SOA Experience Studies

Moderator: Andrew Peterson, Managing Director - International, SOA

Speakers:
Cynthia MacDonald, Senior Director of Experience Studies, SOA
Patrick Nolan, Senior Experience Study Actuary, SOA
Ankita Arora, Lead EMEA Experience Study, MetLife India
Aayushi Sawhney, Assistant Manager, MetLife India

22 June 2023
Active participation in the Society of Actuaries is an important aspect of membership. While the positive contributions of professional societies and associations are well-recognized and encouraged, association activities are vulnerable to close antitrust scrutiny. By their very nature, associations bring together industry competitors and other market participants. The United States antitrust laws aim to protect consumers by preserving the free economy and prohibiting anti-competitive business practices; they promote competition. There are both state and federal antitrust laws, although state antitrust laws closely follow federal law. The Sherman Act, is the primary U.S. antitrust law pertaining to association activities. The Sherman Act prohibits every contract, combination or conspiracy that places an unreasonable restraint on trade. There are, however, some activities that are illegal under all circumstances, such as price fixing, market allocation and collusive bidding.

There is no safe harbor under the antitrust law for professional association activities. Therefore, association meeting participants should refrain from discussing any activity that could potentially be construed as having an anti-competitive effect. Discussions relating to product or service pricing, market allocations, membership restrictions, product standardization or other conditions on trade could arguably be perceived as a restraint on trade and may expose the SOA and its members to antitrust enforcement procedures.

While participating in all SOA in person meetings, webinars, teleconferences or side discussions, you should avoid discussing competitively sensitive information with competitors and follow these guidelines:

- **Do not** discuss prices for services or products or anything else that might affect prices
- **Do not** discuss what you or other entities plan to do in a particular geographic or product markets or with particular customers.
- **Do not** speak on behalf of the SOA or any of its committees unless specifically authorized to do so.
- **Do** leave a meeting where any anticompetitive pricing or market allocation discussion occurs.
- **Do** alert SOA staff and/or legal counsel to any concerning discussions
- **Do** consult with legal counsel before raising any matter or making a statement that may involve competitively sensitive information.

Adherence to these guidelines involves not only avoidance of antitrust violations, but avoidance of behavior which might be so construed. These guidelines only provide an overview of prohibited activities. SOA legal counsel reviews meeting agenda and materials as deemed appropriate and any discussion that departs from the formal agenda should be scrutinized carefully. Antitrust compliance is everyone’s responsibility; however, please seek legal counsel if you have any questions or concerns.
Presentations are intended for educational purposes only and do not replace independent professional judgment. Statements of fact and opinions expressed are those of the participants individually and, unless expressly stated to the contrary, are not the opinion or position of the Society of Actuaries, its cosponsors or its committees. The Society of Actuaries does not endorse or approve, and assumes no responsibility for, the content, accuracy or completeness of the information presented. Attendees should note that the sessions are audio-recorded and may be published in various media, including print, audio and video formats without further notice.
Moderator

Andrew Peterson, FSA, EA, MAAA, FCA
Managing Director - International, Society of Actuaries (SOA)

Andy oversees the SOA’s activities outside of the United States in advancing the actuarial profession through education and research. Andy works with the SOA Board to establish the SOA’s international strategy and oversees the work of members and staff around the world in implementing that strategy. Andy is a Fellow of the Society of Actuaries, and a Member of the American Academy of Actuaries.
Cynthia MacDonald, FSA, MAAA
Senior Director of Experience Studies, SOA

Cindy MacDonald is a Senior Director of Experience Studies at the Society of Actuaries (SOA), where she manages the internal and external resources that work with approximately 250 SOA volunteers to produce SOA experience studies. Prior to coming to the SOA in 2010, Ms. MacDonald obtained over 25 years of industry experience in life and annuity product development and asset/liability management. Ms. MacDonald is a Fellow of the Society of Actuaries, an American Academy of Actuaries member, and a CFA charter holder. She received her BS in mathematics/actuarial science from the University of Illinois in Champaign-Urbana.
Patrick Nolan, FSA, MAAA

Senior Experience Study Actuary, SOA

Patrick Nolan has been an Experience Studies Actuary at the Society of Actuaries (SOA) since July 2014. He has managed pension mortality studies in both the public and private sectors and has been heavily involved in the SOA’s mortality improvement studies and ongoing research into population mortality data sources. In his role at the SOA, Patrick has also managed the Group Life COVID-19 Mortality Survey and contributed to the development of the 2015 Valuation Basic Tables and 2017 Commissioner’s Standard Ordinary Tables. Prior to his current role at the SOA, Patrick worked for six years in Towers Watson’s retirement consulting practice.
Ankita Arora
Lead EMEA Experience Study, MetLife India

Ankita is a Manager at MetLife, India and currently leads Experiences Studies for EMEA. With a degree in Mathematics from the University of Delhi and over 15 years of actuarial experience in the Life Insurance and Pensions sectors, she has worked on major projects and valuations for pension, retiree medical, and long-term disability plans.
Speakers

Aayushi Sawhney
Assistant Manager, MetLife India

Aayushi is an Associate of IFoA with an overall experience of 5 years across actuarial domains such as Life Insurance and Pensions. Currently, she is associated with MetLife GOSC as an Assistant Manager, providing support in the experience analysis and demographic assumption setting exercise for EMEA business.
Agenda

• Welcome
• Resources Needed and Steps to Complete an Experience Study
• SOA Mortality Research in the COVID-19 ERA
• Applications of Experience Studies being done in India
• Questions
The SOA empowers members to drive solutions to life’s financial risks

Values: Integrity, Excellence, Curiosity
The SOA in India

• Dedicated to the advancement of the actuarial profession
• Serves more than 32,000 credentialed actuary members around the world
• Regular sponsor of IAI’s GCA/VAC meeting
• India Advisory Task Force
Upcoming Virtual Events for India

• Webcasts
  • Thursday, July 27: Predictive Analytics and Modeling
  • Additional events being planned...
SOA Resources

• SOA website – https://www.soa.org/asia/
  • Learn about SOA educational offerings and certificates
  • Learn about SOA Research

• SOA India LinkedIn Group

• FREE Affiliate Membership with the SOA

• SOA India Lead: Arindam Mookherjee
  • AMookherjee@soa.org
# SOA Waiver for IAI Exams

<table>
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<tr>
<th>IAI Exams</th>
<th>SOA Exams/VEE Requirements</th>
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<tbody>
<tr>
<td>Business Finance (CB1)</td>
<td>VEE Accounting and Finance</td>
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<tr>
<td>Business Economics (CB2)</td>
<td>VEE Economics</td>
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<tr>
<td>Actuarial Statistics (CS1)</td>
<td>Exam Probability (P)</td>
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<td>Actuarial Mathematics (CM1)</td>
<td>Exam Financial Mathematics (FM)</td>
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[Upload QR code for waiver application and program rules]
Society of Actuaries
Experience Studies

Cynthia MacDonald, FSA, MAAA
Agenda

• Resources needed to do an experience study
• Steps to complete an experience study
• SOA experience study resources to explore
Resources needed for a study

- Product experts
- IT infrastructure & data processors
- Project management & other disciplines
What are the steps in a Study?

Study Design → Feasibility → Collect Data → Validate Data → Metrics/Calculations → Reasonability Analysis → Prepare Data Deliverables → Report Writing → Deliver Study

Resources:
- Product Experts
- Data Processors
- Project Managers
Phase 1: Study Kick-off

- Study Design
- Feasibility
- Collect Data
- Reasonability Analysis
- Metrics/Calculations
- Validate Data
- Prepare Data Deliverables
- Report Writing
- Deliver Study

Resources:
- Product Experts
- Data Processors
- Project Managers
Study Kick-off

Study Design
• Determine what to study, design data request
• Design data validation rules, calculations & metrics

Feasibility
• Secure approval, resources, funding, participation

Collect Data
• Send out data request
• Receive data through file transfer facility
• Monitor participants, manage delays
Phase 2: Data Processing

- Study Design
- Feasibility
- Collect Data
- Reasonability Analysis
- Metrics/Calculations
- Validate Data
- Prepare Data Deliverables
- Report Writing
- Deliver Study

Resources:
- Product Experts
- Data Processors
- Project Managers
Data Processing

Data Validation
• Check format, logic checks, distributions
• Go back to contributors with questions

Calculated Fields and Metrics
• Age, exposure and duration calculations
• Mortality rates, Confidence intervals and credibility

Reasonability Analysis
• Look for outliers
• Contributors validate results
Phase 3: Study Deliverables

- Study Design
- Feasibility
- Collect Data

- Reasonability Analysis
- Metrics/Calculations
- Validate Data

- Prepare Data Deliverables
- Report Writing
- Deliver Study

Resources:
- Product Experts
- Data Processors
- Project Managers
Study Deliverables

Prepare Data Deliverables
- Aggregate data into pivot table, dashboards or csv file
- Contributor results

Report Writing
- Analysis of data and commentary
- Branding, copyright, disclaimers, reliances
- Peer review

Deliver study
- PDF report, dataset, dashboards
- Website publication, email, presentations
Credibility and Confidence Intervals

• Business intelligence tools allow one to quickly visualize areas of low or sufficient credibility


www.soa.org/resources/experience-studies/2022/determine-vbt-required/
Credibility Methods Applied to Life, Health and Pensions
This paper provides the reader with an introduction on the usage and limitations of credibility methods. It also contains a listing of numerous examples of other literature on credibility.

Experience Study Calculations Educational Tool
The Society of Actuaries’ Exposure Calculations Project Oversight Group has completed its paper, which presents and explains the methods for determining rates based on experience, such as mortality and claim utilization rates.

A Practitioner’s Guide to Statistical Mortality Graduation
This paper outlines a statistical modeling framework for fitting mortality laws to mortality experience data. The process can be used as an alternative to traditional graduation techniques used in mortality table development.

Table Development
The Society of Actuaries Research Institute has created this report as a reference document to assist actuaries in the creation of experienced-based tables for mortality rates, lapse rates, incidence rates, severity rates, and much more.
SOA Mortality Research in the COVID-19 Era

Patrick Nolan, FSA, MAAA
Group Life COVID-19 Mortality Survey
Group Life COVID-19 Mortality Survey

• Study gathers data from 20 companies, approximately 90% of Group Life industry

• Measures excess claims during the “pandemic period” (beginning Q2 2020) to pre-pandemic “baseline” (2017-2019 average)

• Includes over 2.7 million claims and more than $120 billion in earned premium as of the end of 2022
Key Study Observations

• Incidence rates up 15.2% (incurred) from 2Q 2020 through end of 2022

• Approximately 11% of claims in the pandemic period due to COVID-19 (down from 13% at mid-year 2022)
Key Study Observations

• Excess claim amounts have run 10% - 20% higher (additive) than excess claim counts

<table>
<thead>
<tr>
<th>Count-Based</th>
<th>Q2 2020-Q4 2020</th>
<th>2021</th>
<th>Q1 2022</th>
<th>Q2 2022</th>
<th>Q3 2022</th>
<th>Q4 2022</th>
<th>2022</th>
<th>Q2 2020-Q4 2022</th>
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<th>Q2 2022</th>
<th>Q3 2022</th>
<th>Q4 2022</th>
<th>2022</th>
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<td>Non-COVID/Baseline</td>
<td>111.2%</td>
<td>114.2%</td>
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<td>109.6%</td>
<td>114.9%</td>
<td>117.3%</td>
<td>112.6%</td>
<td>112.8%</td>
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</table>
Cause of Death Breakdown

- All Other / Unknown: 31.0%
- Major Cardiovascular Diseases: 27.0%
- Cancer: 22.9%
- Respiratory: 6.9%
- Accidents (non-motor vehicle): 27.0%
- Suicide: 22.9%
- Accidents (motor vehicle): 27.0%
- Cerebrovascular, including stroke: 27.0%
- Liver: 27.0%
- Diabetes: 27.0%
- Influenza & Pneumonia: 27.0%
- Drug Overdose: 27.0%
- Homicide: 27.0%
- Alzheimer’s: 27.0%
Cause of Death Trends – Top 7 Causes

- All Other / Unknown
- Cardiovascular
- Cancer
- Respiratory
- Accidents (Other)
- Suicide
- Accidents (MV)

Graph showing trends from 2017 to 2022 with data for each quarter.
Cause of Death Trends – Bottom 7 Causes

Liver
Cerebrovascular
Drug Overdose
Homicide
Diabetes
Flu/Pneum.
Alzheimer’s

20% 40% 60% 80% 100% 120% 140% 160% 180%

4Q22 3Q22 2Q22 1Q22 2021 2020 2019 2018 2017
### Trends by Age

- Excess mortality has downshifted to younger ages as the pandemic has worn on.

<table>
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<tr>
<th>Age</th>
<th>Q3 2020</th>
<th>Q4 2020</th>
<th>Q1 2021</th>
<th>Q2 2021</th>
<th>Q3 2021</th>
<th>Q4 2021</th>
<th>Q1 2022</th>
<th>Q2 2022</th>
<th>Q3 2022</th>
<th>Q4 2022</th>
<th>Apr. 2020 –Dec. 2022</th>
<th>COVID (%)</th>
<th>Non-COVID (%)</th>
<th>Count (%)</th>
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<td>0-24</td>
<td>124%</td>
<td>104%</td>
<td>101%</td>
<td>119%</td>
<td>128%</td>
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<td>119%</td>
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<td>2.8%</td>
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<tr>
<td>25-34</td>
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<td>116%</td>
<td>13.0%</td>
<td>2.9%</td>
<td>100%</td>
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</table>

*Note: The table shows excess mortality rates by age group for different quarters of 2020 and 2021, with the percentage of COVID, non-COVID, and total deaths indicated.*
Trends by Age – COVID Deaths Only

• COVID deaths have decreased after Q1 2022
• Delta wave created high excess mortality in younger age groups in Q3 and Q4 2021

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Trends by Age – Non-COVID Deaths Only

- Non-COVID deaths for ages 25-44 have remained consistently elevated since Q2 2021
- 85+ excess mortality well below 2017-2019 averages

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<td>All Ages</td>
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<td>103%</td>
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U.S. Mortality and Mortality Improvement in the COVID Era
Historical U.S. Population Mortality

• Population Trends
  • 2019: 715 Deaths per 100,000
  • 2020: 835 Deaths per 100,000
    • 16.8% increase over 2019; 4.9% with COVID removed
  • 2021: 880 Deaths per 100,000
    • 5.3% increase over 2020; COVID still an impact
  • 2022: Awaiting 4Q2022 Data; but full year could be near (or below?) results of 2020
  • Population life expectancies in 2021 back to range of mid 1990’s
Change in Mortality Rates by Cause of Death

- Heart disease: Increasing after many years of downward trends
- Cancer: First increase in mortality in last 22 years
- Accidents, diabetes, liver, hypertension, have continuing increases

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>2021 Deaths %</th>
<th>Change in Age-Adjusted Mortality Rates</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2019-2020</td>
<td>2020-2021</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>20.1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Cancer</td>
<td>17.5%</td>
<td>-1.4%</td>
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<tr>
<td>COVID</td>
<td>12.0%</td>
<td>---</td>
</tr>
<tr>
<td>Alzheimer’s/Dementia</td>
<td>6.7%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Accidents</td>
<td>6.5%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Stroke</td>
<td>4.7%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>4.1%</td>
<td>-4.6%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.0%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Liver</td>
<td>1.6%</td>
<td>16.9%</td>
</tr>
<tr>
<td>Suicide</td>
<td>1.4%</td>
<td>-3.0%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.2%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Flu &amp; Pneumonia</td>
<td>1.2%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Assault</td>
<td>0.8%</td>
<td>28.9%</td>
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<tr>
<td>Other</td>
<td>19.3%</td>
<td>6.2%</td>
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<tr>
<td>All CODs</td>
<td>100.0%</td>
<td>16.8%</td>
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</table>
Excess Deaths in the United States

- Study conducted by Rick Leavitt of Guy Carpenter using publicly available CDC mortality information
- Measures week-to-week excess mortality relative to a baseline expectation (2015-2019 trended mortality rates)
- Results published for 2020 and 2021, will likely be updated for 2022
Mortality Results - 2020

- Excess mortality shown for March 22, 2020 through January 2, 2021

<table>
<thead>
<tr>
<th>Age</th>
<th>Total</th>
<th>Female COVID</th>
<th>Excl COVID</th>
<th>Total</th>
<th>Male COVID</th>
<th>Excl COVID</th>
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<tr>
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<td>96.4%</td>
<td>0.3%</td>
<td>96.1%</td>
<td>94.4%</td>
<td>0.4%</td>
<td>94.0%</td>
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<tr>
<td>1-4</td>
<td>91.8%</td>
<td>0.9%</td>
<td>90.9%</td>
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<td>0.8%</td>
<td>95.3%</td>
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<tr>
<td>5-14</td>
<td>96.8%</td>
<td>1.7%</td>
<td>95.1%</td>
<td>107.0%</td>
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<td>15-24</td>
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<td>21.8%</td>
<td>102.9%</td>
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<tr>
<td>GE 85</td>
<td>120.2%</td>
<td>17.7%</td>
<td>102.5%</td>
<td>120.3%</td>
<td>19.8%</td>
<td>100.5%</td>
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<tr>
<td>All Ages</td>
<td>120.6%</td>
<td>16.7%</td>
<td>103.9%</td>
<td>123.3%</td>
<td>18.3%</td>
<td>105.0%</td>
</tr>
</tbody>
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SOA Research Institute
Mortality Results - 2021

- Excess mortality shown for January 3, 2021 through January 1, 2022

<table>
<thead>
<tr>
<th>Age</th>
<th>Total</th>
<th>Female COVID</th>
<th>Excl COVID</th>
<th>Total</th>
<th>Male COVID</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LT1</td>
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<td>102.3%</td>
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<tr>
<td>1-4</td>
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<td>103.1%</td>
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A Sneak Peak at 2022....

• Excess mortality approximately 10% for the full population
  • Significant reduction from 2020 and 2021, but still a long way to go
• COVID deaths decreased considerably from 2021
• Still seeing approximately 2% excess mortality from non-COVID causes
• Highest percentage excess mortality continues to be seen in working-aged Americans.
MetLife Case Study:

EMEA Experience Studies

Ankita Arora, Lead EMEA Experience Study, MetLife India
Aayushi Sawhney, Assistant Manager, MetLife India
Assumptions Studies In Scope

MetLife India Experience Studies Regions

EMEA
- Countries in Scope: 20
- Total Demographic studies: 130
- Files Used: 230
- Result Files: 80

Asia

US
Assumptions and Their Uses

Assumptions
- Demographic
- Economic
- Expense

Users
- Lapse
- Mortality
- Morbidity
- Premium Persistency

Users
- Reporting (Financial/Regulatory/Statutory)
- Financial Planning & Analysis
- Pricing
How Do We Determine Assumptions?

Data
- Previous 10 Years Policy Data Analyzed using SQL and Excel
- Checked for Discrepancies

Results
- Actuals Compared with Expected / Exposed
- Credibility Assessment
- Shares results on 3 observation periods – 3, 5 and 10

Proposal
- Rates Smoothening
- Applying Credibility Weights

Impact
- Impact Assessment on various metrics
Pain Points of Performing Experience Analysis!!

Challenges

• Big data files for processing
• Data Challenges
• Interaction with Multiple teams

Solutions

• Annual Optimization of SQL queries to reduce processing time
• Perform data validation and reasonableness checks to ensure consistencies
• Real-time collaboration and communication to keep all teams aligned

Technology Journey

- 2014: Excel based study models
- 2016: SQL models along with some excel based study models
- 2018: Python & Alteryx
- 2023: Real-time collaboration and communication to keep all teams aligned
Outcome of Experience Analysis

Experience studies team
- Demographic Assumption Analysis & Proposals
- Support to Analysis/review team

Review/Analysis team
- Review & finalization of assumptions

Experience studies team
- Updates the final assumptions in prophet and calculates the impact on various metrics

Review/Analysis team
- Discussion with Chief Actuary for approval

Query Raised
- Questions around the proposals?
- Questions around the data points?
- Questions around the methodology?

Query Raised
- Questions around impact analysis
- Questions around reasonableness of changed assumptions
COVID-19 analysis carried out on internal claims data, comparing with external world data for the period January 2020 to December 2021.

MetLife EMEA claim experience follows a similar trend to the World COVID-19 statistics across pandemic waves.

A major proportion of excess COVID-19 claims due to reasons other than mortality.
Thank you
Q&A