SaniPath assessment of fecal exposure pathways in slum and non-slum communities in Dhaka city, Bangladesh


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Bangladesh
Background

• Globally, an estimated 23% of all deaths attributed to environmental factors

• Rapid urbanization has led to a growing sanitation crisis in urban Bangladesh

• Unhygienic sanitation facilities may spread diseases and threaten public health

Photo: Indrajit Ghosh: The New Age
Multiple exposure routes with different risks
Which exposures pose the greatest risk?

- Household
  - Surfaces
  - Soil
  - Stored drinking water

- Food
  - Ready-to-eat food contaminated by food handler
  - Wastewater-irrigated produce

- Surface Waters
  - Bathing
  - Laundry
  - Swimming

- Flood zones
  - Soil
  - Water

- Open drains
  - Sediment
  - Water

- Public latrines
  - Surfaces

- Municipal Water
  - Drinking
  - Bathing

- Soil
Contamination levels along different environmental pathways were high: Rural Bangladesh

High fecal contamination found on raw produce in Dhaka markets

Street food near Dhaka schools found contaminated

Figure: Jhalmuri

(Mamun et al. *Int. J. Food Microbiol.*. 2013, 116)
Fecal waste Flows Analyses show that fecal sludge is not contained - Reservoirs in urban environment

Fecal Waste Flows in Dhaka, Bangladesh

WSP- 2014
Knowledge gap

• **Limited information** on overall environmental contamination in different neighborhoods of Dhaka city (Slum/non-slum/floating communities)

• Little data to inform **strategies to mitigate risks of fecal exposure** in low-income countries

Figure: Street food *Fuska*
Objectives

• To explore the potential fecal contamination sources in urban neighborhoods of Dhaka, Bangladesh

• To compare the fecal contamination exposure from different environmental sources in urban neighborhoods of Dhaka city, Bangladesh

Figure: Drain sample
Process diagram: Overall SaniPath approaches

1. Conduct Preliminary Assessment (key informant interviews & transect walks)
2. Determine target neighborhoods, pathways, & sampling sites
3. Preliminary Assessment Report
4 & 5. Behavioral & Environmental Data Collection
6. Risk Profiles & Summary Statistics
7. Final Report

We did not analyze the data for this presentation
Study sites

- The sampling neighborhoods selected based on
  - the socio-economic status and
  - water, sanitation and hygiene (WASH) facilities

- **Ten** neighborhoods in Dhaka city
  - 4 slums
  - 4 non-slums
  - 2 floating communities

- Used Bangladesh Bureau of Statistics (BBS) 2014 list to select floating and slum communities
Environmental sample collection

• We followed the SaniPath* deployment manual to collect environmental samples

• Study duration: April to June 2017

10 types of environmental samples collected from each neighborhood

- Surface water
- Non-WASA water
- Soil
- Latrine Swab
- Flood water
- Street food
- Raw produce
- WASA Water
- Open drain
- Bathing water
Laboratory procedure

• Used **IDEXX QuantiTray 2000** tray containing Colilert reagent (IDEXX Laboratories, Maine, U.S.A.)

• Trays were incubated at 37°C for 24 hr

• **Water samples** were reported MPN of *E. coli*/100mL

• **Soil** were reported *E. coli*/gram sample

• **Street food and produce** were reported *E. coli*/single served

• Detection range of <1 to >2419.6 MPN per tray
A total of 1000 samples (10 neighborhoods x 10 sample type x 10 samples each type) were collected.
Percentage of *E. coli* positive samples in 10 different neighborhoods of Dhaka city

**E. coli** positive samples (%)
Comparison of *E. coli* contamination in different environmental samples among neighborhoods of Dhaka city

• Level of significance: * <0.05, † <0.01, ‡ <0.001
Conclusions and recommendations

• All environmental samples collected from Dhaka city were contaminated with *E. coli*

• Surface water, produce, soil, street food and drain were heavily contaminated with fecal bacteria

• WASA drinking water, produce and street food had similar contamination among non-slum, slum and floating communities

• Future studies should assess health impacts of the environmental contamination among the non-slum and slum communities in Dhaka city
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