development. If a Survey observation exhibits subsequent development after an initial apparent closure, the initial instance of apparent closure is not coded as closing. The volume of these instances is small for claims post-USR. Another unique category of open development is that of catastrophic development. *Catastrophic development* is defined as age-to-age link ratios in excess of 300%.

The development parameters are expressed as *Age and Layer Tables*, which incorporate the relative probabilities of the different kinds of development—normal, closing or catastrophic—that an open component can undergo as well as the relative probabilities of selecting different development factors for each kind of development. Exhibit 1 provides an example of the Age and Layer Table for the development from Age 90 to Age 102 for claims with total incurred values of $137,333 to $206,000 at Age 90. When closing or catastrophic development is selected, additional random numbers are generated and additional sub-tables are referenced to determine the appropriate development factors.

Correlation between indemnity and medical development and the correlation of development by size of claim are handled by the structure of the Age and Layer Tables. Though a claim's indemnity and medical components are developed separately, their development is made joint and conditional by reference to a common table appropriate to the age and total incurred size of the claim. This means that the expected development of a $10,000 indemnity component on a $20,000 claim is different from the expected development of a $10,000 indemnity component on a $100,000 claim. Further, to the extent that there is positive correlation between indemnity and medical development, the indemnity component would be more likely to develop when the medical component develops.

Year-to-year development is further conditioned by constraining link ratios to proscribe values at successive ages that were not observed in the Survey data, both by component and by claim. These constraints were developed from an examination of Survey observations. For example, for a claim originating in the $1.5M to $2.5M layer, if the largest claim to "develop out" of this layer was $10M, then the possible age-to-age link ratios for this layer were constrained to proscribe development to the next age that would exceed $10M. To avoid significant downward bias, the number of layers was refined, particularly for larger claims. There are nine layers for claims approximately $1M and larger. For prior retros, most instances that are now constrained would have breached error-out thresholds, the development of which is discussed below. An analogous methodological change was made for the smallest claims. For small claims, claims developing out of the smallest layer are first simulated to develop to a higher layer and then their placement in that higher layer is simulated.[6]

Development is further conditioned by proscribing development below cumulative paid values. In prior updates, these cumulative paid values were those reported in the underlying starting database and did not develop as claims matured during the simulation process. Beginning with this update, paid values are also simulated throughout the

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[5] Observations as old as 936 months, or 78 years, were reported in the Survey. Previously, claims were allowed to develop for only 50 years. The impact of developing to 78 years or for 100 years was infinitesimal. Allowing development for 100 years allows for continued expansions of life expectancy without having to alter the model. Again, the impact of this extension is very small, as can be seen from the age and size tables.
[6] This prevents the "inappropriate" use of a link ratio observed, for example, on a $100 component that developed to $100,000—for a 1,000 component link ratio—being applied to a $3,000 component, developing it to $3,000,000 when no such event might ever have been observed.

life of the claim and incurred development is now bounded by the simulated cumulative paid to date at each claim age in the simulation. At each age, the modeled change in paid losses is dependent on the current paid and incurred values. Moving from age N to age N + 1, incurred losses at age N + 1 are first determined as previously described. The potential amount of incremental paid losses from age N to age N + 1 ranges from $0 to the difference between the newly determined cumulative incurred loss amount at age N + 1 and the cumulative paid loss amount at age N. For example, if a claim had $50 in cumulative paid losses and $100 in cumulative incurred losses at age 5 and the cumulative incurred losses were simulated to be $150 at age 6, then the incremental paid losses between ages 5 and 6 would be between $0 and $100 ($150 - $50). The share of the potential incremental paid loss is simulated using empirical data in a similar manner to how incurred losses are simulated. For paid loss simulation, development is further conditioned on the size of the loss reserve relative to cumulative incurred losses. Minimum constraints, analogous to the maximum constraints discussed above, have been implemented. Year-to-year downward developments not observed in the Survey data are proscribed.

A realistic simulation of the aging of a claim's components depends on Age and Layer Tables that accurately reflect the probabilities of key events in the life of a claim and the probabilities of age-to-age factors.

Development of the Age & Layer Tables

To construct the Age and Layer Tables, development patterns by age and size of claim are examined for statistically significant differences among and between potential thresholds in ages and sizes of claims. Age and Layer cells for which there is no statistically significant difference in developments are collapsed. For these tests, components that do not develop (have unity link ratios) are excluded. The probabilities of a component having a unity link ratio, closing or developing catastrophically are evaluated separately. These separately determined probabilities are later integrated into the Age and Layer Tables' distributions of regular development. For each age-and-layer cell, there is a judgmental minimum volume of observations of about 100.

One statistical tool for evaluating whether, or not, the developments at adjoining ages or layers were combinable (not statistically significantly different) was the Kruskal-Wallis test and the method of Kruskal-Wallis bifurcation. Kruskal-Wallis bifurcation works by ranking observations by size for a given age-to-age link and calculating the Kruskal-Wallis test statistic for the differences between the link ratios of observations less than each claim's size versus greater than each claim's size. (There are nearly as many Kruskal-Wallis tests as there are claims at that size. The test is degenerate at the extremes of the range of sizes when there are insufficient observations in one group.) Generally, the Kruskal-Wallis statistic by size forms a pattern that indicates at which size a difference between link ratios occurs. This division, assuming it is statistically significant, provides the first indication of an appropriate division between sizes at that age. The process is performed iteratively within the indicated halves until there are no indicated significant differences. The process is performed for key ages and then performed for differences by ages within the indicated size ranges. By this iterative process indicated Age and Layer cells are developed, which were then retested against neighboring cells to verify differences. Cells for which there were no statistically significant differences in link ratios were collapsed.

Closed-Closed Development and Reopening Claims
Two adjustments are made to claims reported closed in the starting database: closed-closed development and re-openings. At USR, a share of claims reported as closed develops while remaining closed. This is termed *closed-closed development*. Research at the California WCIRB in 2009 revealed that the magnitude of development on claims reported closed at successive report levels from third through fifth report was not negligible as previously assumed. Simulation of this incremental development was accomplished by randomly selecting closed claims for closed-closed development with the probabilities and developments dependent on the report level and size of claim and parameterized with the most recently available USR data.

After the closed-closed development was applied, a share of closed claims was selected to *reopen from 5th report level*. The percentage of claims to be reopened varies by size of claim, based on empirical probabilities. Both the percentage of claims to reopen and the ages at which the claims reopened were determined by a study of claims that were open in the Long-Term Loss Development Survey but closed at USR 5th report level. For claims selected to reopen, both claim components began aging as open from the age of reopening. Reopening at third or fourth report level is not modeled except to the extent accounted for by closed-closed development. Reopening follows closed-closed development so that reopened claims that were closed at third report have had an opportunity to undergo closed-closed development.

Although only a small share of claims actually reopens post-USR, about 0.14% for this retro database, the reopening rates for the largest claim size layers are over 1.50%. This fact is believed to account for the impression that reopened claims might be related to greater development than open claims. Indeed, the reopening of such large shares of larger claims is material. Nevertheless, by volume most re-openings were associated with smaller claims—both at USR *and* at Survey.

Incurred-but-Not-Reported Claims
Past Surveys have found that the volume of claims truly incurred but not reported (IBNR) to the California workers compensation system is small. More importantly, excepting asbestosis claims, there is no evidence that these claims represent a significantly larger or smaller sub-population. Most apparently IBNR claims are administrative IBNR; for example, characterized by new claim numbers being created to facilitate small payments on old claims or other claim re-numberings. The next largest category of IBNR claims are indeed IBNR to the insurer—but *not* IBNR to the workers compensation system. These claims involve joint coverage, or potential joint coverage, by multiple insurers. When the claim first becomes known, the insurer of the employer reporting the claim submits a unit statistical report, so the claim is not IBNR to the workers compensation system.

The California methodology provides for incurred-but-late-reported claims for a given projection period by assuming that they are adequately modeled by IBNR claims observed in the unit statistical data from prior periods. This should be reasonable in a steady-state environment if unit statistical reports are filed when a claim is new to an insurer. To do this, we added policy year 2017’s fourth report level claims that were IBNR at third report; policy year 2016’s fifth report level claims that were IBNR at fourth report; policy year 2015’s sixth report level claims that were IBNR at fifth report; policy year 2014’s seventh report claims that were IBNR at sixth report; and so on to adding policy year 2011’s tenth report level claims that were IBNR at ninth report. Each of these was added to simulate the IBNR for a single policy year. As there are approximately three policy years in the retro starting database, each of these IBNR claims was added three times. These 7,501 *simulated IBNR* claims are adjusted for trend and benefit on-level using factors appropriate to the policy year of origin.

While duplicating historical IBNR claims is a straightforward approach, there is a risk of inappropriately impacting a classification. LERs are not published for individual classifications, but this process potentially could affect a classification’s hazard group assignment. To address this, simulated IBNR claims are excluded from the hazard group development process. Once hazard groups are developed, these claims are assigned to the hazard group associated with their classification of origin.

Error-Out Thresholds

Components' development across ages is independent. Though there is no statistically significant serial correlation in components' development, there is a reasonable expectation of a natural limit to catastrophic development.[7] As a claim ages through the simulation, there is a minute possibility of drawing successive catastrophic developments that would result in an unreasonably sized claim. To recognize this possibility, *error out thresholds* were developed for each component. When a component is simulated that exceeds the threshold, the simulation is said to error out. The error out simulation is discarded and done over. Additionally, a claim size error out threshold was established.

To establish appropriate error out thresholds, the Survey data is examined under the assumption that somewhere in this data are claims that represent the probable maximum size for each component, albeit reflecting historic price levels. When this approach is used over consecutive parameterizations, its reliability is enhanced by allowing comparison with past Surveys' probable maximum components. The chief problem with this approach is that Survey claims come from accident years ranging from before World War II to recent years. Older claims are smaller because, barring periods of deflation, greater shares of their incurred values represent past payments at historic price levels. This is addressed by adjusting Survey observations to a common price level and then identifying the largest components and the largest claim over the Survey.

To make this adjustment, each survey claim is separated into incremental indemnity and medical payments and final indemnity and medical case reserves. The incremental payments consist of reported observations, where available. Where observed incremental payments are not available, the payout patterns implicit in the WCIRB's latest filing, for indemnity and medical separately, are presumed to represent a common payout pattern over time. This is a broad assumption, but satisfactory in relation to the volume of claims being examined. These payment patterns are used to divide all unknown payments into incremental payments by year. Each incremental payment and the final reserve is adjusted for inflation to bring all values to the cost level of the starting database. After each component is adjusted, the distribution of the largest components and claims is examined and the largest values are selected as the error out thresholds for the simulation.

The error out thresholds used to develop the September 1, 2024 retro database were $15,000,000 for indemnity and $60,000,000 for medical. The largest inflation-adjusted claim observed was $75,000,000. As these thresholds are at the cost level of the starting database, claim simulations are compared to them before further adjustment to a September 1, 2024 cost level. It happened, however, that no simulations exceeded these error-out thresholds, a fact believed to be related to the sufficient level of refinement of the simulation model.

[7] Monitoring of potential serial correlation is routine. In 2011, studies were conducted on an individual insurer basis. There was some evidence of significant takedowns following a small percentage of catastrophic developments. Query responses suggest that these incidents are typically related to subsequent deaths following surgeries or major deteriorations in an injured worker's condition shortly after the change in case reserves. The WCIRB continues to monitor this phenomenon for credible evidence on which to model this phenomenon.

Auditing & Reasonableness

In developing prior retro databases, a key audit measure was the *short-stop simulation*. For short-stop simulations, Survey claims that have been matched to USR are developed from USR using the model. But instead of developing the claims to ultimate, their development is stopped short at the ages observed in the Survey. As these claims form a subset known to be open at Survey, the short-stop simulations do not allow the claims to close. The simulated claim values are then compared to those at Survey. While earlier results using this method were very constructive, a series of reforms have made this approach problematic. Given the difficulty of recognizing reform impacts, alternative reasonableness tests were developed. Nevertheless, simulations of known claims over shorter periods of time are used to test the modeling for reasonableness as well as comparisons of known open portfolios adjusted for inflation with simulated open portfolios of the same age.

Adjusting Starting Values to Projected September 1, 2024 Starting Levels

On-Leveling
After developing claim values to ultimate, this data must be adjusted from the benefit/cost levels of the accident year of origin to the benefit and cost levels of the projected policy year. Table 1 shows the benefit on-level and trend factors applied by type of injury and component. Note that the on-level factors reflect the impacts on severity only and *exclude* any estimated frequency impacts.[8] To the extent that frequency changes affect all claim sizes equally there is no need to model them as they would not alter the size of loss distribution.[9]

Table 1: Benefit and Trend On-Level Factors to a September 1, 2024 Cost Level

	Accident Year			
	2016	2017	2018	2019
Indemnity Benefit On-Level Factors				
Death	1.019	1.018	1.016	1.014
Permanent Total	1.077	1.063	1.050	1.039
Major	1.029	1.026	1.023	1.020
Minor	1.043	1.038	1.034	1.030
Temporary	1.071	1.063	1.054	1.048
Medical Benefit On-Level Factors				
	0.988	1.038	1.041	1.041
Aggregate Trend Factors				
Indemnity	1.080	1.102	1.096	1.055
Medical	1.134	1.126	1.079	1.059

Vector Trend
The trend factors shown in Table 1 correspond to the aggregate trend factors used in the pure premium ratemaking process at the time of database preparation. Trend factors applied to *individual claims* vary by size of claim at USR. Separate off-balance factors for indemnity and medical are applied to ensure that the trend by size of loss vector, or vector trend, balances to the components' aggregate trends. The development of the vector trend is discussed in Appendix 2013-B.

[8] The on-level factors do *not* reflect recent judicial decisions such as Ogilvie, Almaraz/Guzman or Duncan.

[9] If all claim sizes were not expected to be affected equally, modeling the impact on frequency would require knowledge or assumptions about the different impacts by size of claim.

Employers Liability

Employers Liability claims are present in the Survey and their presence is appropriate as they are contemplated in the California Retrospective Rating Plan and are present in the USR data from which the LERs and tables of insurance charges are developed. Separate treatment and modeling of these claims—by way of distinct development distributions—is a possible future enhancement though collection of credible data would be problematic. At present, no distinction between Employers Liability and workers compensation claims is made anywhere in the simulation process. In that few of the total claims reported to the WCIRB each year are for Employers Liability, their impact should not be significant in modeling loss development. The total severities of Employers Liability claims at USR are comparable to those of other indemnity claims.

Hazard Group Development

After the retro database is prepared, aggregate LERs are refined by hazard groups. Hazard groups combine classifications with similar size of loss distributions. The goal of the hazard group development process is to identify groups that optimize the credible variance in LERs across limits. This goal is analogous to an analysis of variance. Optimal groups are those that maximize the variance of LERs subject to the constraints that groups must not be so refined as not to be credible.

Retro hazard groups are used to load expected excess losses at ultimate in classification ratemaking. The hazard group assignments have been updated to optimize this dual use in both classification ratemaking and retrospective rating. Specifically, an approach that focuses on the after-credibility excess loss factors at $500,000 was selected.

Credibility
The credibility of each classification's simulated size of loss distribution was determined by examining the stability of the size of loss distributions across simulations. Each claim was simulated to ultimate 100 times. Each of these simulations was tabulated separately, allowing a comparison of the size of loss distribution across the simulations. The share of a classification's simulations that resulted in a reasonable share of simulated claims excess $500,000 was the basis of credibility. The determination of a reasonable share was based upon the simulated shares of large classifications. A classification was considered large if its total claim volume was large enough that all classifications with the same total claim volume or larger had at least one simulated claim excess $500,000 in all 100 simulations. These reasonable shares were fit to a logistic curve, using the log of the total number of claim simulations as the independent variable. The results of the fit formed the formula for classification credibility.

The relationship between classifications' size of loss credibilities and their credibilities for pure premium ratemaking was studied. No classification's simulated size of loss distribution was more credible than the component-weighted total credibility of its pure premium relativity.

Each classification's simulated size of loss distribution received the fitted credibility associated with its claim volume. The classification size of loss distributions were adjusted to replace simulated severities excess $500,000 with fitted severities excess $500,000 of its current hazard group while retaining the classification's simulated frequency of claims excess $500,000. The classification's size of loss distribution was then credibility weighted with that of its current hazard group.

Hazard Group Assignment
To develop updated hazard group assignments cluster analysis was used on classifications' credibility-weighted $500,000 LERs. Clustering algorithms were tested using both the median LER of a classification's 100 simulations and the aggregate LER of its simulations. Use of median LERs was problematic for many smaller classifications, for which the median LER was often zero, and as such was not used.

The aggregate LERs were tested using the k-means, k-medians, average linkage, median linkage, and Ward's linkage clustering algorithms. The average linkage and median linkage algorithms resulted in degenerate hazard groups and were rejected. The remaining algorithms' results were judged based on the differentiation between the updated RHGs, the reasonableness of the dislocation from the current RHGs, and how well "centered" the resulting RHGs were. The "centeredness" of the RHG was measured by the share of classifications in the resulting RHGs that had LERs above and below the RHG aggregate. The differentiation between the updated RHGs was measured by the differences between the LERs of successive RHGs. The dislocation from the current RHGs was measured by both the changes in RHG at a classification level and the share of data in the updated vs. current RHGs. The k-means and Ward's linkage options resulted in very similar differentiation between updated RHGs. The Ward's linkage algorithm resulted in the most centered RHGs and was selected.

Hazard group assignments were reviewed for reasonableness by WCIRB classification research staff. Any classifications identified by this review, along with any classifications where the hazard group assignment would have moved by at least three groups, received further review using long-term measures of large loss potential at USR. The measures of large loss potential used in the review were the shares of claim counts excess $250,000 and $500,000, along with the 95th and 99th percentiles of loss values. For each available year and each of these four measures, a USR-based hazard group was determined for each investigated classification as the hazard group to which the classification measure was closest. A final USR-based potential alternative hazard group assignment was chosen as the average of these assignments over the most recent five years. These investigations generally confirmed the appropriateness of the cluster-based selections. In cases where the change in hazard group was less extreme using the USR-based alternative, the alternative was selected. A summary of these measures for all classifications where the final hazard group selection changed by at least three groups are available in the Supplemental Information section of the Retrospective Rating Plan on the WCIRB website.

Perceived Severity Potential

The WCIRB's audits of individual claims in the Long-Term Loss Development Survey have shown that especially large, post-USR developments bear little relation with the claim's originating classification. For example, the incidence of failed back surgeries resulting in paraplegia does not depend on classification. This does not mean that there are not differences in rates of very large claims, but that the incidence of very large claims may already be adequately modeled in the simulation process by capturing a classification's potential for claims to develop into very large claims. Perceptions of relative hazardousness may be more closely related to differences in the *emergence* of large claims rather than their incidence. In particular, classifications for which large claims emerge quickly may be perceived as more hazardous than classifications for which large claims tend to emerge later, post-USR.

Decimalized Retro Hazard Groups

Traditionally, retro hazard groups have been expressed as discrete numbers. A review of classifications' after-credibility LERs for a given limit, however, reveal a fairly continuous pattern. Beginning with the 2019 update, the WCIRB developed decimalized hazard group assignments, which provide greater information as to how close or far away two classifications' LERs might be at a given limit. For example, two classifications with decimalized hazard groups of 2.4 and 2.6, for example, are expected to be much closer than their discrete assignments of 2 and 3 might suggest.

Table 2 below provides the decimalized hazard group assignments developed as discussed above. In future updates, the WCIRB expects to use complements of credibility based on the decimalized hazard group assignments. This is expected to permit more natural drift in hazard groups among classifications and to facilitate better understanding of the assignments.

Table 2 - Table of Classifications by Decimalized Hazard Group

Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group
0005	2.0	2150	2.8	3146	1.9	3840	2.5	4683	3.0
0016	2.2	2163	3.0	3152	2.2	4000	3.7	4691	2.1
0034	3.1	2211	3.2	3165	1.3	4034	4.2	4692	4.1
0035	1.7	2222	3.2	3169	4.0	4036	4.1	4717	2.3
0036	2.2	2362	3.6	3175	2.7	4038	1.6	4720	0.7
0038	5.3	2402	2.5	3178	0.9	4041	1.4	4740	4.7
0040	1.7	2413	3.3	3179	1.8	4049	2.2	4771	3.8
0041	1.6	2501	1.0	3180	3.8	4111	2.3	4828	3.5
0042	2.1	2570	2.3	3220	2.9	4112	1.3	4829	3.2
0044	4.3	2571	2.0	3241	2.2	4114	3.4	4831	1.8
0045	4.3	2576	2.9	3255	0.9	4130	4.1	4922	2.7
0050	5.5	2578	1.0	3257	0.9	4133	2.3	4983	4.2
0079	2.1	2584	1.2	3300	0.9	4150	2.1	5020	4.1
0096	3.6	2585	1.0	3339	3.8	4239	3.2	5027	5.2
0106	7.0	2586	1.0	3365	3.1	4240	1.9	5028	4.8
0171	4.3	2589	1.8	3372	3.1	4243	2.8	5029	5.4
0172	2.0	2623	1.0	3373	3.1	4244	4.5	5040	6.9
0251	4.8	2660	1.6	3383	3.2	4250	2.7	5057	5.8
0400	4.5	2683	1.7	3400	5.6	4251	1.3	5059	6.9
0401	4.5	2688	1.1	3401	2.4	4279	2.2	5102	5.8
1122	4.3	2702	7.1	3501	2.4	4283	2.0	5107	3.3
1123	3.8	2710	1.1	3507	3.3	4286	3.3	5108	3.6
1124	3.8	2727	6.8	3560	2.3	4295	3.2	5128	4.7
1320	5.8	2731	4.1	3566	3.0	4297	1.9	5129	5.9
1322	6.1	2757	1.5	3567	3.0	4299	2.6	5130	6.1
1330	3.6	2759	1.8	3568	0.8	4304	1.8	5140	4.7
1438	3.4	2790	2.1	3569	0.7	4312	2.8	5146	4.1
1452	3.6	2797	1.6	3570	3.4	4351	2.2	5160	6.8
1463	5.8	2806	3.1	3572	2.6	4354	2.3	5183	3.3
1624	4.4	2812	4.1	3573	3.1	4360	2.2	5184	6.5
1699	2.2	2819	3.1	3574	2.7	4361	0.8	5185	3.5
1701	6.8	2840	0.8	3577	0.8	4362	2.2	5186	4.1
1710	6.6	2842	2.3	3578	3.0	4410	2.6	5187	4.8
1741	6.2	2852	1.4	3579	3.0	4414	2.6	5188	3.5
1803	4.4	2881	1.7	3612	3.3	4420	0.9	5190	5.9
1925	4.0	2883	2.2	3620	2.6	4431	2.3	5191	5.1
2002	0.9	2915	3.6	3632	2.8	4432	2.5	5192	2.9
2003	2.1	2923	2.6	3634	3.1	4470	3.4	5193	4.2
2014	5.0	2960	1.1	3643	1.9	4478	2.3	5195	4.7
2030	4.9	3004	3.6	3647	2.7	4492	3.3	5201	3.3
2063	2.8	3018	3.6	3651	1.0	4494	3.2	5205	6.3
2081	1.9	3022	3.0	3681	3.0	4495	1.7	5207	6.5
2095	1.7	3030	5.9	3682	1.7	4496	2.3	5212	6.1
2102	3.6	3039	3.7	3683	1.8	4497	2.1	5213	6.2
2106	2.2	3040	2.7	3719	6.2	4498	2.0	5214	2.1
2107	0.9	3060	2.4	3724	5.2	4499	4.0	5222	6.6
2108	2.2	3066	3.4	3726	5.4	4511	3.9	5225	5.9
2109	2.7	3070	2.2	3805	2.5	4512	2.6	5348	4.1
2111	2.2	3076	1.8	3807	2.5	4557	3.6	5403	6.1
2113	3.2	3081	3.0	3808	2.7	4558	2.6	5432	5.9
2116	0.9	3082	2.1	3815	1.6	4567	2.7	5436	2.8
2117	2.5	3085	2.0	3821	1.7	4611	2.6	5443	3.1
2121	1.2	3099	3.3	3828	0.9	4623	1.9	5446	2.8
2123	1.9	3110	5.0	3830	5.1	4635	4.5	5447	5.2
2142	2.1	3131	2.9	3831	2.2	4665	2.8	5467	4.0

Table 2 - Table of Classifications by Decimalized Hazard Group

Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group
5470	3.4	7332	0.8	8063	3.2	8746	4.1	9060	2.3
5473	5.6	7360	2.3	8064	1.7	8748	2.3	9061	1.9
5474	5.1	7365	4.5	8065	2.6	8749	4.0	9066	1.7
5479	4.7	7382	2.7	8066	1.9	8755	5.7	9067	0.7
5482	6.3	7392	0.9	8070	0.7	8800	1.6	9069	1.0
5484	3.2	7403	2.0	8071	0.7	8801	1.8	9070	1.0
5485	5.8	7405	2.4	8078	1.2	8803	2.3	9079	1.3
5506	6.5	7409	6.6	8102	3.0	8804	2.0	9085	1.9
5507	5.8	7410	3.2	8103	3.1	8806	0.9	9092	2.0
5538	5.9	7413	2.4	8106	3.9	8807	1.7	9095	4.4
5542	5.9	7421	2.2	8107	3.0	8808	2.1	9096	1.0
5552	7.1	7424	6.8	8110	2.5	8810	2.4	9097	3.1
5553	6.7	7428	2.3	8111	2.5	8811	2.4	9101	3.6
5606	4.8	7429	2.0	8113	2.5	8812	2.4	9151	1.4
5610	5.1	7500	4.8	8116	0.9	8813	2.3	9154	4.3
5630	6.1	7515	5.5	8117	0.5	8818	1.3	9155	1.5
5631	5.9	7520	4.8	8204	2.5	8820	3.8	9156	0.6
5632	6.1	7538	7.5	8209	1.0	8821	2.4	9180	5.1
5633	5.9	7539	5.7	8215	5.6	8822	3.2	9181	2.9
5645	6.1	7580	6.1	8227	4.6	8823	1.6	9182	4.2
5650	4.4	7600	2.5	8232	4.8	8827	2.0	9184	2.2
5697	5.9	7601	2.0	8264	3.1	8829	1.6	9185	5.3
5951	3.8	7605	3.7	8265	4.9	8830	2.3	9220	3.7
6003	6.7	7606	2.5	8267	3.0	8831	0.9	9402	5.1
6011	6.5	7607	2.2	8278	5.9	8834	1.8	9403	3.9
6204	7.1	7610	3.7	8286	3.6	8838	3.8	9410	1.0
6206	5.3	7706	5.7	8290	2.6	8839	1.7	9420	2.1
6213	5.7	7707	6.3	8291	4.8	8840	5.4	9422	1.8
6216	6.4	7720	4.1	8292	1.2	8846	1.6	9424	3.1
6218	6.1	7721	4.0	8293	3.6	8847	1.7	9426	2.9
6220	6.7	7722	4.9	8304	3.9	8850	1.6	9501	1.3
6233	6.3	7855	6.0	8324	3.1	8851	0.9	9507	2.8
6235	6.6	8001	0.8	8350	3.0	8852	4.3	9516	3.7
6237	6.6	8004	4.0	8370	3.5	8859	2.1	9519	2.4
6251	3.8	8006	1.2	8387	1.6	8868	2.2	9521	3.2
6254	3.8	8008	0.9	8388	1.9	8870	1.6	9522	2.2
6258	6.6	8010	2.5	8389	3.0	8871	2.4	9529	6.1
6307	5.9	8013	3.5	8390	1.0	8874	2.1	9531	3.5
6308	6.5	8015	2.2	8391	2.3	8875	3.8	9549	3.6
6315	5.7	8017	1.8	8392	2.9	8901	2.4	9552	6.1
6316	5.7	8018	1.6	8393	2.8	9007	2.0	9586	1.2
6325	5.6	8019	2.4	8397	1.7	9008	1.5	9610	3.9
6361	3.6	8021	3.5	8400	3.3	9009	3.1	9620	2.6
6364	2.6	8028	4.8	8500	4.9	9010	3.4		
6400	1.9	8031	1.8	8601	6.4	9011	2.9		
6504	1.8	8032	2.4	8604	6.4	9015	3.8		
6834	1.8	8039	1.6	8631	6.6	9016	1.6		
7133	6.2	8041	2.7	8720	3.3	9031	3.2		
7198	2.8	8042	2.6	8729	2.3	9033	2.1		
7207	5.3	8046	2.1	8740	2.4	9043	2.3		
7219	4.1	8057	3.6	8741	3.2	9048	1.7		
7227	4.1	8059	2.0	8742	4.1	9050	1.4		
7232	5.6	8060	2.1	8743	3.1	9053	1.0		
7248	3.3	8061	3.6	8744	4.1	9054	1.1		
7272	6.1	8062	0.7	8745	1.6	9059	1.6		

Per Accident vs. Per Claim Limits

California defines a catastrophe as any claim involving two or more claimants. This coding allows for identification of multiple-claimant accidents when the claimants have the same employer. For multiple-claimant occurrences, claims are simulated to ultimate independently and then aggregated into accidents (catastrophes) using the California catastrophe code. There were 3,298 claims in the retro database that were aggregated into 1,211 accidents to develop LERs on a per accident basis. Each accident is assigned to the hazard group corresponding to the largest claim within the accident. Over 66% of accident dollars are associated with the largest claim of the accident; about 16% are associated with the second largest claim. The largest claims within accidents are most often of the same classification.

Extreme Value Theory and the Pareto Excess Threshold

High Limits & the Simulated/Pareto Hybrid
California's LERs are developed from the simulated ultimates for accidents below $2,000,000. Above the $2,000,000 threshold, a hazard group's frequency of claims excess $2,000,000 is the volume of simulated ultimates above $2,000,000 but the actual simulated severities of the claims are replaced with the fitted excess-$2,000,000 severity distribution for all hazard groups combined. Excess $2,000,000, there is no evidence of statistically significant differences in the distribution of severities by hazard group. A Pareto distribution is used to fit the values excess $2,000,000. The use of the Pareto distribution comports with extreme value theory, which holds that, for a sufficiently large threshold, the excess has a Pareto type IV distribution.[10]

The final LERs by hazard group are shown in Exhibit 3.

[10] A Pareto type IV has the cumulative distribution function, $F(x) = 1 – [1 + (x / \sigma)^{(1/\gamma)}]^{(-\alpha)}$, where x = the original loss amount less $2,000,000.

Tables of Insurance Charges

The table of unlimited insurance charges, or *Table M*, is based on the retro database. Tables of insurance charges have been updated for September 1, 2024.

The updated tables of insurance charges for September 1, 2024 are available on the WCIRB website.

Hazard Group Severity Multipliers

Hazard group severity multipliers are used to adjust a risk's expected losses to a level appropriate for determining insurance charges. The hazard group severity multiplier adjusts a risk's expected losses to a level reflecting the severity of all hazard groups combined. For a given limit, the hazard group severity multipliers are the severity for all hazard groups combined divided by the severity for each hazard group. These factors are shown in Exhibit 4.

Allocated Loss Adjustment Expense (ALAE)

Parallel sets of loss elimination ratios, hazard group severity multipliers, and tables of insurance charges are developed on a loss and allocated loss adjustment expense basis. Allocated loss adjustment expense is reflected by multiplying each claim by a stochastic ALAE loading factor based on claim size *at ultimate*.[11] The aggregate average factors across simulations are shown in Table 3. The ALAE loadings are based on a study of cumulative paid ALAE by size of claim observed at Survey, balanced to an aggregate ALAE loading of 19.9%, the most recently indicated ALAE loading at time of table preparation. Loss and ALAE Elimination Ratios by hazard group are shown in Exhibit 5. Loss and ALAE severity multipliers are shown in Exhibit 6.

Note that the loadings do not vary by indemnity and medical. Further information on the development of the stochastic loadings is provided in Appendix 2013-C. The effective aggregate loadings by size of claim at ultimate are shown in Table 3. An off-balance was applied to these loadings to ensure that the aggregate ALAE load shown in Table 3—that used in the pure premium ratemaking process at the time of database preparation—was achieved.

Table 3: September 1, 2024 ALAE Loads by Size of Claim at Ultimate After Trend & On-Level

Claim Size at Ultimate		ALAE Load		
Lower	Upper	Closed[1]	Open[2]	All[3]
0	7,457	0.218	1.900	0.248
7,457	14,915	0.272	1.632	0.372
14,915	29,830	0.269	1.144	0.362
29,830	59,660	0.226	0.672	0.301
59,660	89,490	0.192	0.422	0.247
89,490	119,320	0.169	0.331	0.219
119,320	149,150	0.153	0.272	0.199
149,150	223,724	0.133	0.228	0.181
223,724	298,299	0.112	0.202	0.170
298,299	596,598	0.090	0.170	0.153
596,598	894,897	0.063	0.139	0.130
894,897	1,193,196	0.054	0.116	0.110
1,193,196	1,491,496	0.048	0.108	0.101
1,491,496	1,938,944	0.038	0.099	0.092
1,938,944	2,684,692	0.042	0.084	0.079
2,684,692	3,579,589	0.030	0.075	0.067
3,579,589	Unlimited	0.030	0.060	0.057
All Sizes Combined		0.184	0.215	0.199

[1] Flat load for claims closed at USR, not reopening.
[2] Aggregate result of stochastic loads for claims open at USR or reopening.
[3] Aggregate result of loads for all claims.

[11] The methodology assumes that observations of ALAE relationships at Survey are reasonably representative of relationships at ultimate.

The stochastic ALAE loads for each open and reopening claim were drawn from a gamma distribution. The parameters of the selected distributions, by claim size at ultimate, are shown in Table 4. There is a chance, particularly for small claims, that a claim will not have ALAE. This is the Zero ALAE Probability parameter shown in Table 4. The Shape and Scale parameters are used to draw from the gamma distribution, given that the ALAE for the claim is greater than zero.

Table 4: September 1, 2024 Selected Parameters for ALAE Load Gamma Fit

Size at Ultimate		Gamma Parameters		
[Lower	Upper)	Shape	Scale	Zero ALAE Probability
0	7,457	0.335	7.233	33.73%
7,457	14,915	0.501	3.709	26.09%
14,915	29,830	0.629	1.879	18.64%
29,830	59,660	0.691	0.916	10.70%
59,660	89,490	0.765	0.494	6.28%
89,490	119,320	0.882	0.330	4.35%
119,320	149,150	0.941	0.251	3.30%
149,150	223,724	1.060	0.185	2.36%
223,724	298,299	1.211	0.143	1.69%
298,299	596,598	1.472	0.098	1.14%
596,598	894,897	1.775	0.066	0.81%
894,897	1,193,196	1.939	0.051	0.70%
1,193,196	1,491,496	2.179	0.042	0.65%
1,491,496	1,938,944	2.264	0.037	0.61%
1,938,944	2,684,692	2.280	0.031	0.58%
2,684,692	3,579,589	2.163	0.029	0.56%
3,579,589	Unlimited	1.808	0.028	0.54%

Development Premiums

Development premiums are an elective element intended to stabilize cash flows between insured and insurer over the early adjustments in a retrospective rating plan. For a given accident limit, the development premium factor = 1 – (1 / LDF_{ij}) where LDF is the development factor to ultimate, i denotes the accident limit, and j denotes the USR report level.

The factors have been developed for limits on a pure loss basis. The development premium factors for all hazard groups combined are shown in Table 5. Development premium factors by retro hazard group as well as the factors for all hazard groups combined are available on the WCIRB's website.

Table 5: Retro Development Premium Factors

	Pure Loss				
Accident Limit	1st to Ultimate	2nd to Ultimate	3rd to Ultimate	4th to Ultimate	5th to Ultimate
50,000	0.174	0.091	0.066	0.052	0.040
75,000	0.221	0.106	0.072	0.054	0.041
100,000	**0.262**	**0.125**	**0.081**	**0.059**	**0.045**
150,000	0.317	0.158	0.100	0.071	0.052
200,000	0.347	0.183	0.117	0.082	0.060
250,000	**0.366**	**0.201**	**0.131**	**0.092**	**0.067**
300,000	0.378	0.215	0.143	0.101	0.074
400,000	0.393	0.233	0.160	0.115	0.085
500,000	**0.402**	**0.244**	**0.172**	**0.126**	**0.094**
600,000	0.408	0.252	0.180	0.134	0.100
700,000	0.412	0.258	0.186	0.140	0.105
800,000	0.416	0.263	0.191	0.144	0.110
900,000	0.419	0.266	0.195	0.148	0.114
1,000,000	**0.421**	**0.270**	**0.198**	**0.152**	**0.117**
2,000,000	0.434	0.286	0.217	0.170	0.135
3,000,000	0.439	0.294	0.224	0.179	0.143
4,000,000	0.441	0.298	0.229	0.184	0.149
5,000,000	**0.443**	**0.301**	**0.232**	**0.187**	**0.152**
6,000,000	0.444	0.303	0.235	0.190	0.155
7,000,000	0.445	0.304	0.237	0.192	0.157
8,000,000	0.446	0.305	0.239	0.194	0.159
9,000,000	0.446	0.306	0.240	0.195	0.160
10,000,000	**0.447**	**0.307**	**0.241**	**0.196**	**0.162**
15,000,000	0.449	0.310	0.244	0.200	0.166
20,000,000	0.450	0.312	0.247	0.203	0.169
Unlimited	**0.452**	**0.315**	**0.249**	**0.205**	**0.171**

Exhibit 1 - Sample Age and Layer Table

Age 90 to 102, Total Incurred Between $137,333 and $206,000

Medical		Indemnity Link Range	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90		1.00	1.10	1.20	1.30		2.90	Ind		
Link Range		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.00	1.10	1.20	1.30	1.40		3.00	Cat	Closing	Total
0.00		0.09%								0.01%			0.01%									0.13%
0.00	0.10	0.01%	0.02%					0.01%				0.02%	0.03%									0.10%
0.10	0.20	0.01%	0.01%	0.01%	0.01%	0.01%		0.01%		0.02%	0.01%	0.01%	0.03%	0.02%								0.16%
0.20	0.30	0.01%	0.03%	0.01%			0.01%	0.01%	0.01%	0.02%		0.06%	0.05%	0.01%		0.01%						0.24%
0.30	0.40		0.01%	0.01%		0.02%	0.01%		0.02%	0.01%	0.02%	0.11%	0.14%	0.02%			0.01%	Not				0.41%
0.40	0.50	0.01%	0.01%	0.01%	0.01%	0.01%	0.03%	0.01%	0.01%	0.02%	0.03%	0.13%	0.18%	0.01%	0.01%			All				0.52%
0.50	0.60		0.01%	0.02%	0.01%	0.01%	0.01%	0.02%	0.02%	0.04%	0.03%	0.23%	0.25%	0.04%	0.01%	0.01%	0.02%	Detail				0.77%
0.60	0.70		0.01%		0.01%	0.02%	0.03%	0.01%	0.03%	0.05%	0.06%	0.23%	0.39%	0.08%	0.03%	0.03%	0.02%	Shown.				1.07%
0.70	0.80	0.01%				0.02%	0.02%	0.02%	0.05%	0.05%	0.09%	0.36%	0.50%	0.09%	0.02%	0.03%	0.02%					1.35%
0.80	0.90		0.01%		0.01%	0.01%	0.02%	0.01%	0.04%	0.08%	0.12%	0.40%	0.92%	0.14%	0.05%	0.03%	0.04%					2.04%
0.90	1.00		0.01%		0.02%	0.02%	0.03%	0.05%	0.07%	0.09%	0.15%	0.73%	3.23%	0.45%	0.12%	0.06%	0.04%					5.26%
1.00		0.03%	0.01%	0.02%	0.04%	0.03%	0.05%	0.05%	0.14%	0.17%	0.20%	0.78%	31.69%	0.72%	0.24%	0.11%	0.09%					34.72%
1.00	1.10	0.01%	0.01%	0.01%	0.01%	0.03%	0.03%	0.08%	0.09%	0.15%	0.19%	0.81%	8.61%	0.91%	0.23%	0.15%	0.13%					11.81%
1.10	1.20				0.01%	0.01%	0.01%	0.04%	0.04%	0.09%	0.12%	0.40%	2.21%	0.45%	0.17%	0.13%	0.08%		0.01%			4.14%
1.20	1.30					0.01%	0.02%	0.04%	0.06%	0.08%	0.05%	0.27%	1.34%	0.35%	0.11%	0.08%	0.06%		0.01%			2.84%
1.30	1.40			0.01%	0.01%		0.02%	0.03%	0.03%	0.04%	0.05%	0.16%	0.99%	0.25%	0.12%	0.07%	0.07%		0.02%			2.15%
1.40	1.50						0.02%	0.02%	0.02%	0.03%	0.06%	0.11%	0.72%	0.23%	0.07%	0.06%	0.03%					1.58%
1.50	1.60			0.01%			0.01%	0.02%	0.02%	0.02%	0.04%	0.08%	0.52%	0.14%	0.06%	0.06%	0.05%					1.18%
1.60	1.70						0.01%	0.02%	0.01%	0.03%	0.04%	0.12%	0.41%	0.13%	0.03%	0.04%	0.03%					1.00%
1.70	1.80						0.01%		0.01%	0.03%	0.02%	0.07%	0.28%	0.10%	0.03%	0.04%	0.02%					0.73%
1.80	1.90								0.01%	0.01%	0.03%	0.05%	0.29%	0.08%	0.02%	0.02%	0.02%	Not				0.65%
1.90	2.00								0.01%		0.02%	0.03%	0.21%	0.06%	0.02%	0.01%	0.01%	All				0.48%
2.00	2.10							0.01%	0.01%	0.01%	0.01%	0.03%	0.14%	0.04%	0.01%	0.01%	0.02%	Detail				0.39%
2.10	2.20							0.01%	0.01%			0.03%	0.14%	0.05%	0.01%	0.01%	0.01%	Shown.	0.01%			0.34%
2.20	2.30								0.01%		0.01%	0.02%	0.14%	0.03%	0.02%	0.01%	0.01%					0.29%
2.30	2.40										0.01%	0.02%	0.11%	0.03%	0.01%	0.01%	0.01%					0.24%
2.40	2.50								0.01%		0.01%	0.03%	0.07%	0.01%	0.01%		0.01%					0.20%
2.50	2.60										0.01%	0.02%	0.06%	0.02%			0.01%					0.16%
2.60	2.70							0.01%				0.01%	0.08%	0.02%	0.01%		0.01%		0.01%			0.19%
2.70	2.80											0.02%	0.05%	0.02%								0.16%
2.80	2.90											0.02%	0.06%	0.01%		0.01%						0.12%
2.90	3.00										0.01%	0.01%	0.06%	0.01%		0.01%						0.12%
Med	Cat																			0.44%		0.44%
	Closing																				24.00%	24.00%
	Total	0.19%	0.16%	0.12%	0.16%	0.22%	0.37%	0.48%	0.73%	1.08%	1.41%	5.36%	53.94%	4.52%	1.40%	1.02%	0.81%		0.06%	0.44%	24.00%	100.00%

Exhibit 2 - Table of Classifications by California Hazard Group

Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group
0005	2	2150	3	3146	2	3840	2	4683	3
0016	2	2163	3	3152	2	4000	4	4691	2
0034	3	2211	3	3165	1	4034	4	4692	4
0035	2	2222	3	3169	4	4036	4	4717	2
0036	2	2362	4	3175	3	4038	2	4720	1
0038	5	2402	3	3178	1	4041	1	4740	5
0040	2	2413	3	3179	2	4049	2	4771	4
0041	2	2501	1	3180	4	4111	2	4828	4
0042	2	2570	2	3220	3	4112	1	4829	3
0044	4	2571	2	3241	2	4114	3	4831	2
0045	4	2576	3	3255	1	4130	4	4922	3
0050	6	2578	1	3257	1	4133	2	4983	4
0079	2	2584	1	3300	1	4150	2	5020	4
0096	4	2585	1	3339	4	4239	3	5027	5
0106	7	2586	1	3365	3	4240	2	5028	5
0171	4	2589	2	3372	3	4243	3	5029	5
0172	2	2623	1	3373	3	4244	5	5040	7
0251	5	2660	2	3383	3	4250	3	5057	6
0400	5	2683	2	3400	6	4251	1	5059	7
0401	5	2688	1	3401	2	4279	2	5102	6
1122	4	2702	7	3501	2	4283	2	5107	3
1123	4	2710	1	3507	3	4286	3	5108	4
1124	4	2727	7	3560	2	4295	3	5128	5
1320	6	2731	4	3566	3	4297	2	5129	6
1322	6	2757	2	3567	3	4299	3	5130	6
1330	4	2759	2	3568	1	4304	2	5140	5
1438	3	2790	2	3569	1	4312	3	5146	4
1452	4	2797	2	3570	3	4351	2	5160	7
1463	6	2806	3	3572	3	4354	2	5183	3
1624	4	2812	4	3573	3	4360	2	5184	7
1699	2	2819	3	3574	3	4361	1	5185	4
1701	7	2840	1	3577	1	4362	2	5186	4
1710	7	2842	2	3578	3	4410	3	5187	5
1741	6	2852	1	3579	3	4414	3	5188	4
1803	4	2881	2	3612	3	4420	1	5190	6
1925	4	2883	2	3620	3	4431	2	5191	5
2002	1	2915	4	3632	3	4432	3	5192	3
2003	2	2923	3	3634	3	4470	3	5193	4
2014	5	2960	1	3643	2	4478	2	5195	5
2030	5	3004	4	3647	3	4492	3	5201	3
2063	3	3018	4	3651	1	4494	3	5205	6
2081	2	3022	3	3681	3	4495	2	5207	7
2095	2	3030	6	3682	2	4496	2	5212	6
2102	4	3039	4	3683	2	4497	2	5213	6
2106	2	3040	3	3719	6	4498	2	5214	2
2107	1	3060	2	3724	5	4499	4	5222	7
2108	2	3066	3	3726	5	4511	4	5225	6
2109	3	3070	2	3805	2	4512	3	5348	4
2111	2	3076	2	3807	2	4557	4	5403	6
2113	3	3081	3	3808	3	4558	3	5432	6
2116	1	3082	2	3815	2	4567	3	5436	3
2117	2	3085	2	3821	2	4611	3	5443	3
2121	1	3099	3	3828	1	4623	2	5446	3
2123	2	3110	5	3830	5	4635	4	5447	5
2142	2	3131	3	3831	2	4665	3	5467	4

Exhibit 2 - Table of Classifications by California Hazard Group

Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group	Class No.	Hazard Group
5470	3	7332	1	8063	3	8746	4	9060	2
5473	6	7360	2	8064	2	8748	2	9061	2
5474	5	7365	5	8065	3	8749	4	9066	2
5479	5	7382	3	8066	2	8755	6	9067	1
5482	6	7392	1	8070	1	8800	2	9069	1
5484	3	7403	2	8071	1	8801	2	9070	1
5485	6	7405	2	8078	1	8803	2	9079	1
5506	7	7409	7	8102	3	8804	2	9085	2
5507	6	7410	3	8103	3	8806	1	9092	2
5538	6	7413	2	8106	4	8807	2	9095	4
5542	6	7421	2	8107	3	8808	2	9096	1
5552	7	7424	7	8110	2	8810	2	9097	3
5553	7	7428	2	8111	2	8811	2	9101	4
5606	5	7429	2	8113	2	8812	2	9151	1
5610	5	7500	5	8116	1	8813	2	9154	4
5630	6	7515	6	8117	1	8818	1	9155	2
5631	6	7520	5	8204	2	8820	4	9156	1
5632	6	7538	7	8209	1	8821	2	9180	5
5633	6	7539	6	8215	6	8822	3	9181	3
5645	6	7580	6	8227	5	8823	2	9182	4
5650	4	7600	2	8232	5	8827	2	9184	2
5697	6	7601	2	8264	3	8829	2	9185	5
5951	4	7605	4	8265	5	8830	2	9220	4
6003	7	7606	2	8267	3	8831	1	9402	5
6011	7	7607	2	8278	6	8834	2	9403	4
6204	7	7610	4	8286	4	8838	4	9410	1
6206	5	7706	6	8290	3	8839	2	9420	2
6213	6	7707	6	8291	5	8840	5	9422	2
6216	6	7720	4	8292	1	8846	2	9424	3
6218	6	7721	4	8293	4	8847	2	9426	3
6220	7	7722	5	8304	4	8850	2	9501	1
6233	6	7855	6	8324	3	8851	1	9507	3
6235	7	8001	1	8350	3	8852	4	9516	4
6237	7	8004	4	8370	4	8859	2	9519	2
6251	4	8006	1	8387	2	8868	2	9521	3
6254	4	8008	1	8388	2	8870	2	9522	2
6258	7	8010	2	8389	3	8871	2	9529	6
6307	6	8013	4	8390	1	8874	2	9531	4
6308	7	8015	2	8391	2	8875	4	9549	4
6315	6	8017	2	8392	3	8901	2	9552	6
6316	6	8018	2	8393	3	9007	2	9586	1
6325	6	8019	2	8397	2	9008	2	9610	4
6361	4	8021	4	8400	3	9009	3	9620	3
6364	3	8028	5	8500	5	9010	3		
6400	2	8031	2	8601	6	9011	3		
6504	2	8032	2	8604	6	9015	4		
6834	2	8039	2	8631	7	9016	2		
7133	6	8041	3	8720	3	9031	3		
7198	3	8042	3	8729	2	9033	2		
7207	5	8046	2	8740	2	9043	2		
7219	4	8057	4	8741	3	9048	2		
7227	4	8059	2	8742	4	9050	1		
7232	6	8060	2	8743	3	9053	1		
7248	3	8061	4	8744	4	9054	1		
7272	6	8062	1	8745	2	9059	2		

Exhibit 3 - Table of Loss Elimination Ratios by California Hazard Group

Accident	California Hazard Group							
Limit	1	2	3	4	5	6	7	All
500	0.974	0.979	0.983	0.985	0.987	0.990	0.992	0.981
1,000	0.956	0.964	0.971	0.974	0.977	0.982	0.986	0.968
2,000	0.928	0.940	0.951	0.956	0.961	0.970	0.977	0.946
3,000	0.903	0.920	0.933	0.941	0.947	0.959	0.968	0.927
4,000	0.881	0.901	0.917	0.926	0.935	0.949	0.960	0.910
5,000	0.861	0.884	0.903	0.913	0.923	0.940	0.952	0.895
10,000	0.782	0.816	0.843	0.858	0.875	0.901	0.920	0.832
15,000	0.720	0.761	0.795	0.814	0.836	0.868	0.893	0.782
20,000	0.667	0.714	0.752	0.776	0.801	0.839	0.869	0.738
25,000	**0.622**	**0.673**	**0.715**	**0.742**	**0.770**	**0.812**	**0.847**	**0.700**
35,000	0.546	0.602	0.650	0.683	0.716	0.766	0.808	0.634
50,000	0.458	0.517	0.571	0.610	0.648	0.707	0.757	0.555
75,000	0.355	0.415	0.472	0.519	0.561	0.628	0.689	0.458
100,000	**0.288**	**0.345**	**0.400**	**0.452**	**0.495**	**0.566**	**0.636**	**0.390**
150,000	0.212	0.259	0.307	0.363	0.403	0.480	0.558	0.304
200,000	0.171	0.210	0.252	0.308	0.345	0.425	0.504	0.254
250,000	**0.146**	**0.180**	**0.218**	**0.272**	**0.306**	**0.387**	**0.465**	**0.222**
300,000	0.130	0.160	0.194	0.247	0.279	0.359	0.436	0.200
400,000	0.108	0.133	0.163	0.213	0.242	0.322	0.393	0.171
500,000	**0.095**	**0.117**	**0.144**	**0.190**	**0.218**	**0.296**	**0.363**	**0.152**
600,000	0.085	0.105	0.130	0.174	0.201	0.277	0.339	0.139
700,000	0.078	0.096	0.119	0.161	0.186	0.261	0.319	0.128
800,000	0.072	0.089	0.110	0.151	0.174	0.247	0.302	0.120
900,000	0.067	0.083	0.103	0.142	0.164	0.236	0.288	0.113
1,000,000	**0.063**	**0.078**	**0.097**	**0.135**	**0.155**	**0.225**	**0.274**	**0.107**
2,000,000	0.041	0.051	0.063	0.089	0.103	0.155	0.187	0.071
3,000,000	0.031	0.038	0.047	0.067	0.077	0.117	0.140	0.053
4,000,000	0.025	0.031	0.038	0.053	0.061	0.093	0.111	0.042
5,000,000	**0.020**	**0.025**	**0.031**	**0.043**	**0.050**	**0.076**	**0.091**	**0.034**
6,000,000	0.017	0.021	0.026	0.036	0.042	0.063	0.076	0.029
7,000,000	0.014	0.017	0.022	0.030	0.035	0.053	0.064	0.024
8,000,000	0.012	0.015	0.018	0.026	0.030	0.045	0.054	0.020
9,000,000	0.010	0.013	0.016	0.022	0.026	0.039	0.046	0.018
10,000,000	**0.009**	**0.011**	**0.013**	**0.019**	**0.022**	**0.033**	**0.040**	**0.015**
15,000,000	0.004	0.005	0.006	0.009	0.011	0.016	0.019	0.007
20,000,000	0.002	0.002	0.003	0.004	0.005	0.007	0.009	0.003

Exhibit 4 - Pure Loss Severity Multipliers

Accident	California Hazard Group							
Limit	1	2	3	4	5	6	7	All
500	1.012	1.003	0.988	0.994	0.983	0.977	0.972	1.000
1,000	1.028	1.003	0.979	0.982	0.972	0.960	0.943	1.000
2,000	1.045	1.004	0.971	0.966	0.965	0.944	0.911	1.000
3,000	1.055	1.005	0.968	0.957	0.959	0.933	0.892	1.000
4,000	1.061	1.005	0.965	0.951	0.956	0.925	0.879	1.000
5,000	1.066	1.006	0.963	0.946	0.953	0.918	0.869	1.000
10,000	1.082	1.011	0.954	0.931	0.937	0.888	0.831	1.000
15,000	1.095	1.015	0.947	0.923	0.926	0.867	0.806	1.000
20,000	1.106	1.016	0.941	0.917	0.917	0.851	0.787	1.000
25,000	**1.116**	**1.018**	**0.937**	**0.913**	**0.909**	**0.839**	**0.772**	**1.000**
35,000	1.133	1.019	0.930	0.906	0.896	0.819	0.749	1.000
50,000	1.154	1.022	0.923	0.897	0.881	0.794	0.721	1.000
75,000	1.181	1.027	0.913	0.885	0.859	0.762	0.686	1.000
100,000	**1.204**	**1.033**	**0.905**	**0.874**	**0.840**	**0.737**	**0.659**	**1.000**
150,000	1.240	1.041	0.894	0.857	0.811	0.701	0.620	1.000
200,000	1.264	1.048	0.888	0.846	0.792	0.679	0.592	1.000
250,000	**1.280**	**1.053**	**0.885**	**0.839**	**0.780**	**0.664**	**0.573**	**1.000**
300,000	1.291	1.056	0.883	0.834	0.772	0.654	0.558	1.000
400,000	1.306	1.061	0.881	0.827	0.761	0.640	0.538	1.000
500,000	**1.315**	**1.064**	**0.881**	**0.822**	**0.754**	**0.631**	**0.524**	**1.000**
600,000	1.322	1.067	0.880	0.818	0.749	0.623	0.513	1.000
700,000	1.327	1.070	0.880	0.816	0.745	0.617	0.504	1.000
800,000	1.332	1.072	0.880	0.814	0.742	0.612	0.497	1.000
900,000	1.336	1.073	0.880	0.812	0.738	0.608	0.490	1.000
1,000,000	**1.340**	**1.075**	**0.880**	**0.810**	**0.736**	**0.604**	**0.485**	**1.000**
2,000,000	1.361	1.086	0.882	0.801	0.721	0.576	0.450	1.000
3,000,000	1.373	1.092	0.884	0.797	0.714	0.561	0.434	1.000
4,000,000	1.379	1.096	0.885	0.794	0.710	0.553	0.424	1.000
5,000,000	**1.384**	**1.098**	**0.886**	**0.792**	**0.707**	**0.547**	**0.418**	**1.000**
6,000,000	1.387	1.100	0.887	0.791	0.705	0.543	0.414	1.000
7,000,000	1.390	1.101	0.887	0.790	0.704	0.540	0.410	1.000
8,000,000	1.392	1.103	0.888	0.789	0.702	0.537	0.408	1.000
9,000,000	1.394	1.103	0.888	0.789	0.701	0.535	0.406	1.000
10,000,000	**1.396**	**1.104**	**0.888**	**0.788**	**0.701**	**0.533**	**0.404**	**1.000**
15,000,000	1.400	1.107	0.889	0.786	0.698	0.528	0.399	1.000
20,000,000	1.402	1.108	0.889	0.786	0.697	0.526	0.396	1.000

Exhibit 5 - Table of Loss & ALAE Elimination Ratios by California Hazard Group

Accident Limit	California Hazard Group 1	2	3	4	5	6	7	All
500	0.978	0.982	0.986	0.987	0.988	0.991	0.993	0.984
1,000	0.962	0.969	0.974	0.977	0.979	0.984	0.988	0.972
2,000	0.937	0.948	0.957	0.961	0.965	0.973	0.978	0.952
3,000	0.917	0.930	0.942	0.947	0.953	0.963	0.970	0.936
4,000	0.898	0.914	0.927	0.935	0.942	0.954	0.963	0.921
5,000	0.880	0.899	0.914	0.923	0.931	0.945	0.956	0.907
10,000	0.808	0.836	0.860	0.872	0.887	0.908	0.926	0.850
15,000	0.752	0.787	0.816	0.832	0.850	0.877	0.900	0.803
20,000	0.703	0.743	0.777	0.796	0.817	0.849	0.876	0.763
25,000	**0.660**	**0.704**	**0.741**	**0.763**	**0.787**	**0.824**	**0.855**	**0.726**
35,000	0.586	0.636	0.679	0.706	0.735	0.778	0.816	0.663
50,000	0.500	0.553	0.602	0.635	0.669	0.720	0.766	0.585
75,000	0.392	0.449	0.502	0.543	0.582	0.641	0.697	0.486
100,000	**0.318**	**0.374**	**0.428**	**0.473**	**0.514**	**0.578**	**0.642**	**0.414**
150,000	0.229	0.277	0.327	0.376	0.417	0.486	0.560	0.318
200,000	0.180	0.221	0.265	0.315	0.353	0.425	0.503	0.261
250,000	**0.150**	**0.186**	**0.225**	**0.274**	**0.310**	**0.383**	**0.461**	**0.225**
300,000	0.130	0.162	0.198	0.246	0.279	0.352	0.429	0.199
400,000	0.106	0.132	0.163	0.208	0.238	0.311	0.383	0.167
500,000	**0.091**	**0.114**	**0.141**	**0.184**	**0.212**	**0.283**	**0.352**	**0.146**
600,000	0.081	0.101	0.126	0.167	0.193	0.262	0.327	0.132
700,000	0.073	0.092	0.115	0.154	0.179	0.246	0.306	0.121
800,000	0.067	0.084	0.106	0.143	0.167	0.232	0.290	0.112
900,000	0.063	0.079	0.099	0.134	0.157	0.221	0.275	0.105
1,000,000	**0.059**	**0.074**	**0.093**	**0.127**	**0.148**	**0.210**	**0.262**	**0.099**
2,000,000	0.038	0.048	0.060	0.084	0.097	0.144	0.177	0.065
3,000,000	0.028	0.036	0.045	0.063	0.073	0.108	0.133	0.049
4,000,000	0.023	0.028	0.036	0.050	0.058	0.086	0.106	0.039
5,000,000	**0.019**	**0.023**	**0.029**	**0.041**	**0.048**	**0.070**	**0.087**	**0.032**
6,000,000	0.016	0.020	0.025	0.034	0.040	0.059	0.073	0.027
7,000,000	0.013	0.017	0.021	0.029	0.034	0.050	0.062	0.023
8,000,000	0.011	0.014	0.018	0.025	0.029	0.043	0.053	0.019
9,000,000	0.010	0.012	0.015	0.022	0.025	0.037	0.045	0.017
10,000,000	**0.008**	**0.011**	**0.013**	**0.019**	**0.022**	**0.032**	**0.039**	**0.015**
15,000,000	0.004	0.005	0.007	0.009	0.011	0.016	0.020	0.007
20,000,000	0.002	0.003	0.003	0.005	0.005	0.008	0.010	0.004

Exhibit 6 - Loss & ALAE Severity Multipliers

Accident	California Hazard Group							
Limit	1	2	3	4	5	6	7	All
500	1.009	1.002	0.991	0.997	0.986	0.983	0.979	1.000
1,000	1.023	1.003	0.981	0.986	0.974	0.964	0.951	1.000
2,000	1.040	1.003	0.973	0.971	0.967	0.949	0.920	1.000
3,000	1.050	1.004	0.970	0.961	0.962	0.938	0.901	1.000
4,000	1.057	1.005	0.967	0.955	0.958	0.930	0.888	1.000
5,000	1.061	1.005	0.965	0.950	0.956	0.924	0.878	1.000
10,000	1.077	1.010	0.958	0.935	0.943	0.899	0.843	1.000
15,000	1.087	1.013	0.951	0.926	0.932	0.879	0.819	1.000
20,000	1.097	1.015	0.946	0.921	0.923	0.863	0.801	1.000
25,000	**1.106**	**1.017**	**0.941**	**0.917**	**0.917**	**0.852**	**0.787**	**1.000**
35,000	1.121	1.018	0.935	0.910	0.905	0.833	0.766	1.000
50,000	1.139	1.021	0.928	0.902	0.892	0.812	0.741	1.000
75,000	1.162	1.025	0.919	0.891	0.874	0.784	0.709	1.000
100,000	**1.182**	**1.029**	**0.912**	**0.882**	**0.858**	**0.761**	**0.684**	**1.000**
150,000	1.214	1.036	0.901	0.866	0.831	0.727	0.647	1.000
200,000	1.237	1.042	0.895	0.855	0.812	0.704	0.621	1.000
250,000	**1.253**	**1.047**	**0.891**	**0.847**	**0.800**	**0.688**	**0.601**	**1.000**
300,000	1.265	1.050	0.888	0.842	0.790	0.677	0.585	1.000
400,000	1.280	1.055	0.886	0.835	0.779	0.662	0.564	1.000
500,000	**1.290**	**1.058**	**0.885**	**0.830**	**0.771**	**0.652**	**0.550**	**1.000**
600,000	1.297	1.061	0.884	0.826	0.766	0.645	0.538	1.000
700,000	1.303	1.063	0.884	0.823	0.762	0.638	0.529	1.000
800,000	1.307	1.065	0.884	0.821	0.758	0.633	0.522	1.000
900,000	1.311	1.067	0.884	0.819	0.755	0.629	0.515	1.000
1,000,000	**1.314**	**1.068**	**0.884**	**0.818**	**0.752**	**0.625**	**0.509**	**1.000**
2,000,000	1.334	1.078	0.885	0.809	0.737	0.598	0.474	1.000
3,000,000	1.345	1.083	0.887	0.805	0.730	0.584	0.458	1.000
4,000,000	1.351	1.087	0.887	0.802	0.726	0.576	0.449	1.000
5,000,000	**1.355**	**1.089**	**0.888**	**0.800**	**0.723**	**0.570**	**0.443**	**1.000**
6,000,000	1.358	1.090	0.888	0.799	0.721	0.566	0.438	1.000
7,000,000	1.360	1.092	0.889	0.798	0.720	0.563	0.435	1.000
8,000,000	1.362	1.093	0.889	0.797	0.719	0.561	0.432	1.000
9,000,000	1.364	1.094	0.889	0.797	0.718	0.559	0.430	1.000
10,000,000	**1.365**	**1.094**	**0.889**	**0.796**	**0.717**	**0.558**	**0.428**	**1.000**
15,000,000	1.369	1.096	0.890	0.795	0.714	0.553	0.423	1.000
20,000,000	1.372	1.098	0.890	0.794	0.713	0.550	0.420	1.000

Appendix 2013-A: Discussion of Stochastic Loss Development Methodology

This appendix, from the technical documentation underlying the 2013 retro database, is repeated here to address common questions and issues.

The large increase in the 2011 LERs from the 2008 LERs precipitated an extensive investigation into a number of issues. Most of the large increase was sourced to changes in trend selections as well as changes in the starting size of loss distribution and its indemnity/medical composition. Evidence supporting the reasonableness of the simulated volume of large claims and the level of dispersion was developed. The discussion of these issues is provided in Appendix A of the 2011 California Retrospective Rating Plan Technical Documentation.

Research into issues surrounding the simulated volume of large claims and the simulated level of dispersion continued in 2011 in advance of the preparation of the 2013 Retro. In 2011, the WCIRB brought together a group of actuaries to review the WCIRB's stochastic simulation model with particular a focus on the reasonableness of the size and volume of simulated large claims. This appendix documents the major findings of this review. Though the review was broad, the principal issues can be summarized by two basic questions:

How large is reasonable for the very largest simulated claims?
How thick is reasonable for the tail of the simulated size of loss distribution?

Investigating these questions required developing empirical benchmarks of reasonableness against which to assess simulated results. The Survey provides empirical data for a portfolio of open claims. The Survey can provide, for example, empirical data on the share of open claims aged 10 years or greater that is aged 40-44 years, or the share of claims aged 40-44 years that exceed a given threshold. A simulated portfolio of open claims can be compared to these Survey measures to evaluate reasonableness.[12] The results shown in this appendix are for the methodology discussed in this Technical Document. Results for alternative methodologies were also examined and informed methodological revisions. For simplicity, these latter results are not presented.

Comparisons of the Survey and simulated age structures are relatively straightforward. Table A1 shows the shares of open claims aged 10+ years in five-year increments for both Survey and simulated claims. Such comparisons were also done on individual years.

Table A1: Open Claims at a Given Age as a Percent of All Open Claims[1]

Claim Age in Years	Simulation	Survey	Survey Adj. for Asbestosis[2]
45-49	0.8%	1.0%	0.2%
40-44	1.9%	3.1%	0.8%
35-39	3.2%	4.4%	1.6%
30-34	5.3%	5.5%	2.7%
25-29	8.8%	6.8%	3.5%
20-24	14.0%	10.9%	12.5%
15-19	22.2%	20.6%	23.8%
10-14	43.9%	47.7%	54.9%

[1] Open claims between ten and forty-nine years old.

[2] Excludes claims that are both less than $20,000 and at least 25 years old.

[12] The simulated portfolio of open claims was developed by simulating claims to each age and then aggregating only the open claims at each age.

In evaluating the comparisons, judgment is required to account for differences between the Survey and simulated portfolios. The simulated portfolio is built from a few recent starting years and developed stochastically using the most recent three calendar years' development patterns. The starting years and development patterns reflected in the Survey data are far more heterogeneous, spanning many decades. Significant changes that impact the age distributions observed in today's Surveys relative to simulated age distributions include the 1972 change in waiting period, the 1980s slowdown in closing rates, the Margolin-Bill Greene Workers' Compensation Reform Act of 1989, the turn of the century wave of insolvencies, among others.

One particularly material difference between the Survey and simulated data is the incidence of asbestosis claims. Large volumes (by claim count) of asbestosis claims are present in the Survey for old years. These claims tend to be small, partly as they are typically covered jointly by many insurers. Given that far fewer asbestosis claims are contemplated in the simulation, a comparison with Survey data adjusted for asbestosis incidence is appropriate. Which Survey observations are asbestosis is unknown, but an attempt to adjust for them is made by comparing Survey distributions excluding observations aged 25+ years and smaller than $20,000. This asbestosis adjustment is crude given the lack of information.[13] Nevertheless, allowing for asbestosis and other differences, the consensus of the group was that the observed and simulated age structures were reasonable.

Comparison of Survey and Simulated Excess Shares
Comparisons of Survey and simulated claim shares excess key thresholds would allow an evaluation of the reasonableness of the simulated dispersion and tail thickness. For this task, threshold sizes that vary by age were sought to normalize for differences in starting period cost levels across time. This would permit a comparison of Survey and simulated exceedance rates by age. Again, judgmental allowances will be needed to recognize that Survey exceedances, developing from decades of starting years and calendar years of development patterns, are more heterogeneous than simulated exceedances.

Many potential thresholds were investigated. The selected threshold was the maximum total incurred observed at USR, smoothed by regression over time.

Conceivable Maximum Total Incurred—Yesterday, Today, and Tomorrow
When smoothed by regression over time and across many individual observations, the maximum total incurred provides a conceptually stable metric that is useful in the evaluation of subsequent exceedances because, the empirical evidence shows, that today's concept of "biggest" virtually always underestimates what will ultimately develop. An example of this is shown in Table A2. For the decade beginning 1952, Table A2 shows the largest total incurred values reported by policy year at first or second report level as well as the largest total incurred reported by accident year reported at Survey.[14] The Survey values exclude maximums that were known to be taken down subsequently.

[13] Approximately half of Survey query responses on claims aged 25+ years cite asbestosis. Though voluminous, these claims are typically—but not always—small. The median queried asbestosis claim aged 25+ years was $3,755 while for non-asbestosis claims the median was $714,074. The average queried asbestosis claim aged 25+ years was $20,368 while for non-asbestosis claims the median was $2,319,648. Of queried claims aged 25+ years with total incurred value of $20,000 or less, approximately 80% were asbestosis.

[14] This is fundamentally a calendar year concept, but its expression is dependent on the data available—policy year, accident year or calendar year. Examination of policy year maximum total incurreds by report level did not reveal substantial differences in maximums by maturity, especially after the extent to which successive report levels reflect calendar year inflation were taken into account. Thresholds were developed on both policy year and calendar year bases. The results are similar.

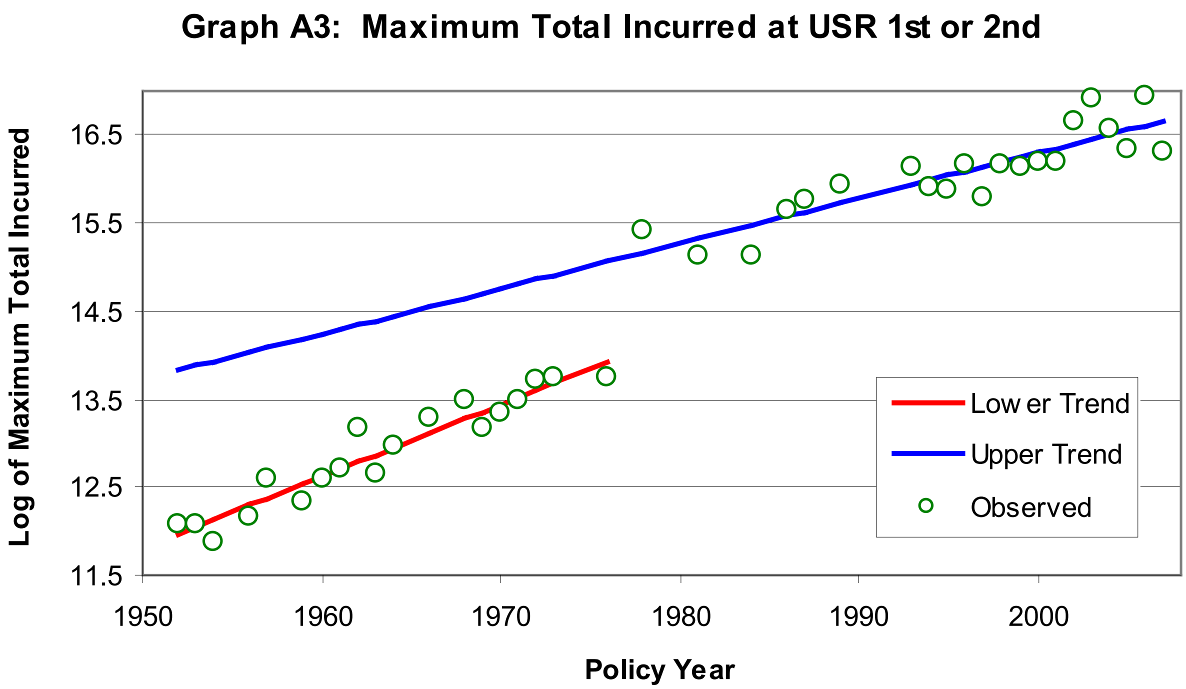
Table A2: Maximum Total Incurreds at USR and Survey – Then vs Now

PY/AY	USR Max at 1st **or** 2nd	Smoothed USR Max Lower Trend	Smoothed USR Max Upper Trend	2005 - 2011 Survey Max[1]	Survey Max/ USR Max
1952	174,030	157,479	1,009,618	1,277,636	7.34
1953	178,067	170,896	1,062,997	471,516	2.65
1954	144,473	185,458	1,119,197	712,922	4.93
1956	190,960	218,408	1,240,669	1,800,955	9.43
1957	292,625	237,017	1,306,263	1,960,202	6.70
1959	226,367	279,128	1,448,038	1,309,759	5.79
1960	292,525	302,911	1,524,595	790,235	2.70
1961	330,552	328,721	1,605,201	2,098,114	6.35
1962	526,428	356,729	1,690,067	4,761,229	9.04
1963	308,249	387,124	1,779,421	2,960,710	9.60

[1] Excludes amounts that were subsequently taken down.

Note that the relationship between the Survey maximums and the actual USR maximums approximates a *minimum* boundary on individual claim development potential. To the extent that the maximum total incurreds at Survey developed from claims at USR that were smaller than the at USR maximum total incurreds, then the realized individual claim loss development from USR to Survey would be larger than the Survey-to-USR relationships shown in Table A2. This concept informed development of the constraints discussed in the *Stochastic Loss Development Methodology—Survey & Simulation* section above.

There are two sets of smoothed values shown in Table A2. The latter, labeled as “Upper Trend,” are considerably larger than those fitted to the actual values. This is because, in addition to the usual differences across time, a particularly material issue was present—as asbestosis was in the above section—for the development of age-normalized thresholds for exceedance rates. The issue here is that of a spike in recognized cost levels that occurred in the late 1970s. The spike, which approximately tripled the concept of largest conceivable claim at the time, can be seen in Graph A3.



The spike in Graph A3 is material to evaluating exceedances. Survey exceedances measured relative to a line smoothed across all years will be quite different from alternative smoothings. Survey exceedances from the 1950s and 1960s, for example, will be considerably higher relative to the actual maximums at USR rather than relative to a smoothed line that "corrected" historical maximums for the late 1970s cost level spike, which may have been a one-off event. Table A4 shows Survey exceedance rates for claims aged 10+ years in five-year increments. The exceedance rates for the Survey data relative to the blue line shown in Graph A3 *and* with the asbestosis adjustment were selected by WCIRB staff and reviewed by the group for the comparison with exceedances for the simulated open claim portfolio.

Table A4: Share of Survey Claims in Excess of Multiples of Smoothed USR Max

Age in Years	Lower Trend - All Claims % of Claims in Excess of Multiple of USR Max > 2x	> 3x	> 4x	> 5x	Lower Trend - Asbestos Adjusted[1] % of Claims in Excess of Multiple of USR Max > 2x	> 3x	> 4x	> 5x
45-49	0.38%	0.21%	0.14%	0.11%	2.40%	1.30%	0.90%	0.70%
40-44	0.32%	0.15%	0.12%	0.12%	1.80%	0.85%	0.67%	0.67%
35-39	0.43%	0.22%	0.14%	0.08%	1.57%	0.80%	0.52%	0.30%
30-34	0.16%	0.07%	0.01%	0.01%	0.46%	0.21%	0.04%	0.03%
25-29	0.05%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%
20-24	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
15-19	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
10-14	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Age in Years	Upper Trend - All Claims % of Claims in Excess of Multiple of USR Max > 2x	> 3x	> 4x	> 5x	Upper Trend - Asbestos Adjusted[1] % of Claims in Excess of Multiple of USR Max > 2x	> 3x	> 4x	> 5x
45-49	0.08%	0.03%	0.03%	0.00%	0.50%	0.20%	0.20%	0.00%
40-44	0.06%	0.03%	0.02%	0.01%	0.36%	0.18%	0.09%	0.04%
35-39	0.05%	0.00%	0.00%	0.00%	0.17%	0.00%	0.00%	0.00%
30-34	0.03%	0.00%	0.00%	0.00%	0.09%	0.01%	0.00%	0.00%
25-29	0.05%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%
20-24	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
15-19	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
10-14	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[1] Excludes claims that are both less than $20,000 and at least 25 years old.

Since the simulation sourced from several starting years, the maximum total incurred corresponding to Graph A3's blue line was selected as the smoothed USR max for each claim's policy year of origin. These thresholds are approximately $15.5 million for policy year 2005, $16.3 million for policy year 2006, and $17.2 million for policy year 2007. The comparison with Survey exceedance rates with those of the simulated portfolio of open claims for the prior and revised methodologies are shown in Table A5.

Table A5: Share of Open Claims in Excess of Multiples of Smoothed USR Max
Survey vs. 2011 Simulation Methodology vs. 2013 Simulation Methodology

Age in Years	Survey % of Claims in Excess of Multiple of USR Max—Upper Trend & Asbestosis Adjusted[1] > 2x	> 3x	> 4x	> 5x	2011 Simulation Methodology (Excludes 316 Error Outs) % of Claims in Excess of Multiple of USR Max > 2x	> 3x	> 4x	> 5x	2013 Simulation Methodology (Excludes 9 Error Outs) % of Claims in Excess of Multiple of USR Max > 2x	> 3x	> 4x	> 5x
45-49	0.50%	0.20%	0.20%	0.00%	0.33%	0.12%	0.02%	0.00%	0.14%	0.00%	0.00%	0.00%
40-44	0.36%	0.18%	0.09%	0.04%	0.30%	0.06%	0.04%	0.00%	0.04%	0.00%	0.00%	0.00%
35-39	0.17%	0.00%	0.00%	0.00%	0.15%	0.01%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%
30-34	0.09%	0.01%	0.00%	0.00%	0.05%	0.01%	0.00%	0.00%	0.06%	0.02%	0.00%	0.00%
25-29	0.12%	0.00%	0.00%	0.00%	0.04%	0.01%	0.00%	0.00%	0.05%	0.02%	0.00%	0.00%
20-24	0.01%	0.00%	0.00%	0.00%	0.04%	0.01%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%
15-19	0.01%	0.00%	0.00%	0.00%	0.04%	0.01%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
10-14	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[1] Excludes claims that are both less than $20,000 and at least 25 years old.

Error-out thresholds are employed in both simulated versions, and this aspect of the methodology is unchanged. In addition to the comparison of the simulated exceedance rates, a review of the mean excess patterns for both the Survey and simulated data was conducted. Based on its review of the exceedance rates and mean excess analysis, the group determined that the levels of dispersion and tail thickness for the revised stochastic loss development methodology were reasonable.

Development on Jumbo and Very Old Claims and Future Survey Queries
A common concern surrounds the development potential of jumbo claims and the very oldest (aged 25 or 30 years) claims. This concern seems to stem from a notion that these claims have little development potential. The empirical evidence, however, does not support this notion. Development histories for the largest claims in CY 2001—the first available calendar year for the recent consecutively available Surveys—and the largest claims aged 30+ years, were reviewed by the group. These individual claim development histories document that the development potential for these claims is, in fact, significant.

Moreover, for aggregate incurred developments, though the link ratios are small at greater ages, this development is occurring on increasingly fewer claims. Incurred and paid loss development patterns may differ from time to time, but in the long run, we expect them to project similar ultimates. A reconciliation of Financial Call incurred development (link ratio triangles) with Survey data was made to demonstrate that the Survey data should estimate Financial Call incurred development. For the most recent three calendar year diagonals of incurred development from the Financial Calls, the Survey data that would contribute to these links was examined. An example of this for a single total incurred link ratio cell is shown below in Table A6.

Table A6: Reconciliation of Financial Call Incurred Development - AY 1994: Age 192 to 204

Claim Type	Claim Count	Total Inc. ($M) Age 192	Total Inc. ($M) Age 204	Incr. Total Inc. ($M)	Avg. Incr. Total Inc. ($K)	Total Inc. Severity ($K) Age 192	Total Inc. Severity ($K) Age 204	Aggregate Link Ratio
Survey								
Increase	541	138.3	160.8	22.5	41.6	255.7	297.2	1.163
Takedown	435	96.9	83.7	-13.1	-30.2	222.7	192.5	0.864
No Dev.	2,608	418.8	418.8	0.0	0.0	160.6	160.6	1.000
All	3,584	654.0	663.4	9.4	2.6	182.5	185.1	1.014
Developing	976	235.2	244.6	9.4	9.6	241.0	250.6	1.040
Financial Call								
Open	1,049	325.2	339.2	14.0	13.3	310.1	323.4	1.043
All	205,459	1805.0	1819.0	14.0	0.1	8.8	8.9	1.008

Developments on older claims are often larger than expected because of the role of inflation. (Periods of very high inflation, as experienced in the 1970s, will accentuate this.) For the oldest claims, much of their total incurred value represents payments made at historical costs. The latest incremental developments for these claims can be very large relative to these historical costs. An example seen in an actual response to a Survey query involved a prosthetic eye. In such situations, a claimant might receive a new prosthetic only once every decade. However, given technological advances and medical inflation, the cost of the latest prosthetic can be very large. If costs were constant, we might expect incurred development for a fourth replacement prosthetic to be +25% (5/4). However, with technological advances and medical inflation, the incurred development observed to recognize this replacement will far surpass the constant cost +25%.

Going forward, the group requested additional information to understand better these developments on jumbo and very old claims. As an initial step, Survey responses were mapped by age and size and a commitment was made to target developments on very old claims in future Survey queries. In the long run, transactional medical data is expected to allow a better understanding of the qualitative differences in development dynamics across ages and sizes.

Short-Stop Simulations
One available test of the appropriateness of the simulated level of dispersion is *short-stop simulation*. These are simulations of older claims observed both at USR and at Survey. For these tests, claims observed at USR are simulated to the year-ends observed at Survey, *stopping short of ultimate*. Patterns among developments to each of the year-ends are studied to detect any issues that merit investigation. The claims included in a short-stop simulation are a unique subset of the originating year's claims as they are known to have remained open from USR through Survey. This condition is simulated by not permitting claim closure in the short-stop simulations.

Short-stop simulations do *not* attempt to recreate actual dispositions at Survey. To do this would require the use of development tables based on the calendar year development patterns appropriate to each age-to-age development. This would require a different set of development tables (one for each calendar year of development) for each originating accident year. Instead, short-stop simulations are a reasonableness test using the same development tables used to build the retro database.

For the short-stop simulations conducted in developing the 2011 retro, differences in development patterns between the actual calendar years through which the claims developed and calendar years that populated the simulation were much more material than for past short-stop simulations. This was because each claim used in the short-stop simulations was impacted by the legislative reforms of 2003-2005 and these impacts were largely realized before calendar year 2006. Judgmentally allowing for the reform impacts and differences in development patterns, the level of dispersion of the short-stop simulations was deemed reasonable. New rounds of short-stop simulations, which would continue to be confounded by the 2003-2005 reforms, were not expected to develop substantially new information on the reasonableness of the simulated level of dispersion. Therefore, in developing the 2013 retro, short-stop simulations were foregone to free resources to develop alternative tests.

Appendix 2013-B: Development of Vector Trend

This appendix, from the technical documentation underlying the 2013 retro database, is repeated here to address common questions and issues.

Significant contributors to the 2011 increase in LERs were the very large trend factors used in the pure premium ratemaking process in 2009. The annual medical trend of approximately 13% per year resulted in a near doubling of each claim's medical component. This impact was significantly leveraged by a shift in the composition of the starting size of loss distribution from the period underlying the 2008 retro database (policy years 1999-2001) to the period underlying the 2011 retro database (policy years 2004-2005). This shift was driven by claims excess $1,000,000, and more importantly for its impact on levels of dispersion, a shift in the indemnity/medical composition. The indemnity/medical split for policy years 1999-2001 at third was 51.1%/48.9%; for policy years 2004-2005 at third, 43.2%/56.8%—a nearly 8 point shift from indemnity to medical. As the medical component accounts for a much greater share of the largest claims, this compositional shift leveraged the impact of the high medical trend factors—which were both high absolutely and higher relative to indemnity—on LERs.

The shift in indemnity/medical composition has continued from the 2011 retro database to the 2013 retro database, for which the indemnity/medical composition at USR was approximately 41.0%/59.0%—an additional 2.2 point shift from indemnity to medical relative to the 2008 retro database. The annual aggregate trend factors, however, are much lower, and for one year were negative.

Although the current trend factors do not pose the dilemma they did for the 2010 retro, a growing consensus has recognized that, to the extent that aggregate trend factors represent shifts in the size of loss distribution, they might not be appropriate for application at an individual claim level in contexts such as the retro. Working with the 2011 and prior groups of actuaries, WCIRB staff explored numerous approaches to disentangling core claim component inflation rates from shifts in the size of loss distribution and other effects. Many approaches failed. Traditional descriptors of size, such as type of injury, are cross correlated with size of loss and undergo intra-type shifts as well. Cohorts defined by paid medical percentiles may be distorted by changes in payment patterns or reforms. All dollar variables are themselves inflating or deflating, so controlling by any measure itself denominated in dollars can be confounding. Further, core inflation rates may differ by size of claim depending on the mix of services.

The approach selected by WCIRB staff and reviewed by the group, differential trends by incurred medical percentile at USR, or *vector trend*, sidesteps the confounding issues by ignoring type of injury and equating size across time by comparing common percentiles of incurred medical across all claims *without* adjustment for declining claim volumes. The theory underlying the approach is that trend differentials are driven by changes in discretionary elements, which are most manifest in "medium sized" claims, where more or less benefit might be provided, while the smallest and largest claims are more homogenous, stable, and therefore more closely reflect core claim inflation. The use of the percentile of the incurred medical component across time allows a ranking of all claims, avoiding shifts among injury types, including shifts between indemnity and medical-only, and changes in indemnity benefit levels.

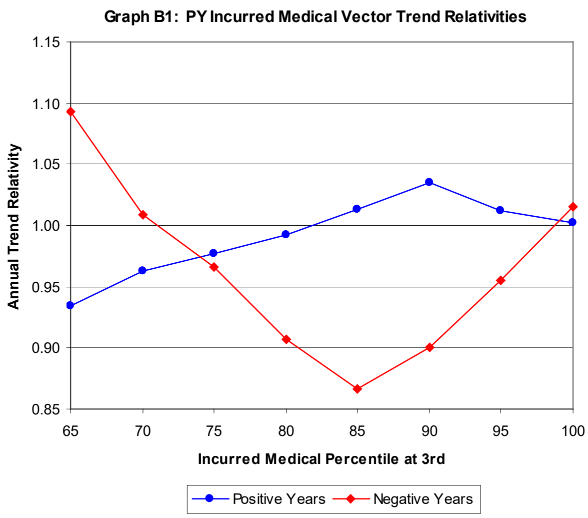
The approach assumes that the frequency declines observed over the last many years are independent of size of loss. This assumption is likely to be at least partially false. But to the extent to which it is false, it does not appear to be particularly material. There is also evidence to support that the assumption is true: over the long-term, claim volume declines for indemnity and medical-only are comparable, suggesting that the declines attributable to changes in hazardousness mix and safety improvements have affected both indemnity and medical-only claims approximately equally.

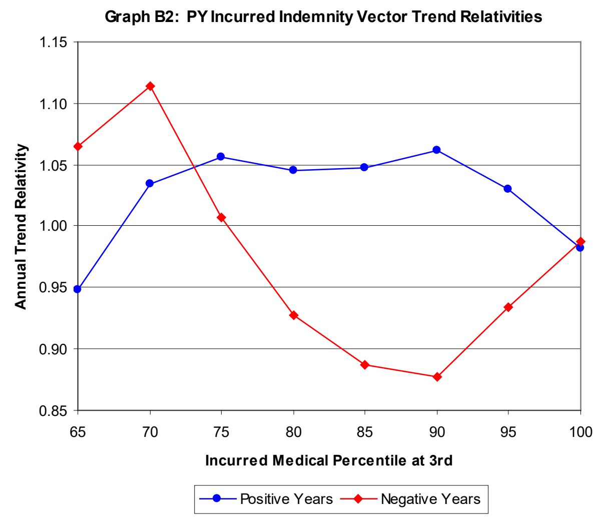
Trend relativities by size are determined by segregating claims into incurred medical percentiles, calculating the year-to-year severity changes by percentile and their relativity to each year's aggregate trend. Then—and key to the detection of the expected patterns—the relativities of years with positive and negative aggregate trend are segregated. Then, for the indemnity and medical components independently, the percentiles' relativities to the aggregate trends are examined. From this the following general patterns can be observed:

- Trends for the smallest and largest claims tend to be smaller in absolute value;
- Trends for the medium-sized claims tend to be larger in absolute value;
- Relativities for years with positive/negative aggregate trends tend to be symmetrical opposites.

Here, the smallest claims are those with incurred medical percentiles up to the 65th percentile for each year. The largest claims are those with incurred medical percentiles in the top 5% for each year. Medium-sized claims fall somewhere in between.

This analysis was performed using USR data for policy years 1993 through 2006 at third report level. The median relativities across years were selected as the incurred medical percentile differentials in 5% increments except for the smallest claims, which were defined as the smallest 65%. These are shown in Graph B1 for medical at third report level and Graph B2 for indemnity at third report level.





Appendix 2013-C: Development of Stochastic ALAE Loading

This appendix, from the technical documentation underlying the 2013 retro database, is repeated here to address common questions and issues.

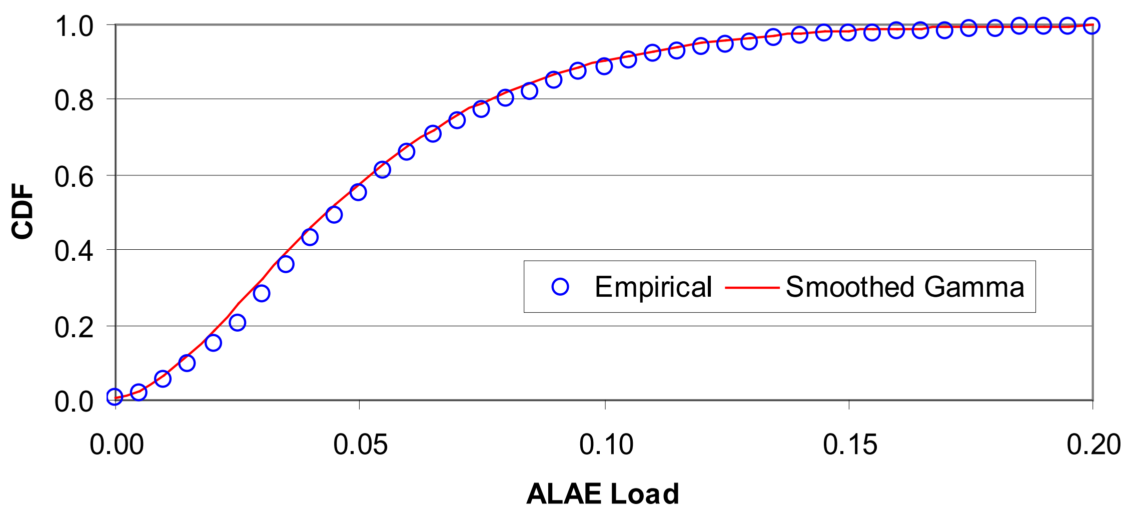
The methodology used to develop the parallel set of loss and ALAE parameters was revised for the 2013 retro to provide stochastic ALAE loading for claims open at USR or selected to reopen from USR. For claims closed at USR, scalar ALAE loadings by total incurred size at USR are applied. These latter loadings are developed from the reported ALAE at USR on closed claims.

The ALAE loadings for open or reopened claims are based on data reported at Survey during CY 2010, which is accepted as a reasonable proxy for loadings at ultimate. CY 2010 observations were selected, in lieu of using multiple years, because CY 2010 observations were different from prior calendar years' observations and to use the most recent ALAE data available. Projection of ALAE to ultimate is under study as a future enhancement.

To develop the ALAE loading, kernel density estimates of ALAE loads (paid ALAE / total incurred) reported at Survey were examined for sixteen credible size bands for claims with ALAE. The examination of the kernel density estimates suggested that a gamma distribution was reasonable for modeling the ALAE loads. The empirical cumulative distribution functions for the ALAE loads by size were fit to three-parameter gamma distributions. The first two parameters are the standard shape and scale parameters. The third is a shift parameter that controls for the probability of having no ALAE, or a load of zero. The fit of the CDF of ALAE loads for claims between $1M and $1.6M total incurred at ultimate is shown in Graph C1.

Graph C1: CDF of ALAE Loads

Claims Between $1,004,500 and $1,623,346 Total Incurred at Survey



To stochastically load ALAE for claims simulated to ultimate, a random number, representing the ALAE load, is drawn from the fitted gamma distribution corresponding to the size group to which the claim belongs. The parameters that underlie the selected ALAE load distributions are shown in Table C2.

Table C2: Selected Parameters for ALAE Load Gamma Fit

Size at Ultimate		Gamma Parameters		
[Lower	Upper)	Shape	Scale	Shift
0	3,134	0.130	13.732	-0.0440
3,134	5,064	0.301	2.772	-0.0394
5,064	8,185	0.384	1.792	-0.0424
8,185	13,227	0.466	1.178	-0.0226
13,227	21,375	0.526	0.780	-0.0118
21,375	34,544	0.603	0.474	-0.0038
34,544	55,826	0.702	0.280	-0.0029
55,826	91,126	0.933	0.165	-0.0046
91,126	147,267	1.432	0.098	-0.0115
147,267	237,994	2.059	0.064	-0.0191
237,994	384,616	2.389	0.047	-0.0151
384,616	621,568	2.549	0.034	-0.0080
621,568	1,004,500	2.252	0.029	-0.0042
1,004,500	1,623,346	2.310	0.023	-0.0033
1,623,346	2,623,448	2.833	0.015	-0.0036
2,623,448	and Greater	1.064	0.025	-0.0001

If a scalar ALAE Load had been used instead, the resulting LAERs would have been lower, as the stochastic ALAE loads allow the largest claims to have the chance of an ALAE load many times larger than the scalar load, an outcome observed in the empirical data. The differences for select per accident limits are shown below in table C3.

Table C3: Comparison of ALAE Methodology

	LAER at Select per Accident Limits		
per Accident Limit	Stochastic Load	Scalar Load	Difference
25,000	0.827	0.789	0.038
100,000	0.578	0.543	0.036
250,000	0.381	0.358	0.023
500,000	0.265	0.252	0.013
1,000,000	0.178	0.170	0.008
5,000,000	0.060	0.057	0.003
10,000,000	0.034	0.032	0.002

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