

Exposomes for Children's Studies: Importance of Life Stage Considerations



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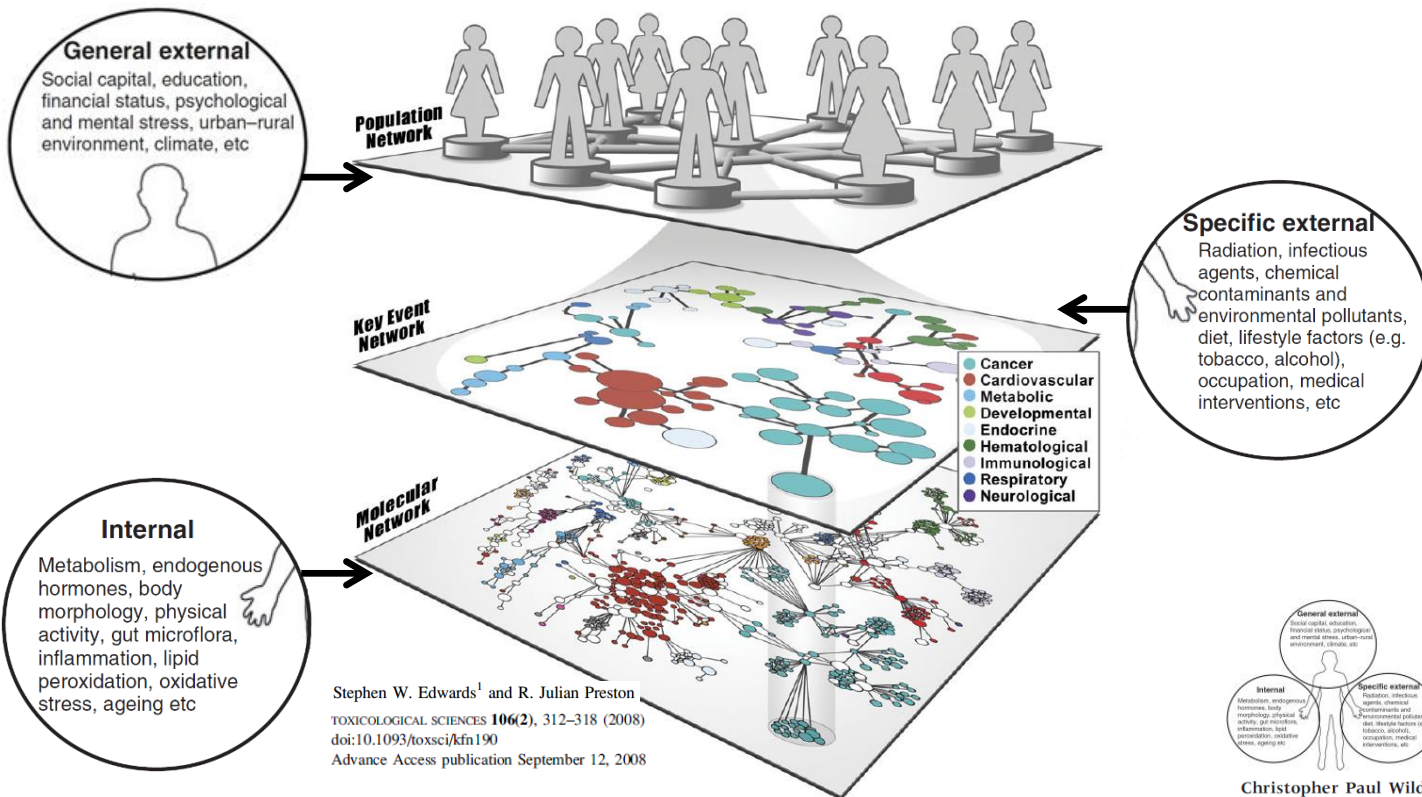
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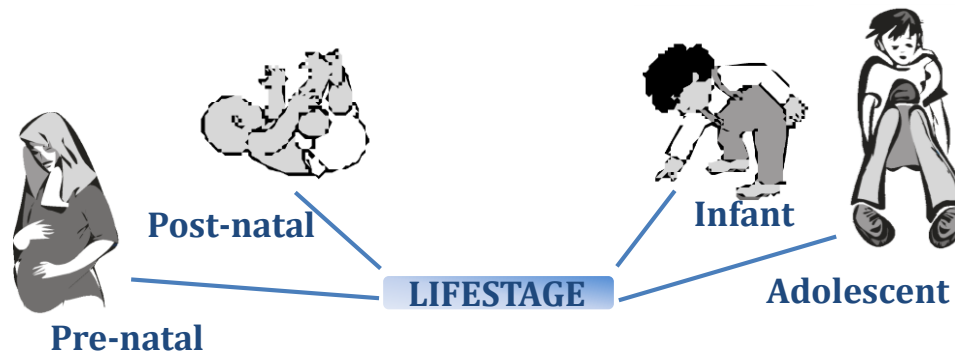
SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON

Exposome and Systems Biology

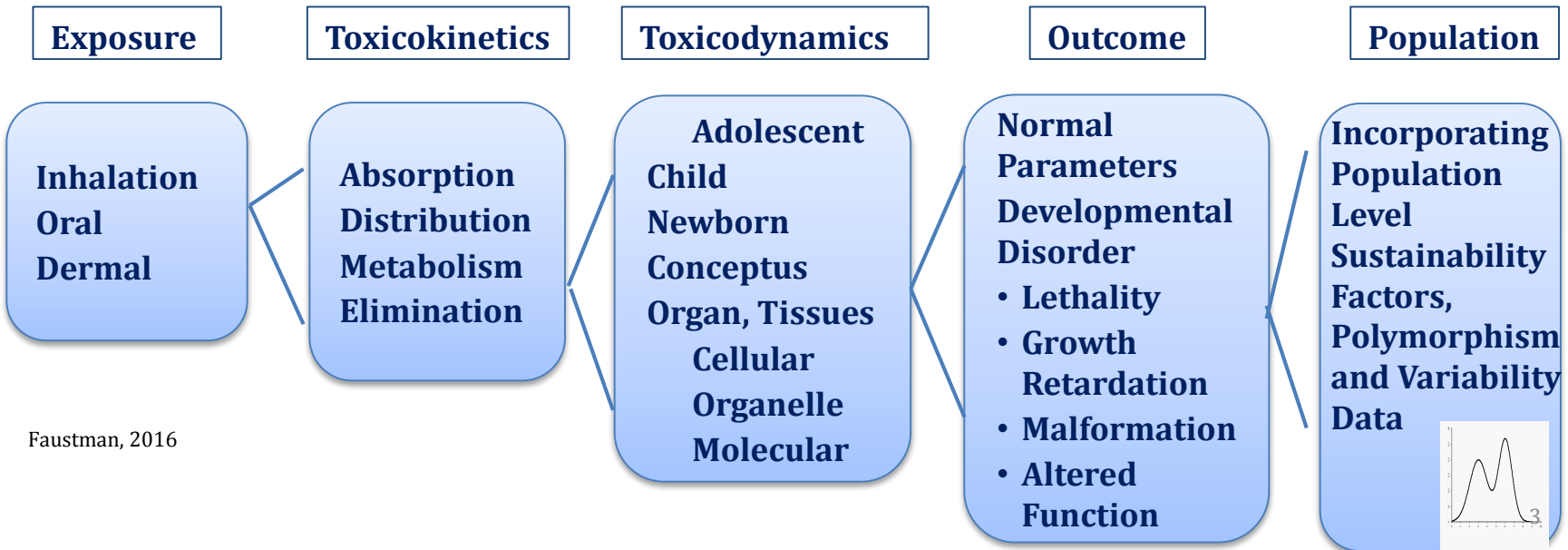


International Journal of Epidemiology 2012;41:24-32
doi:10.1093/ije/dyr236

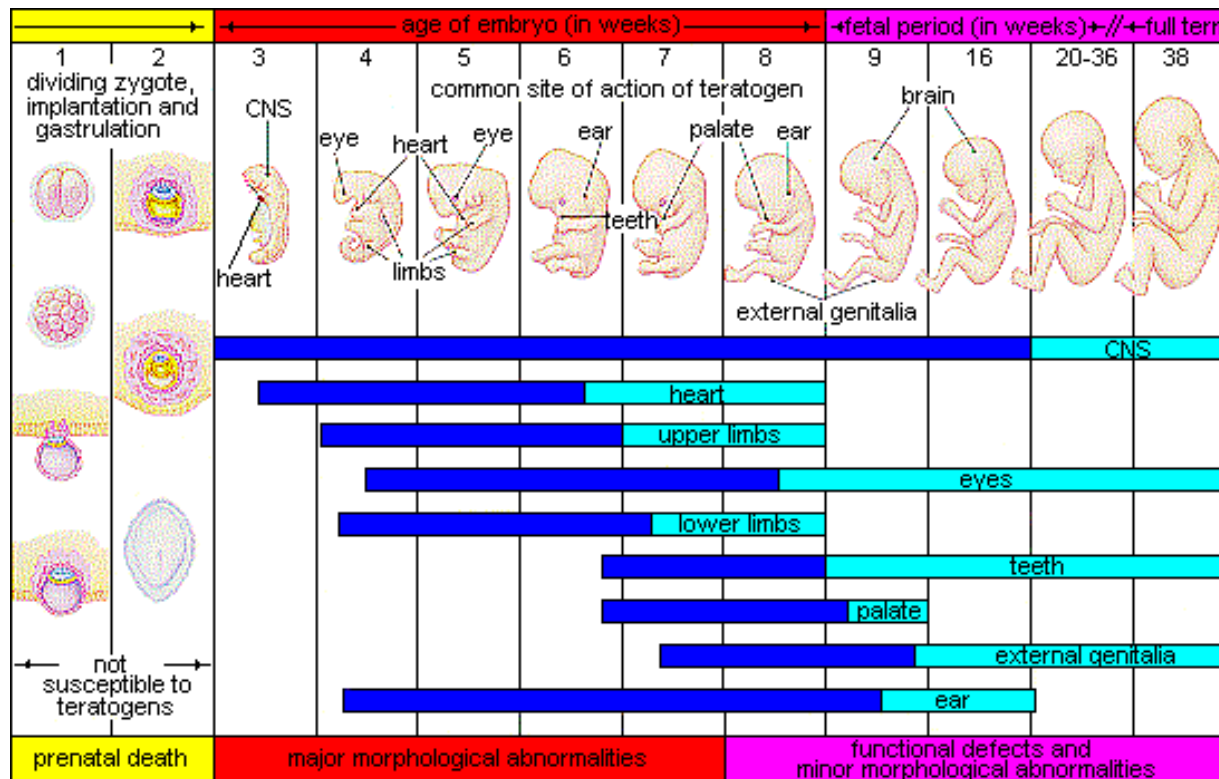
Lifecourse Specificity



RISK ASSESSMENT

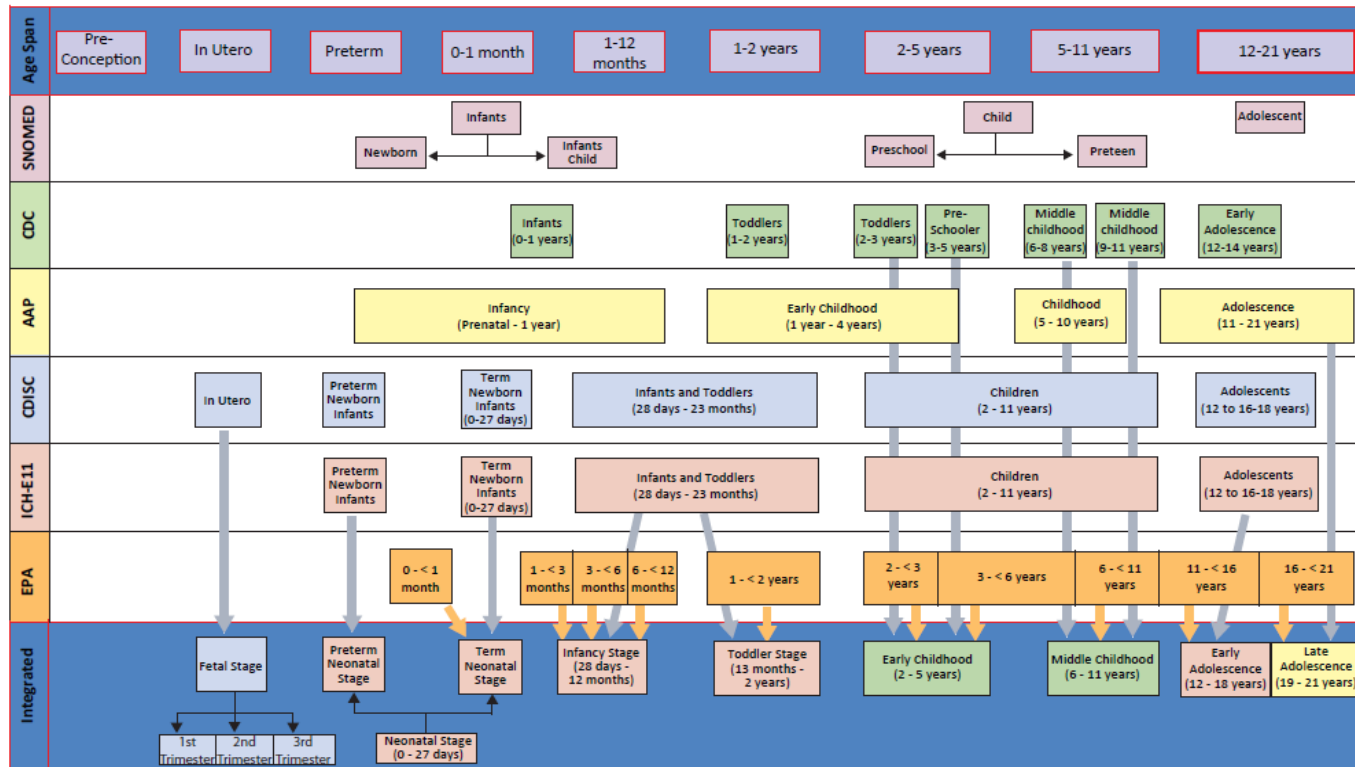


Initial Appearance Of Organs During Gestation In Humans Can Define Windows Of Sensitivity



Definitions of Exposome by Disciplines

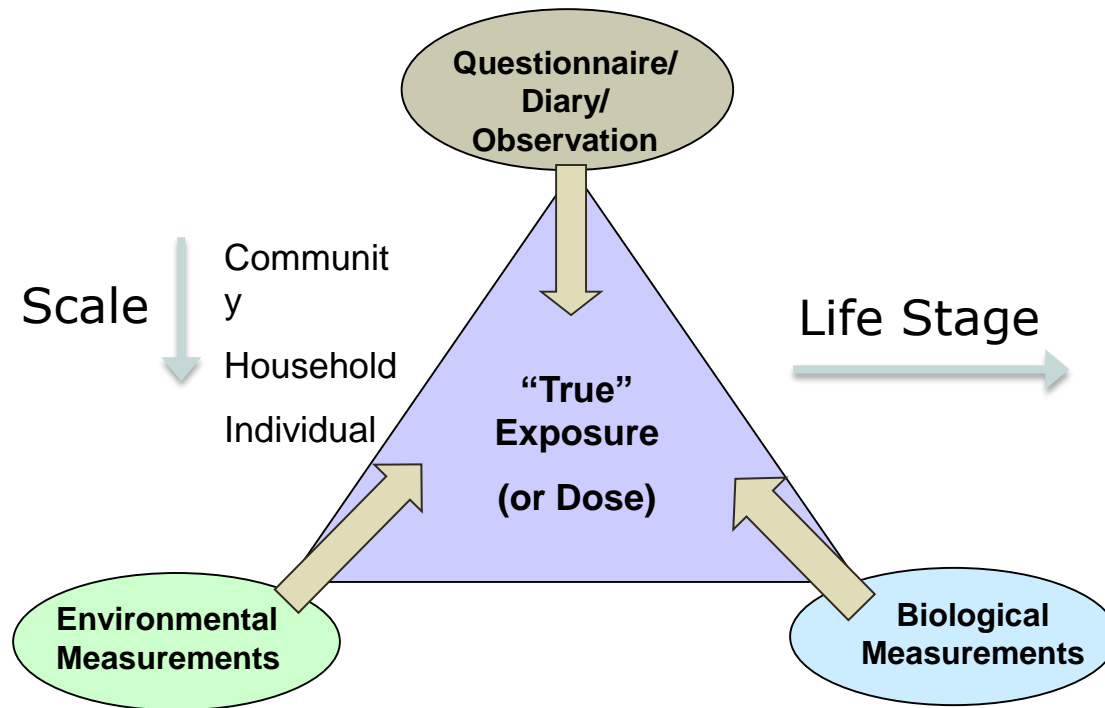
Integrated child-life stages for NICHD Pediatric Terminology as mapped to existing medical terminologies



AAP: American Academy of Pediatrics
 CDC: Centers for Disease Control and Prevention
 CDISC: Clinical Data Interchange Standards Consortium
 EPA: Environmental Protection Agency
 ICH-E11: International Conference on Harmonisation
 SNOMED: Systemized Nomenclature of Medicine

Adapted from NCS, 2011; Hubal et al 2014

Cumulative Exposure Approaches for Assessing Exposome within Children's Cohort Studies



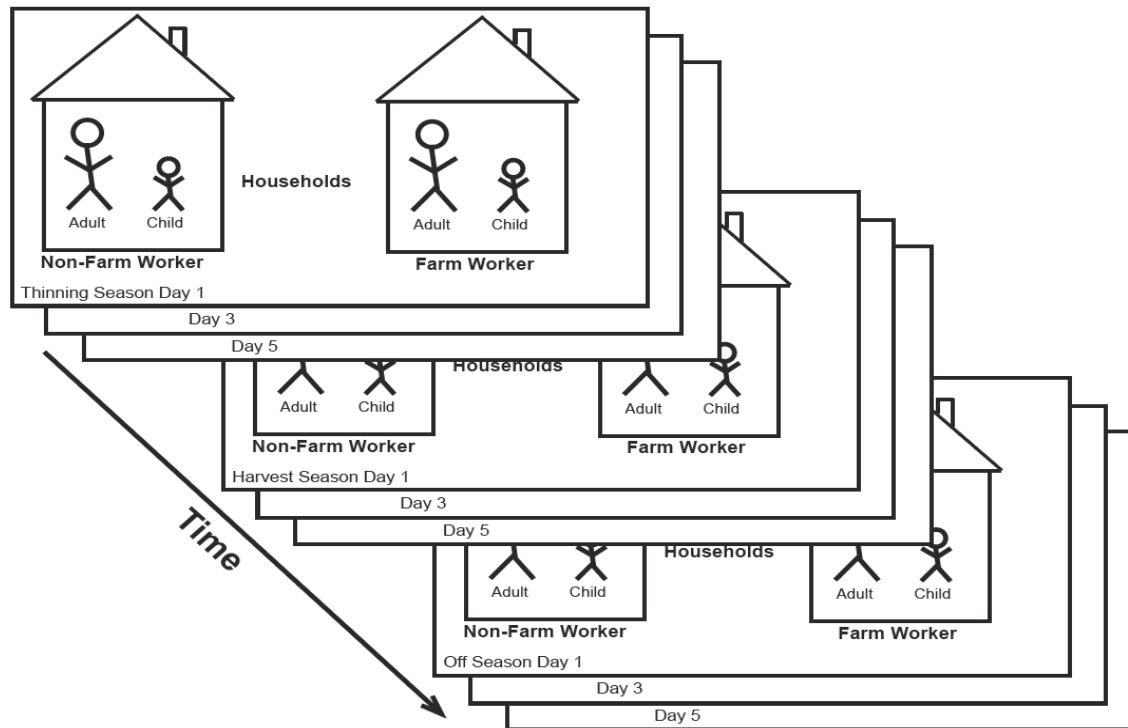
“Environment” Broadly Defined in NCS

- **Physical** environment:
 - housing, neighborhoods and communities, climate, radiation...
- **Chemical** exposures:
 - air, water, soil, food, dust, industrial products, pharmaceuticals...
- **Biological** environment:
 - womb, infection, nutrition; inflammatory and metabolic response...
- **Genetics**:
 - influence of genetics on disease; relationships between genes and the environment
- **Psychosocial**:
 - influence of family, socio-economics, community, culture, stress...

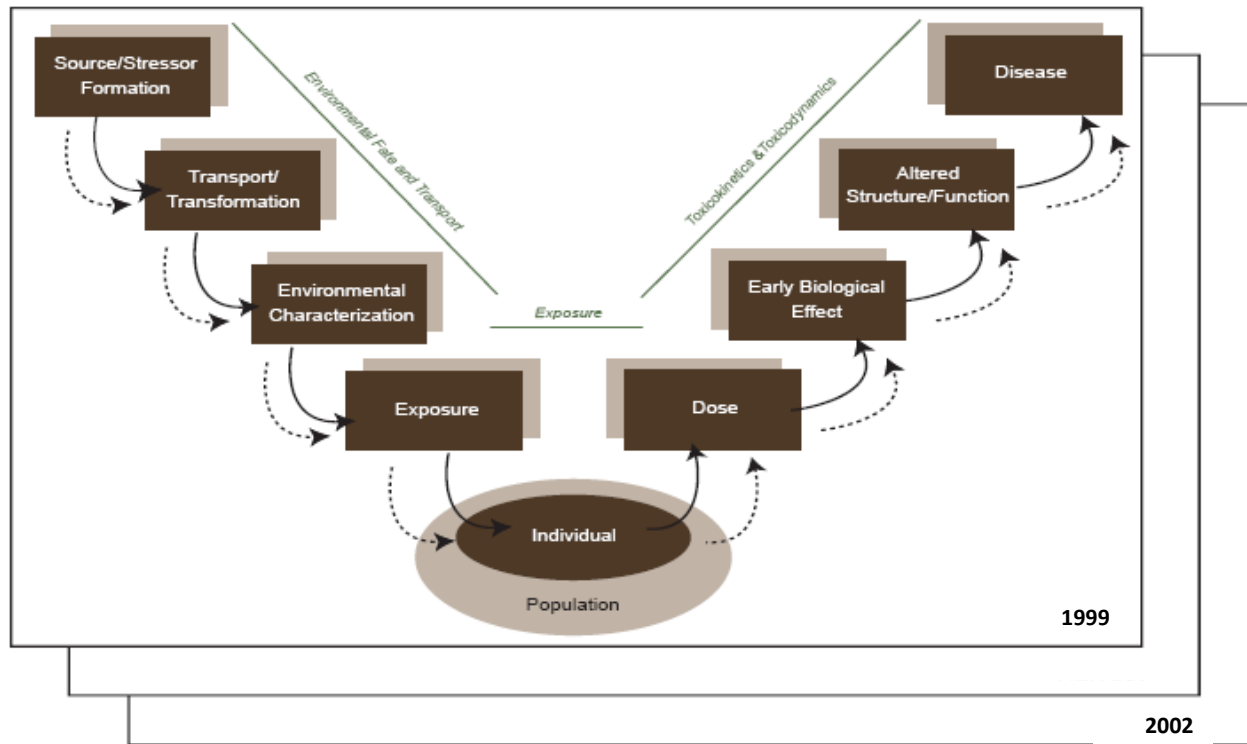
CHC Cohort – Yakima Valley



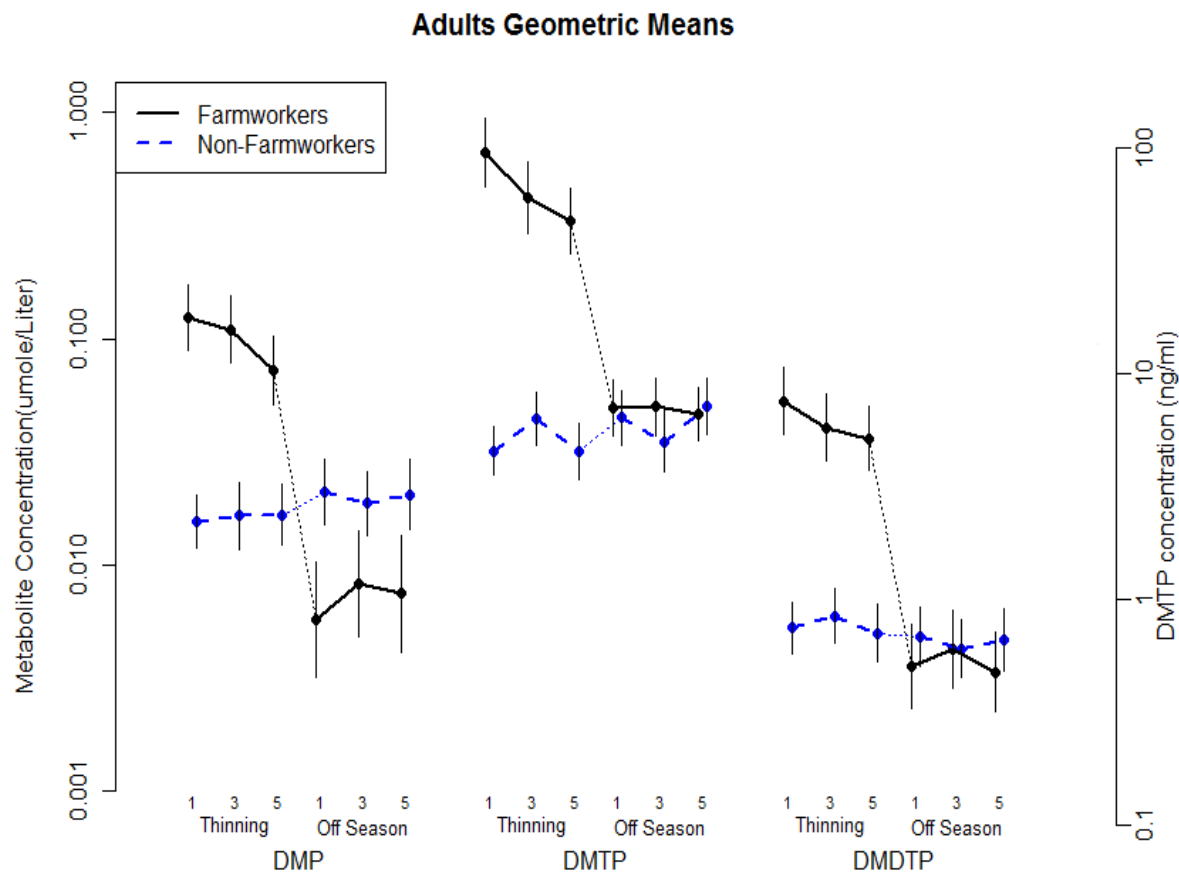
Longitudinal Children's Health Center Study Design



Integrated Framework Tool

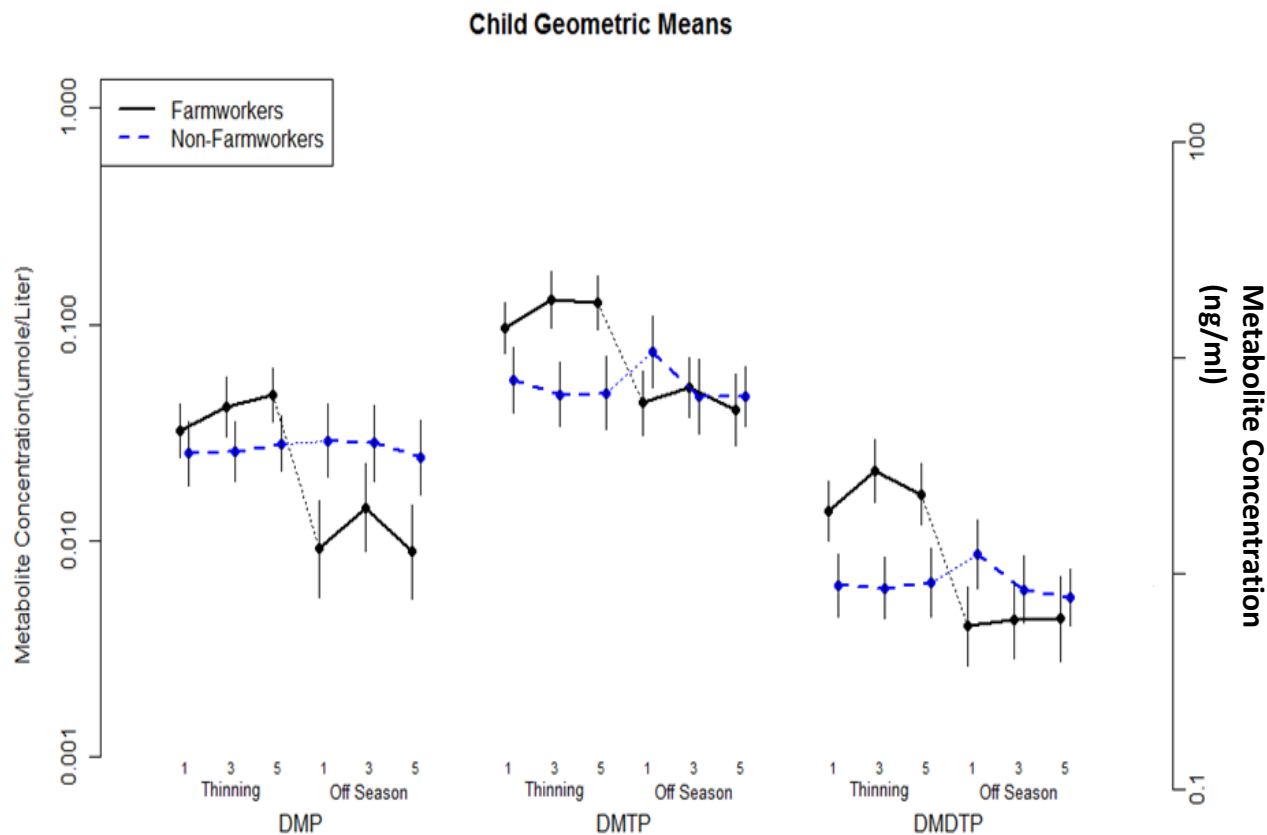


Dimethyl DAPs in Farmworker and Non-Farmworker Adults



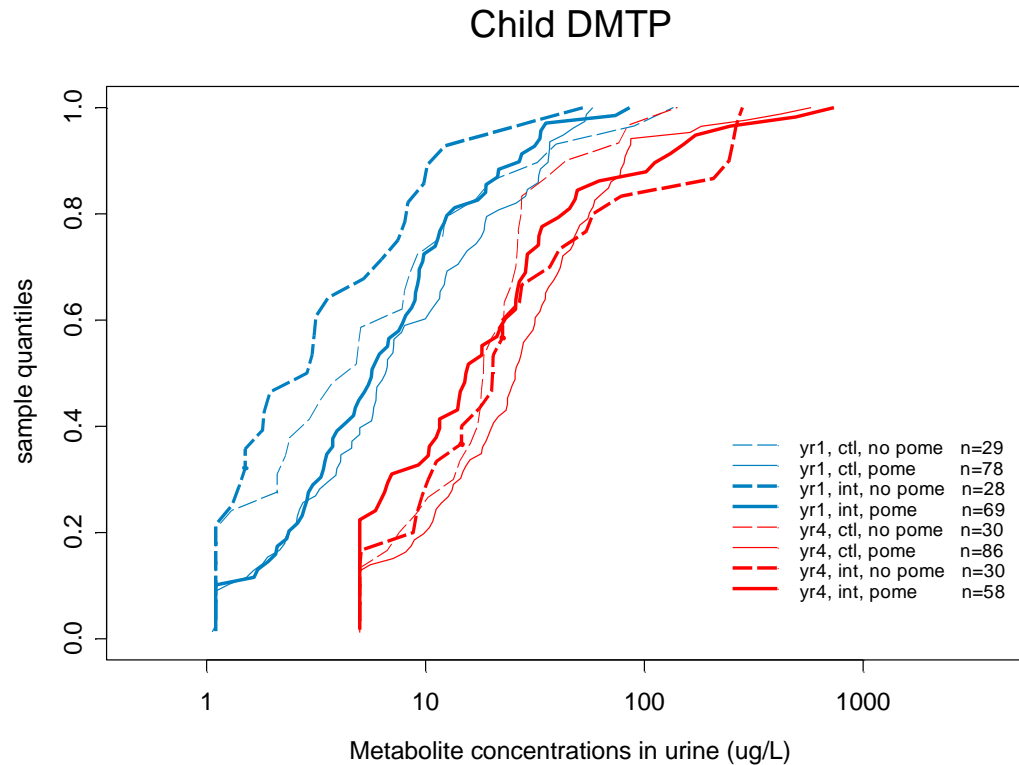
Values represent geometric means and 95% confidence intervals

Dimethyl DAPs in Farmworker and Non-Farmworker Children

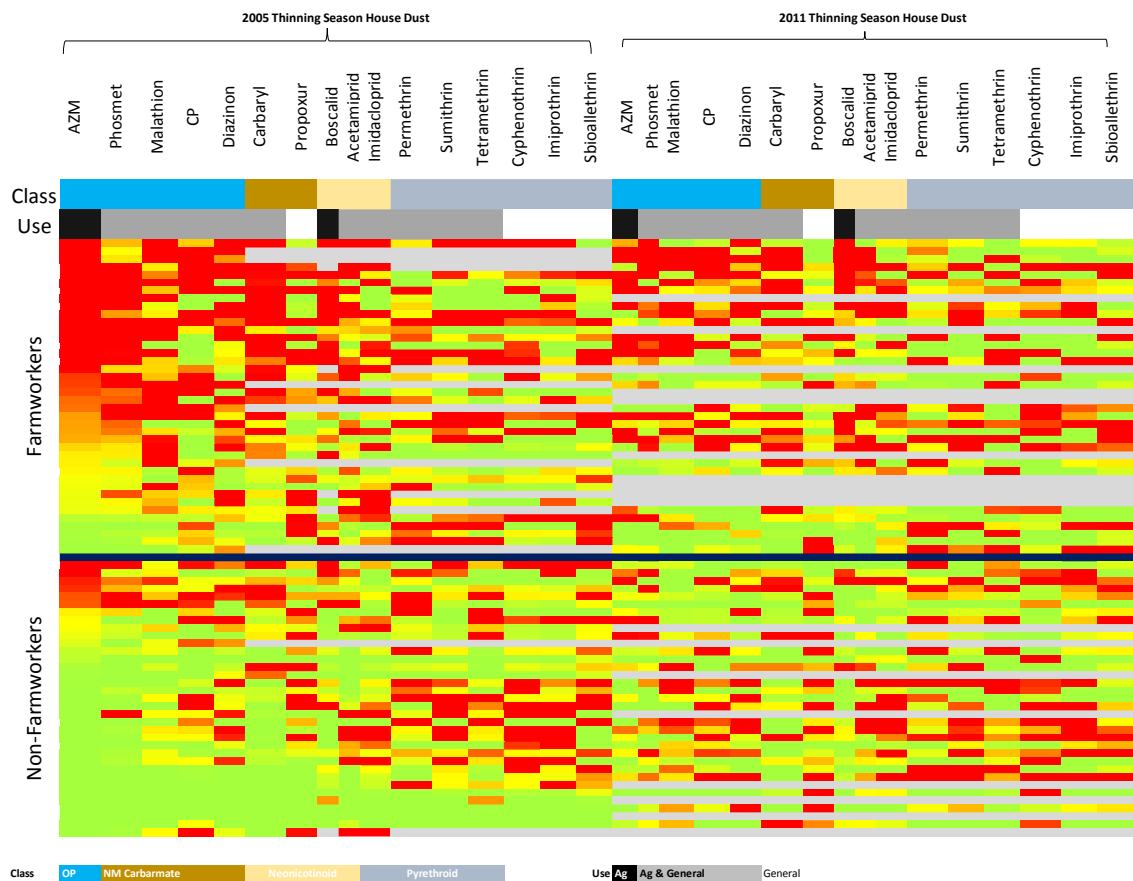


Values represent geometric means and 95% confidence intervals

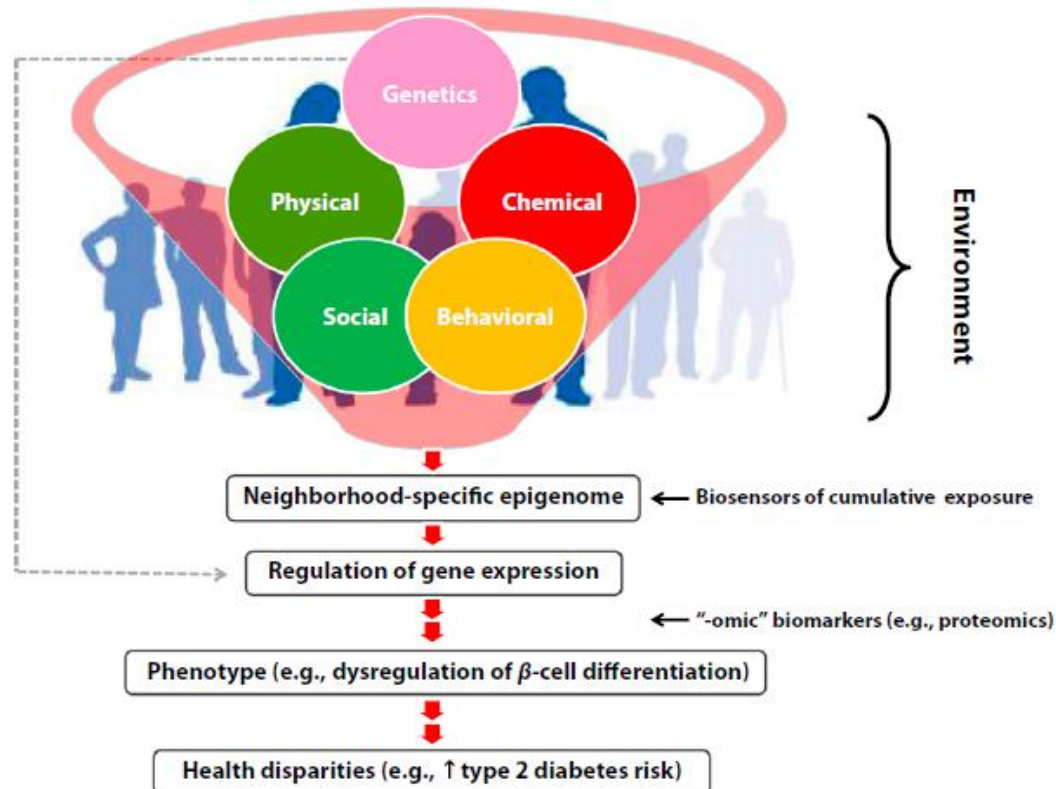
Distribution of Child DMTP from year 1 to year 4 of CHC study: Impacts of year to year variability



Example Exposome for Farmworker and Non-Farmworker House Dust Across 2 Different Years, Same Season



Epigenome: Biosensor of Cumulative Exposure to Chemical and Nonchemical Stressors Related to Environmental Justice



American Journal of Public Health | October 2014, Vol 104, No. 10

K. Olden et al,

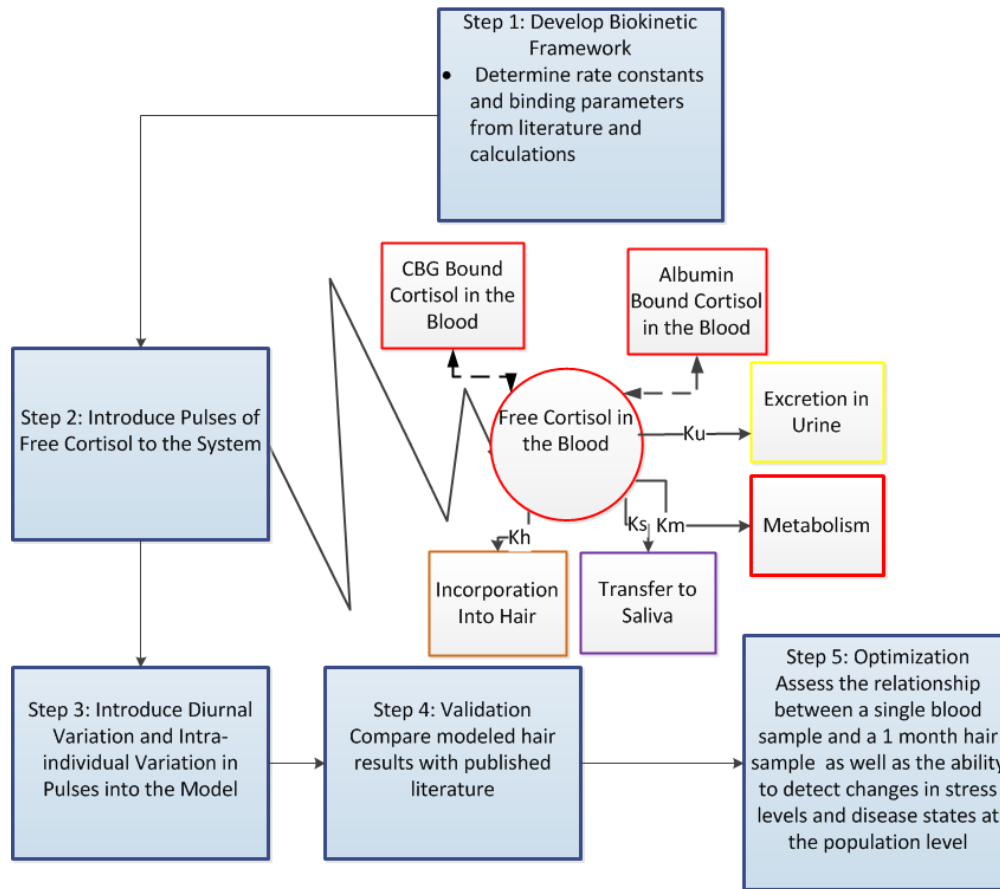
Integrating Chemical and Non-Chemical Exposures

Jesse Plascak, Marissa N Smith, Elaine Faustman, Beti Thompson

Latino residential segregation, discrimination, neighborhood disorder and hair cortisol concentration among Latinas. 2016. Submitted

Plascak et al. 2016 Submitted

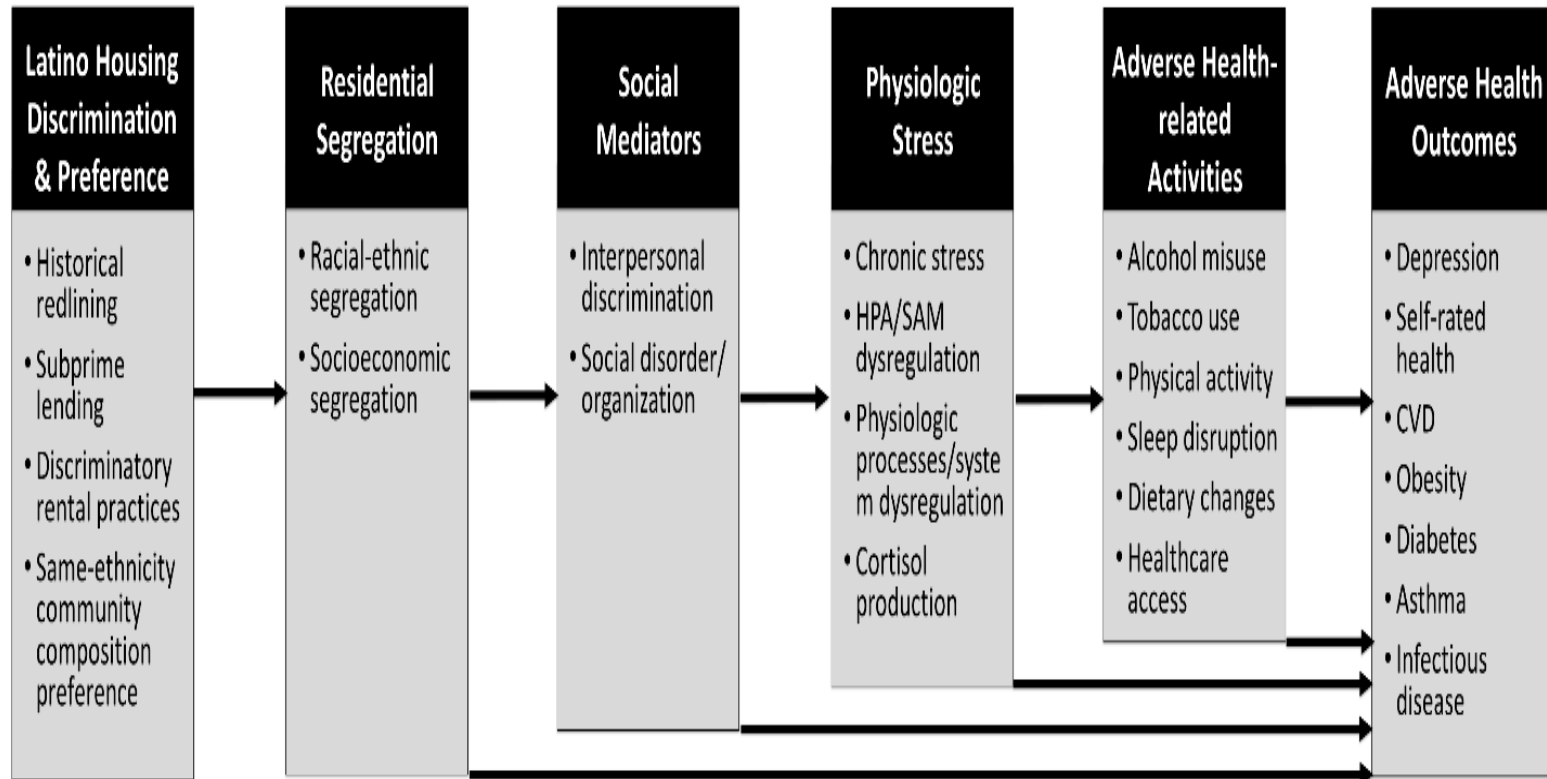
Biokinetic Models/Needed for Integration of Biomarkers



- K_m is the rate constant for free cortisol metabolism
- K_s is the rate constant for free cortisol transfer to saliva
- K_u is the rate constant for free cortisol transfer to urine,
- K_h is the rate constant for free cortisol transfer to hair
- CBG bound cortisol is bound to corticosteroid binding globulin (CBG) in the blood

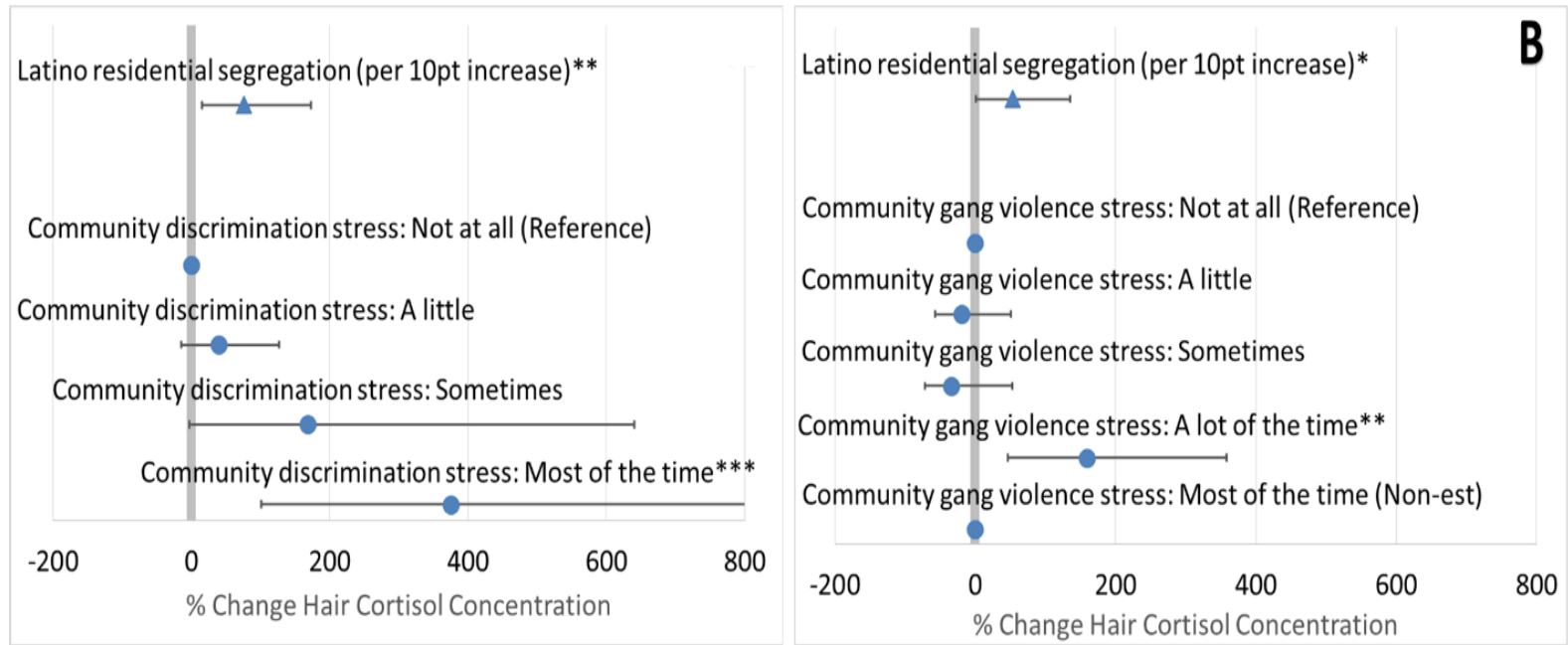
Smith et al 2013 JESEE

Conceptual Model for Pathways linking neighborhood factors, social stress and health



Plascak et al. 2016 Submitted

Conceptual Model for Pathways linking neighborhood factors, social stress and health



Model estimated percent changes in hair cortisol concentrations by Latino residential segregation, discrimination and social organization, *For Healthy Kids! Stress Study* (N=25)¹ Figures A-G represent separate models including each discrimination or neighborhood disorder measure.

Identifying important life stages for monitoring and assessing risks from exposures to environmental contaminants: Results of a World Health Organization review ☆☆☆



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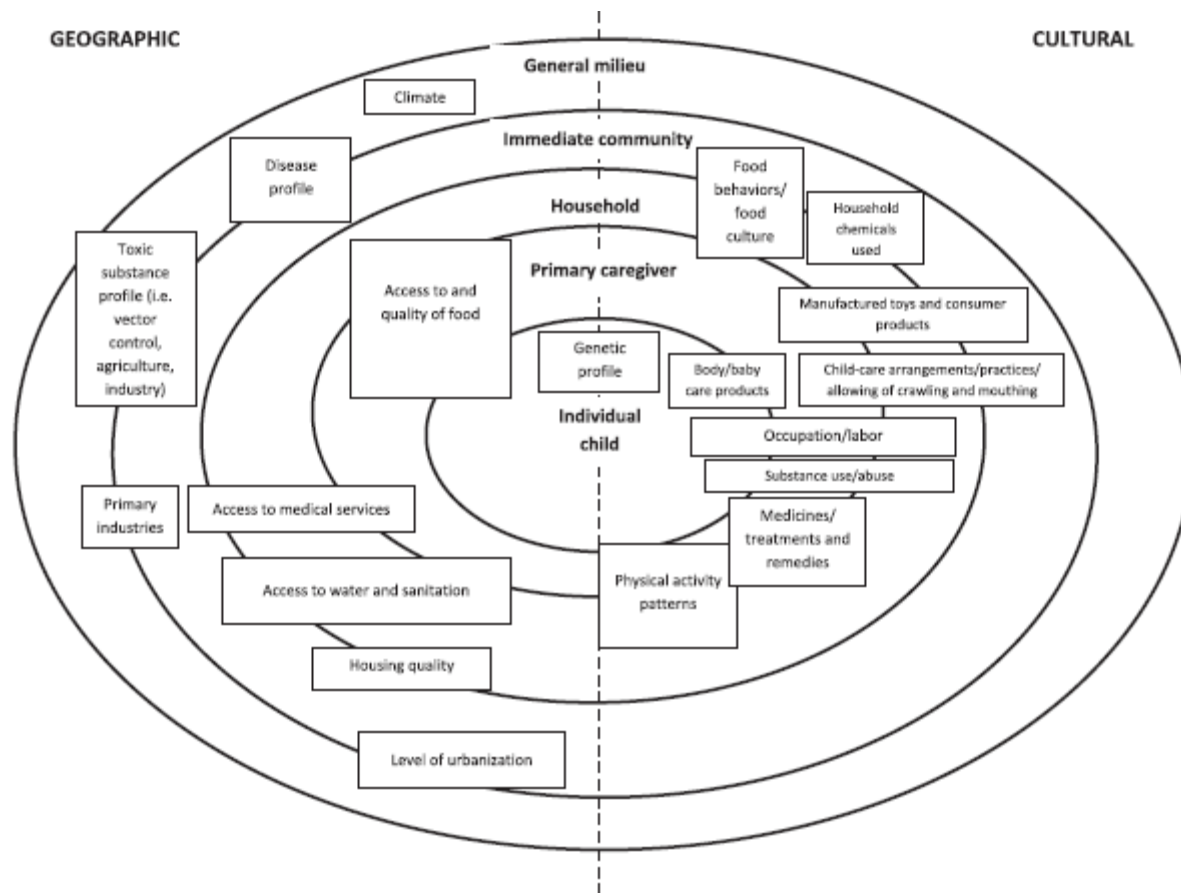
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^fCenter for Sustainability, Environment and Health, National Institute for Public Health and the Environment (RIVM), PO Box 1, 3720 BA Bilthoven, The Netherlands

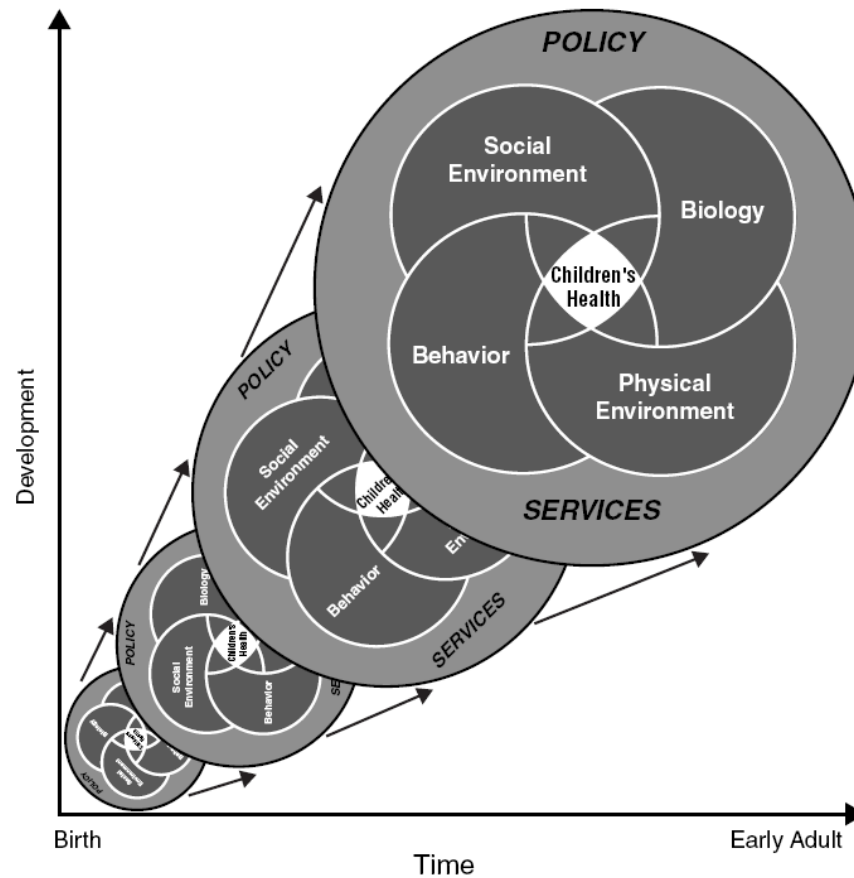
^gInternational Programme on Chemical Safety, World Health Organization, 20 Avenue Appia, CH-1211 Geneva 27, Switzerland

Regulatory Toxicology and Pharmacology 69 (2014) 113–124

Framework of modifying factors for exposure associated with geography and culture.



Life Course Based Model of Children's Health and its Influences



Source: *Children's Health, Nation's Health*, IOM report, 2004

Lessons Learned for Children's Exposome

1. Unique features and needs for children's exposome
Lifestage assessments matter!
2. Models are needed that link kinetic and dynamic features in order to understand the potential for exposure at specific sensitive lifestages, the form of the exposures in complex environments, and duration and magnitude of exposures related to disease outcomes that may happen at the same lifestage or much later in life.
3. Temporal specific exposures are useful for designing and evaluating interventions
4. Temporal considerations for children's exposome are essential for predicting and identifying impacts during childhood development

Acknowledgements

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Extra Slides

Community Intervention



After a series of presentations made in second and third grade classrooms, students were invited to enter a coloring contest. Winning entries were included in a calendar. In this drawing the woman tells the man to wash his own clothes, because she's going to a dance...and she reminds him to leave his boots outside.

Photo: Gloria Coronado