

EXPOSURE EVIDENCE INTEGRATION IN SYSTEMATIC REVIEW

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Exposure Data Extraction in litstream™

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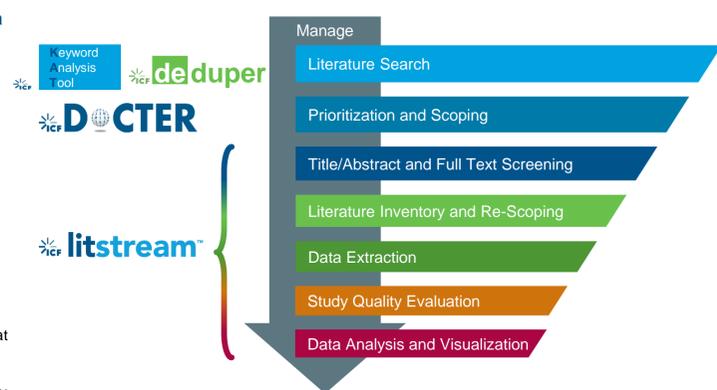


Systematic Reviews and the ICF Tools

Integrating Exposure Data Across Diverse Data Streams

Systematic review has grown out of the fields of healthcare and toxicology to become a standard practice in risk assessment. As such, best practices in systematic review and evidence integration are now required to be adapted to the field of exposure assessment.

Exposure studies and data are frequently more heterogeneous in nature than toxicology data and differ in structure and format from epidemiological studies. This requires new methodologies for systematically extracting, evaluating, and integrating exposure data.



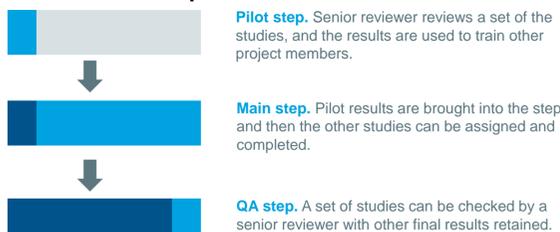
Flexible Extractions Forms for Exposure Data Curation

Flexible Forms Extraction Steps in litstream™

Due to the non-standardized format of most exposure data, the ability to create custom forms designed to meet the needs of individual assessments rather than relying on a set of pre-existing templates is frequently required.

Flexible extraction forms in ICF's litstream™ systematic review management application can be quickly and easily customized to accommodate the capture of differing streams of exposure data ranging from environmental monitoring data; biomonitoring data; data generated from laboratory experiments; and modeling data estimates for media concentrations, intake, and dose.

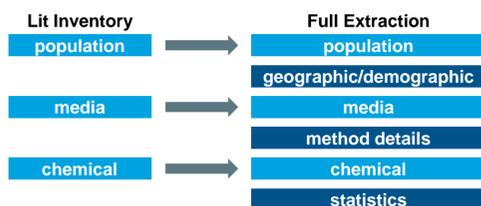
Blueprint Feature Workflow



Features of Flexible Forms

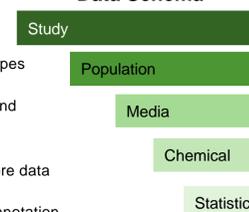
- Assignment-based structure.** Extraction tasks are assigned to specific individuals, and studies receive a final result when the final task is finished.
- Visual schema builder.** Assessors are able to design and test the layout and behavior of flexible extraction forms using a visual schema builder. Data containers are objects holding fields with text, numeric or boolean data. Lists can be employed to nest data where there is a many-to-one relationship.
- Flexibility of ad-hoc edits.** Additional changes can be made by project admins outside of assignments when needed to overwrite final results.
- Specific functionality for pilot and QA steps.** litstream™ integrates a blueprint feature used to document pilot steps, main extraction and downstream QC steps. This feature documents task assignment at each step while migrating data to downstream steps.
- Extraction Lit Inventory.** Using the blueprint feature while conserving a nested data schema, users can catalog literature in inventory step then move targeted studies into downstream steps for full extraction where data from the inventory are repopulated to save time.

Extraction Light Workflow



Monitoring Data Curation

Data Schema

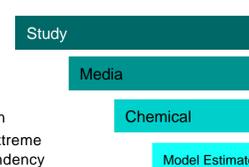


Considerations

- Flexibility to handle many media types encountered in:
 - Biomonitoring (ecological and human)
 - Environmental monitoring
- Capture enough metadata to explore data without creating an overburden
 - Geographic and temporal annotation
 - Population/receptor descriptions and classification
 - Detailed chemical identification
 - Sample collection and analysis details

Modeled Concentration Data Curation

Data Schema

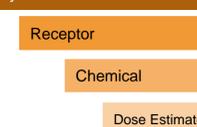


Considerations

- Capture modeling details
- Differentiate matrix type
- Detailed chemical identification
- Denote estimate type as an extreme range estimate or a central tendency

Modeled Intake/Dose Data Curation

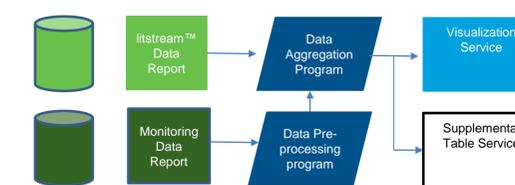
Data Schema



Considerations

- Capture modeling details
- Differentiate receptors by life stage and country to enable conversion of intakes to dose using exposure factors
- Classify receptor population
 - General population
 - Highly exposed population
 - Occupational exposure
- Detailed chemical identification
- Denote estimate type as an extreme range estimate or a central tendency

Data Aggregation Approach



Flexible data aggregation workflow can accommodate data streams generated both within and outside of litstream™

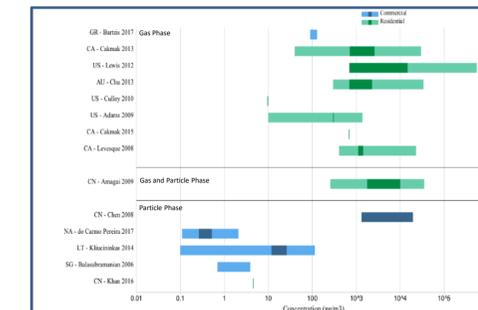
Data Aggregation Workflow

- Combine all data streams
- Convert to common units
- Select aggregation levels
- Calculate
 - Overall range of observations
 - Range of central tendencies
 - Total observations
 - Frequency of detection
- Gather (if applicable)
 - Geographic details
 - Sample details (species, receptor, etc.)
 - Detection limits
 - Sampling date ranges

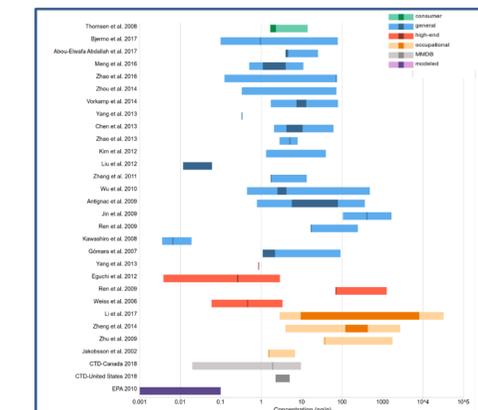
Exposure Data Visualization

- Visualize magnitudes of central tendency and ranges in common units
- Use color to distinguish between exposure population types or data types
- Utilize external services built in node.js/D3

Example Indoor Air Data



Example Blood Concentrations



Exposure Evidence Integration

- Exposure data can be curated and aggregated across a number of fields to explore spatially, temporally, by microenvironment, and more.
- Using this integration approach data are easily summarized and used as model inputs for exposure models.
- The litstream™ flexible form feature is versatile for data extraction and evaluation. We have successfully implemented flexible forms to extract and evaluate data from sources on exposure, toxicology, epidemiology, and economic impacts.

