CHE Collaborative for Health & Environment

Webinar Highlights

Children's Health: Assessing impacts of the exposome

The human exposome refers to the many environmental exposures experienced throughout our lifetime, starting from conception and pregnancy. The exposome approach promotes a fundamental shift in studying environmental impacts on health, moving research from a 'one exposure, one disease' approach to one that is more comprehensive and consistent with the thousands of exposures most humans now experience.

Early life stages are a key period of our development during which we are highly susceptible to environmental damage, often with life-long health consequences. This makes this period an important starting point for addressing the exposome and an ideal time window for implementing cost-effective preventive actions and policies aimed at reducing adverse environmental exposures.

A recent study explored the environmental factors that are most likely to affect children's health, ranking the impact of these factors. Building from that work, a follow-up study set out to identify the dose-response relationships of those factors on children's health. In a recent webinar, **Dr. Rémy Slama** explained the methodology and results of those studies.

Featured Speaker: Rémy Slama, PhD, environmental epidemiologist and senior investigator at the French National Institute of Health and Medical Research (Inserm), speaking April 15, 2025.

This fact sheet has been created by CHE based on information presented in an EDC Strategies Partnership webinar. Selected quotes in bold are from the webinar speaker(s). For the full set of resources provided by the webinar presenters, see the webinar page, where you'll also find associated Slides & Resources.

The Problem

A large number of studies have been conducted on the effects of various environmental exposures on children's health. These studies take a variety of approaches to assessing hazards. A recent study sought to develop a pragmatic approach to assess the overall level of evidence connecting exposure risks to cardiometabolic, neurodevelopmental, respiratory,

and other birth and child health outcomes. In their review, the researchers compiled a "plausibility database" to characterize the level of evidence (LoE) linking 88 environmental factors to children's health outcomes.

The study considered findings from epidemiological, toxicological, and mechanistic studies. The window of exposures included were from the prenatal period through adolescence. Exposure factors were paired with specific health outcomes, and the strength of each linkage was rated based on the strength of the overall scientific evidence from the three knowledge streams, with ratings from "very unlikely" to "very likely." An example of a factor-outcome pair is PCB exposure with lower birth weight, which was found to be very likely.

The study considered 88 chemical and physical factors, including:

- Air pollutants
- Tobacco smoke
- Pesticides
- Bisphenols
- Parabens
- Phthalates (such as DEHP)
- Metals, including lead and cadmium
- Perfluoroalkyl substances (PFAS)
- Physical factors (such as noise, temperature, and access to green spaces)

A total of 611 factor-outcome pairs were considered.

Key Finding:

The study found 127 factor-outcome pairs that had an overall LoE of 60% or more, and were therefore found to be likely or very likely. Those 127 pairs involved 49 different factors/exposures.

Some exposures were associated with multiple adverse health outcomes. These included the following: **8 outcomes:** HCB (a pesticide), PCB, temperature (heat); **7 outcomes:** PFOA (a PFAS); **6 outcomes:** PFOS (a PFAS), cotinine (from tobacco smoke); **5 outcomes:** arsenic, lead; **4 outcomes:** BPA, BPS, PFNA (a PFAS), and $PM_{2.5}$; **3 outcomes:** DDT (including DDE and DDD), PFHxA (a PFAS), PFDA (a PFAS), UV radiation.

Out of the 127 factor-outcome pairs, a follow-up study focused on the 78 substance-outcome pairs (excluding air pollution and physical factors) that were likely or very likely. This study sought to identify which pairs had dose-response relationships that had been identified in

existing epidemiological studies in children. (A separate follow-up study was also conducted, which analyzed the evidence for air pollution and physical factors.)

Fifty of the substance-outcome pairs had known dose-response relationships. For the remaining 28 pairs, very limited dose-response relationship is available in the existing research. **This highlights an important knowledge gap.**

Below are the identified chemical exposures and their likely or very likely health outcomes in children. Those without identified dose-response relationships are in yellow:

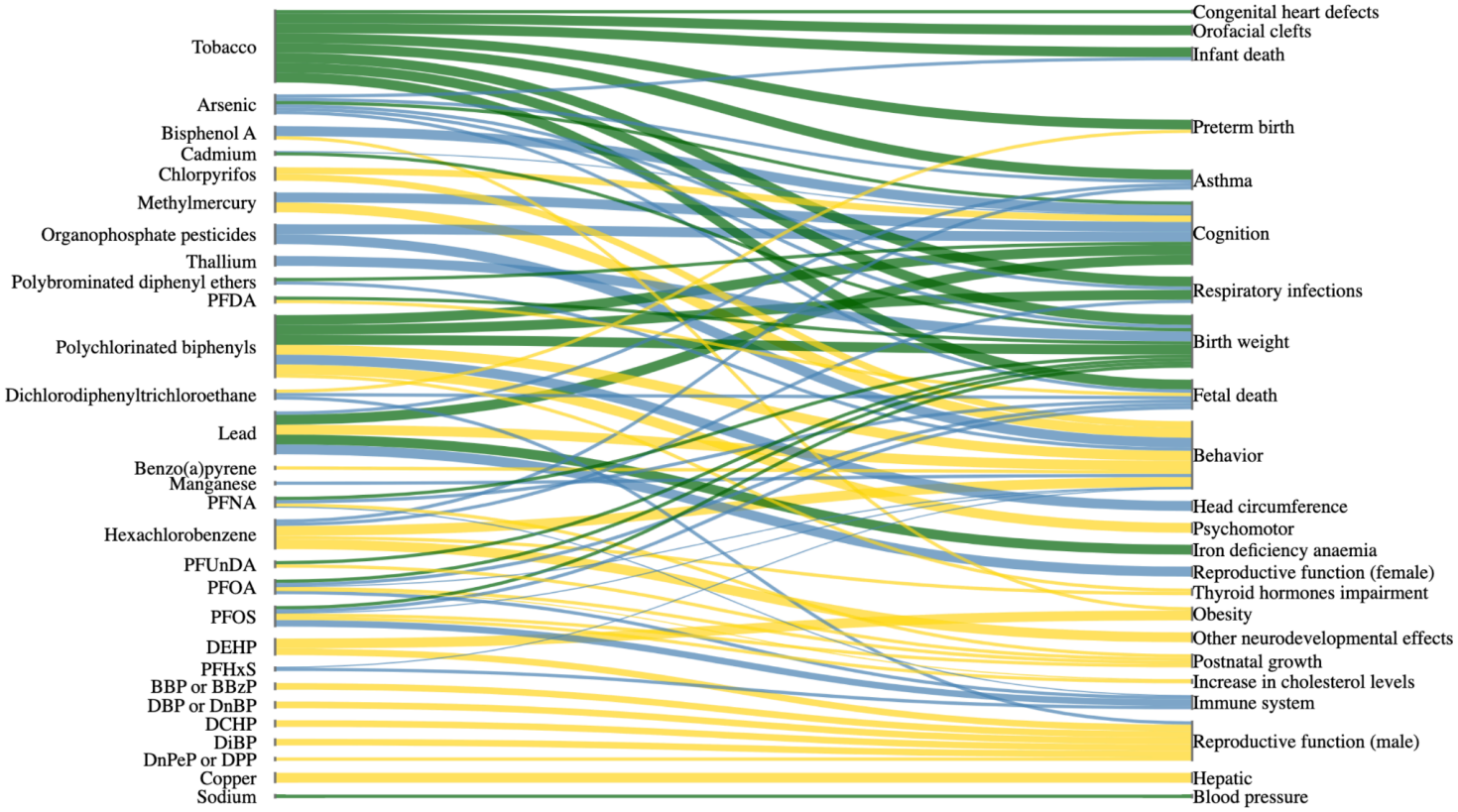

Figure 1. Likely or very likely exposure-outcome pairs.

Source: Rocabois A et al. 2024. Chemical exposome and children health: Identification of dose-response relationships from meta-analyses and epidemiological studies. *Environmental Research* 262:1, 119811.

Recommendations

These studies identified strong concerns about the effects on children's health of many specific risk factors. Dr. Slama noted that some of the identified risk factors are now strongly regulated (such as PCBs, PFOA, and PFOS via the Stockholm international convention). However, for others, regulations are more limited or piecemeal (such as PFAS

other than PFOA and PFOS, and phenols (including parabens)). This highlights the need for more protective policies around these risk factors.

The project also identified which risk factors did not have known dose-response relationships, which could be areas for future research. Reducing the health burden attributable to these environmental exposures requires policies designed to reduce exposures. Health Impact Assessment (HIA) studies are an important tool for prioritizing the most harmful chemicals. Studies that establish dose-response relationships are an important part of HIAs. Twenty-eight substance-outcome pairs are likely or very likely and lack an established dose-response relationship. More research on these relationships could help inform better policies.

To Find Out More

- Watch the April 15, 2025 webinar: Children's Health: Assessing impacts of the exposome
- Read the presentation slides: Children's Health: Assessing the impact of the exposome
- Read the studies:
    - A plausibility database summarizing the level of evidence regarding the hazards induced by the exposome on children health
    - Chemical exposome and children health: Identification of dose-response relationships from meta-analyses and epidemiological studies
    - Urban environment and children's health: An umbrella review of exposure response functions for health impact assessment

About the Speaker

Rémy Slama, PhD is an Environmental epidemiologist and senior investigator at the French National Institute of Health and Medical Research (Inserm). Rémy works at the Institute of Biology of the *Ecole Normale Supérieure Paris* (IBENS), a joint research center from ENS-PSL, Inserm and CNRS, on the PARSEC initiative, aiming to develop research on the nexus between climate change and human health. Rémy is a former member of the Scientific Committee for Health, Environmental and Emerging Risks (SCHEER) of the European Commission's Directorate-General for Health and Food Safety (DG Sante).