



National Institute of Environmental Health Sciences  
*Your Environment. Your Health.*

# **The Exposome - A Systems Approach for Discovery in Environmental Health**

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**The Exposome (Wild):** The totality of exposure an individual is subjected to from conception to death...the 'environmental' correlate to the genome.





[http://www.nature.com/ki/journal/v62/n5/fig\\_tab/4493262f1.html](http://www.nature.com/ki/journal/v62/n5/fig_tab/4493262f1.html)

## The NIEHS strategic plan (2012-2017)

**Strategic Goal 3:** Transform exposure science by enabling consideration of the totality of human exposures and links to biological pathways and create a blueprint for incorporating exposure science into human health studies.

- Advance characterization of environmental exposures through **improved exposure assessment** at both the individual and population levels
- **Define** and disseminate the **concept of the exposome**
- Create **tools and technologies**, and the research capacity, needed to **characterize the exposome**

## Exposome activities supported by NIEHS

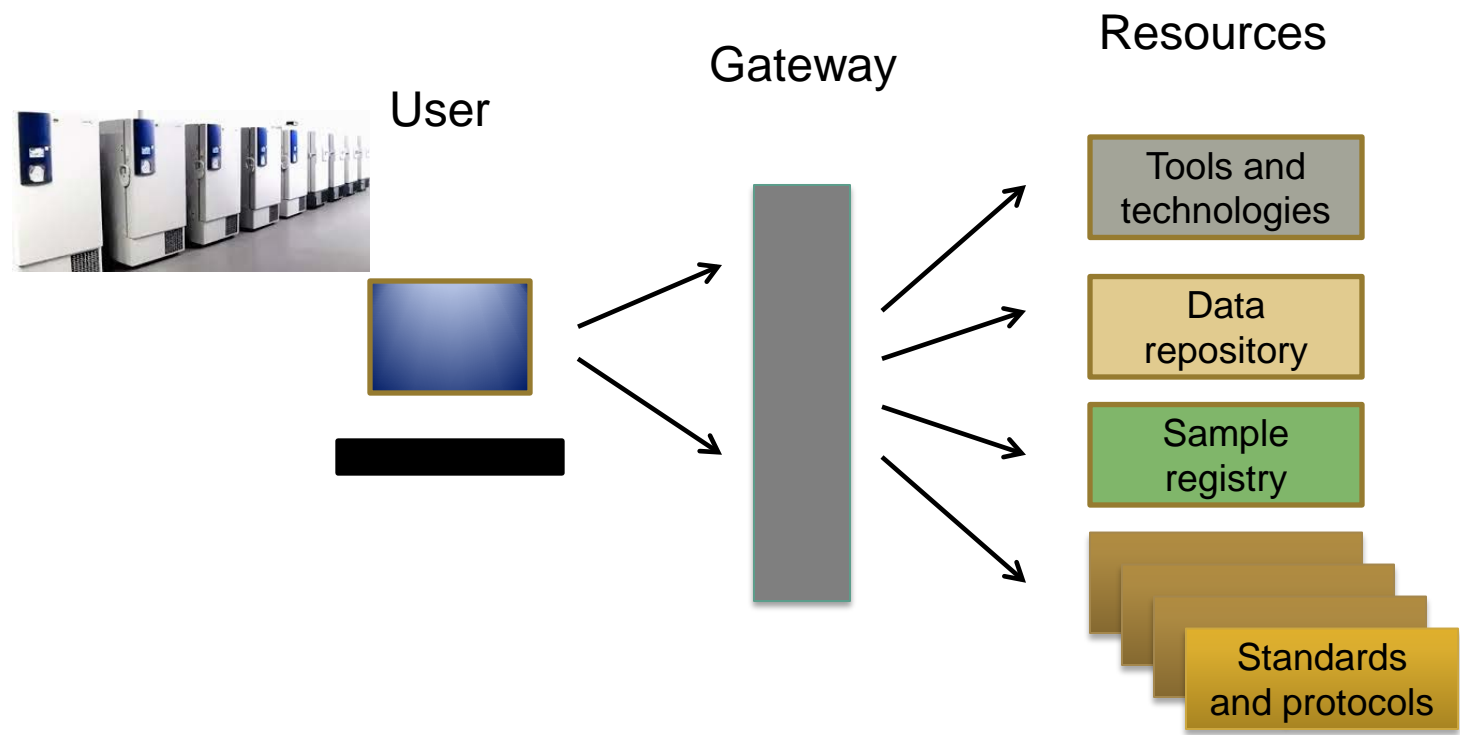
- Sensor development
  - The Exposure Biology Program
  - SBIR
  - Superfund Program
- The HERCULES Exposome Center (2013)
- The Exposure Science and Exposome Webinar Series (2014-)
- **The NIEHS Exposome Workshop (2015)**
- **Children's Health Exposure Analysis Resource (2015)**

# The NIEHS Exposome Workshop

## - More than an in-person workshop

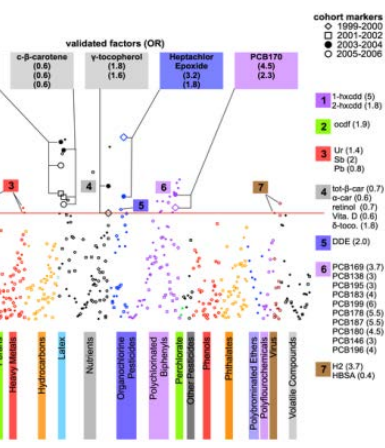
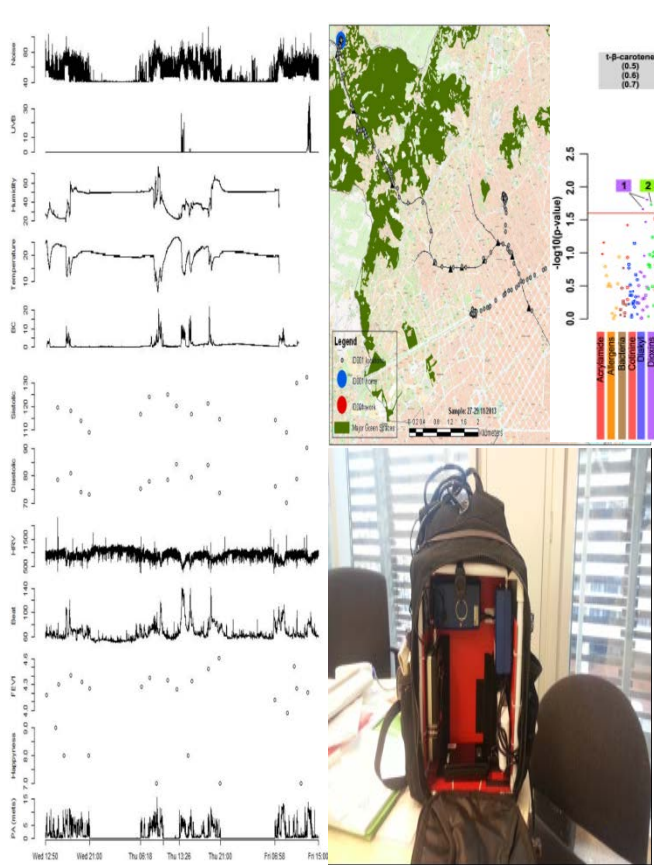
- Five pre-meeting workgroups formed in summer 2014
  - External exposure assessment
  - Biomonitoring
  - Biological impact and consequences
  - Epidemiology
  - Data science and informatics
- At-meeting workgroups, January 14-15, 2015
  - Integrate/prioritize recommendations
  - Use-cases

# (1) Exposome clearinghouse

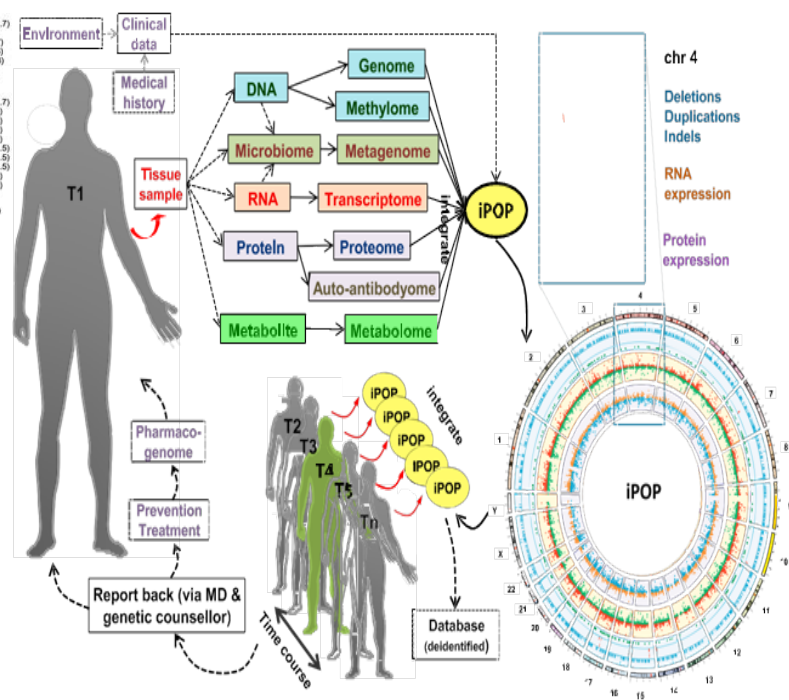


A resource to facilitate and promote exposome research

## (2) Improve methods and technologies



Patel et al PLOS1, 2010



Chen et al, Cell, 2012

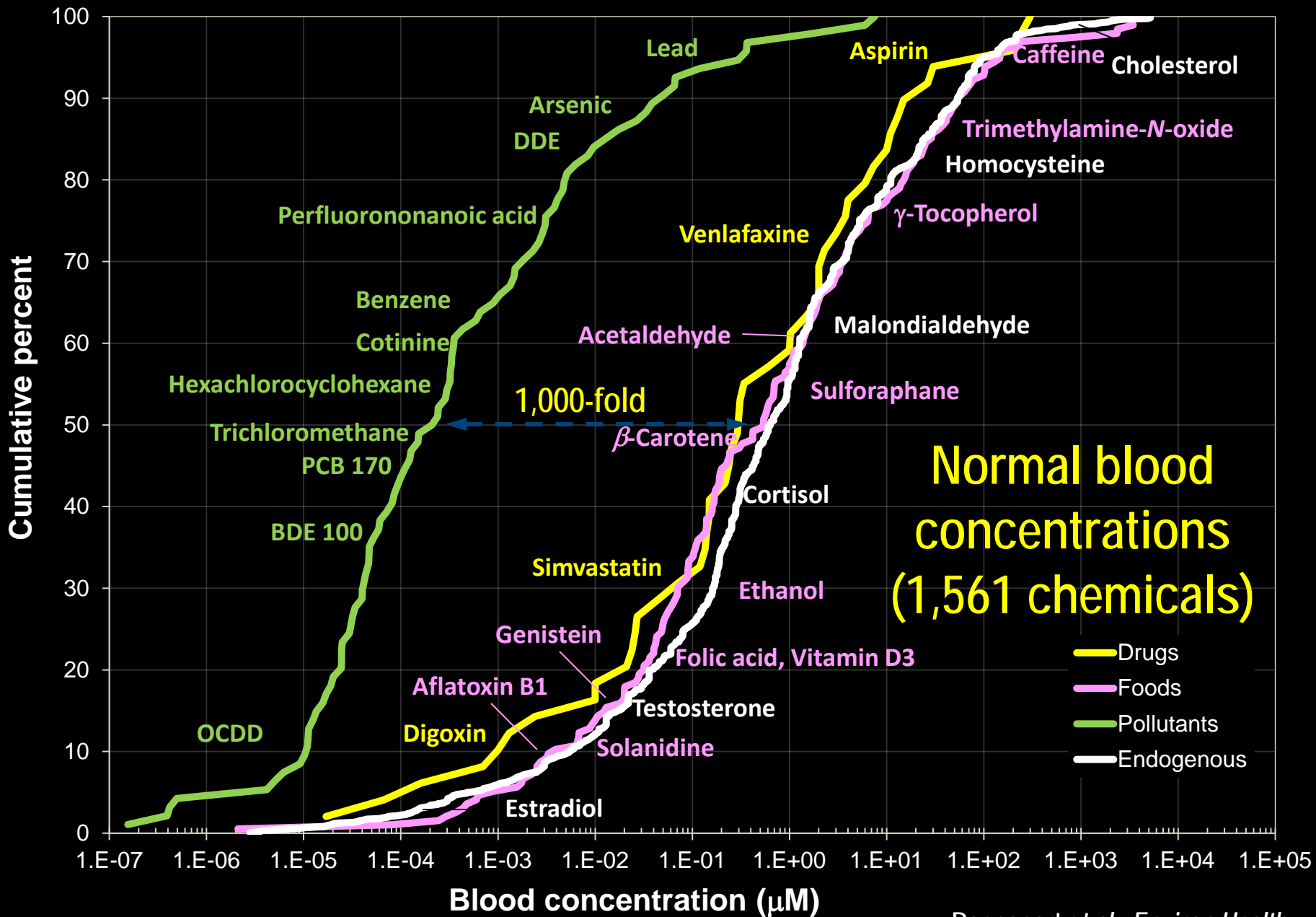
Nieuwenhuijsen et al. Int. J. Environ. Res. Public Health 2014, 11, 7805

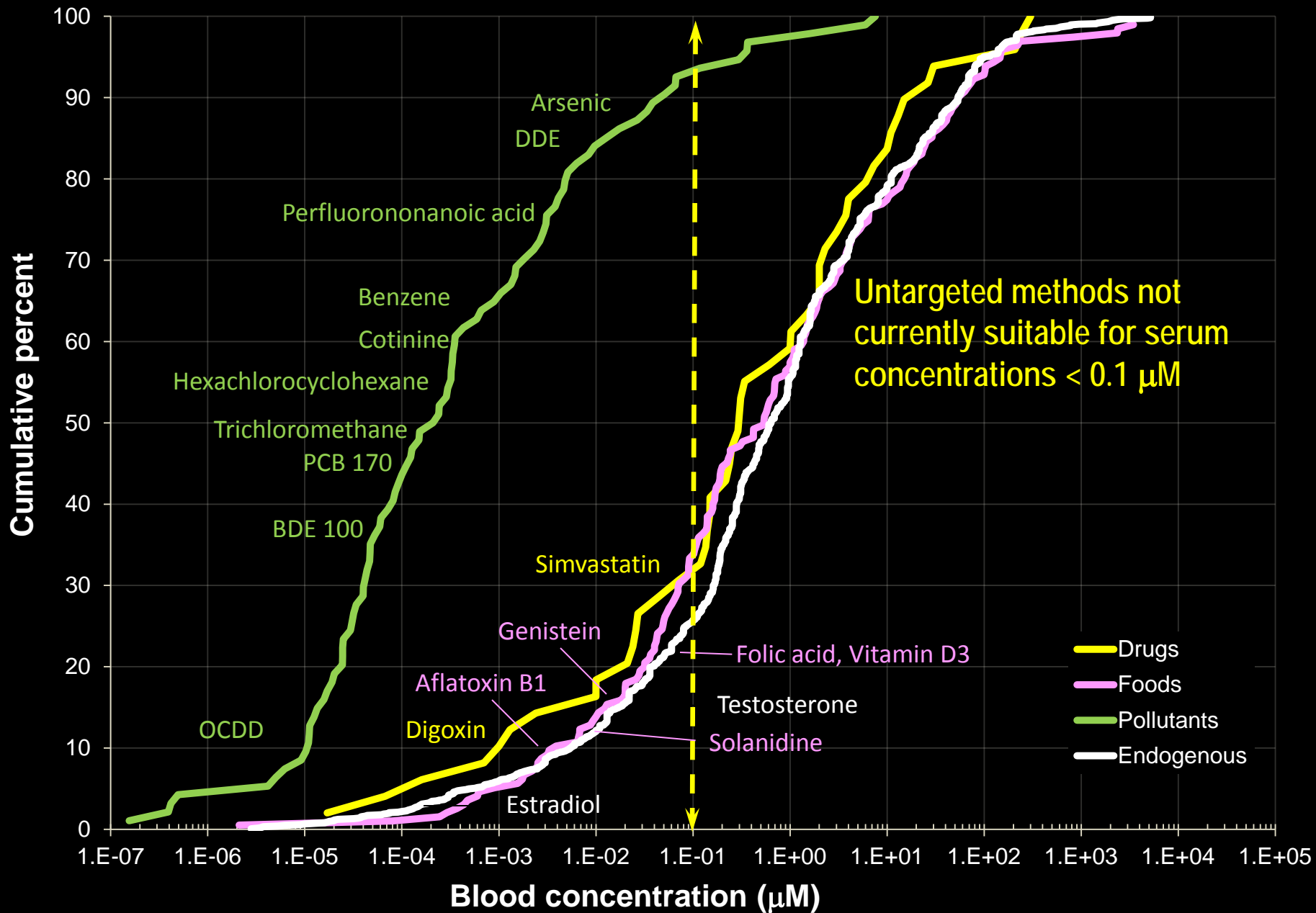


### **(3) Practical considerations and exposome promotion strategies**

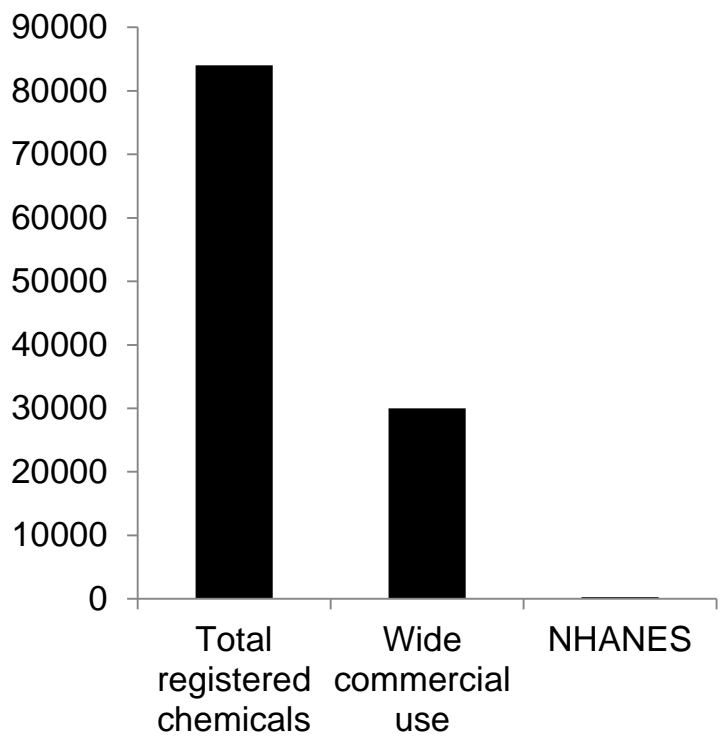
- Identification of use cases
- Secondary analyses of banked samples
- Establishing policies to promote data sharing
- Education and training

**A series of EHP commentaries will be coming soon.**

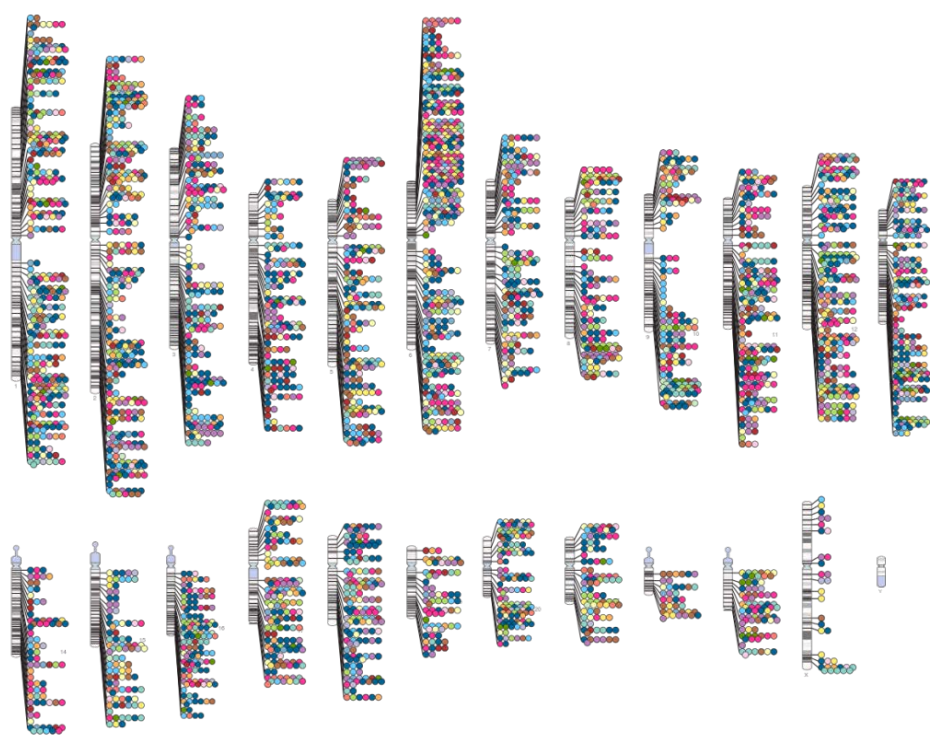




**Less than 300 chemicals are being reported in NHANES**



**SNP-trait associations with p-value  $\leq 5 \times 10^{-8}$  from 2000+ GWAS studies**



<http://www.ebi.ac.uk/fgpt/gwas/>

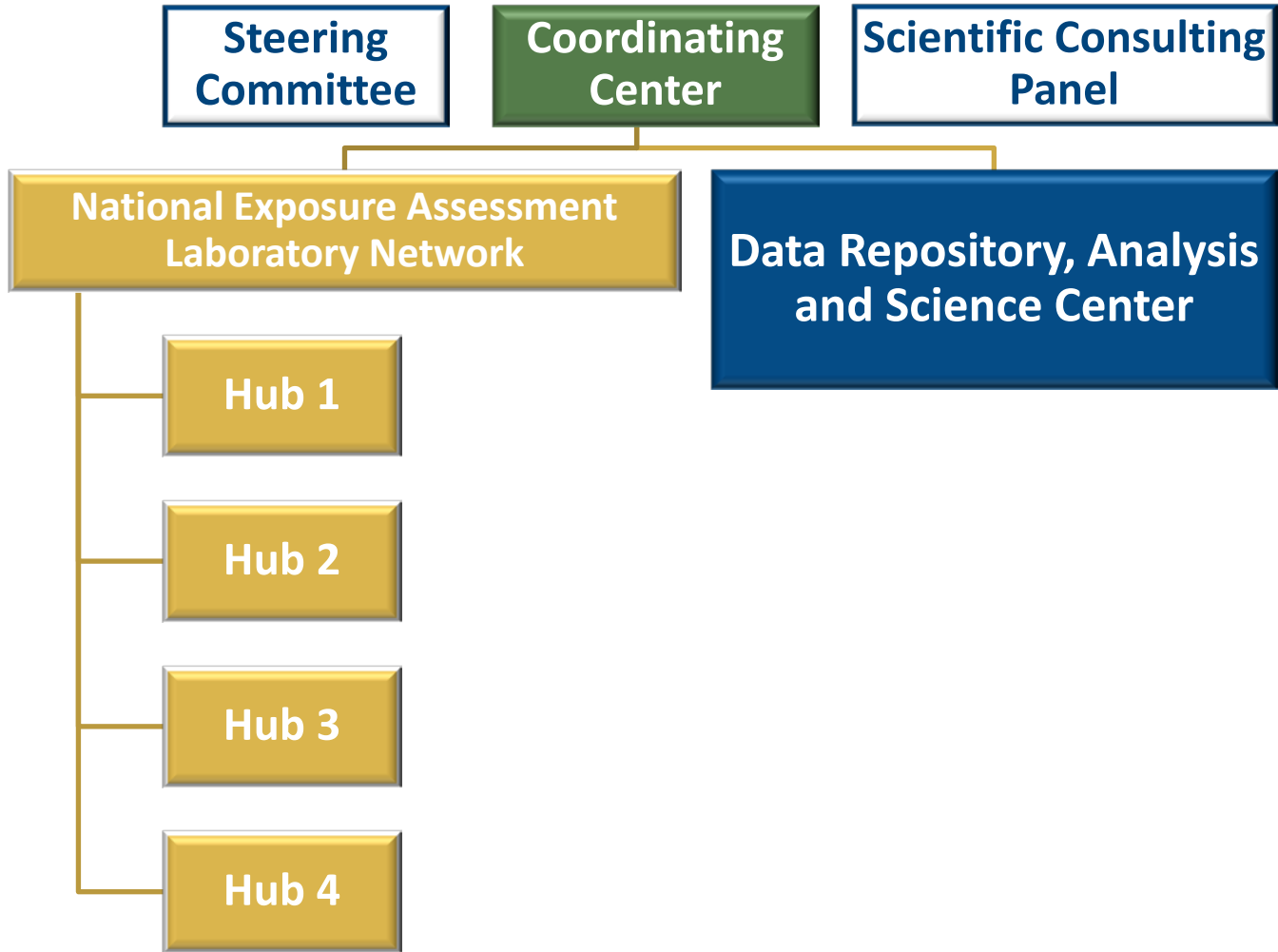


## CHEAR at NIEHS

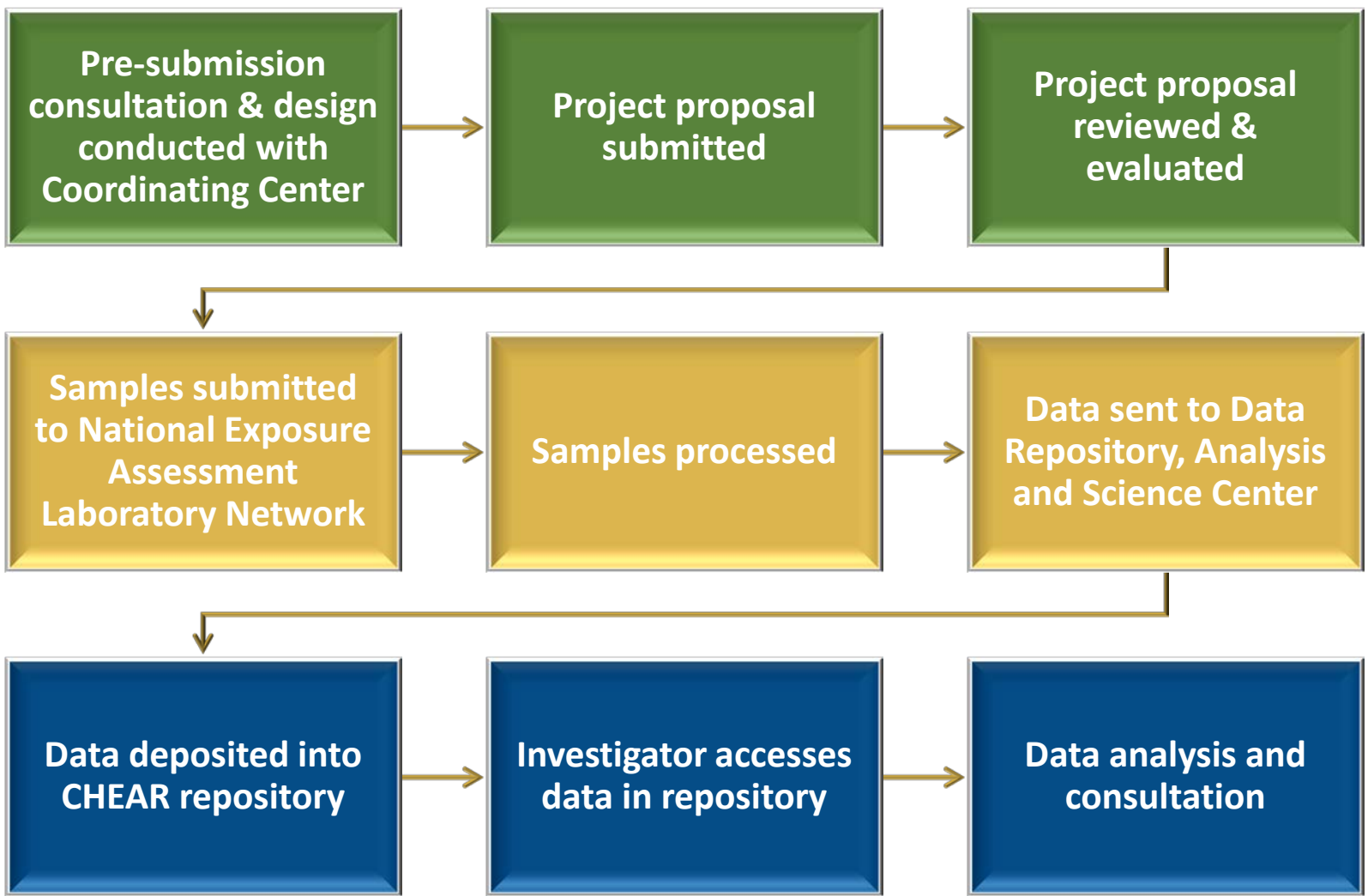
- Purpose
  - Provide infrastructure for adding or expanding exposure analysis to studies involving research in children's health
  - Promote incorporation of environmental exposure factors in studies of children's health and development
- Time line
  - RFAs announced in February 26, 2015
  - Applications due April 30, 2015
  - Plan to fund in September 2015



# The CHEAR Infrastructure

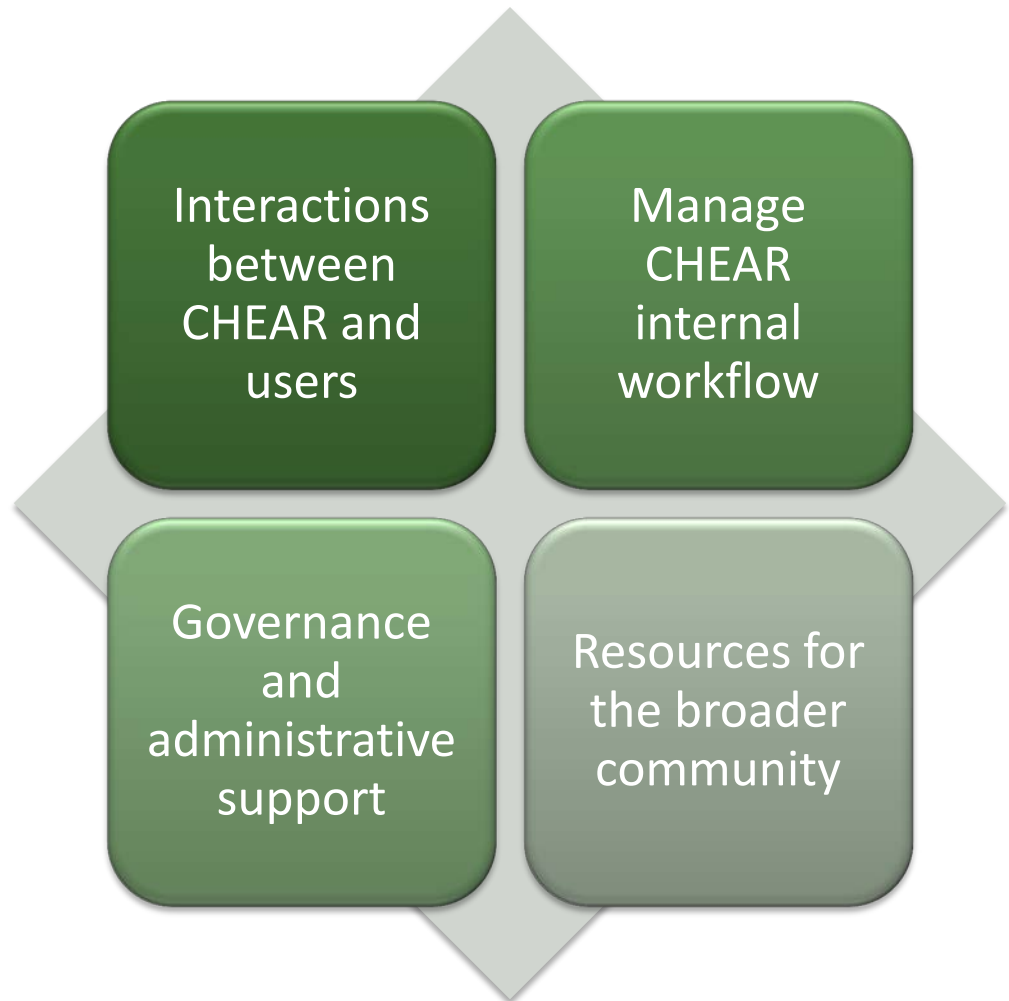


# The CHEAR work flow





# CHEAR Coordinating Center





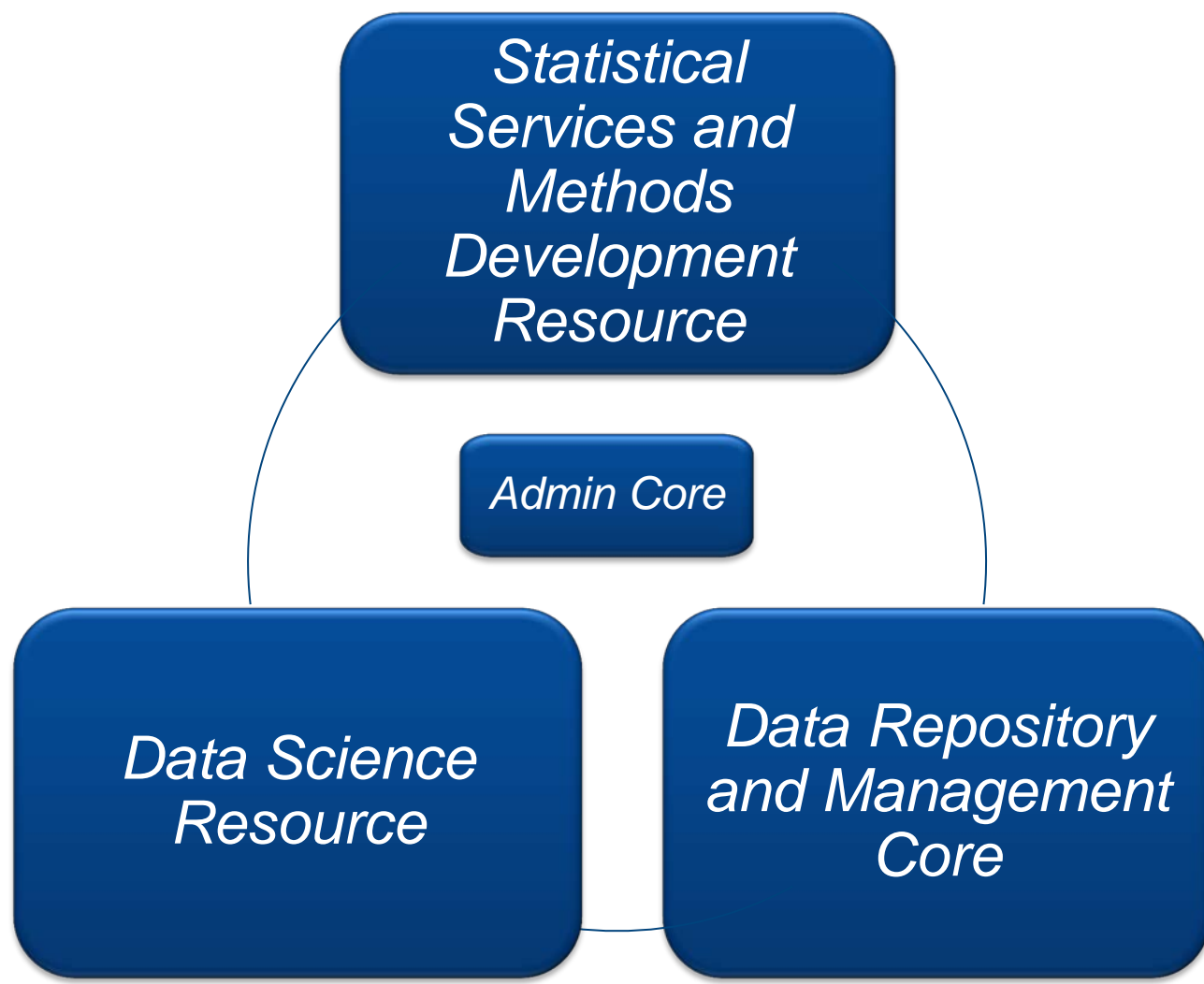
# National Exposure Assessment Laboratory Network



**Clarification:**  
Analysis of exogenous  
and endogenous  
analytes



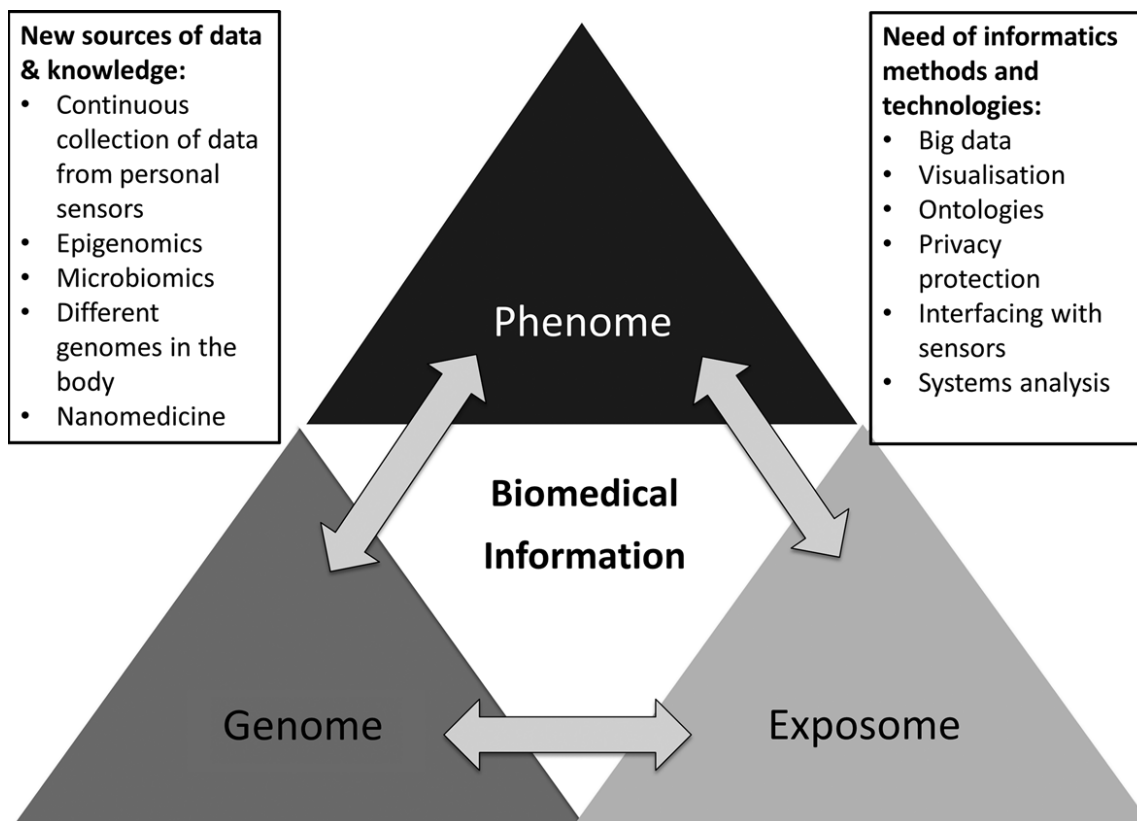
# Data Repository, Analysis and Science Center



## Outcomes

- Create a public resource of children's exposures across the country
- Expand the number of studies that include environmental exposure
- Develop data and metadata standards to facilitate data sharing and meta data analysis

# Measuring the exposome is just the first step





# Thanks!



## To learn more

CHEAR: <http://www.niehs.nih.gov/research/supported/dert/programs/chear/index.cfm>

Email: [CHEAR@niehs.nih.gov](mailto:CHEAR@niehs.nih.gov)

The NIEHS Exposure Science and the Exposome Webinar Series

Registration @ [http://tools.niehs.nih.gov/conference/exposome\\_webinar/](http://tools.niehs.nih.gov/conference/exposome_webinar/)

Email: [exposome@niehs.nih.gov](mailto:exposome@niehs.nih.gov)