



Session 4J: Earth, Wind and Fire - Finding and Using Climate Data

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The American Academy of Actuaries Climate Change Joint Committee

Recent Relevant Publications:

- Policy Paper: Actuarial Perspectives on Quality, Challenges, and Effective Risk Quantification
- Issue Paper: Climatic Events, Inequities, and Risk Mitigation

Ongoing work due to be released soon on various topics

- Insurance Affordability
- ORSA Climate Scenarios
- Attribution Science

Of note for today's topic

- The Casualty Practice Council, Risk Management and Financial Reporting Council, and Research Committee sent a comment letter to the National Oceanic and Atmospheric Administration (NOAA), strongly urging the reversal of the planned retirement of NOAA's Billion-Dollar Weather and Climate Disaster Database. The joint comments, in consultation with CAS, emphasize the continued need for large, public datasets that influence public policy and the day-to-day responsibilities of actuaries, academics, and insurance companies that directly impact consumers and communities.

Our Speakers today

- Peter Ott, FCAS - Senior Pricing Officer & Vice President
Reinsurance - Property & Specialty Underwriting
Swiss Re America Holding Corporation
- Dan Pribe, FSA MAAA – Member Climate Change Joint Committee

The Property & Casualty Data Landscape

The Property & Casualty Data Landscape

- Matching Losses to Exposures & Peril
- What's Available at the Moment?
- Where Do We Go From Here?

Matching Losses to Exposures & Peril

Matching Losses to Exposures & Perils

The core challenge is correctly mapping losses to the perils that generated them and the exposures affected



Typical Boston triple-decker construction

- If there is wind damage to this location, how do you distinguish between the floors?
 - Does that even matter?
- Triple-deckers are technically a small commercial policy but the occupancy is residential
- The previous building was duplex, while the current pace has 3 units



Common set up on Capitol Hill in Seattle

- But that zoom+ care used to be a Qdoba

Matching Losses to Exposures & Perils

Is our loss data even designed to capture climate related information?

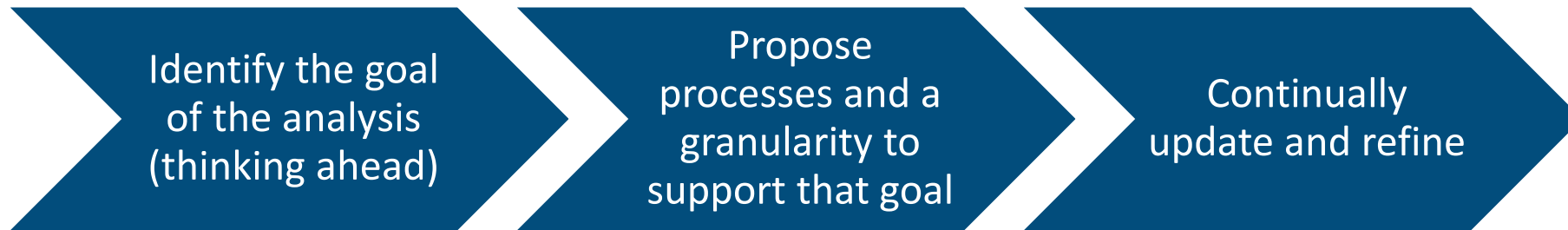
<u>Adjuster Notes</u>	<u>Coded Peril in Claims</u>		
"Tree fell from nowhere..."	All Other Peril	}	• Accurately coding meaningful loss causes is difficult
"Windy day, damage to the roof"	Wind		• Data is often highly unstructured, and claims coding is prone to error and ambiguity
"Water damage, basement flooded"	Water damage		

- We need to consider the longitudinal aspect of our data
- The data often has a reporting lag bias (do we even know the conditions of the day(s) in question?)
- How to we handle all of the old data that isn't on the "current" segmentation level and granularity?

What's Available At The Moment?

Mastering Internal Data

Actuaries Need a Seat at The Claims Table



Actuaries Need To REALLY Understand Exposure Data

- Meeting with the Catastrophe modeling teams who often have centralized exposure databases
- Risk Engineering departments that get into the weeds of exposure classifications
- Field Operations and survey team who may do onsite inspections or aerial imaging

Data From the Outside

Wrangling Vendor & Third Party Data Is a Challenge (and disappearing)

Historical Loss Data



Billion-Dollar Weather and
Climate Disasters

No Longer
Supported



- Highly curated external loss data can be very useful
- Caveat is geographical scope, and censoring from below
- Attribution is still an emerging topic

Weather & Climate

Our Current Blind Spot



ECMWF Reanalysis v5 (ERA5)



Somethings
missing...

Where Do We Go From Here?

Initiatives To Improve

There Is No Silver Bullet But Actuaries are Well Positioned

Movement In the Field

- Data Commons Initiatives
 - Ex: Nancy Watkins and Wildfire Wildland Urban Interface (WUI)
- Resiliency is requires a broader view of exposure to risk (communal exposure)
- Catastrophe Vendor models are increasingly putting climate into focus
- Affordability is a key focus

Educating Ourselves

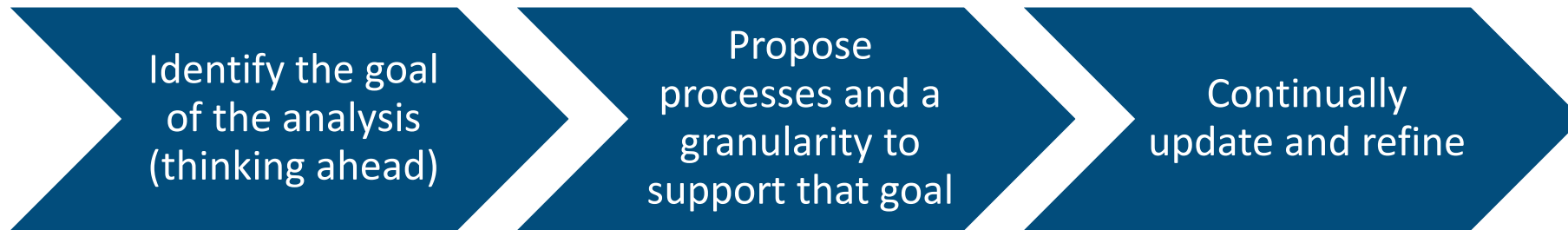
- Getting up to speed on weather/climate data
- Actuaries and attribution science



The Health Data Landscape

Mastering Internal Health Claims Data

Actuaries Need a Seat at The Claims Table



Actuaries Need To REALLY Understand Exposure Data

- Health Claims data needs to have more elements included
- Mortality data , like the CDC Wonder database, are distinct from the health claims data
- All this data needs to be merged with the external information about the climate event

Remember this slide? Life and Health actuaries will need to access and integrate these same sets with the same concerns about source materials.

Weather & Climate

Our Current Blind Spot



ACTUARIES CLIMATE INDEX
INDICE ACTUARIEL CLIMATIQUE



climate extremes
ARC centre of excellence

ECMWF Reanalysis v5 (ERA5)



NOAA

Something
missing...

Specific needs for Health Data in claims (including mortality)

- Geography and date
 - Define the heat wave locations and the dates
- Diagnosis lists for attributable conditions
 - eg. COPD or Heart Disease
- Site of care/delivery type
 - Emergency room
- Episode grouping and downstream impacts
 - Mental health claims persisting after the event

Climate Data for Health & Life Actuaries

(Climate Chaos vs. the need for Actuarial Clarity)

Provocative Realities

- Heat-related deaths in the U.S. have tripled since 2000—yet most life tables remain climate-agnostic.
- Urban mortality from heat is projected to rise 45% by 2030, but morbidity models still treat climate as background noise.
- Vector-borne diseases like dengue and malaria are becoming year-round threats—yet few health insurers model climate-driven disease dynamics.
- Climate change may drive \$1.1 trillion in additional healthcare costs by 2050, while less than 5% of adaptation funding targets health protection.

Non-Claim Characteristics

- Community - is it rural? Are there resources? Is it in a vulnerable location
- Member/Patient – Age, economic and education levels, community connection
- Health Coverage – Medicare, Medicaid Commercial?

So many sources:

AHRQ SDOH database

PLACES Social Determinants of Health (SDOH) data CDC

SDOH View from Office of Minority Health MMD

Data for Better Health initiative, powered by AHIMA

Addressing Social Determinants of Health (SDOH) from IQVIA

Neighborhood Atlas and ADI

Need to look very closely at methodology, sources and dates in these sets.

Current Data Landscape

Source	Strengths	Limitations
CDC WONDER CDC WONDER	Mortality data by ICD code, time/location granularity	No climate linkage; requires external merging
NOAA Climate Data Online *	High-resolution weather data (heatwaves, droughts, floods)	No direct healthcare outcomes
NASA EarthData Your Gateway to NASA Earth Observation Data NASA Earthdata	Satellite-based environmental indicators (PM2.5, vegetation, drought)	Complex formats; preprocessing needed
Actuaries Climate Index Home - Actuaries Climate Index	Aggregated climate indicators tailored for actuarial use	Not health-specific; coarse resolution
Global Burden of Disease (IHME) Global Burden of Disease (GBD)	Rich morbidity/mortality data linked to environmental exposures	Attribution to climate hazards is indirect; global scale may limit U.S. specificity

* Climate Data Online (CDO) - The National Climatic Data Center's (NCDC) Climate Data Online (CDO) provides free access to NCDC's archive of historical weather and climate data in addition to station history information. | National Climatic Data Center (NCDC)

Current Data Landscape (cont.)

- Climate, Weather and Environmental Sources for Actuaries
 - [Climate, Weather, and Environmental Sources for Actuaries, 2022 Update](#)
- Climate Data: Actuarial Perspectives on Quality, Challenges, and Effective Risk Quantification
 - [ClimateDataPP8.25.pdf](#)
- Others

Case Study – Heatwaves and Morbidity Modeling

- Overview: *A regional health insurer in Phoenix notices a 12–18% spike in emergency room claims during summer heatwaves, especially among older adults and those with chronic conditions.*
- Climate Trigger: *NOAA heat index exceeds 95°F for 5+ consecutive days*
- Health Impact: *Increased ER visits for dehydration, cardiovascular events, respiratory distress*
- Actuarial Challenge: *Traditional pricing and reserving models don't account for climate-driven morbidity volatility*

Case Study (cont.)

Area	Impact
Pricing	Underestimation of seasonal claim costs; need for climate-adjusted rating factors
Reserving	Inadequate reserves during extreme heat periods
Forecasting	Poor alignment between climate forecasts and utilization trends
ORSA	Climate-health scenarios missing from enterprise risk stress testing

Possible Future Directions

- Climate-Adjusted Morbidity and Mortality Tables
 - Incorporate environmental stressors (heat, air quality, disease vectors) into baseline assumptions for pricing and reserving.
- Scenario Engines for Health Risk Volatility
 - Build modular tools that simulate morbidity spikes under climate stress—heatwaves, wildfire smoke, flooding, etc.
- Data Partnerships
 - Integrate use of private EHRs, claims, and public health surveillance (without compromising privacy)
- Standardized Climate-Health Data Frameworks
 - Advocate for interoperable, actuarial-grade datasets across agencies (CDC, NOAA, CMS, NASA) with stratification by age, geography, and comorbidity..... Yeah, right 😊

Data issues.

- In this case, the past does not always predict the future.
- Local data may be sparse
- And national data may not be really relevant.
- To see patterns data for the entire area including all payers, is better.
- Sometimes the issues do not emerge or resolve quickly so longitude is important.
- Spotty and distinct events make modeling challenging.

Sources

- [jama howard 2024 Id 240057 1727459184.54647.pdf](#)
- [As much of the US braces for extreme heat, statistics show 2,000 die from it annually - ABC News](#)
- [Incorporating Climate Change into Actuarial Practice: SOA Article Series | SOA](#)
- [ClimateDataPP8.25.pdf](#)

Questions?

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Questions?



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