# Impact of COVID-19 on Casualty Segments

Casualty Loss Reserve Seminar
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Jon Sappington, FCAS, MAAA
Ashley Wohler, FCAS, MAAA
Kyle Walker

# Agenda

- Development Impacts
  - Methods and Data
  - High-Level Results by LOB
  - Detail by Method, LOB
- Berquist-Sherman
- COVID-19 Workers Compensation Liability Model
  - Process
  - Assumption Updates
  - Future Consideration

# COVID-19 Introduction

# COVID-19: Overview

- COVID-19 pandemic has been a major issue for the insurance industry. Lines of business have been affected both positively and negatively from both the indirect and direct impacts of the virus.

- We will discuss today those impacts on the casualty classes of business and some techniques to properly reserve in a changing reserving environment.

# COVID-19 Drivers of Pattern Changes

- Temporary court closures, slowing down resolution of liability and adjudication of WC claims

- Delays in access to care for WC claimants and bodily injury claimants

- Operational issues due to shift to work-from-home environment

- For Auto Liability, more attention paid to resolving older case inventory drops

- Propensity to settle existing claims

- Changes to the average accident date for some lines on the 2020 accident year due to non-uniform exposures

# COVID-19 Overview: Poll 1

- Have you observed these impacts in your data (Select all that apply)
  - Court delays
  - Delays in care
  - Increase in settlements of existing claims
  - Operational impacts in claims handling
  - Other
  - None

# COVID-19 Development Impacts

## COVID-19 Development Impacts: Poll 2

- What adjustments are you making for Accident Years 2019 and prior (Select all that apply)
  - Apply a lag to patterns
  - Giving weight to IELR method longer than usual
  - Adding a specific dollar load
  - Ignoring 2020 diagonal when selecting pattern
  - Berquist Sherman adjustments
  - None

# COVID-19 Development Impacts: Data

- Data Source:
  - Schedule P, for the top 25 companies by LOB
    - Excludes carriers with publicly-announced adjustments due to LPTs, case reserve strengthening
  - Paid and Reported triangles, where reported equals Schedule P Incurred minus Bulk/IBNR

- Reviewed the following lines of business
  - Commercial Auto Liability
  - Medical Professional Liability Claims-Made
  - Medical Professional Liability Occurrence
  - Other Liability Claims-Made
  - Other Liab Occurrence
  - Private Passenger Auto Liability
  - Workers' Compensation

# COVID-19 Development Impacts: Methods Used to Measure Impact

- ## Lag Relation
  - Compare the volume-weighted 3 average ex latest with the latest diagonal
  - Use solver to find the month lag or lead that minimizes the square difference between the two patterns

- ## Actual vs Expected
  - Using age to age factors from VW3 ex latest to calculated expected 2020 emergence, compared to actual emergence

- ## Residuals
  - Examined the residuals from using the average VW3 excluding the latest diagonal
  - Residuals are normalized using the square root of the cumulative data divided by Mack's alpha
  - Plot the residuals by calendar year and accident year

- ## GLM
  - Using GLM model on incremental triangle, run sequential F-tests to add/remove parameters along 3 dimensions to test for statistically significant parameter at calendar year 2020

# COVID-19 Development Impacts: Poll 3

- Which class would you expect to have the largest lag impact from COVID-19 in the calendar year 2020 diagonal?
    - Commercial Auto Liability
    - Medical Professional Liability CM
    - Medical Professional Liability Occ
    - Other Liability CM
    - Other Liability Occ
    - Private Passenger Auto
    - Workers Compensation

# COVID-19 Development Impacts: High Level Results

| LOB | Lag: Paid | Actual vs Expected: Paid | Lag: Reported | Actual vs Expected: Reported |
|---|---|---|---|---|
| Commercial Auto Liab* | 1.531 | (691) | 0.503 | 26 |
| Med Mal CM | 1.301 | (484) | -1.077 | 119 |
| Med Mal Occ | 1.049 | (102) | -2.253 | 170 |
| Other Liab (Claims Made)* | -1.195 | 263 | 0.441 | (194) |
| Other Liab (Occurrence)* | 2.195 | (2,478) | 2.876 | (2,289) |
| Private Passenger Auto Liab | 0.245 | (815) | 0.626 | 80 |
| Workers Compensation* | 0.574 | (924) | 0.654 | (322) |

* Excludes carriers with publicly-announced adjustments due to LPTs, case reserve strengthening

- Lags shown are the number of months required to minimize the squared difference between the latest diagonal and the volume-weighted 3 ex ante 1 pattern

- Expected development uses the ATA factors from the volume-weighted 3 ex ante 1 pattern
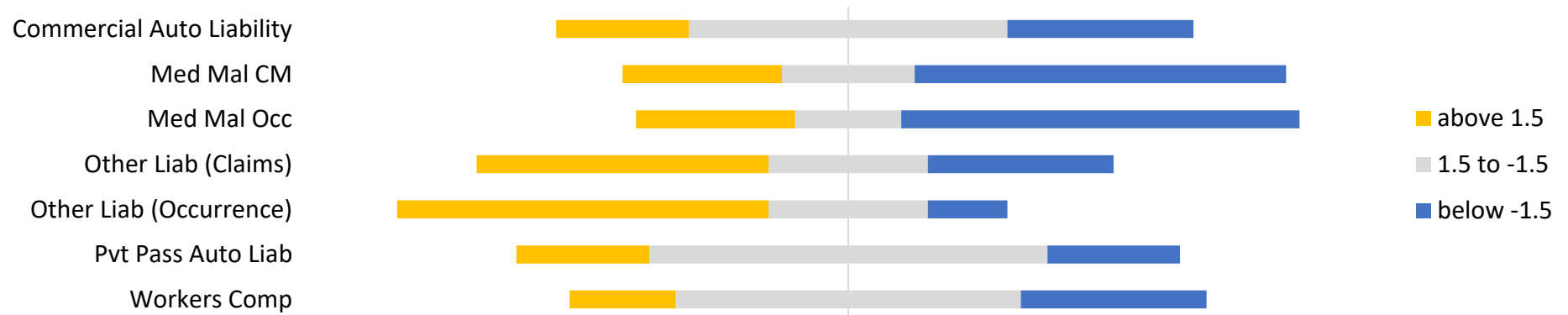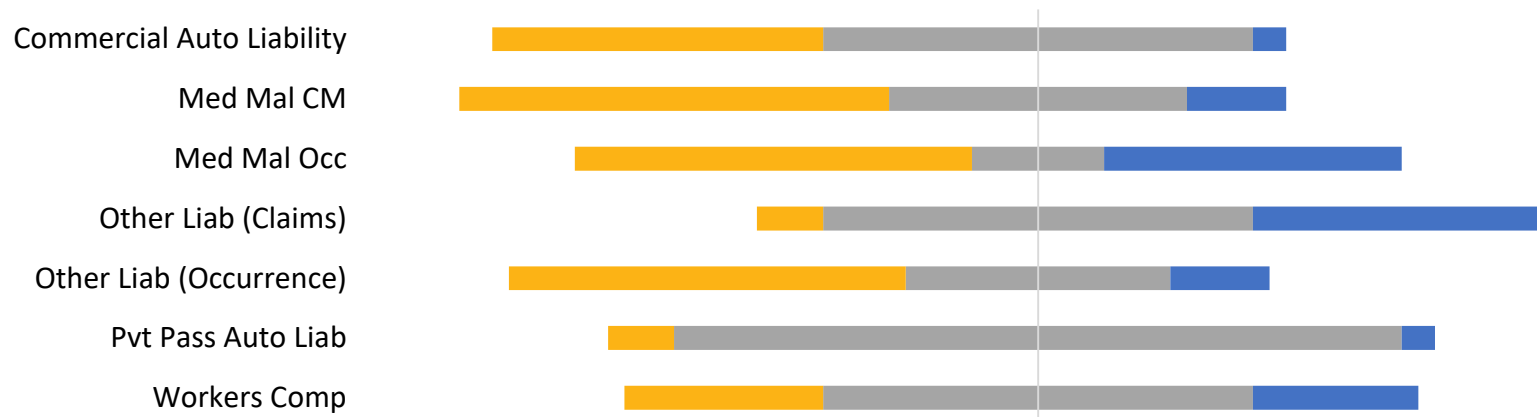
# COVID-19 Development Impacts:
## Commercial Auto Liability Summary

| Method | Paid | Reported |
|---|---|---|
| Lag | 1.5 month lag | 0.5 month lag |
| Actual vs Expected | $691M below expected | $26M above expected |
| Residuals | Strong recent upward calendar year trend, with a sharp downward reversal in 2020 | |
| GLM | No significant parameter detected for CY2020, but CY2020 residuals show sharp decrease | |

# COVID-19 Development Impacts:
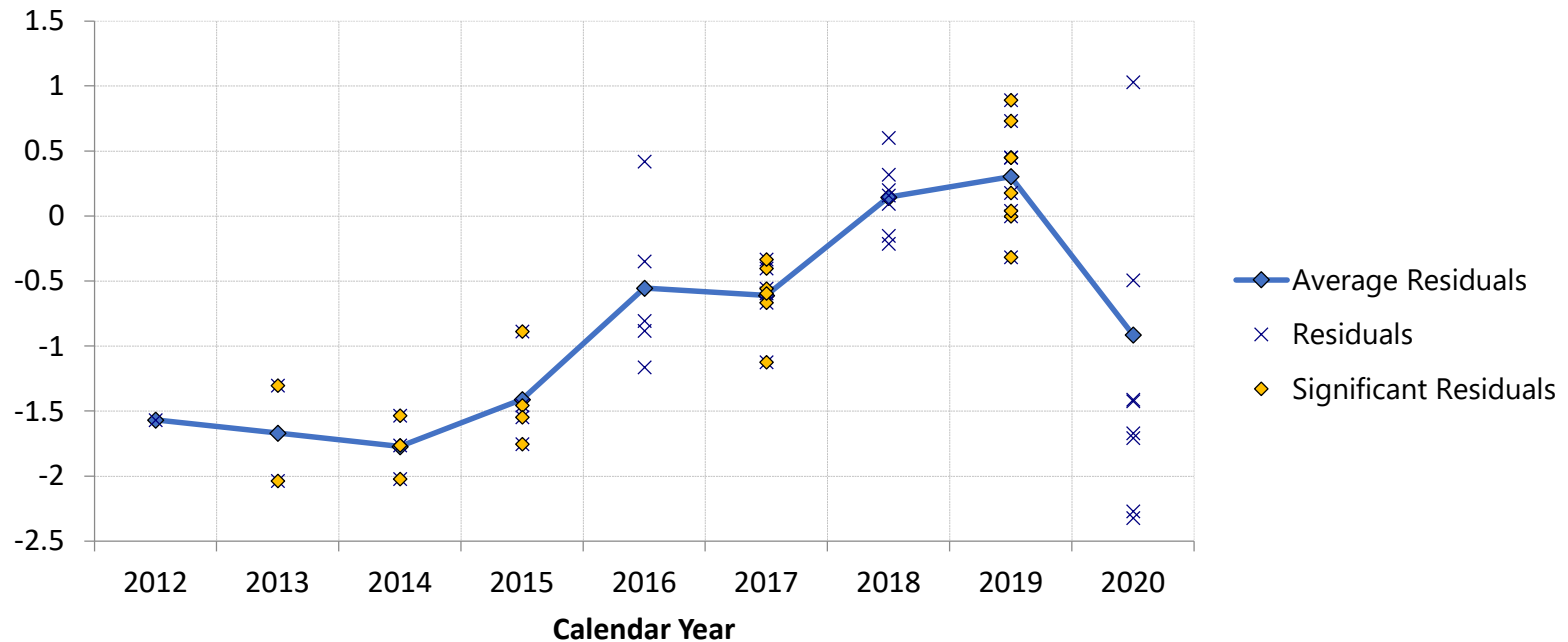## Commercial Auto Liability Residuals: Reported
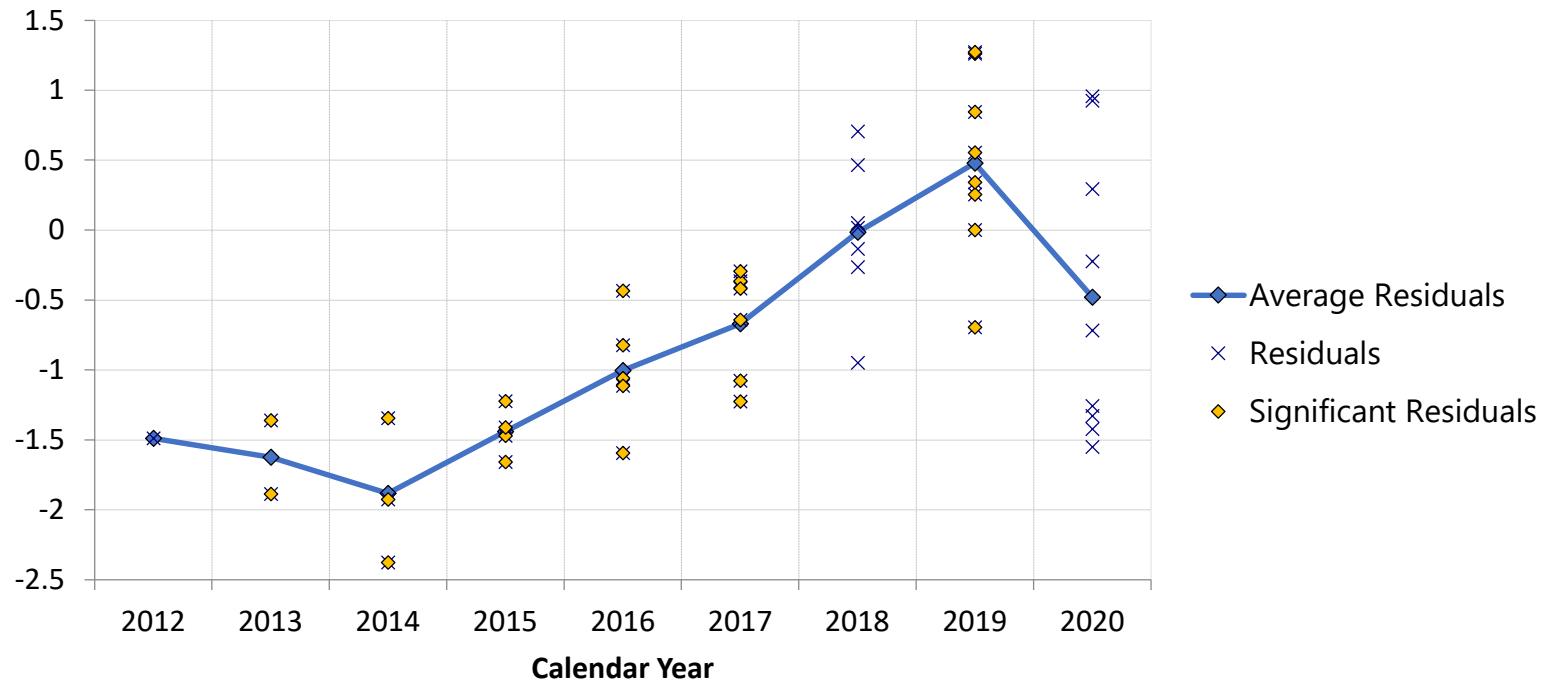


- **Reported residuals have a rising CY trend, with a sharp decline in CY 2020**

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993

# COVID-19 Development Impacts:
## Commercial Auto Liability Residuals: Paid



- **Paid residuals also have a rising CY trend, with a sharp decline in CY 2020**

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993

# COVID-19 Development Impacts:
## Other Liability Claims-Made Summary

| Method | Paid | Reported |
|--------|------|----------|
| Lag | 1.2 months speed-up | 0.4 months lag |
| Actual vs Expected | $263M above expected | $194M below expected |
| Residuals | Mostly flat | Sharp dip in calendar year 2020 |
| GLM | No significant calendar year parameters | |

# COVID-19 Development Impacts:
## Other Liability Claims-Made Residuals: Reported
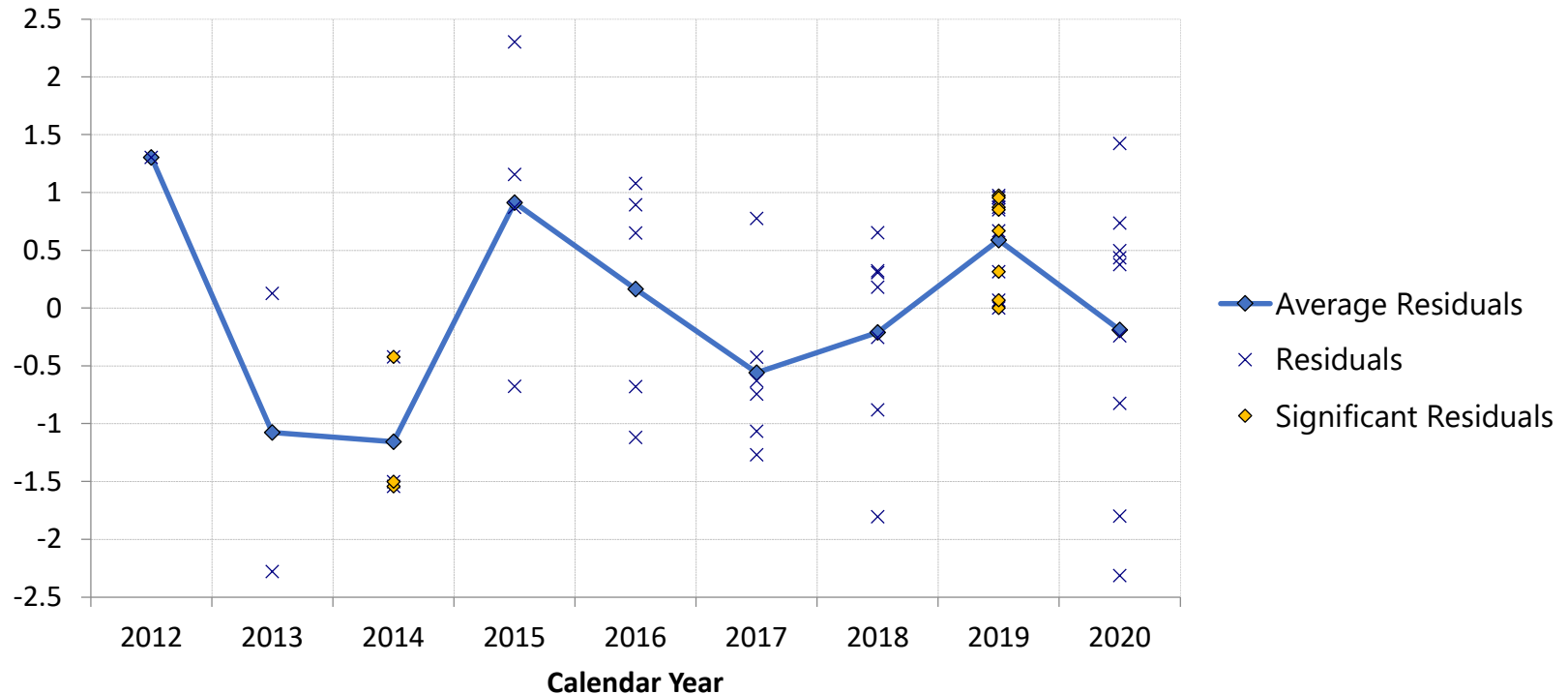


- **Reported residuals are volatile**

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993

# COVID-19 Development Impacts:
## Other Liability Claims-Made Residuals: Paid
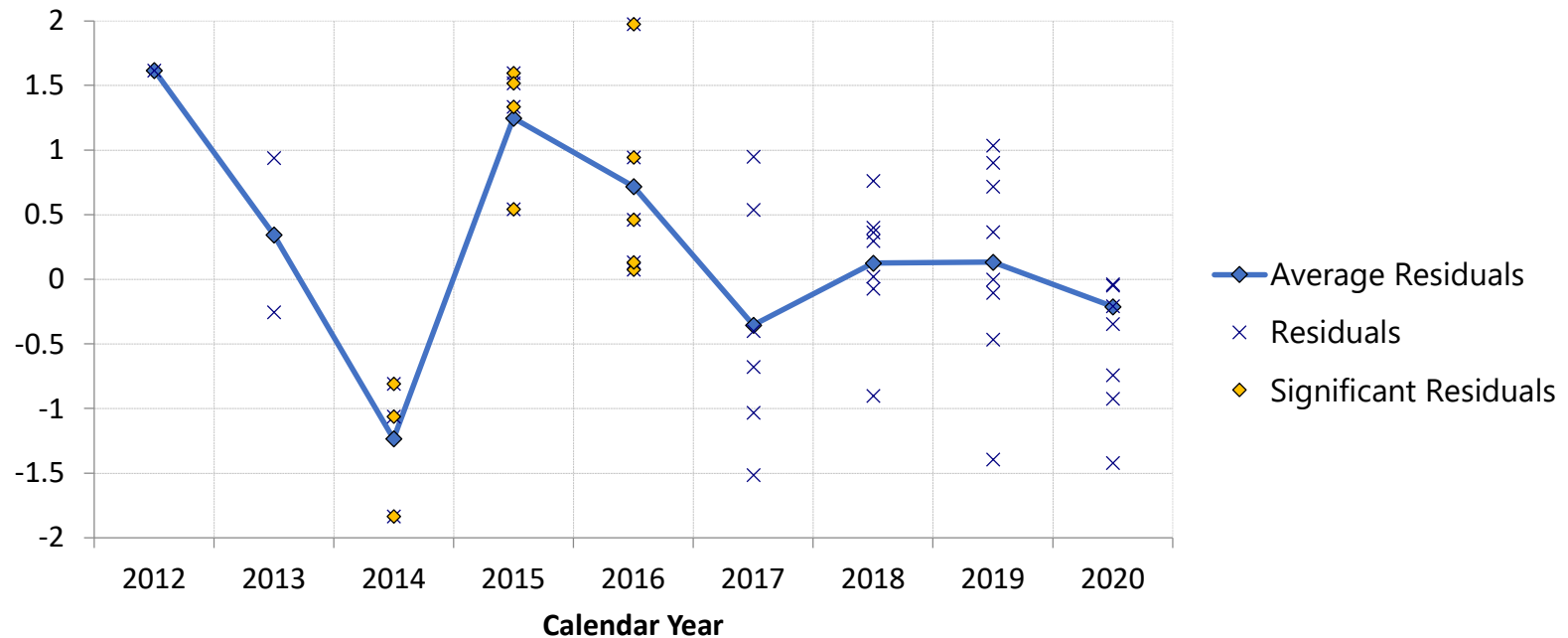


- **Paid residuals are relatively stable since calendar year 2017**

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993

# COVID-19 Development Impacts:
## Other Liability Claims-Made GLM Reported

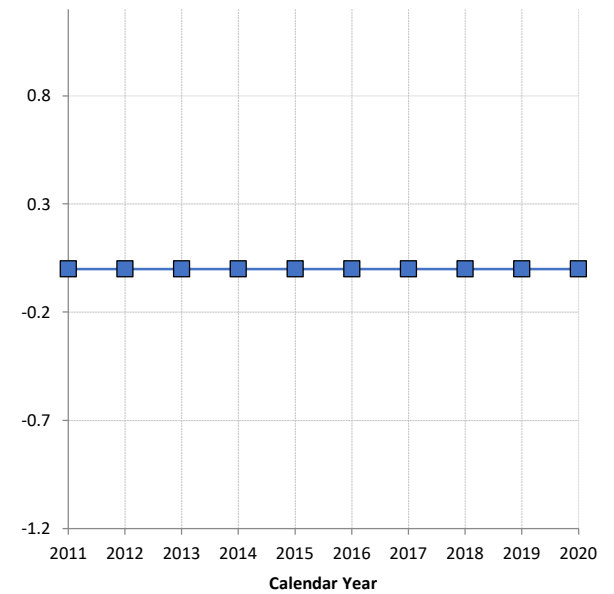**Calendar Residuals**
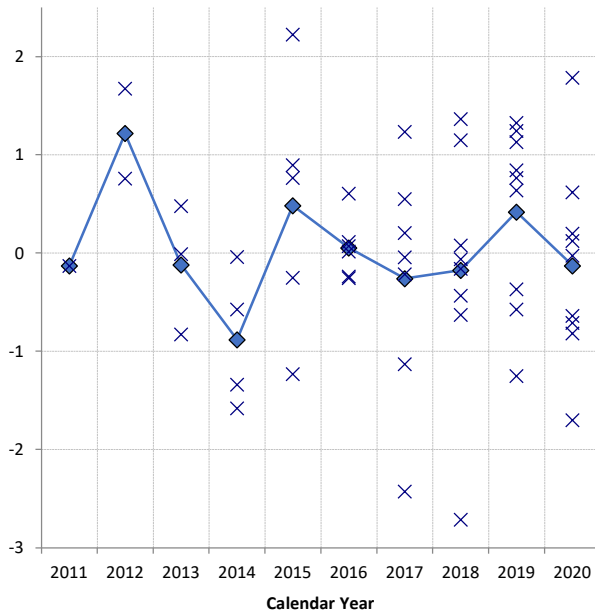
**Average Observed and Fitted Values By Calendar Year**
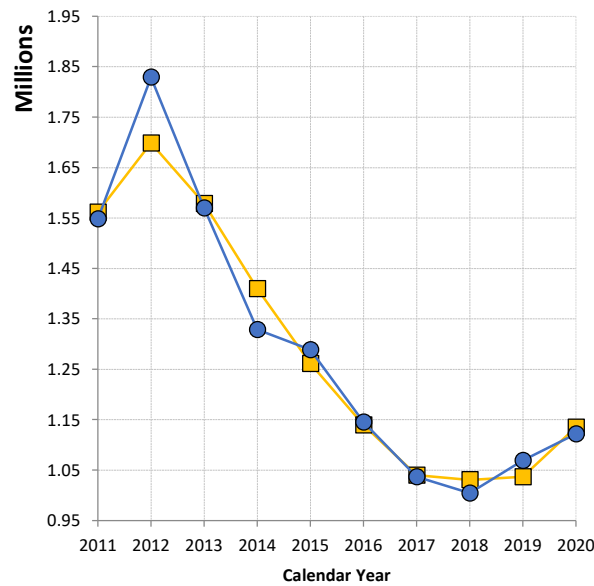
**Linear Predictor Values By Calendar Year**



- No statistically significant calendar year parameters

- There remains a slight dip in residuals for calendar year 2020

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# COVID-19 Development Impacts:
## Other Liability Occurrence Summary

| Method | Paid | Reported |
|---|---|---|
| Lag | 2.2 month lag | 2.9 month lag |
| Actual vs Expected | $2.5B below expected | $2.3B below expected |
| Residuals | Volatile history, but sharp decrease in calendar year 2020 | |
| GLM | Significant CY parameters in CY2018 (upward) and CY2020 (downward) | Significant CY parameters in CY2017(upward) and CY2020 (downward) |

# COVID-19 Development Impacts:
## Other Liability Occurrence Residuals: Reported
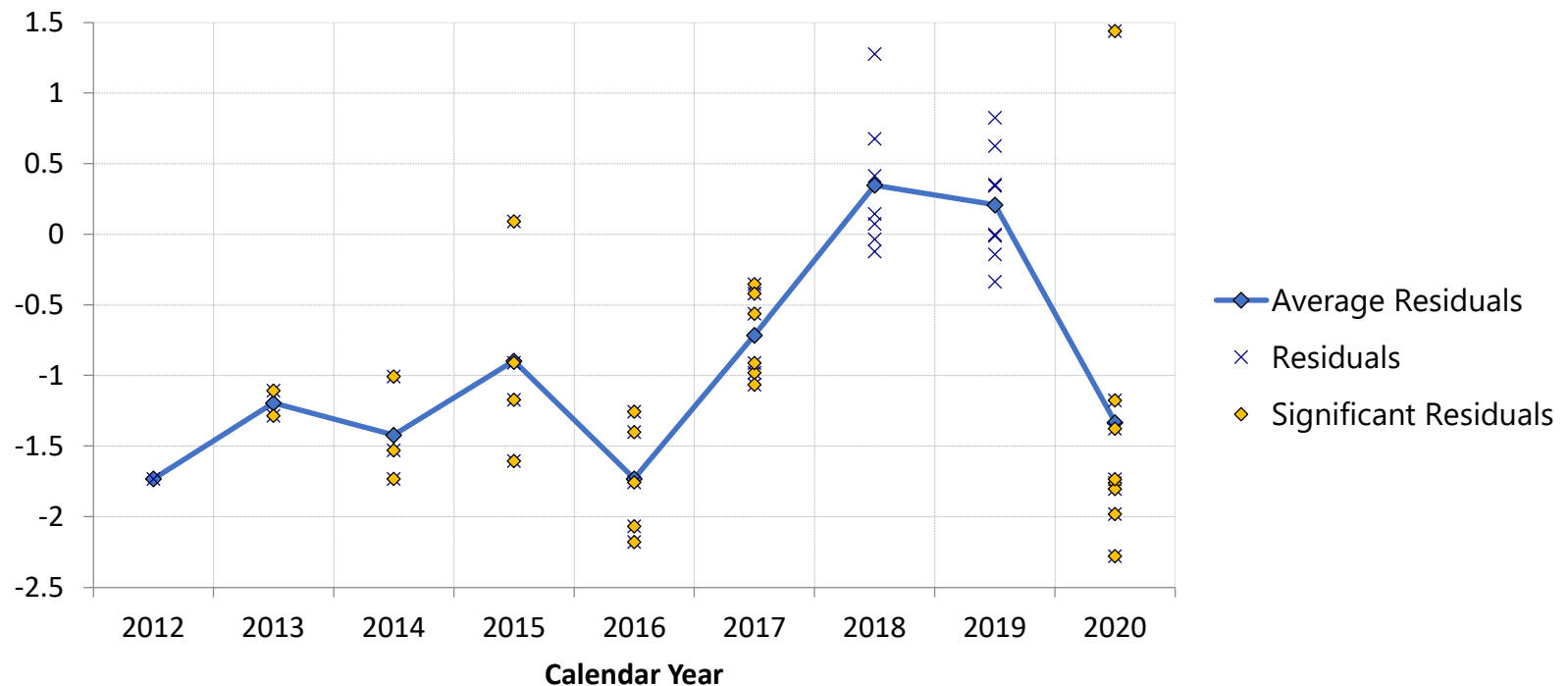


- Reported residuals have a rising trend, with a reversal in calendar year 2020

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993

# COVID-19 Development Impacts:
## Other Liability Occurrence Residuals: Paid
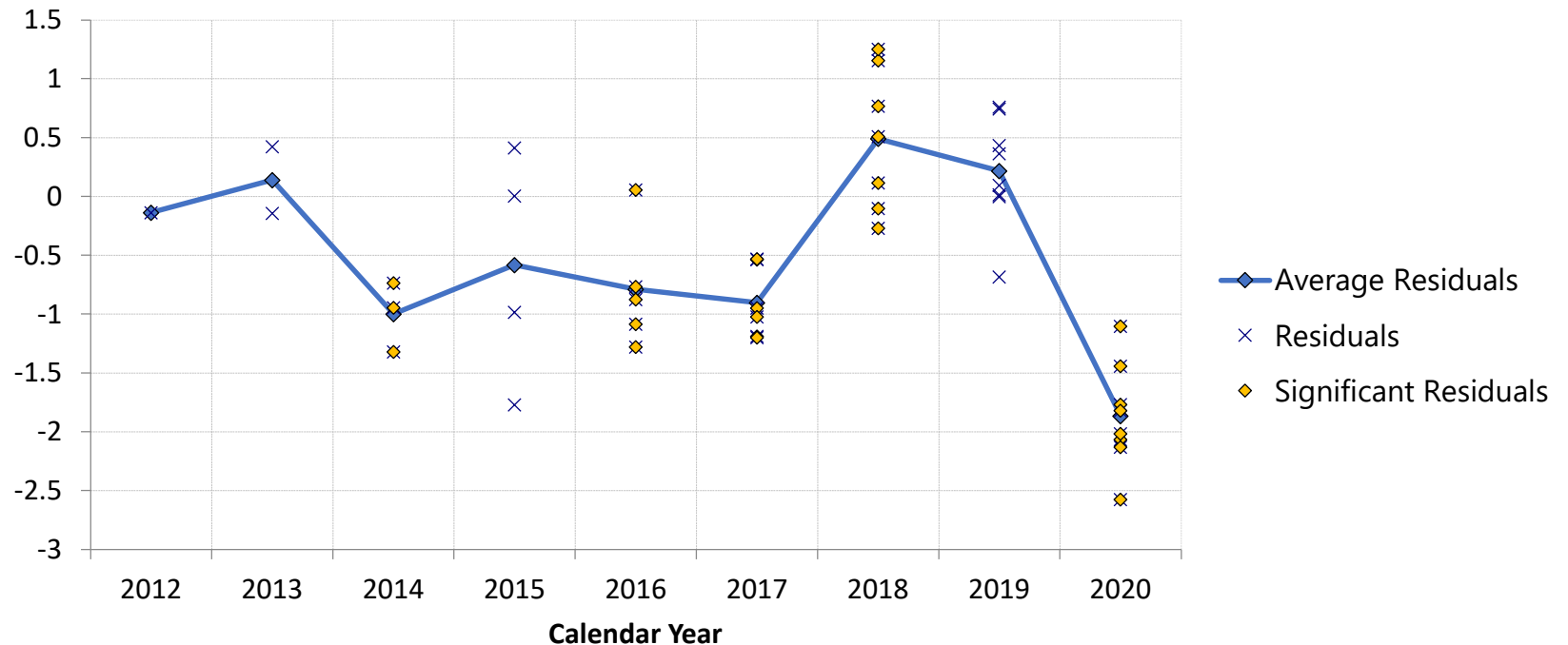


- **Paid residuals have a declining trend since calendar year 2018**

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993
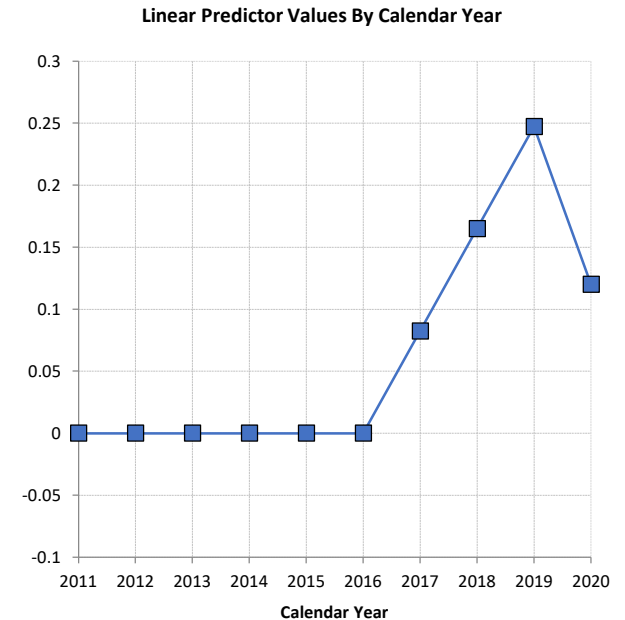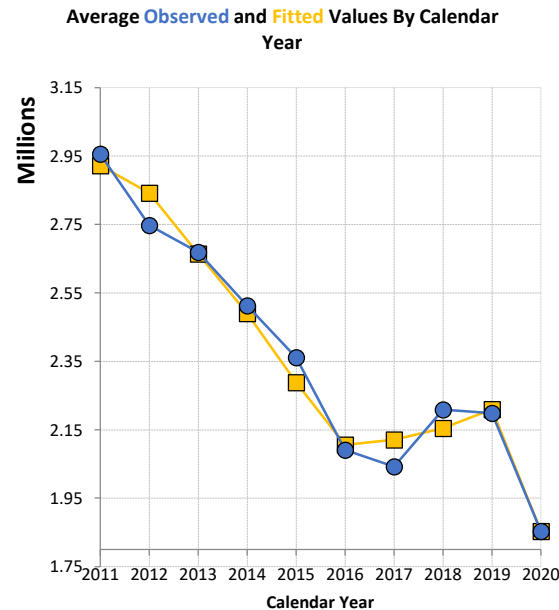
# COVID-19 Development Impacts:
## Other Liability Occurrence GLM Reported

**Calendar Residuals**

**Average Observed and Fitted Values By Calendar Year**

**Linear Predictor Values By Calendar Year**
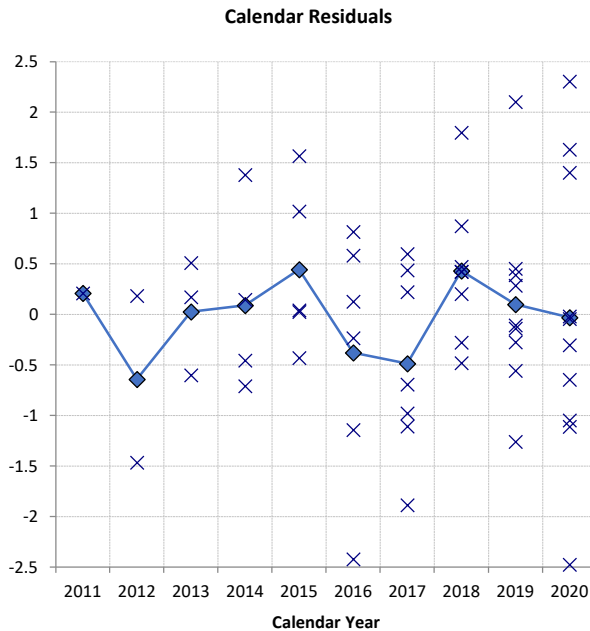
- Significant CY parameters at CY 2017 and 2020

- Because the model fits a parameter at CY2020, the residuals for CY2020 are flat

# COVID-19 Development Impacts:
## Workers Compensation Summary

| Method | Paid | Reported |
|---|---|---|
| Lag | 0.7 month lag | 0.6 month lag |
| Actual vs Expected | $322M below expected | $924M below expected |
| Residuals | Long-running declining trend continues and intensifies in calendar year 2020 | |
| GLM | Significant parameter in CY 19 | Significant parameter in CY 17 |

# COVID-19 Development Impacts:
## Workers Compensation Residuals: Reported
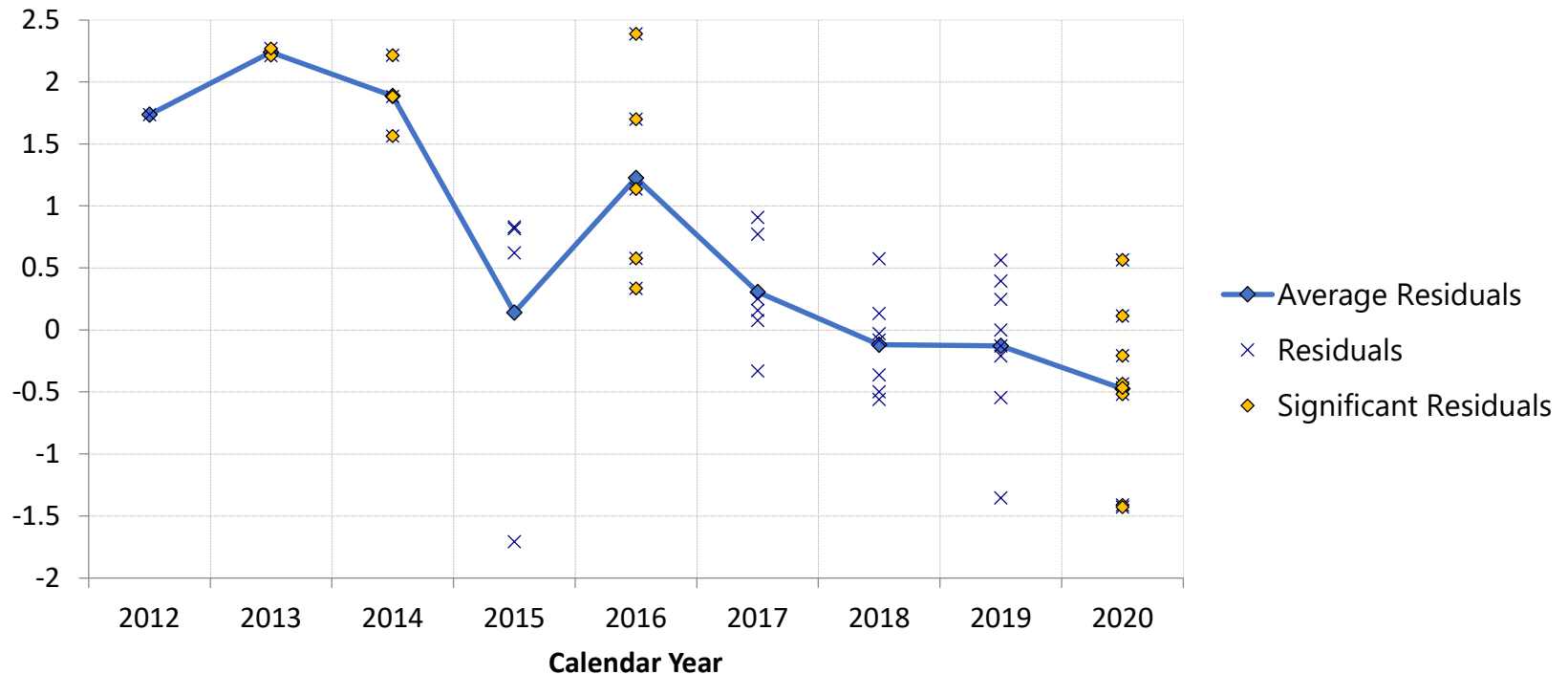


- **Reported residuals have a long-running decreasing trend that continues in calendar year 2020**

Each residual is scaled using the factor $\frac{\sqrt{D_{w,d}}}{\alpha_d}$, where $D_{w,d}$ is the cumulative loss at accident year $w$, column $d$, and $\alpha_d$ is Mack's alpha value for column $d$. For more information on Mack's alpha, see Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates. *ASTIN Bulletin: The Journal of the IAA*, 23(2):213–225, 1993

# COVID-19 Development Impacts: Conclusions by LOB

- Some lines have a measurable impact along the last diagonal

- Strong Signals
  - Other Liability Occurrence
  - Commercial Auto Liability

- Mixed Signals
  - Other Liability Claims-Made
  - Medical Professional Liability

- Weak Signals
  - Workers Compensation
  - Personal Automobile

# COVID-19 Development Impacts: Responses

- Possible Responses
  - Where volume permits, perform similar tests on your own data
  - Discuss results and industry observations with claims and other stakeholders
  - Seek additional diagnostics from operations
  - Use these results to inform actuarial pattern selection and sensitivity testing
  - Review Berquist-Sherman adjusted data

# Berquist-Sherman

# COVID-19 Berquist-Sherman

- Normally when we have a distortion along calendar years, we can rely on Berquist-Sherman (BS) methods

- Unlike in traditional uses of BS methods, the latest diagonal is unreliable

- We can make quantitative adjustments to our data to project

- The next couple of slides are a high-level overview of possible adjustments to data

# COVID-19 Berquist-Sherman: Changes to Settlement

- Compare the latest diagonal disposal rates to the history

- Make a selection for disposal rates in "normal" environment

- Create an adjusted diagonal(s) where COVID-19 impacted the closure of claims

COVID-19 Impacted Diagonal
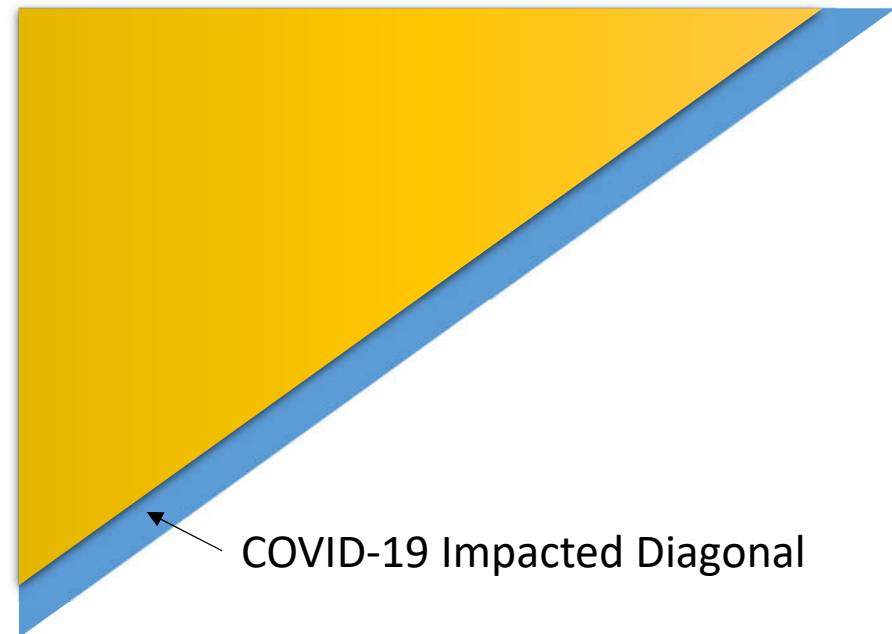
# COVID-19 Berquist-Sherman: Changes to Settlement

- Approximate the relationship between cumulative closed claim counts and cumulative paid claims (BS uses an exponential curve fit)

- Create an adjusted diagonal of paid losses based on the paid to closed relationship with the previously adjusted closed claim count diagonal

COVID-19 Impacted Diagonal
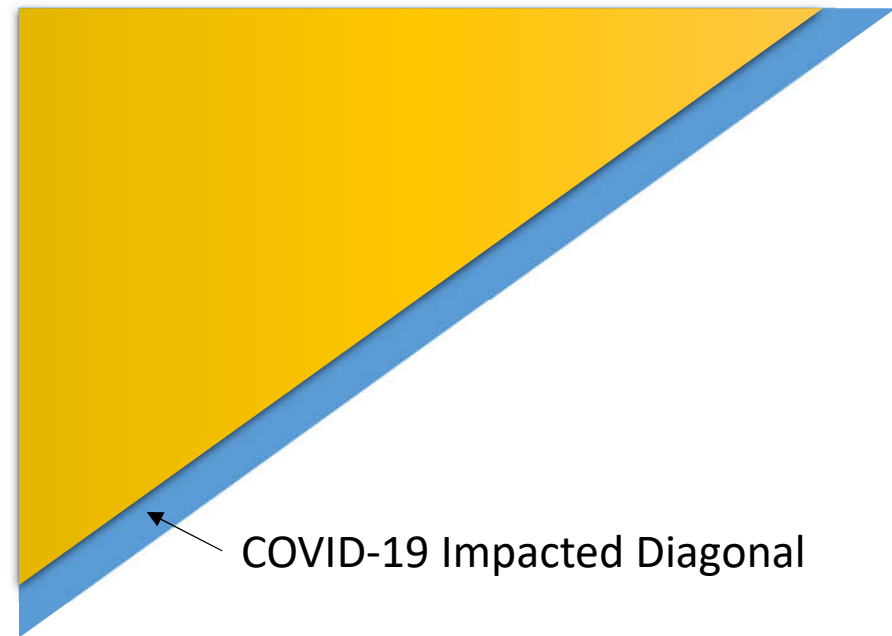
# COVID-19 Berquist-Sherman: Changes to Settlement

- Use the adjusted paid triangle for selecting a pattern and projecting ultimate losses

- This is likely to project higher ultimate losses than an unadjusted paid triangle if the closure rate is slowing down

COVID-19 Impacted Diagonal

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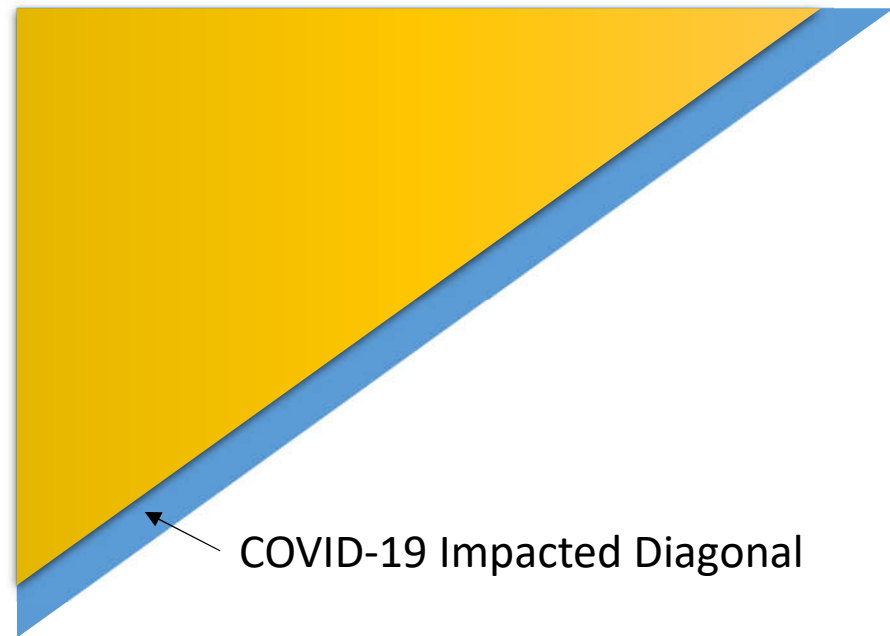
# COVID-19 Berquist-Sherman: Changes to Settlement Example

| | Unadjusted Paid Losses | Cuml LDF Factors | Unadjusted Paid LDF | Unadjusted Unpaid | Unadjusted Closed Claim Count | Ultimate Claim Count | Unadjusted Disposal Rate |
|---|---|---|---|---|---|---|---|
| 2013 | 28,732 | 1.000 | 28,732 | - | 235 | 235 | 100.0% |
| 2014 | 30,743 | 1.000 | 30,743 | - | 242 | 242 | 100.0% |
| 2015 | 32,895 | 1.000 | 32,895 | - | 250 | 250 | 100.0% |
| 2016 | 31,646 | 1.001 | 31,678 | 32 | 232 | 257 | 90.0% |
| 2017 | 33,496 | 1.006 | 33,697 | 201 | 225 | 265 | 85.0% |
| 2018 | 34,363 | 1.025 | 35,225 | 862 | 191 | 273 | 70.0% |
| 2019 | 25,012 | 1.428 | 35,717 | 10,705 | 141 | 281 | 50.0% |
| 2020 | 10,705 | 2.800 | 29,975 | 19,269 | 58 | 290 | 20.0% |
| **Total** | **227,590** | | **258,660** | **31,070** | **1,574** | **2,093** | |

Disposal rate is depressed for the latest diagonal due to COVID-19 lags

Using adjusted disposal rate, unpaid reflects the low closure rate

| | Adjusted Disposal Rate | Adjusted Closed Claim Count | Average Paid to Closed | Adjusted Paid Losses | Adjusted Paid LDF | Adjusted Unpaid |
|---|---|---|---|---|---|---|
| 2013 | 100.0% | 235 | 122 | 28,732 | 28,732 | - |
| 2014 | 100.0% | 242 | 127 | 30,743 | 30,743 | - |
| 2015 | 100.0% | 250 | 132 | 32,895 | 32,895 | - |
| 2016 | 100.0% | 257 | 137 | 35,162 | 35,197 | 3,551 |
| 2017 | 95.0% | 252 | 149 | 37,436 | 37,661 | 4,165 |
| 2018 | 80.0% | 218 | 180 | 39,311 | 40,297 | 5,935 |
| 2019 | 60.0% | 169 | 179 | 30,195 | 43,118 | 18,106 |
| 2020 | 30.0% | 87 | 190 | 16,477 | 46,137 | 35,431 |
| **Total** | | | | **250,950** | **294,780** | **67,189** |

# COVID-19 Berquist-Sherman: Changes to Settlement

- The settlement rate adjustment is dependent on creating an accurate ultimate claim count projection along with accurate paid to closed relationship
  - Could there be impacts to claim severity to consider?
    - Beyond pattern change impacts, will delays of care increase severity of claims?
    - Will delays in trials increase attorney fees? Will virtual depositions reduce attorney fees?

# COVID-19 Berquist-Sherman

- In addition to changes in claim settlement, we have concerns on maintaining case reserve adequacy while claims departments information has slowed
  - Important to monitor average case reserves
- Techniques similar to the BS case adequacy method can be used to restate the COVID-19 impacts on case reserve diagonals

# COVID-19 Berquist-Sherman

- It is also important to monitor the number of claims opened over the COVID-19 impacted months
  - Has reported claims lower due to changes in exposure?
  - Has my claims department taken a longer time to establish a reported claim under my company's definition of claim count?

- The need is to monitor if there is a shortfall in your reported claim count diagonals to adjust for as well

- Important to discuss with your claims team

# References

- Thomas Mack: Distribution-free calculation of the standard error of chain ladder reserve estimates.
  - ASTIN Bulletin: The Journal of the IAA, 23(2):213–225, 1993

- Björkwall, S, Hössjer, O, Ohlsson, E, & Verrall, R. (2011). A generalized linear model with smoothing effects for claims reserving.
  - Insurance: Mathematics and Economics, 49(1), 27-37

- Jacqueline Friedland: Estimating Unpaid Claims Using Basic Techniques.
  - Casualty Actuarial Society 2010

# COVID-19 WC Liability Model

# The Problem at Hand



How do we translate COVID WC exposure into COVID WC liability?
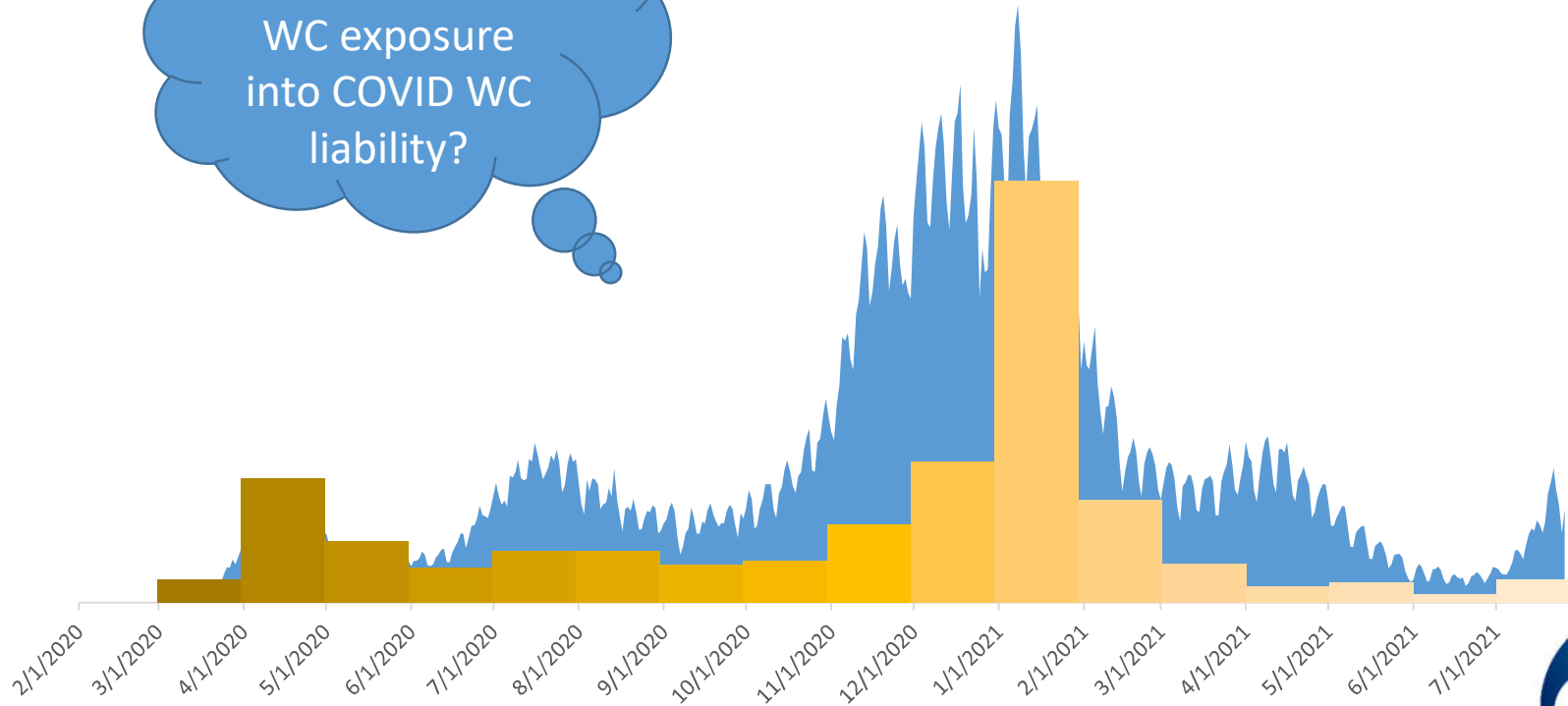
# COVID-19 WC Liability: Poll 4

- What methods did you use to estimate COVID liability for WC? (Select all that apply)
  - Factored into the overall analysis, but no separate methodology
  - Reserved off separate triangles
  - Adding a specific dollar/percentage load
  - Created a predictive model or stand-alone tool
  - None
  - Other

# Our Process of Estimating COVID-19 WC Liability

| March to June 2020 | July 2020 to April 2021 | Now and the future |
|---|---|---|

**March to June 2020**
- Find Appropriate Data
- Understand Exposure Base
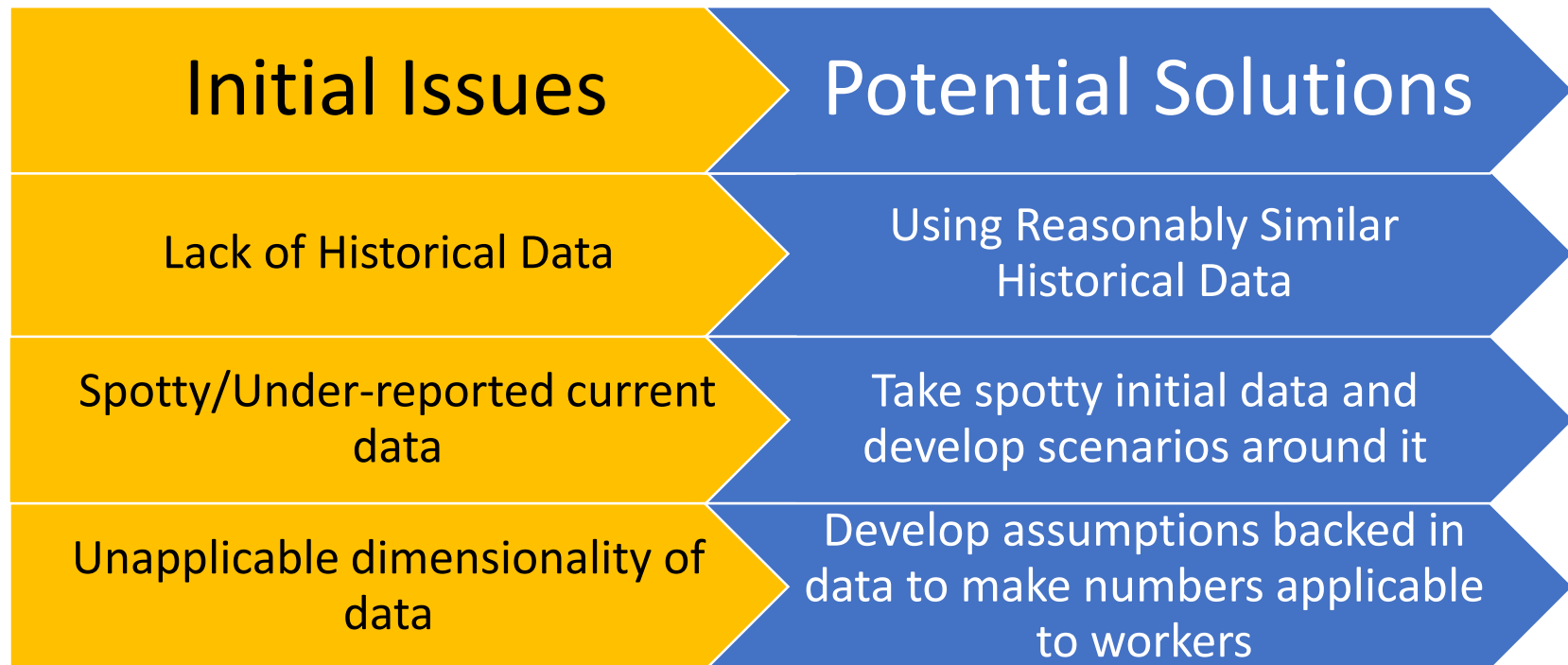- Determine Reasonable Frequency/ Severity Estimates

**July 2020 to April 2021**
- Using COVID claims data, update assumptions with initial estimates
- Consider presumption of compensability, and long-term effects

**Now and the future**
- Revisit the effects of presumption
- Adjust long-term claims estimates from experience
- Monitor changes to the virus' nature

# Finding Data

| Initial Issues | Potential Solutions |
|---|---|
| Lack of Historical Data | Using Reasonably Similar Historical Data |
| Spotty/Under-reported current data | Take spotty initial data and develop scenarios around it |
| Unapplicable dimensionality of data | Develop assumptions backed in data to make numbers applicable to workers |

# Understanding the Exposure Base: Using Non-Actuarial Data

**Population of workers**

**Essential workers**

**Non-essential workers**

**Healthcare**

**First responders**
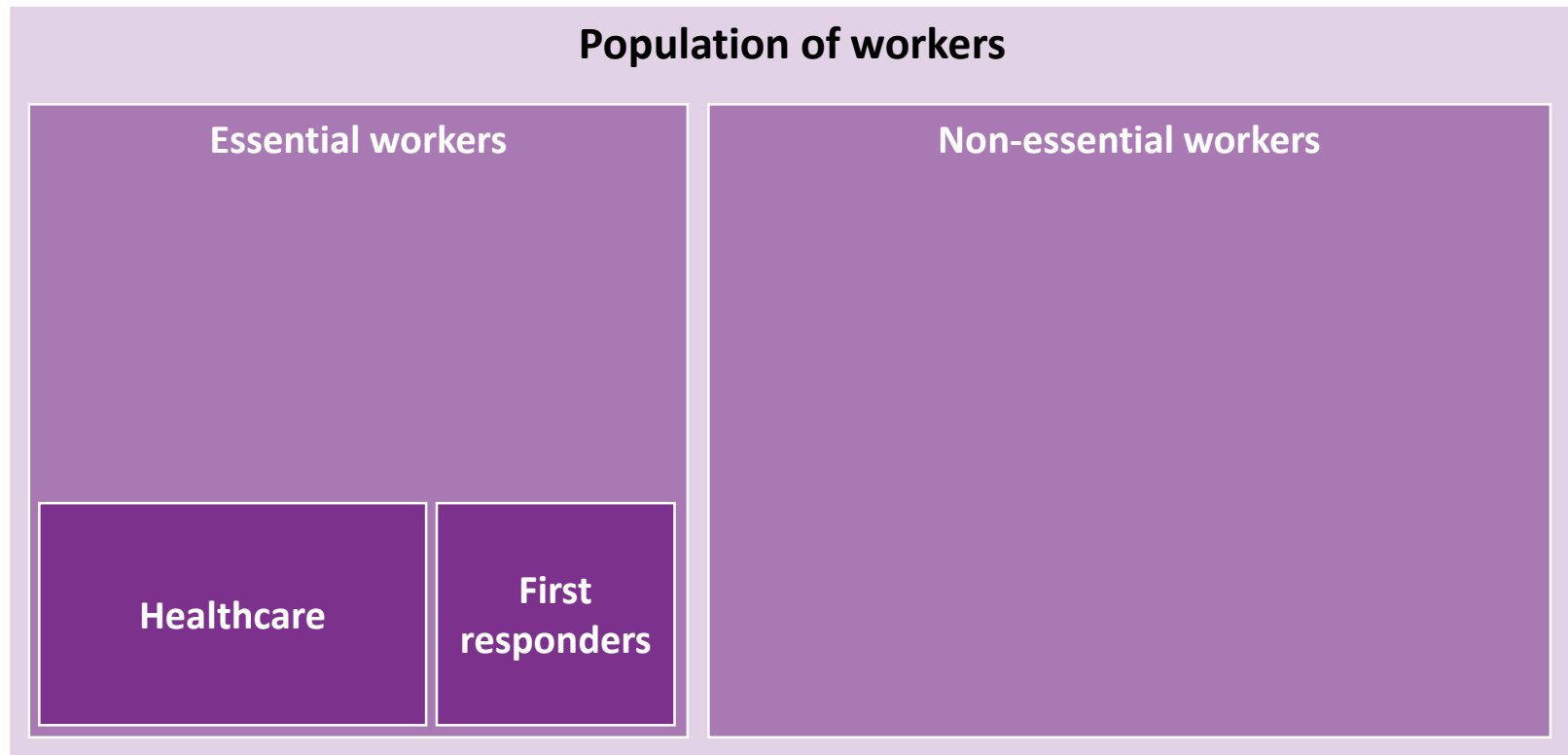
# Estimating a Frequency: Developing Scenarios

**Population of workers**

Scenario 3     **50%**

Scenario 2     **25%**

Scenario 1     **5%**

**Observed data**

| March to June 2020 | July 2020 to April 2021 | Now and the future |
|---|---|---|

45
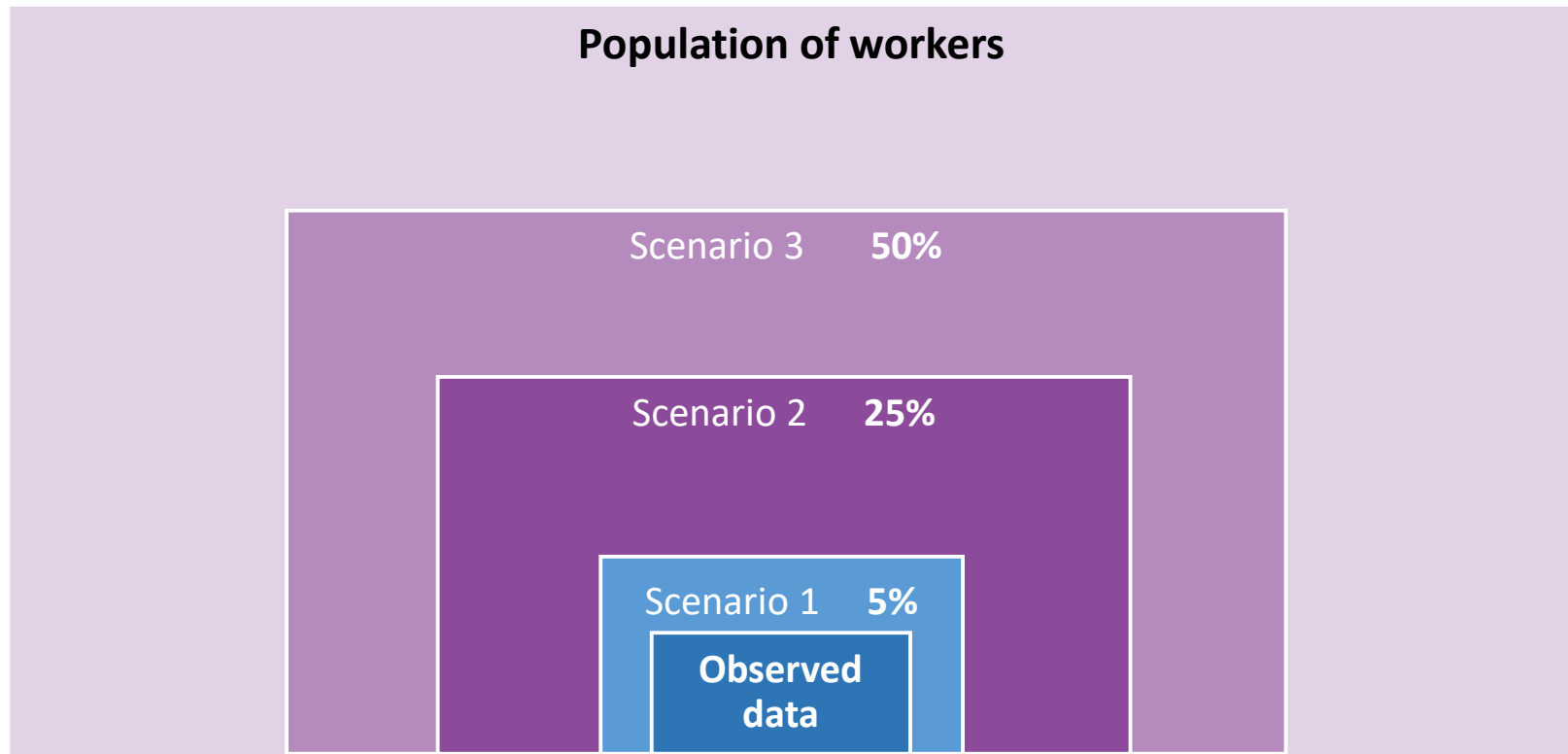
# Severity Assumptions: Reasonably Similar Historical Data

**Mild**
- No hospitalization
- Small medical fees

**Moderate**
- Short hospitalization
- No ICU

**Severe**
- Longer hospitalization
- ICU stay

**Fatal**
- Medium hospitalization
- State-appropriate benefits
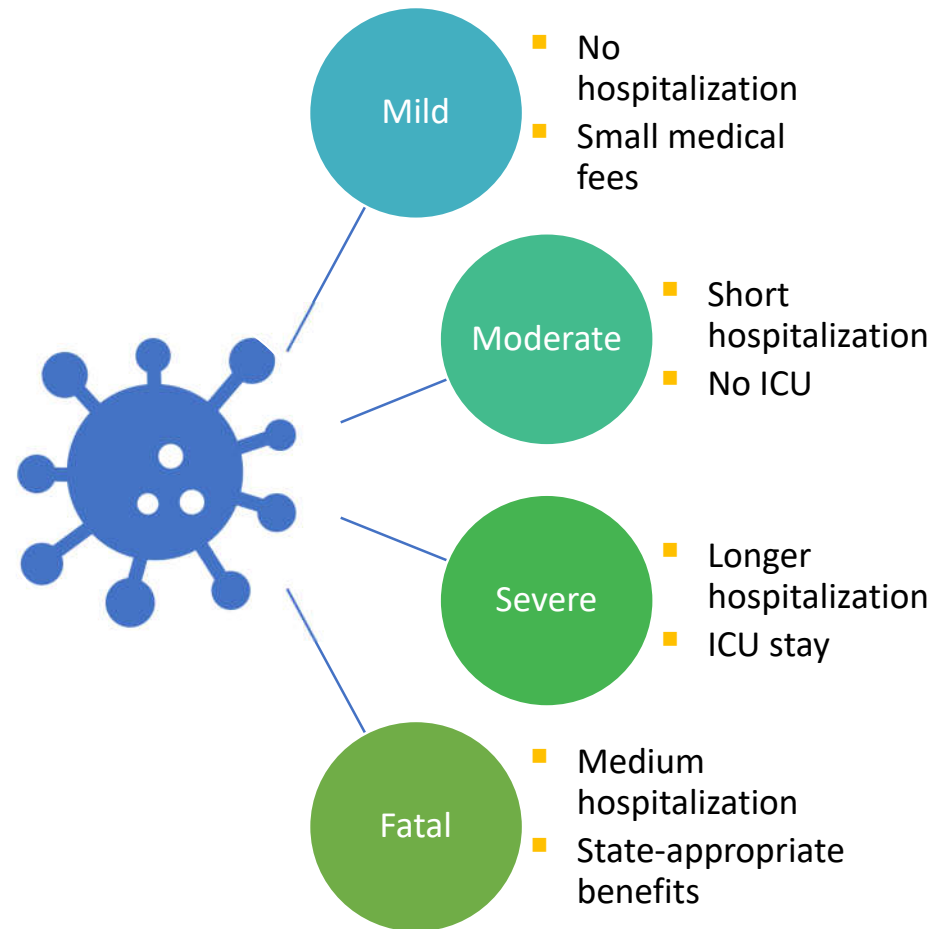
# Updating Assumptions and Associated Limitations



Frequency data

Demographic effects

Updated Assumptions

Claim severities

Legislative environment

March to June 2020 | July 2020 to April 2021 | Now and the future

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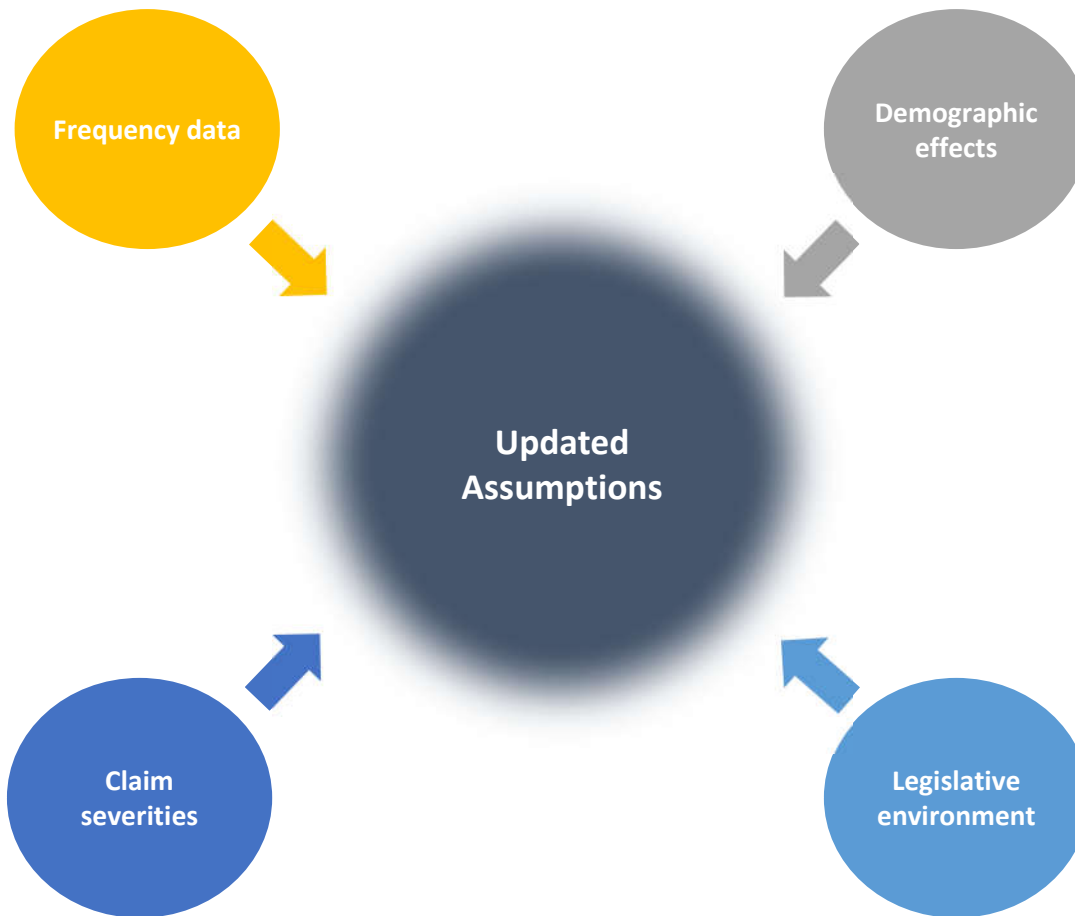
# COVID-19 WC Liability: Poll 5

- What developments caused the largest shift in your initial estimates before year-end 2020?
  - Frequency of infections
  - Claim Count Experience
  - Severity of Claims
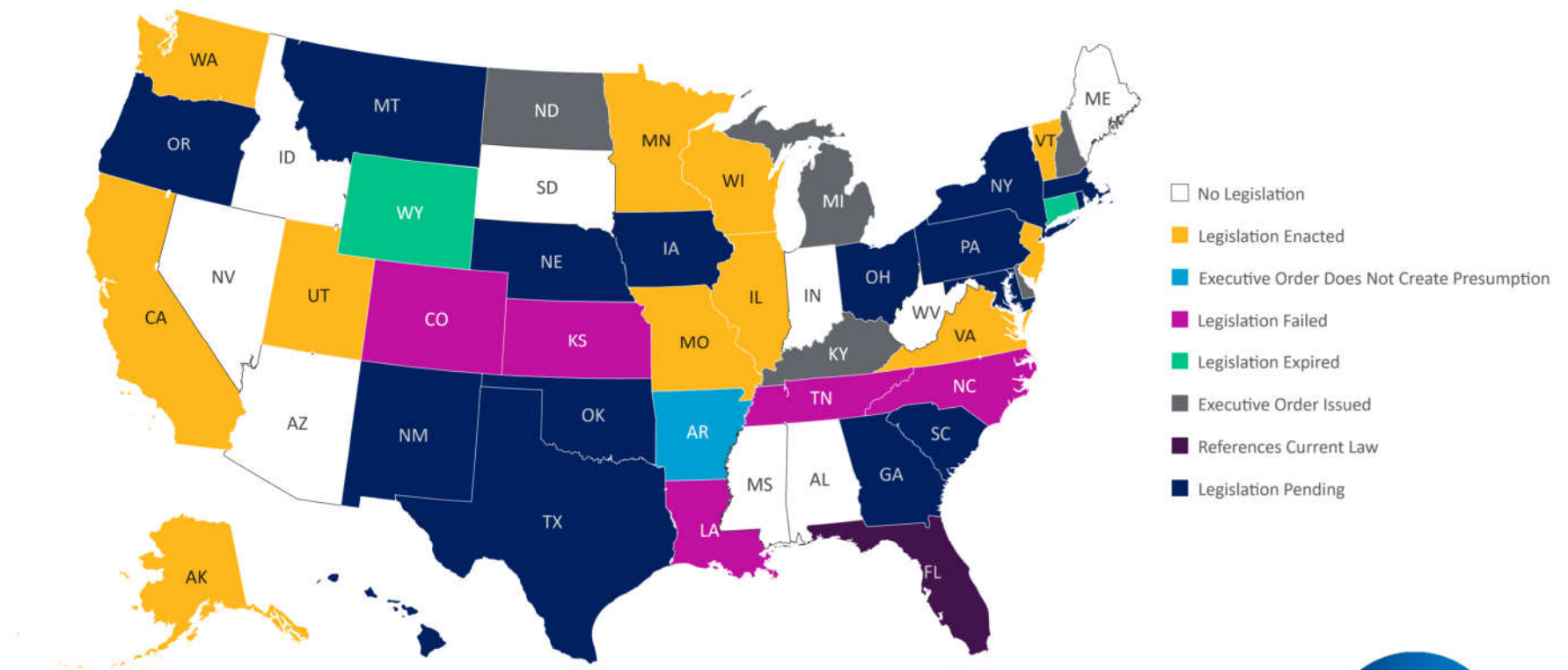  - Legislative Environment
  - Demographics of Affected Groups
  - Other

# New Assumption: Presumption of Compensability



No Legislation
Legislation Enacted
Executive Order Does Not Create Presumption
Legislation Failed
Legislation Expired
Executive Order Issued
References Current Law
Legislation Pending

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March to June 2020 | July 2020 to April 2021 | Now and the future

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# New Assumption: Presumption of Compensability



**California**

**Connecticut**

Map legend:
- No Legislation
- Legislation Enacted
- Executive Order Does Not Create Presumption
- Legislation Failed
- Legislation Expired
- Executive Order Issued
- References Current Law
- Legislation Pending
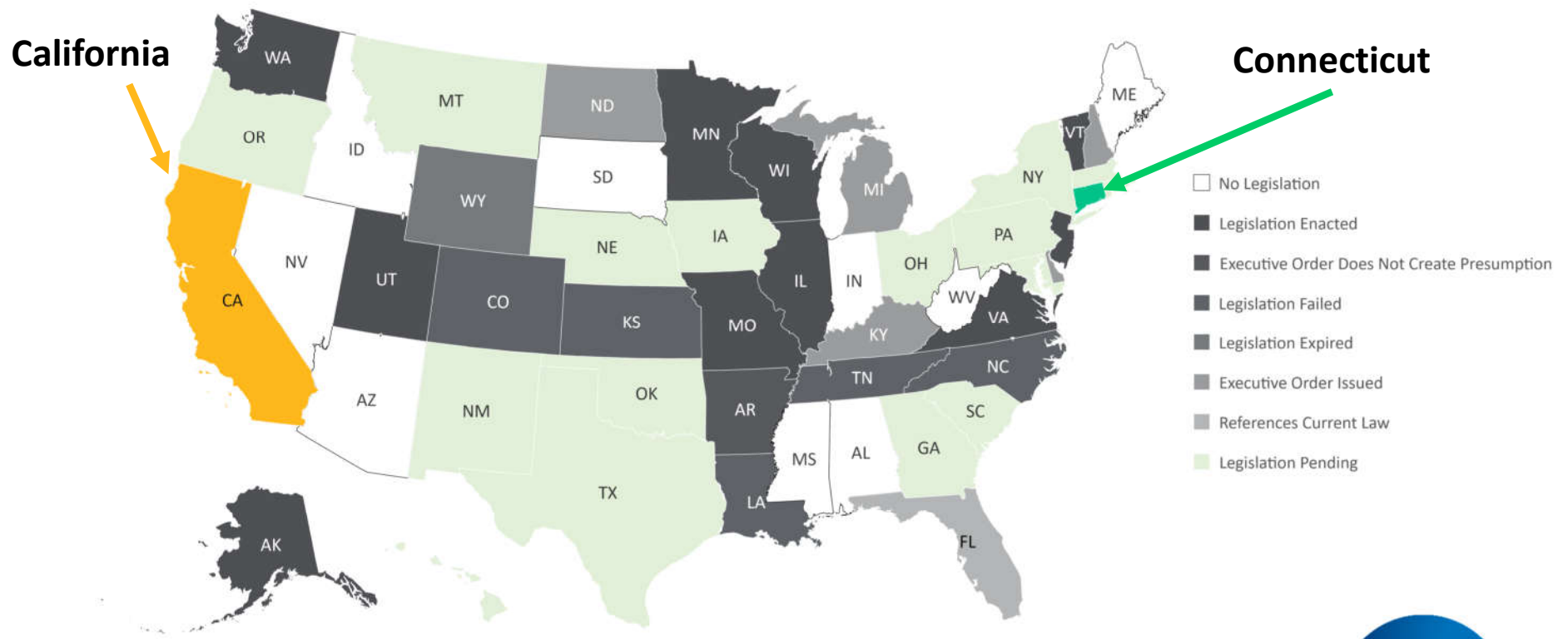
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| March to June 2020 | July 2020 to April 2021 | Now and the future |
|---|---|---|

# Comparing Spring 2020 Assumptions to Now: Severity Proportions

**Mild**
- No hospitalization
- Small medical fees

**Moderate**
- Short hospitalization
- No ICU

**Severe**
- Longer hospitalization
- ICU stay

**Fatal**
- Medium hospitalization
- State-appropriate benefits

**Initial 2020 assumptions**

| |
|---|
| **Mild** |
| **Moderate** |
| **Severe** |
| **Fatal** |

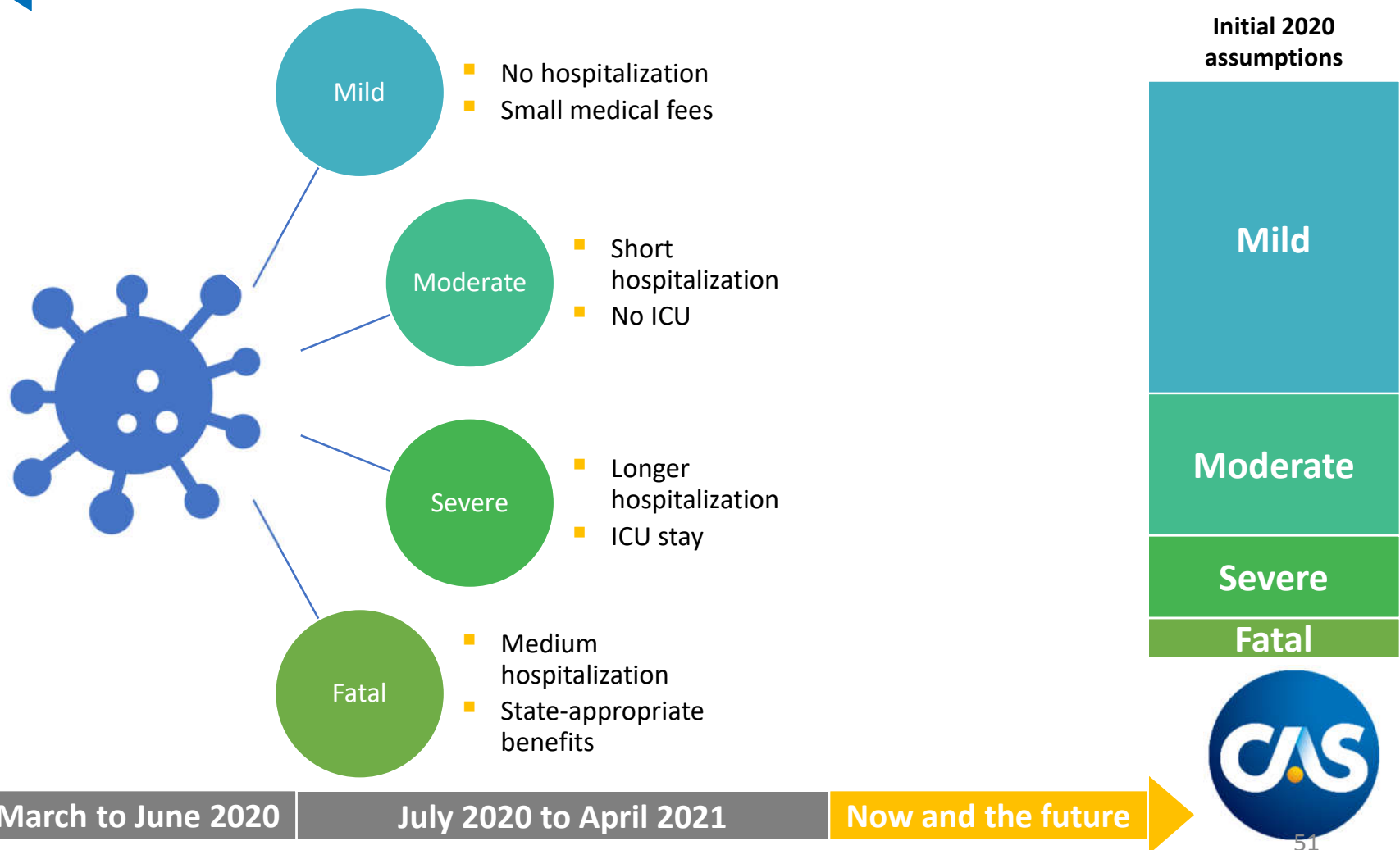**March to June 2020** | **July 2020 to April 2021** | **Now and the future**

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# Comparing Spring 2020 Assumptions to Now: Severity Proportions

**Mild**
- No hospitalization
- Small medical fees

**Moderate**
- Short hospitalization
- No ICU

**Severe**
- Longer hospitalization
- ICU stay

**Fatal**
- Medium hospitalization
- State-appropriate benefits

**Initial 2020 assumptions**

- Mild
- Moderate
- Severe
- Fatal

**Updated assumptions**

- $0 Incurred
- Mild
- Moderate
- Severe
- Fatal

**March to June 2020** | **July 2020 to April 2021** | **Now and the future**

CAS

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# Presumption of Compensability: How Much Did it Matter?



Highest Acceptance Rate

- Legislation
- Legislation Enacted
- Executive Order Does Not Create Presumption
- Legislation Failed
- Legislation Expired
- Executive Order Issued
- References Current Law
- Legislation Pending

Lowest Acceptance Rate
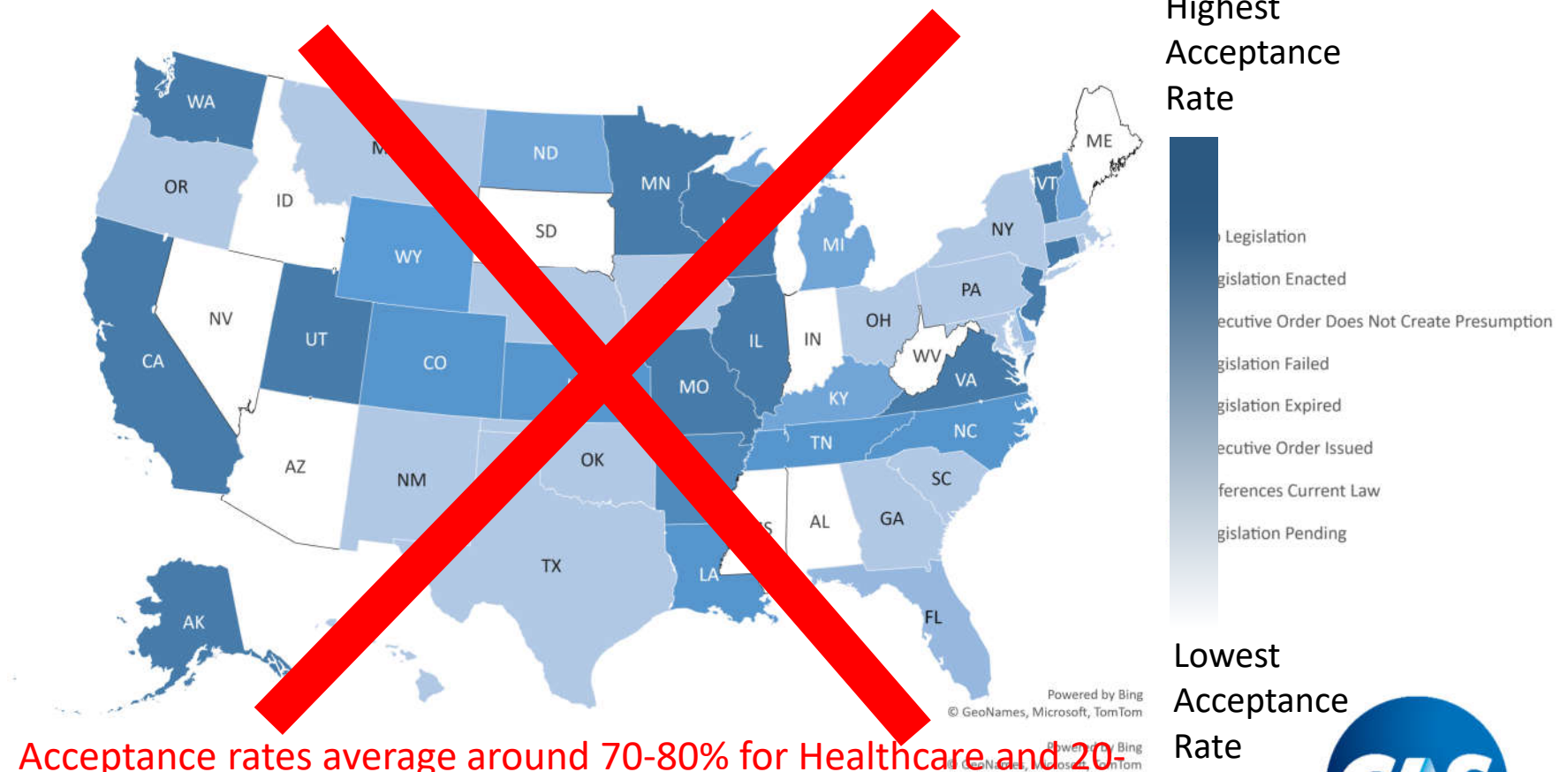
Acceptance rates average around 70-80% for Healthcare and 20-40% for Essential Workers

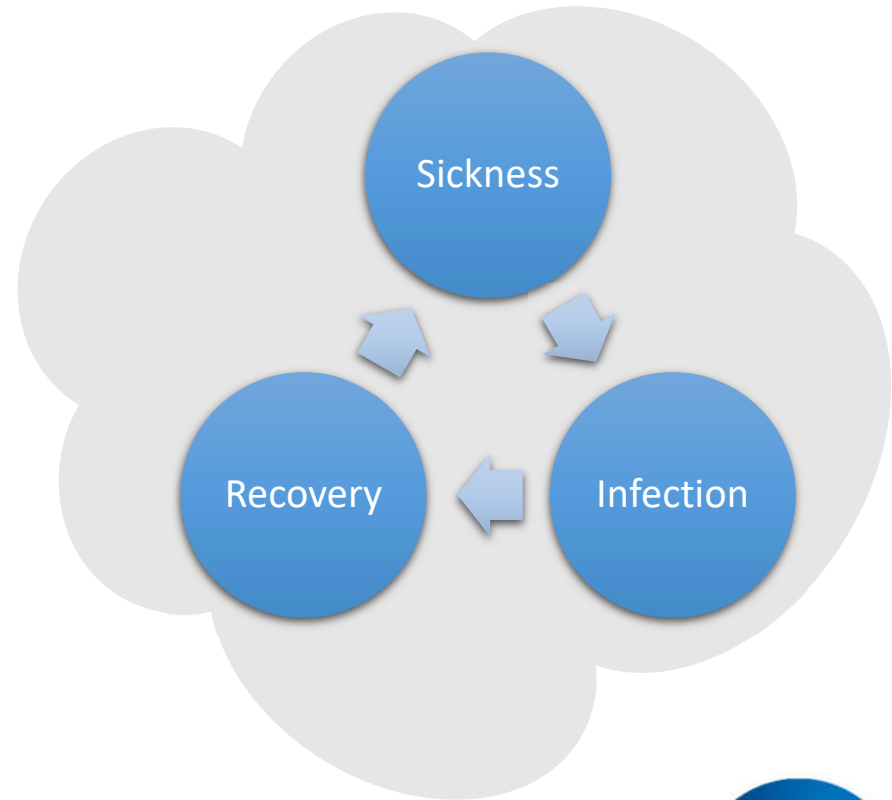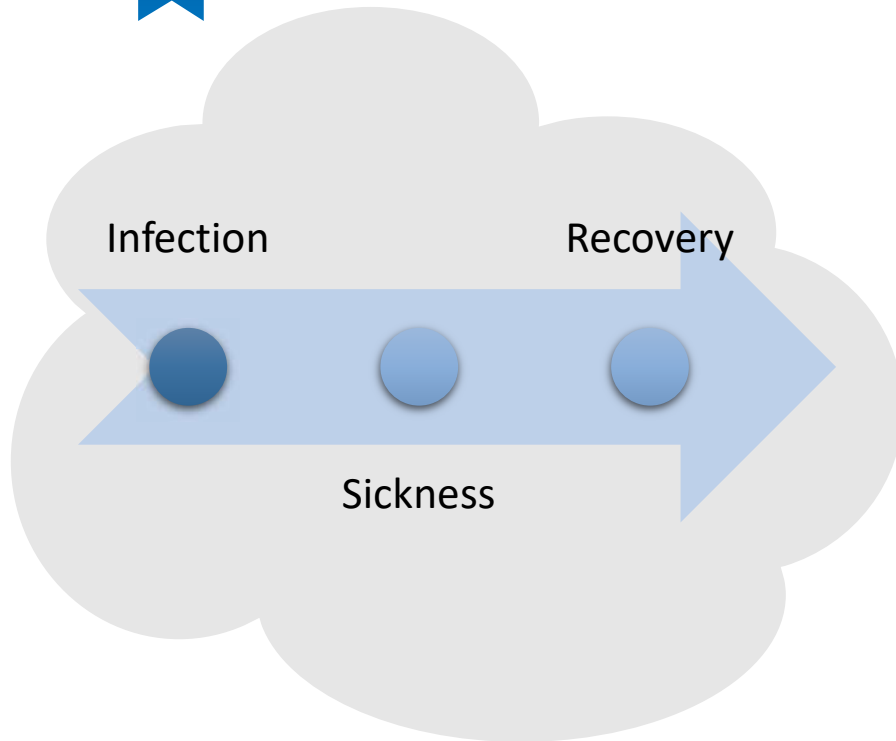| March to June 2020 | July 2020 to April 2021 | Now and the future |

# ● COVID-19 WC Liability: Poll 6

- What are the largest issues looming in your mind for estimating COVID-19 WC Liability?
  - Infections
  - Vaccinations
  - Variants
  - Legislative Environment
  - Long-Term Claims
  - Other

# Future Considerations: Long-Term Claims



Infection    Recovery

Sickness

Sickness

Recovery    Infection

| March to June 2020 | July 2020 to April 2021 | Now and the future |

# Future Considerations: Variants and the Effect of Vaccinations

Will variants negate the effects of the vaccine?

How have vaccinations changed the exposure base?

Employer-Mandated Vaccinations

# Conclusions

## PAST
### Lessons

- Use alternative data sources to create robust estimates

- Evolve tools in anticipation of future effects

## FUTURE
### Considerations

- Long-Term Claims

- Litigation

- Vaccinations

- Virus Variants

| March to June 2020 | July 2020 to April 2021 | Now and the future |
|---|---|---|

# Thank you!

## Get in touch:

**Jon Sappington**

Philadelphia
jon.sappington@willistowerswatson.com

**Ashley Wohler**

Philadelphia
ashley.wohler@willistowerswatson.com

**Kyle Walker**

Hartford
kyle.walker@willistowerswatson.com

Casualty Actuarial Society

4350 North Fairfax Drive, Suite 250

Arlington, Virginia 22203


www.casact.org