

From Pilot to R01s: promoting children's environmental health research in Kenya

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Fertile Ground

Strong history of child health research collaboration (U Nairobi, UW)



Growing curiosity of U Nairobi team regarding environmental health (air pollution, lead)

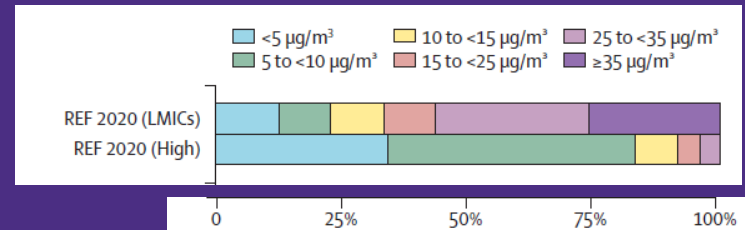
Recognition of LMIC exposures >> HIC



Article

Implications of Combined Exposure to Household Air Pollution and HIV on Neurocognition in Children

Megan K. Suter¹, Catherine J. Karr^{1,2,3}, Grace C. John-Stewart^{1,2,4}, Laurén A. Gómez⁴, Hellen Moraa⁵, Duke Nyatika⁵, Dalton Wamalwa⁵, Michael Paulsen³, Christopher D. Simpson³, Niloufar Ghodsian³, Michael J. Boivin⁶ , Paul Bangirana⁷  and Sarah Benki-Nugent^{4,*}



PMID: 2936170, 41856137



Pilot funding → relationships, methods development → collaborations, grants



Workshop: Link environmental scientists with maternal child health experts in Kenya



Orly Stampfer, UW and Vincent Kipter, Univ. of Nairobi

**Peer Mentoring:
Methods development**



Faridah Were, Dept. Chemistry, Univ. of Nairobi



Anne Riederer, UW



8 publications
2 pre-doctoral Kenyan students

- 2020 R01 ABC Study (Benki-Nugent)
- 2022 R21 Hair Metals (Simpson, Riederer)
- 2025 R01 LEIP Study (Karr, Benki-Nugent, Maleche-Obimbo)
- 2025 R01 HOPE-X (John-Stewart)
- 2026 Vital Strategies Lead Opp. Fund (Riederer, Were)

Collaborations, NIH funding



EDGE Pilot, Characterizing perinatal neurotoxicant exposures in a dense urban informal settlement in Nairobi: A community-engaged approach to foster new Maternal Child Environmental Health research and interventions in Kenya – 2019 -2020

UW Global Innovation Fund, Kenya Health Home Healthy Brain Project - 2019

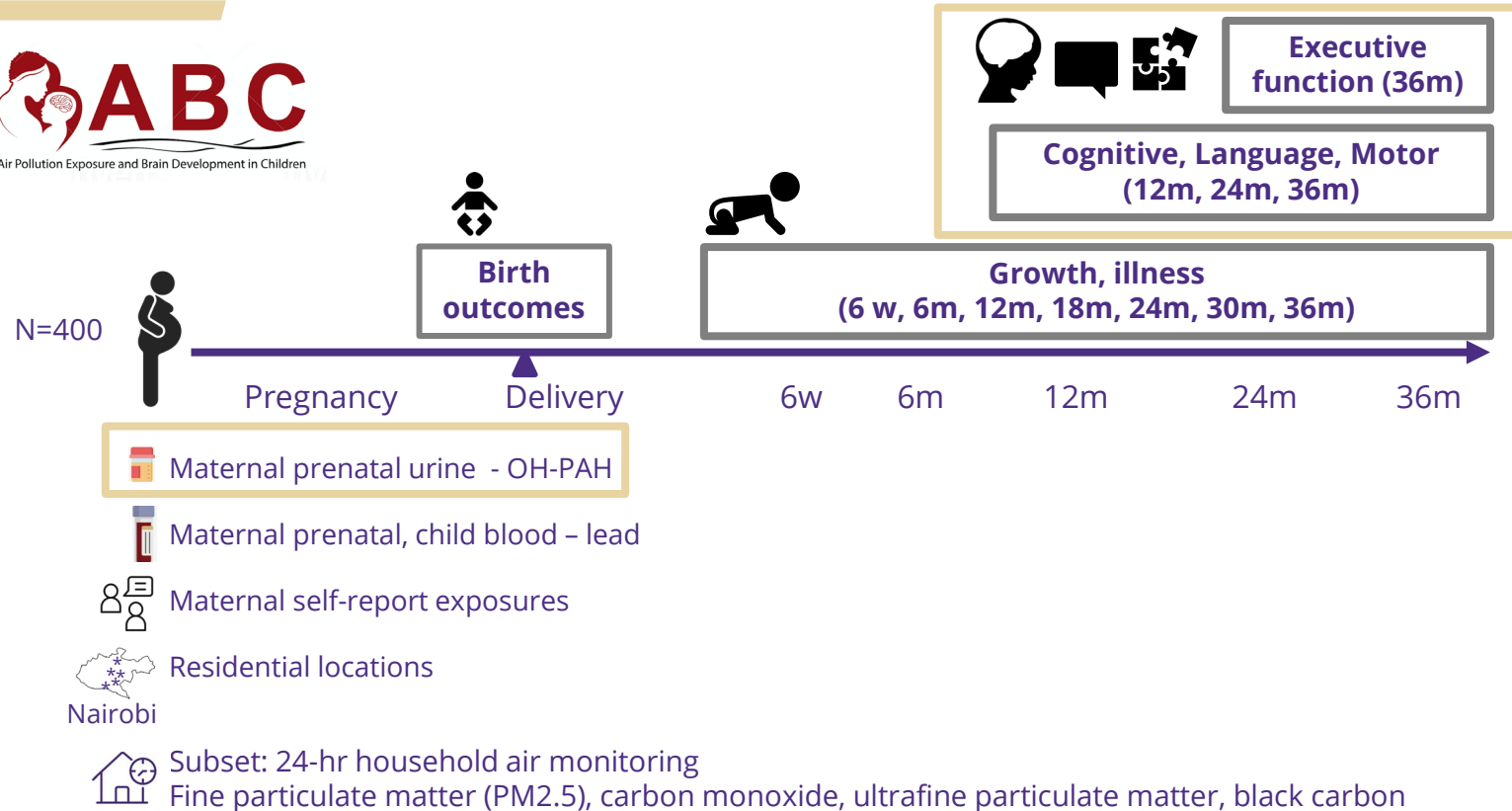


What are early life exposures to air pollution in urban Kenya and how do they affect child development?

- ✓ Ambient and household sources
- ✓ Urban setting
- ✓ Individual prenatal exposures
- ✓ Focus on executive function
- ✓ Include consideration of lead
- ✓ Capacity building



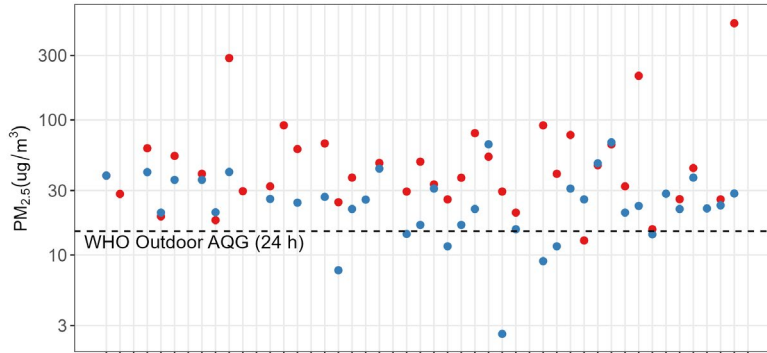
ABC : Characterize early life exposures in urban Kenya, determine implications of exposures



High exposures to PM2.5 at household level



Vincent Kipter, MS,
Chemistry, Univ. of
Nairobi
Pre-doctoral, Auburn
University



Indoor 24h PM2.5: median, 39.9 $\mu\text{g}/\text{m}^3$
97% > 24 h WHO AQG

Outdoor 24h PM2.5: median, 23.3 $\mu\text{g}/\text{m}^3$
79% > 24 h WHO AQG

AQG, Air Quality Guideline

Kipter et al. PLOS Global Public Health 2026



Air Pollution Exposure and Brain Development in Children



PAH pregnancy in urban Kenya were 4–10x higher than in USA pregnant populations, associated with kerosene use



Ann Riederer,
DEOHS, UW



3rd trimester
urinary OH PAH

OH-PAH analyte	Urban Kenya (ABC)	USA (ECHO Pathways*)
2-OH-NAP	14.0	3.6
2,9-OH-FLUO	0.45	N/A
2-OH-PHEN	0.44	0.07
3-OH-PHEN	0.23	0.07
1-OH-PYR	0.79	0.07
Shown are geometric means (ng/ml)		

*ECHO PATHWAYS Consortium: pregnant people living in 7 US cities (Memphis, Minneapolis, Rochester, San Francisco, Seattle, Yakima); Masterson EE et al. PLoS One. 2024 19(7):e0305004



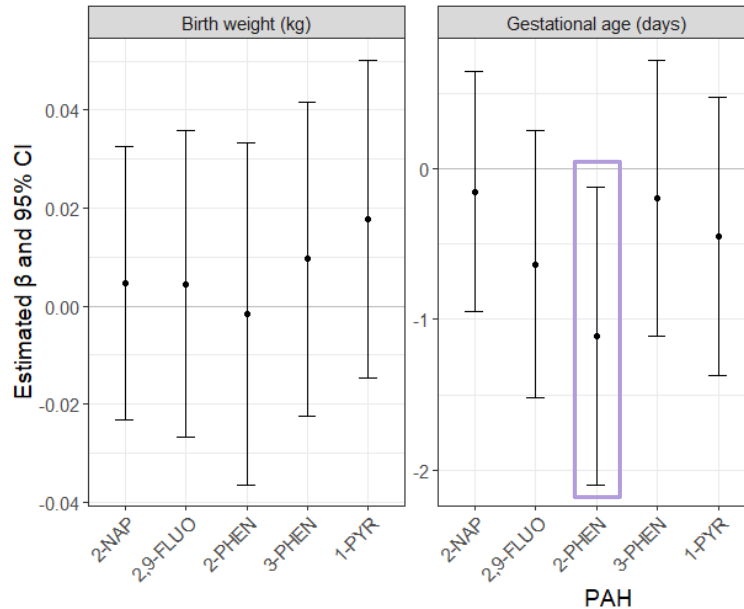
Higher 2 OH phenanthrene in pregnancy → younger gestational age at birth, stronger for females



Allison Sherris,
DEOHS, UW



Adverse birth
outcomes



Aligns with prior study:
↑ prenatal 2-PHEN → ↑ pre-term
birth in females
Freije et al. 2022

*adjusted for specific gravity; child sex;
maternal age, employment, education,
marital status, parity, cotinine > 10 ng/mL

Subtle relation between certain analytes and fine motor



Child age 12
months

- > Preliminary analysis of child age 12-month neurodevelopment
- > No associations for cognitive, gross motor or language
- > Certain analytes associated with lower fine motor scores (2 hydroxy-phenanthrene, 2,9 hydroxyfluorine)
- > Interpret carefully – mixed results in analyses stratified by sex

Lead exposure?

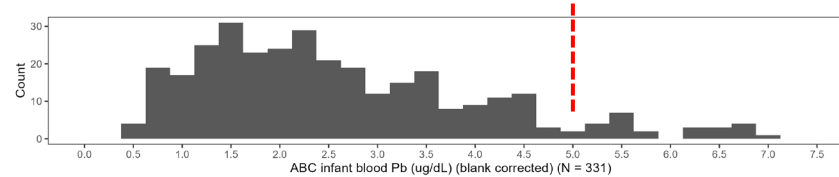


N = 20
77% have high BLL



N = 331, 12 months
27 (8.2%) have high BLL

Histogram of child blood lead levels



Shared results with mothers
Informational poster:

- Impact of lead on health
- Common sources
- Ways to avoid exposure
- Focus on nutritional sources of calcium and iron



Edith Lumumba,
MS, PhD ongoing

High BLL = blood lead level is >5 ug/dL

Addressing Lead Exposure

Announcement: Implementation Research on NCD Risk Factors among LMIC and Tribal Populations living in City Environments (2022)

Implement Pediatric Lead screening in Nairobi?



Lead Exposure Intervention Program



LEIP Aims

Adapt, pilot and refine a prototype child lead screening program

Accuracy, understandability, acceptability

Implement comparing 2 strategies: in clinic only vs addition of home visit

Evaluate barriers: individual & structural level



Accessible BLL testing



Pb Source ID



Risk
Reduction
Messaging



Thank You

LEIP/ABC Co-Is, Post-docs, Students

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Centers

UW EDGE Center
UW Global WACH
UW Kenya Research and Training Center

Institutions

University of Washington (UW)
University of Nairobi (UoN)
Kenyatta National Hospital (KNH)

ABC Study Families

Extra slides

LEIP Framework

Fig. 1. Public health approach to preventing childhood lead exposure.

