

# Environmental exposures due to informal level e-waste recycling activities and human health

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McGill



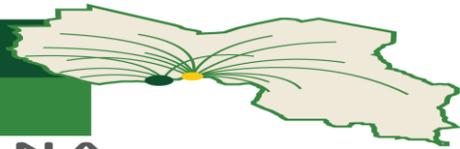
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# E-waste: global production

E-WASTE GENERATED BY COUNTRY (2012 total, in millions of tons)



Source: [Stap-Initiative.org](http://Stap-Initiative.org)

# E-waste: global movement

## Export of e-waste



# E-waste: global destinations



# Recycling Methods

- ❑ Recycling activities take place in a highly concentrated area and include:
  - ❑ Open burning
  - ❑ Manual dismantling
    - ❑ Chisels and hammers
- ❑ Fabrication/moulding into local cookstoves



# Recycling Methods



# Multiple Toxic Exposures



# Multiple Toxic Exposures



# U01 Research Studies



Electronic-Waste in Ghana

## GEOHEALTH STUDY

ENVIRONMENTAL AND  
OCCUPATIONAL HEALTH



# Broad Scientific Goals

□ Scientific goals include:

□ 1) characterize work-related, time-varying, job-specific exposures of electronic waste recycling activities at the Agbogbloshie site, and assess biological markers of dose, to metals, organic compounds, and markers of combustion products;

□ 2) provide estimates of potentially increased lifetime, work-exposure-associated cancer risks; and,

□ 3) evaluate associations of exposures with measures of acute and chronic respiratory morbidity in workers.

□ Scientific goals are fully integrated with strengthening EOH capacity in West Africa

# Specific Aims<sup>1/2</sup>

❑ **Specific Aim 1.** To enroll 207 study participants over a 12-month period: 142 Agbogbloshie waste recycling workers...as well as a group of 65 'controls' residing in Madina Zongo...

❑ **Specific Aim 2.** To collect and analyze, at 0-, 6-, 12-, and 16-months for each participant,

❑1) biological samples (blood and urine) for a) metals, b) organic compounds including flame retardants, polycyclic aromatic hydrocarbons (PAHs), dioxin-related compounds, and,

❑2) personal air monitoring, through a combination of real-time measurements and analysis of size-specific samples collected on filters

❑3) estimate life-time cancer risks

# Specific Aims<sup>2/2</sup>

❑ **Specific Aim 3.** To collect respiratory health data (symptom reports; spirometry) at 0-, 6-, 12-, and 16-months for each participant.

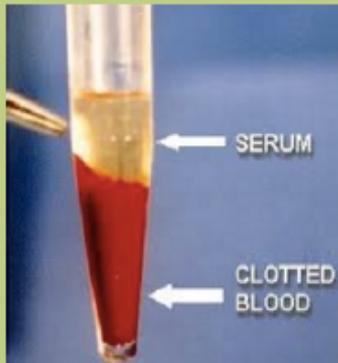
❑ Specific Aim 3a. To evaluate whether working on the Agbogbloshie site, ...and whether quantified exposures ...(PM 2.5, elemental carbon, PAHs) are associated with differences in respiratory health status.

❑ Specific Aim 3b. To investigate interactions between occupational exposures ...and 1) ...biomass fuels for cooking in domiciles, 2) tobacco use, 3) pre-employment history of ... asthma or tuberculosis, in producing adverse respiratory health effects.



# Media for Assessment

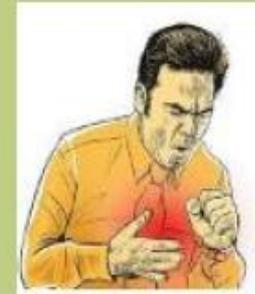
Depending on the metal's half-life, blood and urine biomarkers will give an indication of recent cumulative exposure.



METALS	Whole Blood	Urine
Cadmium	✓	✓
Mercury	✓	✓
Lead	✓	✓
Chromium	✓	✓
Arsenic	✓	✓
Copper	✓	✓
Aluminum	✓	✓
Manganese	✓	✓
Nickel	✓	✓
Zinc	✓	✓

# Assessment of Confounders

With little background data on prior exposures and health conditions among informal e-waste workers, our questionnaire is comprehensive.



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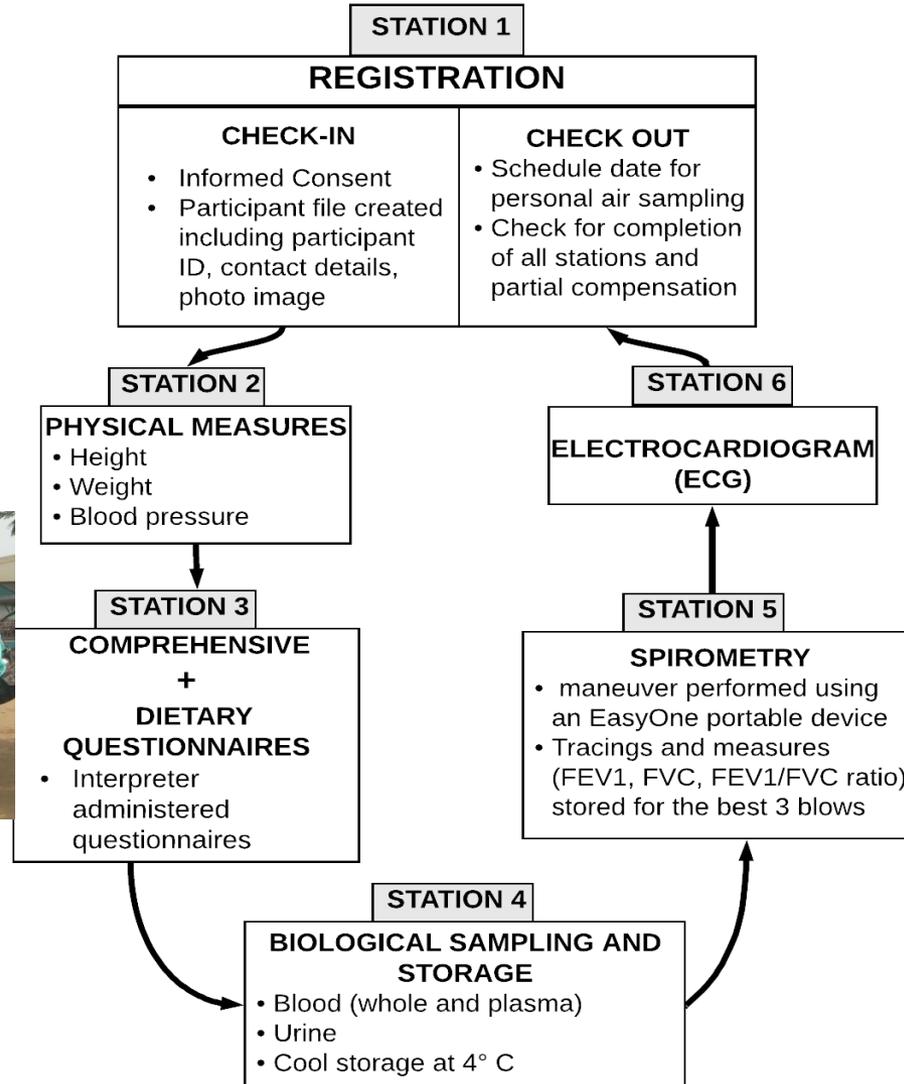
# Ambient and Personal Level Assessments



- Agbogbloshie worker study includes
  - Fixed site and real time & filter personal measures of airborne exposure (PM including analysis for organics, e.g., PAHs)
  - Time-lapse photography (one photo per minute) using GoPro cameras
  - Backpack containing instrumentation for personal-level PM data collection
  - Measures of respiratory, cardiovascular & musculoskeletal outcomes
  - Repeated measures on participants over 3 seasons

# Sample Collection Work Flow

DATA COLLECTION FLOWCHART



# Collaborators



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# Acknowledgement



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**Thanks for your attention**

