

The Bangladesh Longitudinal Child-Adolescent Development, Education, and Environment Study (BLADES): A Community-level Multipollutant Study on Mother-Child Health in Bangladesh

Motivation



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SAIST Foundation

- A non-profit research institute based in Dhaka, Bangladesh.
- Est in 2010. Started its journey as SAYRID



The core mission is to:

- facilitate and advocate for evidence-based sustainable policy decisions in Bangladesh and South Asia aimed at reducing disparities in education, public health, and vulnerabilities to environmental pollution and climate change by generating and disseminating scientific knowledge for social transformation



BLADES Cohort Profile

The Bangladesh Longitudinal Child-Adolescent Development, Education, and Environment Study (BLADES), which encompasses approximately 2,500 households in four subdistricts of Dhaka and three subdistricts of Dinajpur districts.

Adopting a community-level exposomics framework, **BLADES** aims to examine the concurrent, prospective, and lifetime effects of environmental, climate-sensitive, psychosocial, lifestyle, and structural factors on child development, academic performance, and mother-child health.

Started: May 2021

Child-mother Pairs: ~ 2500

Age Range: 0 to 18 Years Old



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BLADES Location



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Recruitment & Timeline



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BLADES

May 2021-June
2022: Study
Area
Identification,
Household
Selection &
Recruitment

Baseline Phase I

Sep 2022-Jan
2023:
Recruitment &
Baseline for
1045
Households in
Four Urban
Slums in Dhaka

Baseline Phase II

Nov 2023-Jan
2024: Baseline
for 340
Households in
Dhaka, 637
Households from
two Subdistricts
of Dinajpur

Baseline Phase III

August 2024-
Feb 2025:
Baseline for
481
Households
with Under
Five Children
in Dinajpur

Follow- Ups

Daily,
Annual, &
Biannual:
First
Follow-up
January
2023

Eligibility Criteria: Households in the selected areas with under-five or school-going children enrolled in schools within a 2 km radius

Households=2503; N=~2784; Non-response: less than 1%

Air Pollutant Measurements

Air Sample Collection



Blue Sky & Purple Air Sensor



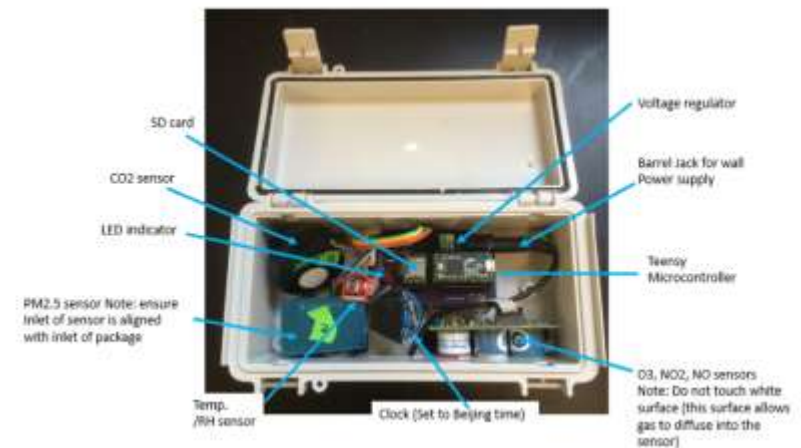
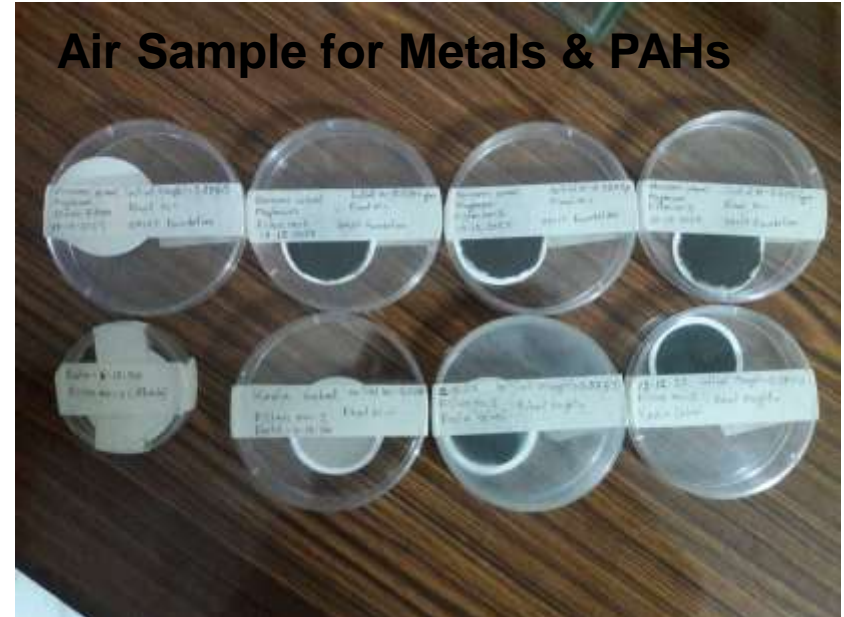
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Air Sample for Metals & PAHs






DUKE Sensor for Indoor Air Pollutants



Triangulation of Measures

Exposure Measurements

-  **Satellite** (i.e., AOD, NDVI, land use, temperature, greenness)
-  **DOE Monitoring Stations** (PM/NO₂/SO₂ monitors)
-  **Low-cost Community Sensors** (indoor and ambient monitors)

**Hybrid
Spatio-
temporal
Modeling
(LUR+ML)**



**Modelled
7 Criteria
Pollutants
Surface
2010-2024**

 **Filter Samples** —metals (XRF/ICP-MS), PAHs (GC-MS), Pesticides



LOADING



Blood



**Deciduous
Tooth**



i.e., metals (Pb, As), PAHs
metabolites, CRP/inflammation,
lipid profile; omics-serum
metabolites, plasma proteins

Exposomic Domains



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Exposome
(~200 Exposures)

**Childhood
Exposure**



Metorological & Climate
Sensitive Exposures

18

12 PM1, PM2.5, PM10, SO₂, SO₄,
BC, OC, CO, CO₂, NO, NO₂, O₃

Social and Behavioral

15

11 Airborne Heavy Metals

Nutrition and Food Security

25

10 Polycyclic Aromatic
Hydrocarbons

Extreme Weather Events

07

In
Progress

Airborne Pesticides

Migration History

05

-20 Built Environment-Home &
School

Psychosocial Stressors

16

65

Socioeconomic Status
63 Durable & Non-durable Assets,
including agricultural land, & income

Outcome Measures



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Under Five Children

Birth Outcomes, Vaccination, Early Child Development, Ages and Stages Questionnaire, Functional Difficulties, Anthropometric Features, Respiratory Problem, Foundational Learning



Mother/Caregiver

Anthropometric Features, Lung Function, Blood Pressure, NCD History, Depression & Anxiety (PHQ9 and GAD7), COVID-19 Disease, and Vaccination Status, Quality of Life (WHOQOL-BREF), and Functional Difficulties, Migraine, and Respiratory Problems



5+ to 18 Years Old

Behavioral Problems (SDQ), Anthropometric Features, Lung Function, Blood Pressure, Migraine, Fever, Cough, and Respiratory Problems, Functional Difficulties, Physical Activity, Sleeping Patterns, Child Marriage, Child Labor, Self-reported NCD History



School-Specific

School Attendance, Academic Attainment, Extracurricular Activities, Sense of Belongingness to School, Learning Environment, Bullying and Sexual Harassment

Adolescent Girls

Menstrual Hygiene, WASH Facilities, and Sexual Harassment



Study Participants

Dhaka (N=1351)	Dinajpur (N=1433)
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Age of the Children

Below 6 years old	121 (8.9%)	533 (37.2%)
6 to 10 years old	459 (34.0%)	143 (10.0%)
11 to 15 years old	568 (42.1%)	473 (33.0%)
16 years & above	203 (15.0%)	284 (19.8%)
Maternal age	35 (20-60)	32 (18-55)

Biological Sex of Children

Girls	797 (59.0%)	688 (48.0%)
Boys	554 (41.0%)	745 (52.0%)

External Exposome Distribution

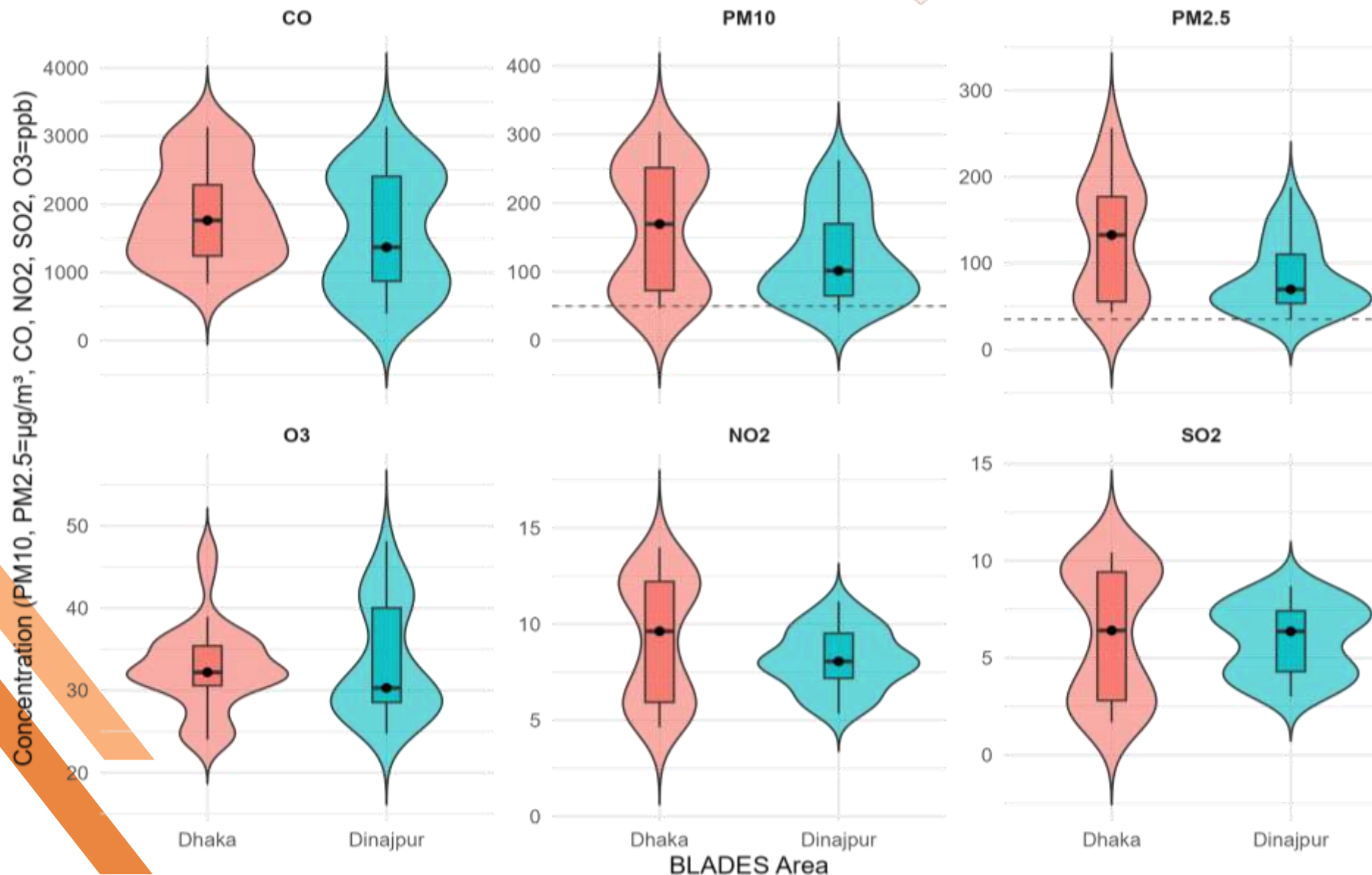


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Analytic Potential and Future Endeavours



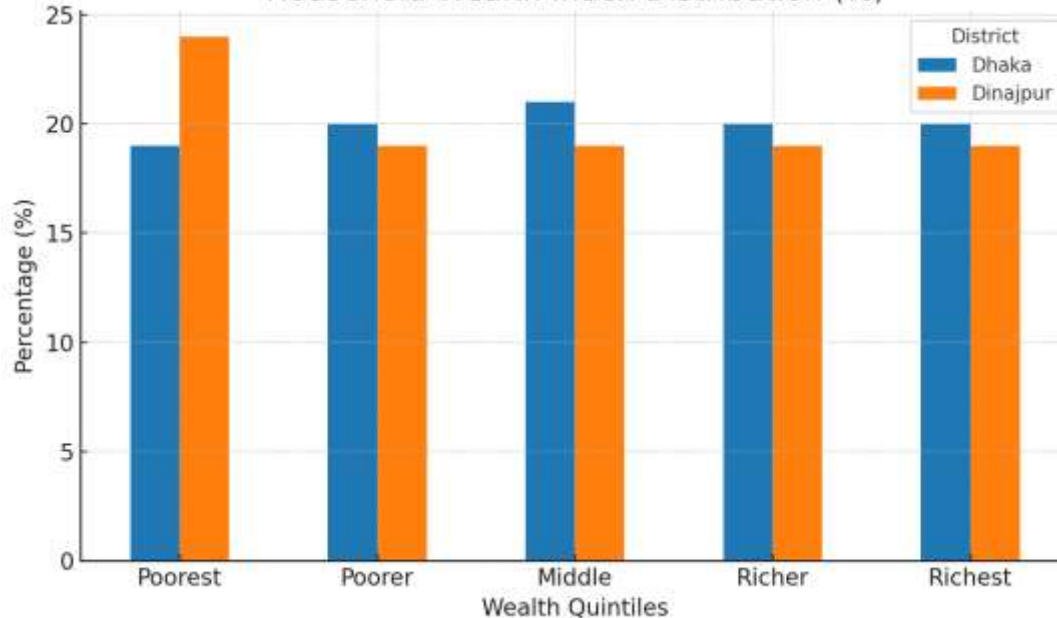
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Household Wealth Index Distribution (%)



- ~25% of children experience asthma-related symptoms
- ~10% of children with high SBP and DBP

- Greater overall greenness associated with fewer internalizing behavioural difficulties



LOADING



Blood



Deciduous
Tooth



i.e., metals (Pb, As), PAHs metabolites, CRP/inflammation, lipid profile; omics-serum metabolites, plasma proteins

Take Home Message

- Research is more art than science; studying the exposome is no exception!
- Turning crisis into opportunity and ownership-foreign Donor dependency, developing resilience and local infrastructure etc
- We advance by creatively leveraging the data, tools, and communities already around us
- Trust in data, in collaborators, and with communities
- Collaboration among scientists and across disciplines is the only way forward in this new, crazy world!



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Open for Collaboration



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Acknowledgement



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A House of Total Quality, Trust & Faith

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Thank You for Your Feedback



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