Long Tails, Q1 2020
The Learning Zone
Scenarios

For the first time in a long time, the catastrophic potential of latent liability exposures is in the news. As the glyphosate, talc, and opioid litigation continues to unfold and grab headlines, you may naturally be asking "How bad could it get?" and "How is my portfolio exposed?" In addition to getting answers to these questions, you may want to conduct stress tests of your portfolio across a range of outcomes involving latent liability exposures and demonstrate to rating agencies, regulators, and investors that you understand and are managing your latent liability accumulations appropriately.

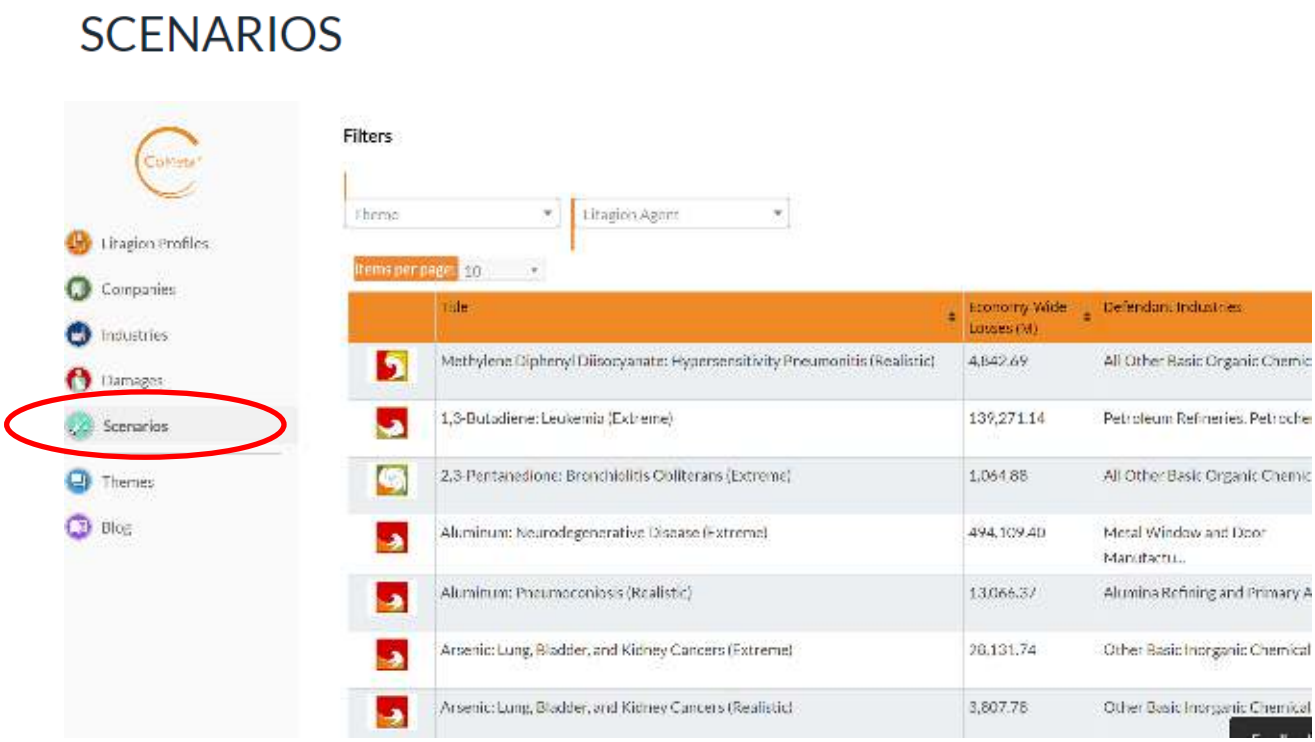
Praedicat's library of 69 realistic (RDS) and extreme disaster scenarios (XDS) provides a comprehensive framework to describe exposure to modellable and un-modellable scenarios. Praedicat's realistic disaster scenarios (RDS) describe catastrophic mass litigation events that we consider unlikely but minimally probable and consistent with current science and law, or in other words, within Praedicat's event set. Extreme disaster scenarios (XDS) describe hypothetical liability catastrophes that lie outside of Praedicat's estimated probabilistic model or the event set. These scenarios explore the magnitude and distribution of losses across a range of conceivable disasters that would require extreme shifts in science or law.

In Praedicat's software products, CoMeta and Oortfolio, you can access this diverse library of scenarios to better understand casualty catastrophe risk and inform portfolio stress testing and portfolio risk management. Praedicat's scenarios can be used to quantify exposure to emerging risks that are not currently implicated in litigation but have the potential to drive litigation in the future. They can also be used as an additional resource for quantifying latent liability losses for both internal and external reporting requirements.

Our scenarios can be used to answer these questions and more:

- What losses can I expect to hit my book of business if mass litigation involving a particular chemical or class of chemicals, e.g. phthalates or per- and polyfluoroalkyl substances, were to unfold?
- What RDS's are most relevant to my book of business? What do my projected losses under this scenario look like in comparison to economy-wide losses?
- If litigation were to be successful around glyphosate and Non-Hodgkin lymphoma, what might my insured "Company X's" losses look like in this scenario?
- What is my portfolio's exposure to emerging risks that are not fully modeled and quantified, like nanotechnology?
- How might my exposure to a certain RDS/XDS change over time as my portfolio evolves? How can I track this for internal/external reporting?

You can access the scenarios library in CoMeta from the Scenarios page (see below):



Scenarios, by definition, are envisioning one possible future latent mass action and one future possible universe where the projected science risk develops according to the specific narrative described. It is important to distinguish between the deterministic scenario loss estimates and our probabilistic model loss estimates. A scenario describes the magnitude of loss of one conceivable, defined event. The scenario is presumed to occur with low probability but the exact probability is unknown. Instead of having a frequency distribution, we resolve it and stipulate that a mass litigation event, driven by changes in the science or law, has in fact occurred. The estimate of economy-wide losses driven by an individual Litagion agent, on the other hand, which you see in the Projected Losses section of the Litagion agent's profile, is intended to reflect potential losses arising from all possible future litigation (or in Praedicat terminology, *latent mass actions*) and the industries and companies that could become ensnared in that litigation.

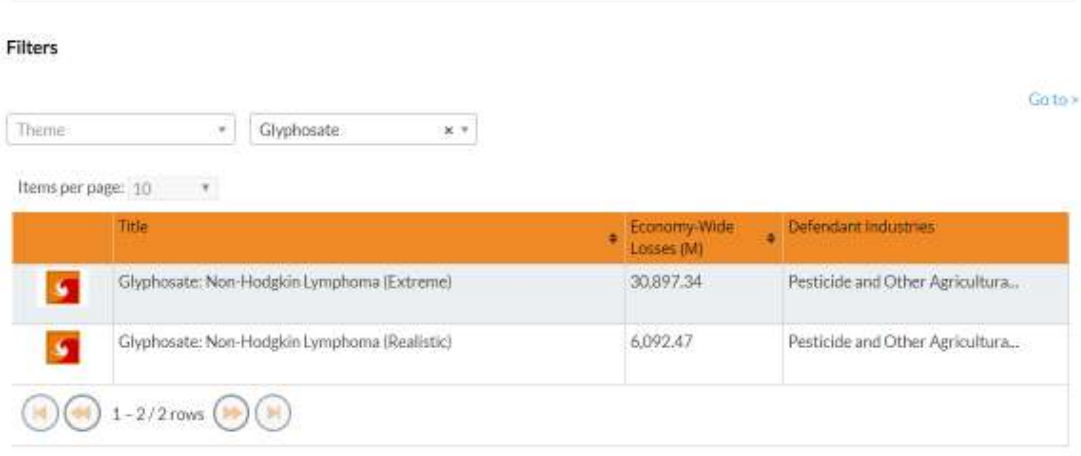
Under the conditions of this stipulated scenario, given that this event occurs, total industry-wide loss is the estimated severity, which is a function of:

1) **Exposed population:** Estimated size and demographics of the exposed population (via business activities)
2) **Target prevalence:** The percentage of those exposed estimated to manifest the harm
3) **Average severity:** The cost to indemnify the plaintiffs, i.e., how much it costs to treat the various harms or the sum of lost wage, medical cost, non-economic damages, and defense costs

Let us look first at the RDS for glyphosate and then we will consider the XDS for glyphosate.

Economy Wide RDS/XDS Analysis

We'll go to the Scenarios section of CoMeta, and filter on glyphosate.



Once at the glyphosate RDS page, you will see a narrative describing how the scenario unfolds and economy wide loss estimates, broken down into indemnity and defense, as well as the top defendant

industries and the top plaintiff exposures by losses.

Courts treat evidence negating causal link between glyphosate exposure and non-Hodgkin lymphoma as biased

Model Version: **December 28, 2018**

In this realistic disaster scenario:

- More than 10,000 lawsuits filed by landscapers and agricultural workers alleging exposure to glyphosate-based herbicides caused their non-Hodgkin lymphoma are consolidated in federal multi-district litigation.
- Pre-trial discovery reveals that glyphosate manufacturers suppressed internal animal studies that support a finding of carcinogenicity and that they funded and otherwise promoted studies demonstrating the safety of glyphosate. Allegations that defendants manipulated scientific findings in their favor also emerge.
- The perception that glyphosate manufacturers have manipulated the scientific literature and unduly biased regulatory deliberations leads courts to discount the many studies that reject the hypothesis that glyphosate exposure elevates the risk of non-Hodgkin lymphoma.
- Juries return verdicts in support of plaintiffs in several bellwether trials. Large punitive damage awards suggest that juries believe defendants had undue influence. Although defendants believe the balance of the scientific literature strongly supports the safety of glyphosate, they decide bad publicity generated by the trial undermines the long-term viability of marketing glyphosate-based herbicides.
- Manufacturers of glyphosate and completed herbicide formulations ultimately settle nearly six thousand individual lawsuits. Total losses are significant, but far less than if the published scientific evidence had uniformly supported the hypothesis that glyphosate exposure causes non-Hodgkin lymphoma.

Economy-wide losses:	$6,092M
Indemnity:	$4,860M
Defense:	$1,233M
Claims Asserted:	5,789
Claims Successful:	3,371
Avg. settlement:	$1.4M

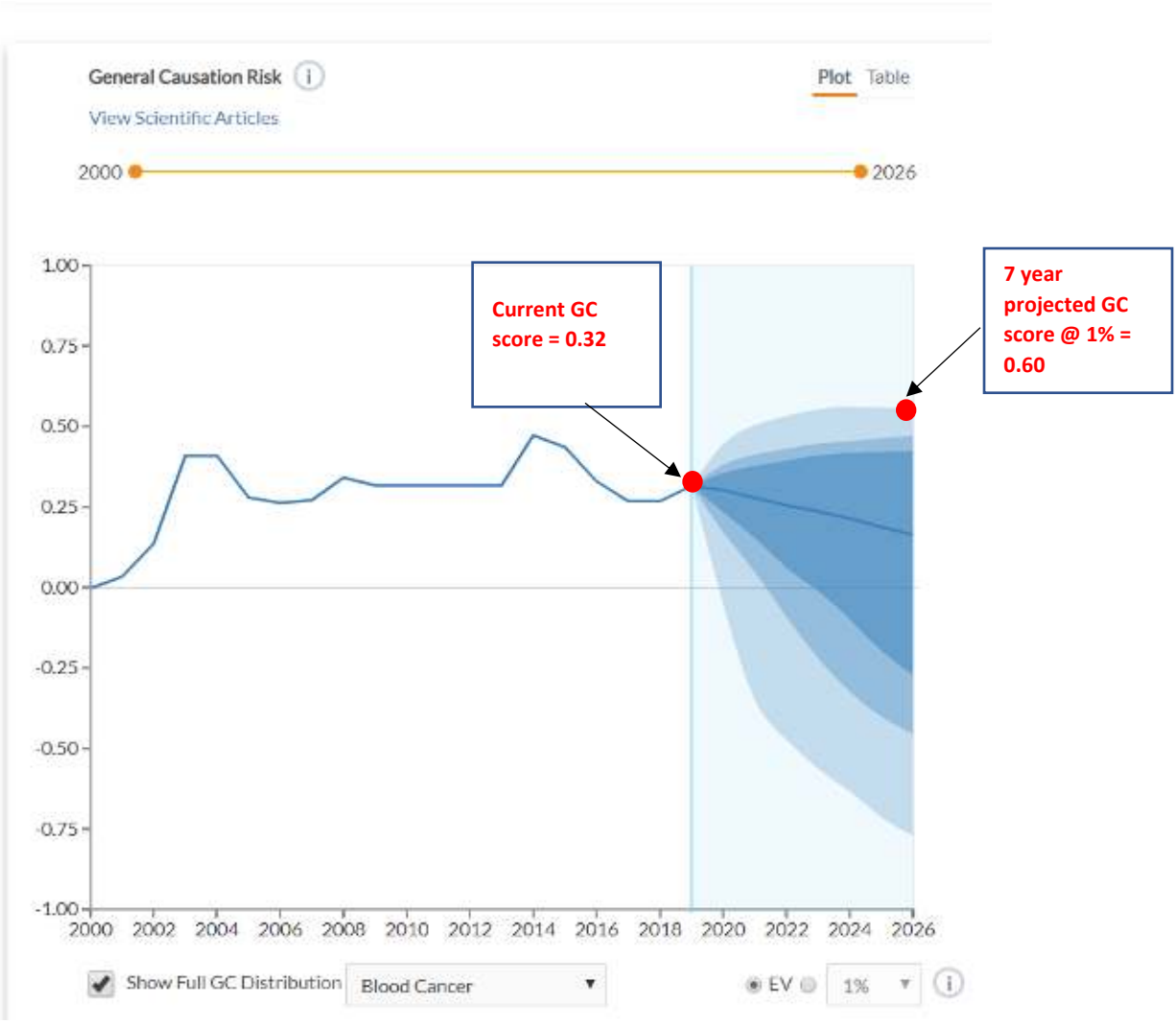
Top 5 plaintiff exposures by losses:
agricultural crop grower, not elsewhere classified (worker)
commercial landscaping company (worker)
cotton grower (worker)
hay grower (worker)
golf course (worker)

Top 5 defendant industries by losses:
Pesticide and Other Agricultural Chemical Manufacturing
Economy-wide losses:

This RDS hinges on a stipulated change in the legal environment, in which courts ultimately reject evidence negating a causal link between glyphosate and Non-Hodgkin lymphoma as biased.

Now let's turn to the glyphosate XDS. As you will recall, realistic means that it is within the range of our trajectory of simulated future science and extreme means it that lies outside this range. What is extreme about this scenario is that the GC score for glyphosate/non-Hodgkin lymphoma rises to a level *not* contained within our seven-year simulated forecast.

You will see below the GC plot for the glyphosate / Non-Hodgkin lymphoma harm hypothesis with the full distribution for GC scores forecast seven years into the future. The current glyphosate/non-Hodgkin lymphoma GC score is .32, which is well below the threshold to support mass litigation. Our current probabilistic model results indicate that there is only a 1% chance of the seven-year forecast GC score being 0.60 or greater, which could sustain claims of causation and support mass tort litigation, but this projected score is at the very outer edge of the event set.



The glyphosate/NHL XDS posits that scientists demonstrate that there is a strong causal link between glyphosate and non-Hodgkin lymphoma and develop a method to determine whether an individual's non-Hodgkin lymphoma was caused by glyphosate or some other genetic or environmental factor. As a result, the seven-year forecast GC risk score for this harm hypothesis would need to be at a much higher

level than it currently is. The median value for the seven-year projected GC score is 0.22 which remains below the level of scientific support required to trigger and sustain mass litigation.

Portfolio-Related RDS/XDS Analysis

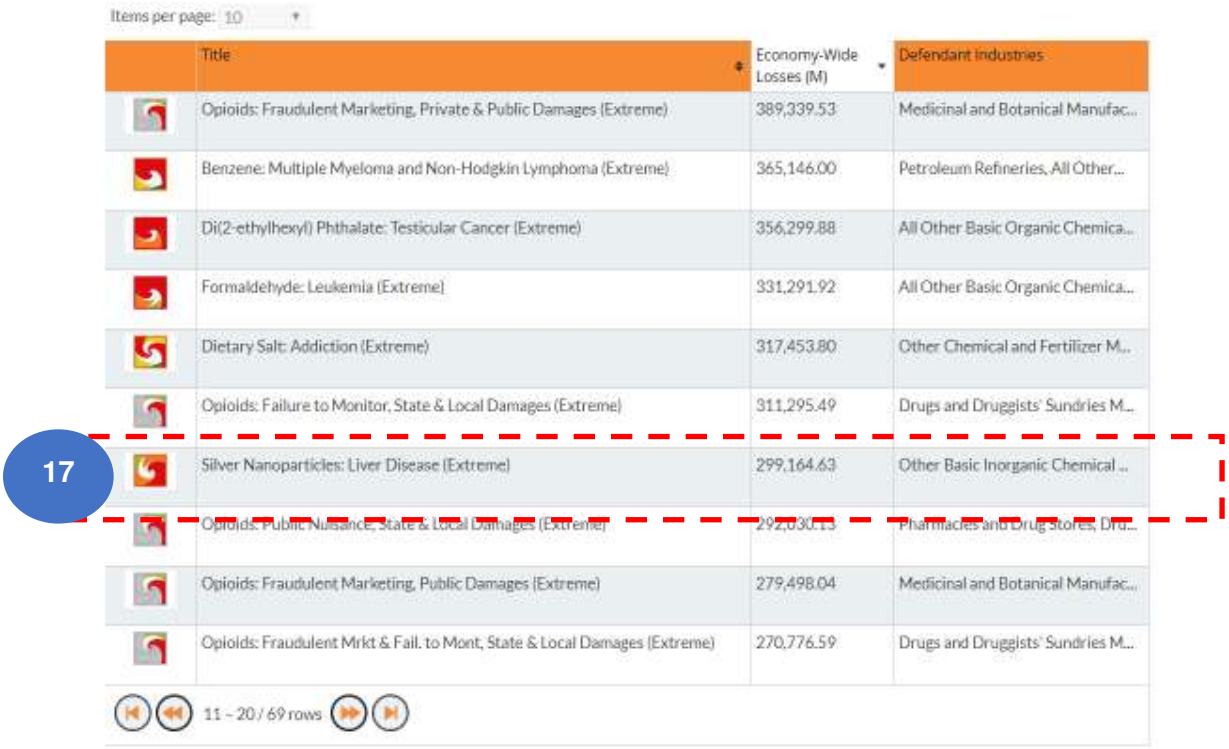
Let's move to considering how you can assess your portfolios' exposure to our RDS and XDS scenarios and use these scenarios for monitoring purposes. Praedicat's Oortfolio® software product allows (re)insurers to simulate realistic and extreme disaster scenarios based on existing or potential portfolios. Oursolution has a growing library of 69 scenarios, with new scenarios being developed and added on a regular basis, that produce large economy wide mass litigation. These simulations provide immediate results that would otherwise require several months for multiple people to develop and run a small number of scenarios.

To view your portfolios' scenarios exposure, follow these steps:

1. Log onto Oortfolio
2. Go to Portfolios and select one of your portfolios (in this example we will use the LARGE ACCOUNT HIGH AND INDUSTRY – SAMPLE portfolio
3. Click on the Scenarios tab

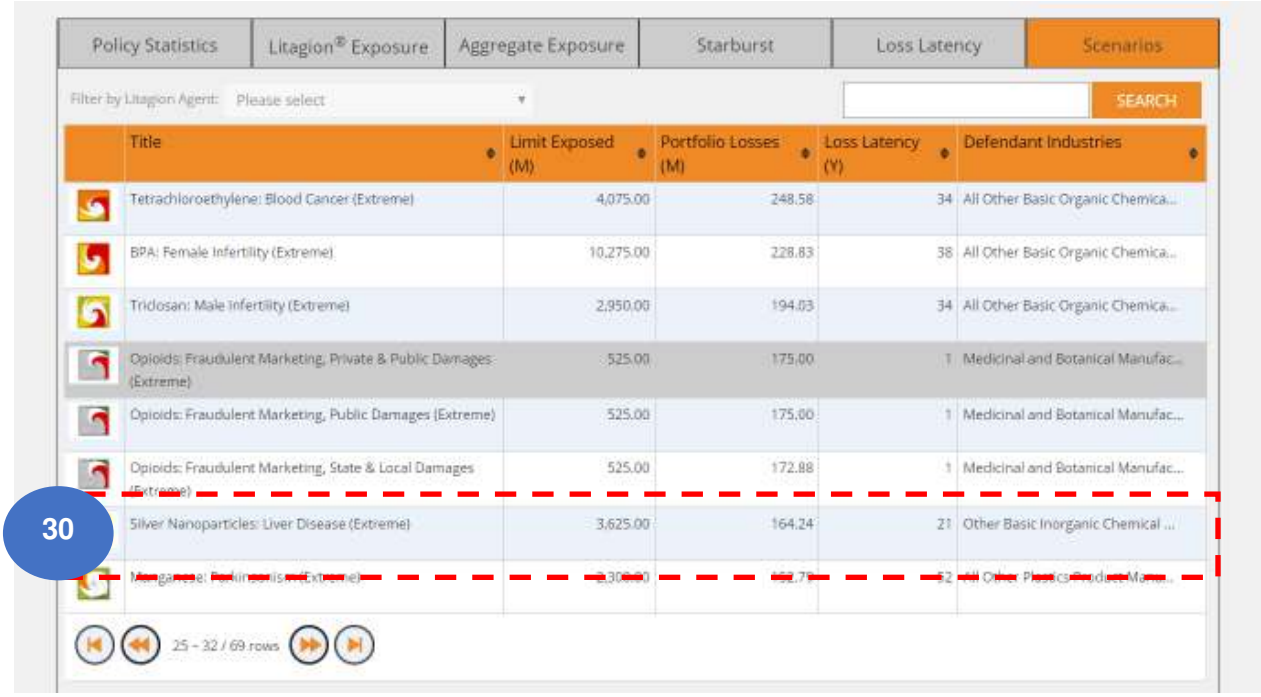
This will bring you to a screen that shows your portfolio's latent liability scenario exposure in descending order of total portfolio loss and limits exposed. This section also provides detailed information on your portfolio companies with the highest allocated losses.

Looking at the economy wide loss estimates for Praedicat's 69 scenarios and focusing on extreme disaster scenarios can help you screen for risks that were not previously on your radar but that you determine warrant monitoring based on how they rank out of all 69 of our scenarios based on economy wide losses. One such example might be silver nanoparticles. which is part of the class of nanomaterials that has been a focus of concern over the past several years due their broad commercial and industrial footprint.



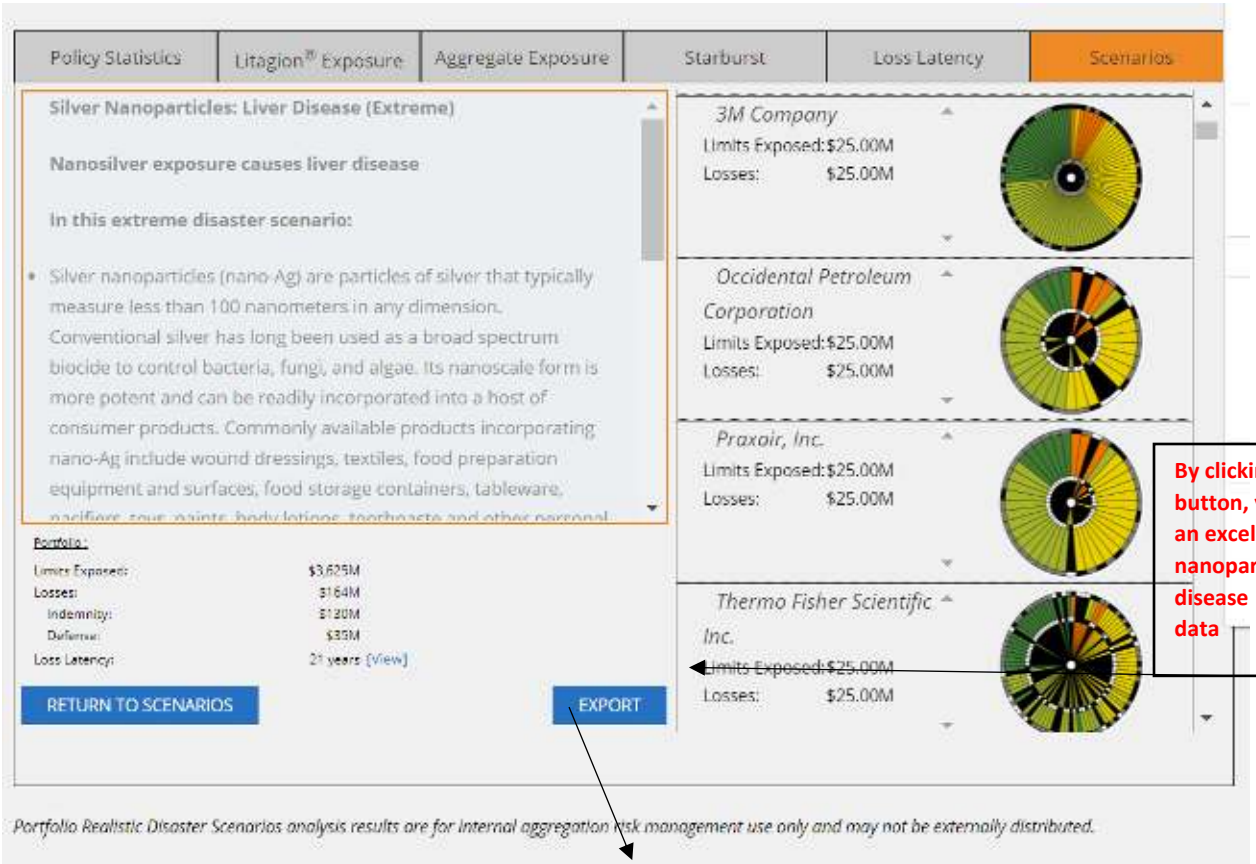
The silver nanoparticles / liver injury XDS ranks 17th with $299 million in economy wide losses. Conventional silver has long been used as a broad spectrum biocide to control bacteria, fungi, and algae. Its nanoscale form is more potent and is incorporated into a host of consumer products as a deodorizer. Silver nanoparticles' science risk is developing rapidly, although the economy wide probabilistic losses attributed to it are still relatively low. Research shows that nano-Ag particles primarily accumulate in the liver. Scientists are therefore currently exploring whether the presence of nano-Ag in the liver is connected with liver disease. However, research has yet to establish this link. Praedicat's analytics suggest that science has virtually no chance of establishing that nano-Ag causes liver disease in the next seven years. But given its broad commercial and industrial footprint, liability for nano-Ag-induced liver disease would be massive.

To investigate the potential impact of litigation under this scenario, we hypothesize that somehow, scientific consensus changes dramatically over the next seven years and finds strong epidemiological evidence that nano-Ag causes liver disease and harmed individuals can specifically identify nano-Ag as the cause of their injury. Although the silver nanoparticles / liver disease scenario is an Extreme Disaster Scenario, with the science risk not yet sufficiently developed to support litigation and the outcome is outside of our event set,it is nonetheless useful to see how your portfolio might be exposed to this rapidly evolving risk.
Let's look at your portfolio's potential exposure to silver nanoparticles,



For this portfolio, the silver nanoparticle ranks 30th in terms of exposure out of the full library of 69 scenarios. The silver nanoparticles XDS link will take you to a page with a brief narrative describing how the scenario will unfold, portfolio limits exposed to this scenario, and portfolio losses arising from this scenario, broken down into indemnity and defense. To the right, you will see a listing of industries identified by NAICS code and companies in the portfolio most exposed to this scenario, with their respective limits exposed and total losses attributable to the company or industry segment. You can also click on the Export button to generate an excel file with the detailed underlying data for this

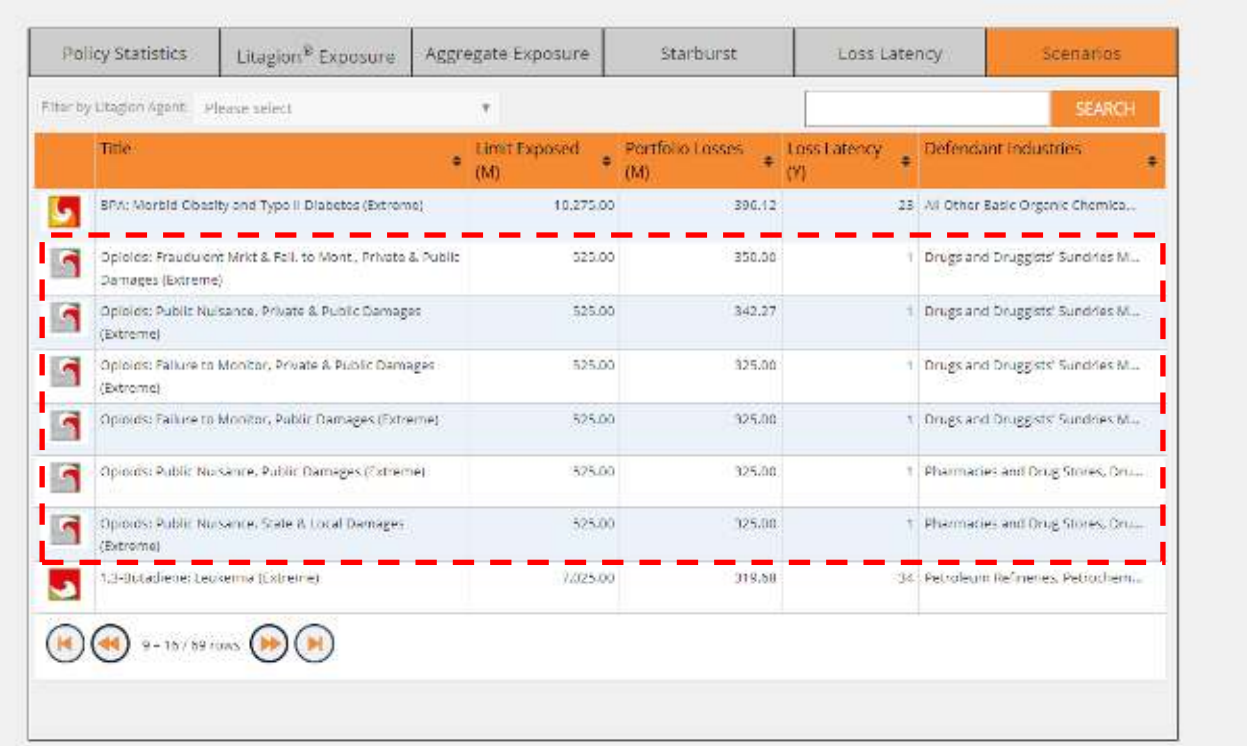
scenario.

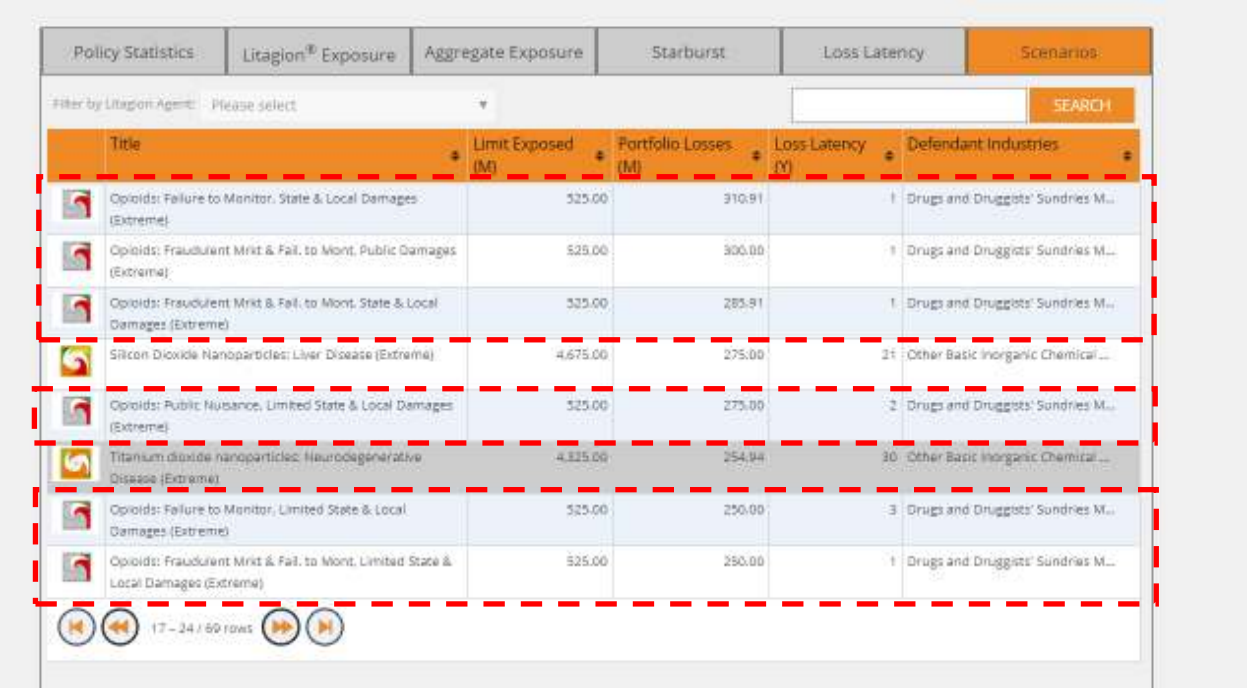


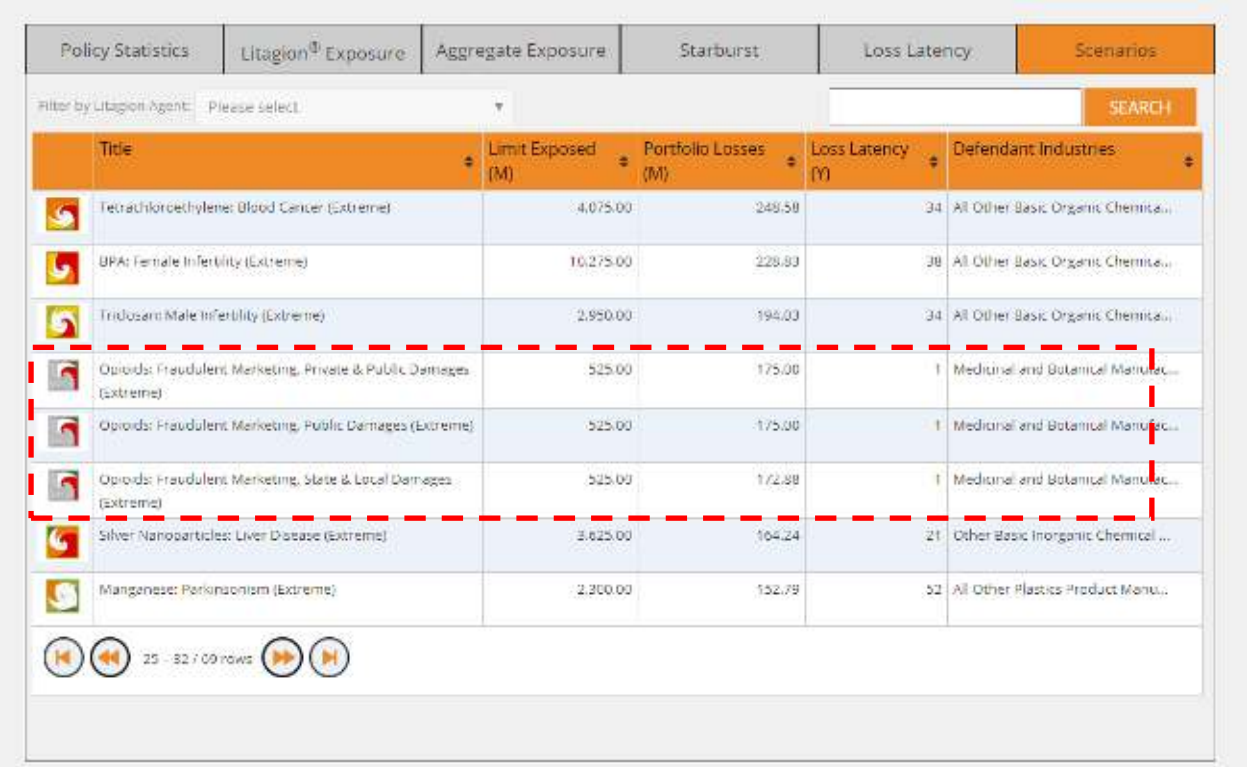
Scenario Name	Scenario ID	Unit ID Type	Unit Name	Unit ID	Trigger Type	Limit Exposed	Losses	Indemnity
Silver Nanoparticles: Liver Disease (I	1066002	3	Polish and Other Sanitation Good M	10325612	Occurrence	125,000,000.00	64,238,637.09	50738953.81
Silver Nanoparticles: Liver Disease (I	1066002	1	Thermo Fisher Scientific Inc.	34215	Integrated Oc	25,000,000.00	25,000,000.00	19706696.19
Silver Nanoparticles: Liver Disease (I	1066002	1	3M Company	51	Integrated Oc	25,000,000.00	25,000,000.00	19688339.89
Silver Nanoparticles: Liver Disease (I	1066002	1	Praxair, Inc.	26660	Integrated Oc	25,000,000.00	25,000,000.00	19706484.36
Silver Nanoparticles: Liver Disease (I	1066002	1	Occidental Petroleum Corporation	24485	Integrated Oc	25,000,000.00	25,000,000.00	19706722.36
Silver Nanoparticles: Liver Disease (I	1066002	1	Seaboard Corporation	29543	Integrated Oc	25,000,000.00	0.00	0
Silver Nanoparticles: Liver Disease (I	1066002	1	Berkshire Hathaway Inc.	4137	Integrated Oc	25,000,000.00	0.00	0
Silver Nanoparticles: Liver Disease (I	1066002	1	L Brands, Inc.	19002	Integrated Oc	25,000,000.00	0.00	0
Silver Nanoparticles: Liver Disease (I	1066002	1	Honeywell International Inc.	15956	Integrated Oc	25,000,000.00	0.00	0
Silver Nanoparticles: Liver Disease (I	1066002	1	Target Corporation	32561	Integrated Oc	25,000,000.00	0.00	0
Silver Nanoparticles: Liver Disease (I	1066002	1	Foot Locker, Inc.	12796	Integrated Oc	25,000,000.00	0.00	0
Silver Nanoparticles: Liver Disease (I	1066002	1	Pfizer Inc.	26006	Integrated Oc	25,000,000.00	0.00	0

Praedicat often uses scenarios as a sandbox to explore new frontiers in latent liability risk development such as fourth party litigation. We also often use scenarios to understand how liability risk might develop when complex political and societal factors are at play. This was the case with opioid litigation, where we have not developed a full probabilistic loss model around opioids but rather developed sixteen extreme disaster scenarios that revolve around the potential for four different theories of liability (Failure to Monitor, Fraudulent Marketing, Fraudulent Marketing & Failure to Monitor, Public Nuisance) to prevail and therefore for different segments of the stream of commerce to be affected.

Let's see how this sample portfolio is exposed to the sixteen opioids scenarios.




Policy Statistics
Litagion® Exposure
Aggregate Exposure
Starburst
Loss Latency
Scenarios
Filter by Litagion Agent: Please select
SEARCH
Title
Limit Exposed (M)
Portfolio Losses (M)
Loss Latency (Y)
Defendant Industries
Opioids: Failure to Monitor, State & Local Damages (Extreme) 525.00 310.91 1 Drugs and Druggists' Sundries M...
Opioids: Fraudulent Mrkt & Fail. to Mont, Public Damages (Extreme) 525.00 300.00 1 Drugs and Druggists' Sundries M...
Opioids: Fraudulent Mrkt & Fail. to Mont, State & Local Damages (Extreme) 525.00 285.91 1 Drugs and Druggists' Sundries M...
Silicon Dioxide Nanoparticles: Liver Disease (Extreme) 4,675.00 275.00 21 Other Basic Inorganic Chemical ...
Opioids: Public Nuisance, Limited State & Local Damages (Extreme) 525.00 275.00 2 Drugs and Druggists' Sundries M...
Titanium dioxide nanoparticles: Neurodegenerative Disease (Extreme) 4,325.00 254.94 30 Other Basic Inorganic Chemical ...
Opioids: Failure to Monitor, Limited State & Local Damages (Extreme) 525.00 250.00 3 Drugs and Druggists' Sundries M...
Opioids: Fraudulent Mrkt & Fail. to Mont, Limited State & Local Damages (Extreme) 525.00 250.00 1 Drugs and Druggists' Sundries M...
17 – 24 / 69 rows


Policy Statistics
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Loss Latency
Scenarios
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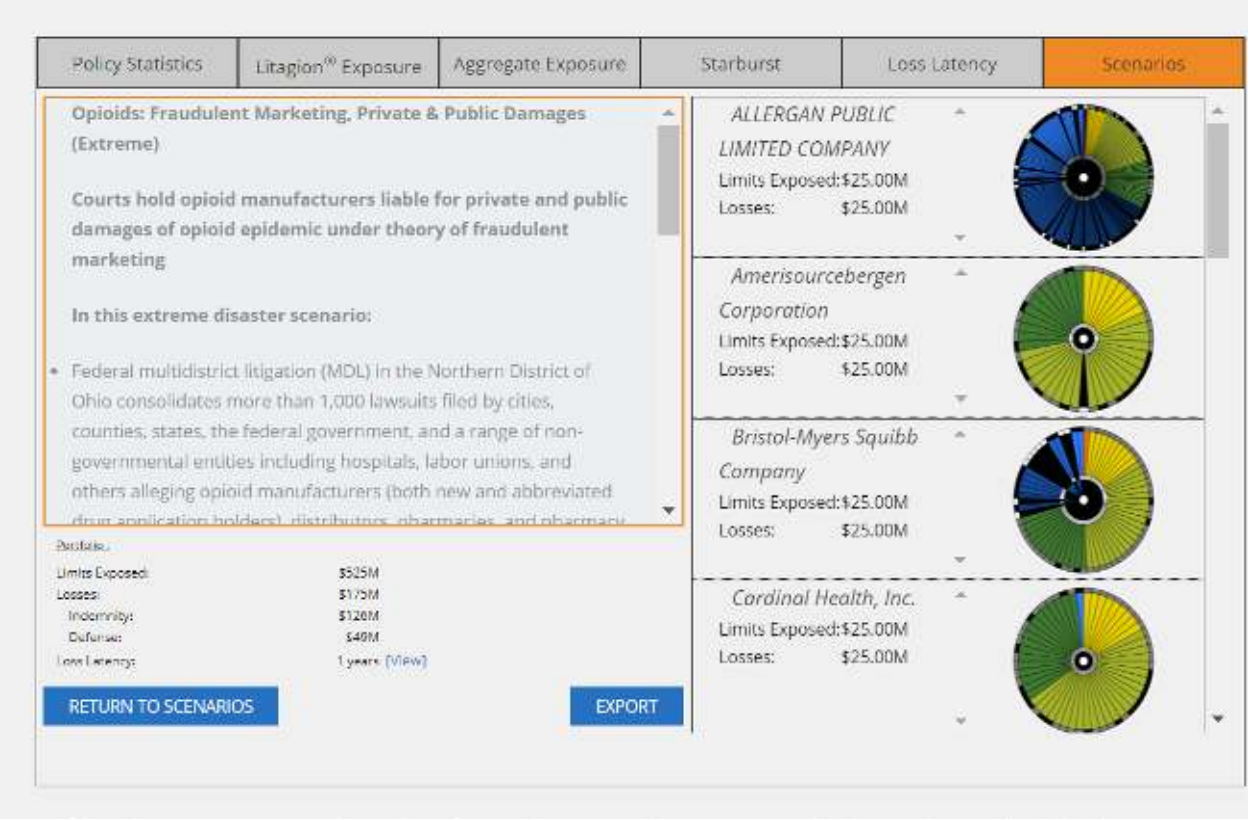
SEARCH
Title
Limit Exposed (M)
Portfolio Losses (M)
Loss Latency (Y)
Defendant Industries
Tetrachloroethylene: Blood Cancer (Extreme) 4,075.00 249.58 34 All Other Basic Organic Chemica...
BPA: Female Infertility (Extreme) 10,275.00 228.83 38 All Other Basic Organic Chemica...
Triclosan: Male Infertility (Extreme) 2,950.00 194.03 34 All Other Basic Organic Chemica...
Opioids: Fraudulent Marketing, Private & Public Damages (Extreme) 525.00 175.00 1 Medicinal and Botanical Manufac...
Opioids: Fraudulent Marketing, Public Damages (Extreme) 525.00 175.00 1 Medicinal and Botanical Manufac...
Opioids: Fraudulent Marketing, State & Local Damages (Extreme) 525.00 172.88 1 Medicinal and Botanical Manufac...
Silver Nanoparticles: Liver Disease (Extreme) 3,625.00 164.24 21 Other Basic Inorganic Chemical ...
Manganese: Parkinsonism (Extreme) 2,300.00 152.79 52 All Other Plastics Product Manu...
25 – 32 / 69 rows

In our Fraudulent Marketing, Private and Public Damages scenario, these are some of the companies in the portfolio that are most exposed.



Building a Framework for Accumulation Management Using Scenarios

Praedicat tools and analytics can be used to develop a systematic approach to managing accumulations by providing a science-based means of monitoring emerging risks and identifying the best scenarios to stress test your portfolio. As you have seen, our tools can enhance your approach to selecting and running scenarios that will help identify previously unrecognized aggregations. Just as you would with managing property cat exposures, you can select and run 2-6 scenarios per quarter to address latent liability risk . This will provide insight into:

- Significance of the scenario to your portfolio in comparison with other risks
- Top accounts driving the exposure and potential losses;
- Your largest casualty scenario is and how should you manage capital with regard to this risk.

You are thus better positioned to establish boundaries on your risk appetite and communicate this guidance to your underwriting community, as well as evidencing a more sophisticated understanding of your accumulations to rating agencies and regulators.