The Environmental Health Language Collaborative (EHLC): Spotlight on Community-Driven Projects that Harmonize Toxicology Data

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What is EHLC?

EHLC was created to facilitate a public, community-driven effort to advance the development and adoption of harmonized language approaches within toxicology and environmental health science fields.

- The availability of data is rapidly advancing opportunities to answer large-scale, complex questions in toxicology and environmental health sciences. However, a significant challenge remains around the development and use of a **harmonized language** to allow for streamlined workflows to find, share, and reuse this data.

Value of a Shared Language

- Increases the **findability** of data
- Facilitates **consistent interpretation** of data & metadata
- Permits data **integration** and promotes **interoperability** of data and databases
- Enables the assembly of datasets for computational modeling and **knowledge discovery and transfer**

EHLC Vision and Mission

EHLC's vision is to enhance the value of environmental health research data for translation and knowledge discovery to improve personal and public health.

EHLC's mission is to advance integrative environmental health research by promoting access, use, and harmonization of data through interoperable terminologies and best practices.

References and Resources

QR code directs to: **https://github.com/NIEHS/EHLC**

Environmental Health Language Collaborative - Harmonizing Data. Connecting Knowledge. Improving Health Website. (n.d.). National Institute of Environmental Health Sciences.

Holmgren, S. et al. (2023). Workshop Report: Catalyzing Knowledge-Driven Discovery in Environmental Health Sciences through a Harmonized Language. International Journal of Environmental Research and Public Health, 20(3), 2317. MDPI AG.

EHS Domain Specific Data Repositories. (n.d.). National Institutes of Environmental Health Sciences.

2023 Virtual Workshop Report Sharing Your Environmental Health Sciences (EHS) Data: Metadata, Standards, and Tools. (2023). National Institute of Environmental Health Sciences.

2025 Virtual Workshop Report Adverse Outcome Pathways Standardization Workshop. (2025). National Institute of Environmental Health Sciences.

Karmaus, A. et al. (2025). Methods2AOP: A Collaboration to Strengthen the Integration of Test Methods into the Adverse Outcome Pathway Framework. F1000Research.

Stingone, J. et al. (2025). Unlocking the Power of Data Harmonization in Environmental Health Sciences: A Comprehensive Exploration of Significance, Use Cases, and Recommendations for Standardization Efforts. Environmental Health Perspectives.

We acknowledge and thank the EHLC Executive Committee and Use Case Champions for contributing to this poster.

Community-Driven Use Case Projects and Events

USE CASES

EHLC's Use Case Working Groups bring together experts from diverse sectors to collaboratively harmonize language and standardize data in environmental health and toxicology. These open, community-driven groups support EHLC's core activities, foster cross-domain collaboration, and address evolving needs in the field.Read full summaries of use case activities that advance the adoption of a shared language online: Environmental Health Use Cases.

NAME AND CHAMPION	Data Harmonization Champion: Jeanette Stingone	Data Discovery Champions: Michelle Angrish, Shannon Bell	Biomarkers & Biological Processes of Exposure Champions: Steve Edwards, Chirag Patel
FOCUS AREA	Explores the combination and cleaning of data sets across independent toxicology and environmental health science studies.	Explores how to more easily find and use published toxicology and environmental health sciences data and resources.	Explores generation of a conceptual model linking potential sources of particulate matter to human exposures and respiratory health outcomes.
SCIENTIFIC QUESTION	"How can we combine individual-level data from multiple independent studies to understand how exposures X + Y impact health outcome Z?"	"What data exists for a given chemical/endpoint/exposure scenario?"	"What are the biological processes and biomarkers associated with exposure and how do they relate to the potential for an adverse outcome associated with a given exposure?"
2025 ACTIVITIES	Published a manuscript focused on the existing data harmonization landscape in environmental health sciences and offered recommendations for collaborative approaches to data harmonization.	Developing communications strategies for describing Use Case findings on data findability challenges and systemic solutions, such as application of standards and structured reporting, throughout the data lifecycle.	Finalizing a manuscript assessing data science tools and knowledge bases for their utility in digitizing relationships between exposures, biomarkers, and disease outcomes, focusing on $PM_{2.5}$ exposure and airway-related disease outcomes as a test case.
NEXT STEPS	Finalize a brief commentary calling for further action on environmental health science data standards.	Identify next phase of research questions and activities.	Identify next phase of research questions and activities.

EVENTS

In addition to the EHLC Use Case Working Group activities in 2025, the EHLC community organized and hosted a virtual workshop in June of 2025 focused on Adverse Outcome Pathways (AOP) Standards and collaboration with the knowledge base community. Read the full summary of the workshop online: Adverse Outcome Pathways Standardization Workshop.

AOP Standards Workshop	Aimed to advance AOP standards for consistent data integration and regulatory use in toxicology and environmental health. Over 75 global experts and 18 presenters participated, fostering consensus, collaboration, and ongoing dialogue on priority actions for standard development and implementation. These efforts help the AOP community leverage biomedical resources and interoperability frameworks while adhering to FAIR principles (Findable, Accessible, Interoperable, Reusable).

How Can I Get Involved?

SOT professionals can contribute to the effective sharing and use of toxicological and environmental health sciences data by engaging with the EHLC community.

- **Explore** the EHLC Website for upcoming events, previous event recordings, and valuable resources to support your work.
- **Participate** in upcoming EHLC workshops and webinars as either a participant or presenter.
- **Join** the EHLC email distribution list to receive the latest updates on ongoing community activities.
- **Propose** an EHLC Use Case Working Group idea, speaker for an event, or supportive resource or event.

Engage with EHLC During and After SOT

The EHLC community invites SOT attendees to contribute to the development of a harmonized language to help data effectively answer the toxicology and environmental health sciences field's most pressing questions.

1. Go to the interactive EHLC SOT Microsoft Form using this link or QR code:

QR code directs to: https://forms.office.com/r/yHDTpyfXBY

2. In the Microsoft Form, share your ideas related to the following questions:

Question 1:	Question 2:	Question 3:	Question 4:
What data and metadata harmonization-related capabilities and tools would be useful to your work in environmental health science?	How has the availability and capabilities of AI and machine learning tools changed your standardized language needs?	What data gaps would benefit from community-level, language-based solutions?	What EHLC webinar and event topics are of interest to you and would benefit your work?

Email EHLC@icf.com to share your ideas, questions, interests, and contributions for future use cases, webinars, and EHLC activities after SOT.

EHLC Highlights and Future Work

2021

- Hosted the inaugural, two-day virtual workshop that led to an identified need for community-led "use case" working groups. Workshop results and community next steps are described in the Holmgren, et al. (2023) manuscript.

2022

- Established EHLC Use Case Working Groups related to topics of biomarkers and biological processes, data harmonization, place-based exposures, and data discovery.

2023

- Hosted a virtual, three-day workshop focused on data management and sharing plans, resources, and a progress update from the Data Harmonization Use Case Working Group. A summary of the workshop is available in the report: 'Sharing Your Environmental Health Sciences (EHS) Data: Metadata, Standards, and Tools'.
- Published the Environmental Health Sciences (EHS) Repositories Dashboard, which helps researchers identify discipline or data-type specific repositories.

2024

- Established an interdisciplinary Executive Committee that conducts governance and organizational oversight for EHLC, including supporting EHLC Use Case Working Groups, resource preparation, and community engagement.
- Hosted a webinar on Common Data Elements (CDE) and a roundtable and focus group discussion on Geospatial Environmental Determinants of Health.
- Shared a panel presentation and poster at Society of Toxicology and held over 20 EHLC Use Case Working Group meetings.
- Held seven EHLC Executive meetings and coordinated efforts to align with community needs.

2025

- Published one EHLC Data Harmonization Use Case Working Group manuscript.
- Hosted five public webinars on topics such as data annotation, ontology curation, and large language models.
- Hosted a two-day virtual workshop focused on Adverse Outcome Pathways (AOP) Standards, developed and released a workshop summary report, and contributed to a related follow-up publication.
- Collaborated with Earth Sciences Information Partnership (ESIP) to develop Common Data Elements and minimal metadata for place-based exposure and health research to standardize collection of geospatial measures and enable data and knowledge integration across various projects.
- Held 25 EHLC Use Case Working Group meetings and continued development of emerging topics for new research questions and manuscript consideration.
- Held two EHLC Executive meetings and coordinated efforts to align with community needs.

2026 Planned Activities

- Identify next phase of research questions and activities for EHLC Use Case Working Groups, explore new EHLC Use Case Working Groups, and inspire collaborative engagement and raise awareness of available resources.
- Host EHLC events including webinars funded by the Accelerating Data and Metadata Standards in Environmental Health Sciences Program, on topics like community-led resources, semantic standards, exposome data tools, EHS standards, and source integration for outcome modeling.