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# The quest for average water:

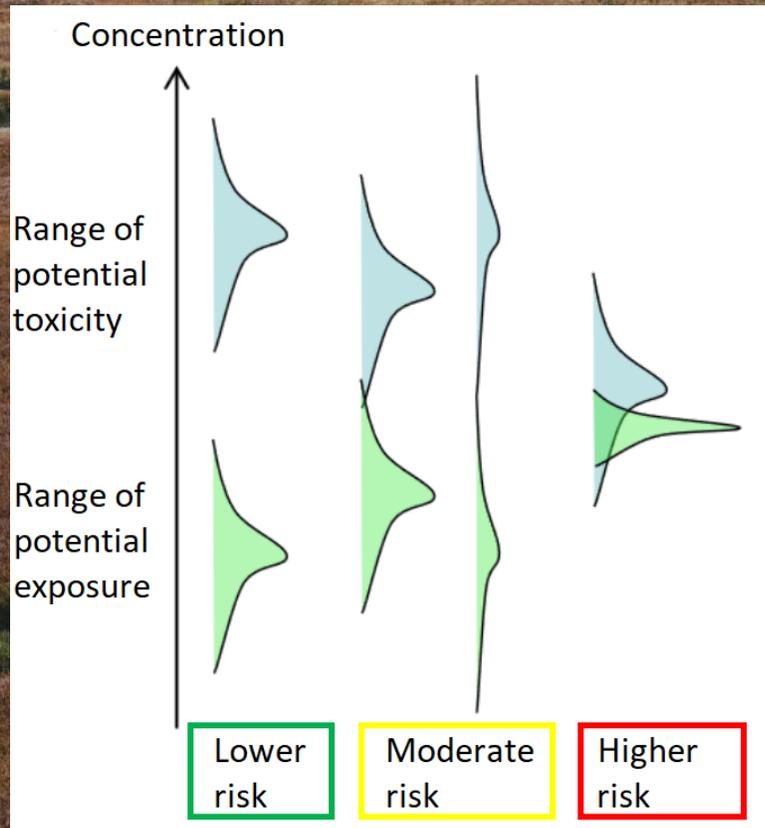
## Determining Representative Surface Water Concentrations for Chemical Risk Assessment Prioritization

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This presentation does not necessarily reflect U.S. EPA policy.

An aerial photograph of a winding river or stream cutting through a vast, flat, brownish-green landscape, likely a wetland or marsh. The water is a light, silty grey color, contrasting with the dense, low-lying vegetation. The river meanders from the top center towards the bottom left, then turns back towards the right. The overall scene is a wide, open expanse of natural terrain.

Why do I want to find  
average water?



Even a highly uncertain estimate can provide enough information to rank chemicals for risk prioritization.

## Risk prioritization:

National average surface water concentrations of anthropogenic chemicals can be used to estimate one type of potential **exposure**: a component needed to identify the most important chemicals for a thorough risk evaluation.



What data will help me find  
average water?

## Representative samples:

I designed an automated workflow to pull and clean National Water Quality Portal records from 2008-2018 for all organic chemicals from sites or activities that would yield ambient concentrations from across the U.S.

1761 chemical names

1382 unique chemical structures

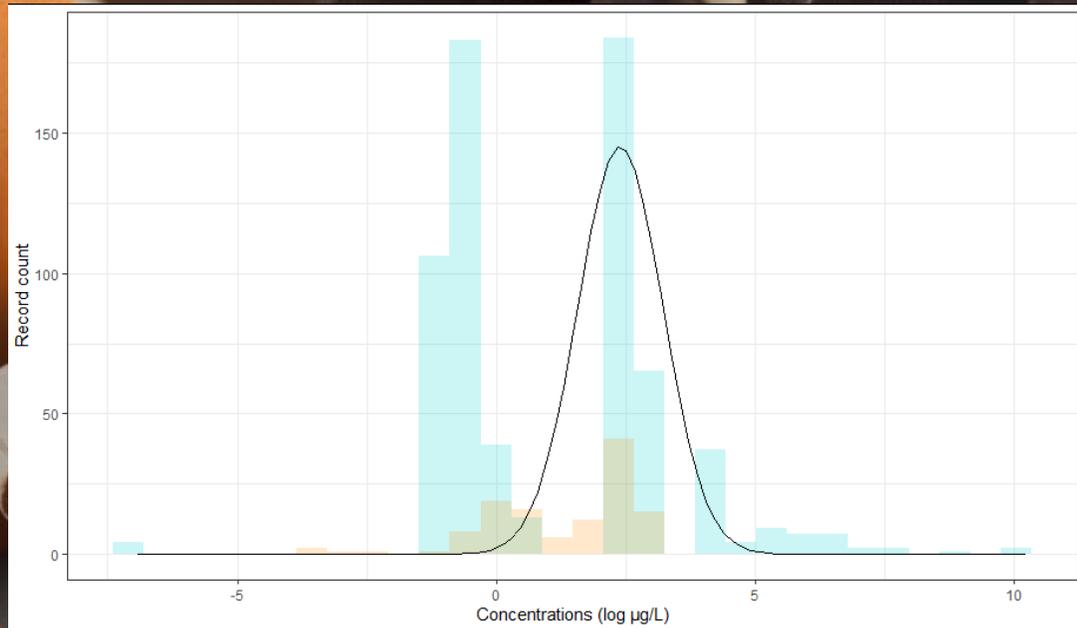
1310 chemicals with data from ambient surface water sites

498 chemicals with at least 50 discrete values (above detection and reporting limits)

The number of chemicals for which estimates could be made decreased with each data cleaning step.

A collection of colorful wooden human figures in various colors (red, orange, yellow, green, blue, brown, black) scattered across a dark surface. The figures are made of wood and have a simple, stylized design. They are scattered across the frame, with some in the foreground and some in the background. The colors are vibrant and varied, creating a diverse and inclusive visual representation of people.

How will I get representative values from my data?



Estimated representative distribution for 1,4-Dioxane, with histogram showing censored (aqua) and uncensored (orange) data

Mean of the lognormal maximum likelihood estimate:

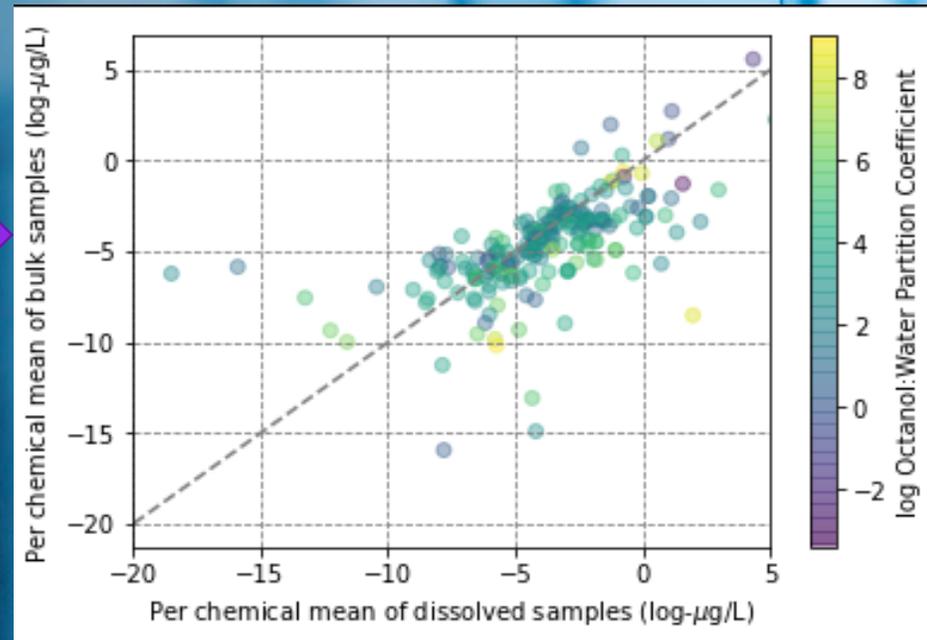
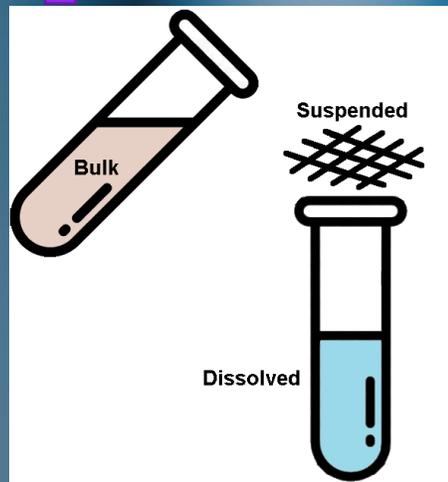
Records for most chemicals were over 80% censored (below a detection or reporting limit).

We needed a method that could incorporate knowledge from both discrete values and left-censoring limits.

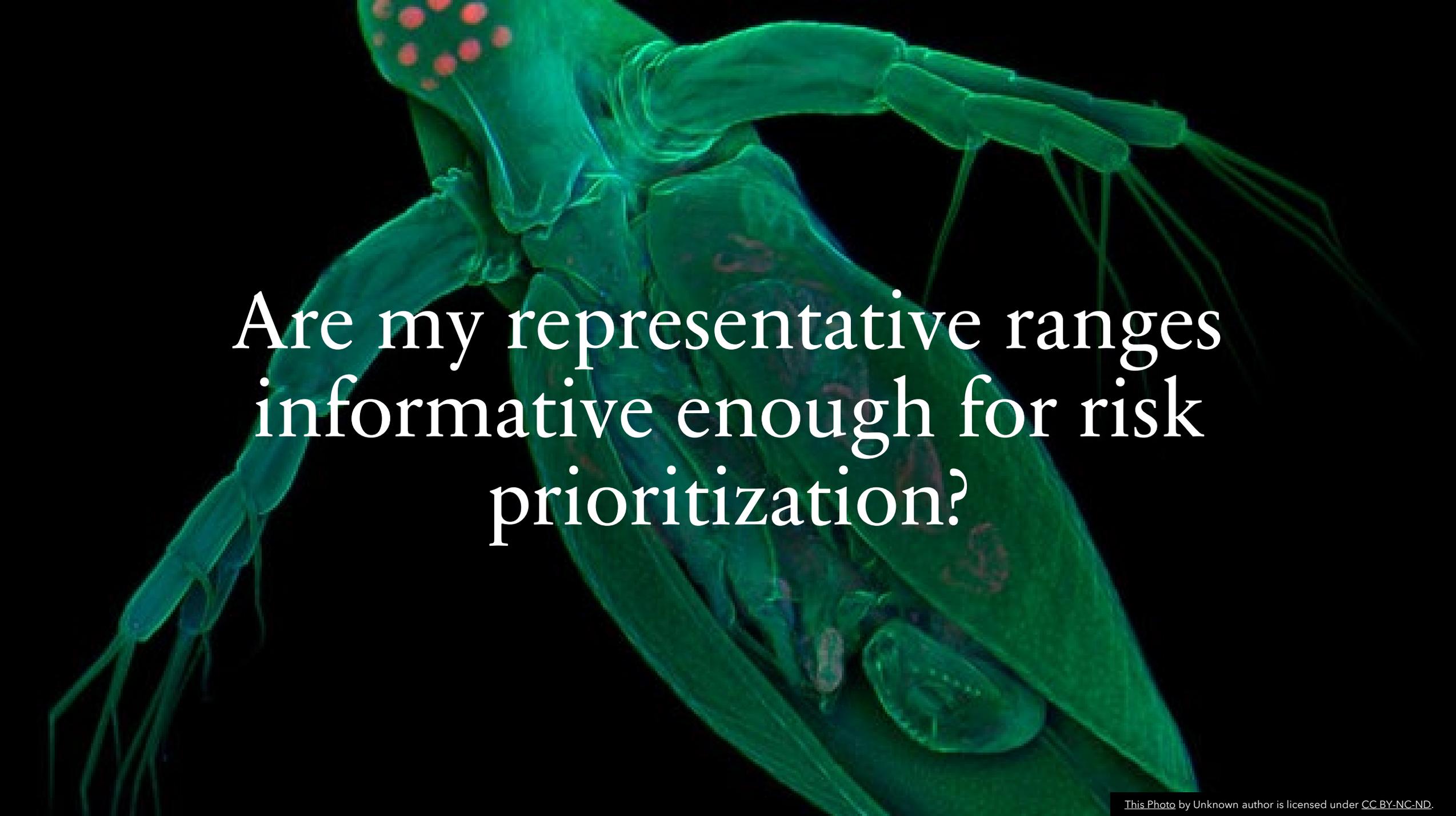
A photograph of several glass test tubes. The foreground test tube is tilted and contains a vibrant red liquid. The background shows several other test tubes, some containing clear liquids, all slightly out of focus. The overall lighting is a cool, blueish-white.

Do different sample types  
change the average?

# Different sample types had similar averages



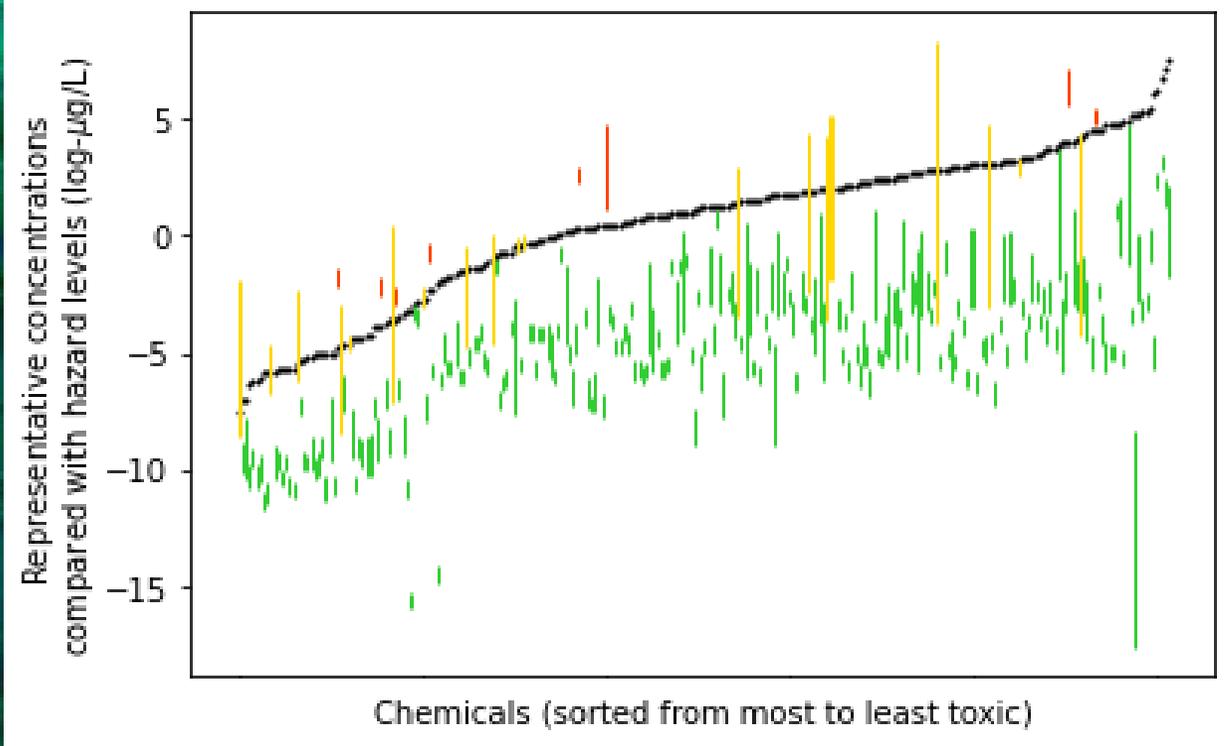
For most chemicals, the mean bulk concentration is similar to the mean dissolved concentration, regardless of the chemical's affinity for organic matter.

A glowing green insect, possibly a mantis, is shown against a black background. The insect's body is covered in small red spots. The text is overlaid on the insect's body.

Are my representative ranges  
informative enough for risk  
prioritization?

Representative ranges overlap hazard concentrations in *Daphnia* for some chemicals

The uncertainty in the mean + standard deviation is less than the range of toxicities and can help prioritize risk to *Daphnia*, a sensitive organism.



Chemicals where the estimated average exceeds the toxic level are the highest priority (red). The most toxic chemicals are not always the highest priority, due to low exposures.



Thank you!