



Visualizing the Evidence: Exploring and Explaining Your Data via Interactive Methods

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Data, Data, Everywhere...

Risk assessments begin with broad comprehensive literature searches which can produce **tens of thousands** of results that must be systematically screened and characterized. This also creates **large databases** of systematic review metadata (screening and tagging information, literature evaluation details) and relevant data extracted from the literature (exposure-response data, NOAELs and LOAELs, uncertainty ranges) that can be difficult and time-consuming to evaluate.

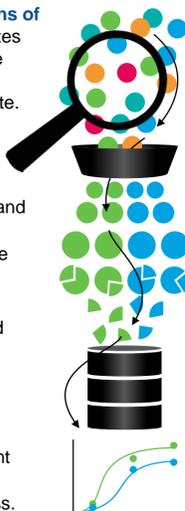
Data Visualization is ultimately one of the most useful methods risk assessors have in their toolbox to address these areas of need at every step of the systematic review process and in two contexts:

- **Exploring data** – Helping risk assessors explore complicated datasets to identify hazards and make decisions.
- **Explaining data** – Increasing the transparency and clarity with which data and analyses are presented to risk managers and the general public.

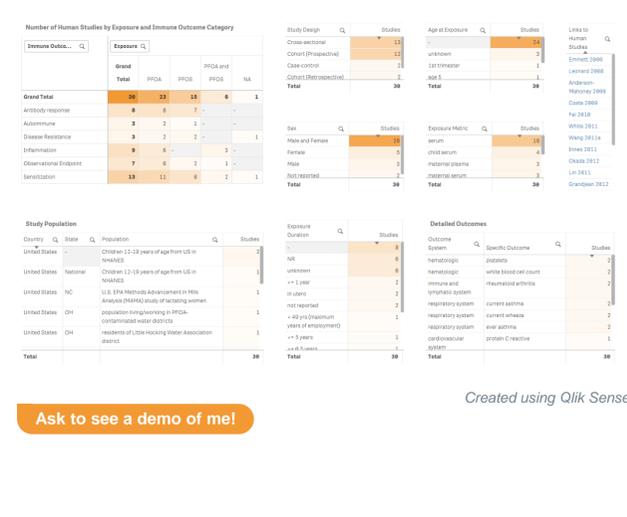
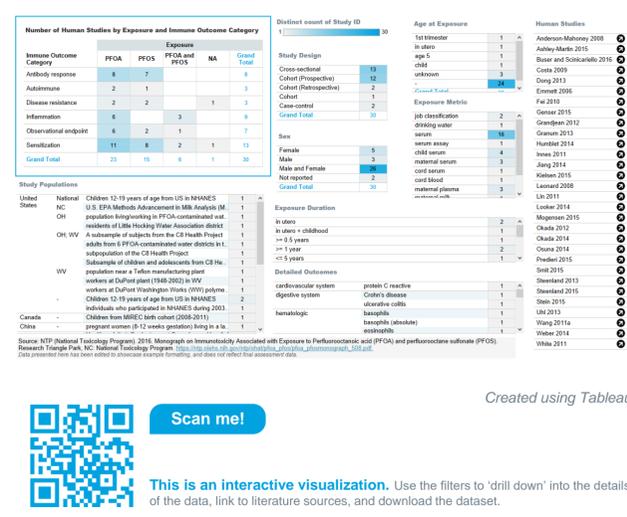
Evidence maps are one type of data visualization that can address these needs, and they are being used more often in public reports to visually represent systematic review databases and communicate characteristics of integrated evidence.

We present here:

1. How **adding an element of interactivity** to data visualizations can improve their ability to explore and explain your data;
2. **Examples of evidence maps** created using published assessment data¹ and three different tools and with varying degrees of interactivity, and
3. **Concepts to consider** while developing these visualizations to maximize their effectiveness.



Example Evidence Maps



Exploring and Explaining Your Evidence

All data visualizations ultimately serve two purposes: exploring, explaining, or both!³

Exploratory Visualizations

You've collected so much data, now you need to know:

- What patterns are emerging?
- What story are the data telling?
- Do you have what you need to make actionable decisions?
- What conclusions can you make?

How are you currently exploring your evidence?

Adding **elements of interactivity** to your data visualizations can enhance your examination of your dataset by

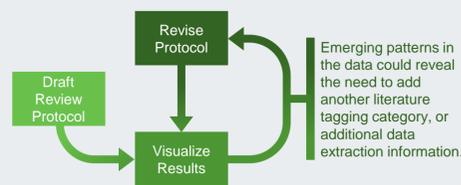
- Amplifying your ability to 'drill down' into your data,
- Helping you easily view emerging patterns and compare groups, and
- Facilitating clear decision-making.

These evidence maps make it easy to discern:

- **Emerging patterns** – Chemicals and/or outcomes with the most supporting studies
- **Data storytelling** – Gaps in the literature
- **Possible conclusions** – Number of studies examining exposures/outcomes under similar comparable conditions

Data visualization isn't often the first approach that comes to mind to explore risk assessment datasets, but it is a very effective tool for risk assessors to use to delve into their data and gain insights that allow them to better make decisions based on those data.

Using visualizations like these throughout the literature characterization and data extraction processes can inform decisions to revise the review protocol:



Explanatory Visualizations

You've characterized and integrated your evidence, now you need to support your findings:

- Will your audience understand your presentation of the data supporting your decisions?
- Does your audience have specific priorities to consider?
- Does your audience have meaningful access to your underlying data?

How are you currently explaining your evidence?

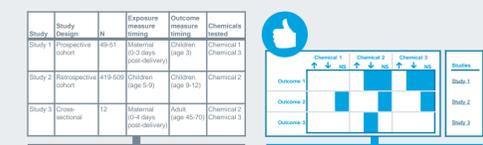
Leveraging **interactive visualizations** can help you reach your audience by

- Presenting complicated information in an intuitive and clear manner and
- Facilitating trust; the audience can interact with and discover the data for themselves to validate your conclusions.

Considering your audience's needs and perspectives is crucial when crafting useful explanatory visualizations:

- **Expertise** – Are you presenting data to risk managers? Or justifying decisions to the general public? How much does your audience know about your assessment? About exposure-response data?
- **Priorities** – What's important to your audience? Are they interested in data supporting an exposure or outcome that could affect them? Will they have access to all the information important to them in your visualizations?

These evidence maps, compared to conventional summary tables, are an efficient means of presenting evidence because they provide audiences with meaningful access to the data used in the assessment, facilitating understanding and trust.



It is difficult to process data summarized in text and tables quickly. It's also more difficult to check the author's work.

Providing a visual makes the data easier to digest. Interactive features provide 'drill down' capabilities and immediate access to source studies.

Using interactive data visualizations tailored to your audience's priorities and expertise level is an excellent way to present findings and justify conclusions.

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¹NTP (National Toxicology Program). 2016. Monograph on Immunotoxicity Associated with Exposure to Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Research Triangle Park, NC: National Toxicology Program. https://ntp.niehs.nih.gov/ntp/ohat/pfoa_pfos/pfoa_pfosmonograph_508.pdf. Data presented here has been edited to showcase example formatting, and does not reflect final assessment data.

²Funding for this work was partially provided by U.S. EPA under contract EP-C-14-001, work assignment 5-105. The views in this poster are those of the authors and do not reflect the views or policies of the EPA.

³Shander, B. (2014, June 5). Learning Data Visualization. [Video File]. Retrieved from Lynda.com.

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