Public Health Rapid Risk Assessment Tool

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Diagnostic Tools and Guidelines for FSM, with a focus on

Faecal Waste tracking and Public Health

Hanoi, Vietnam 2015

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What is the risk of exposure to fecal sludge in the urban environment?

Fecal contamination + Behavior

Examples from Accra, Ghana

Children have accidental and deliberate contact with open drains

Flooding moves fecal sludge from drains throughout the neighborhood – contaminating soil and households

Urban agriculture using drain water for irrigation

What is the risk of exposure to fecal sludge in the urban environment?

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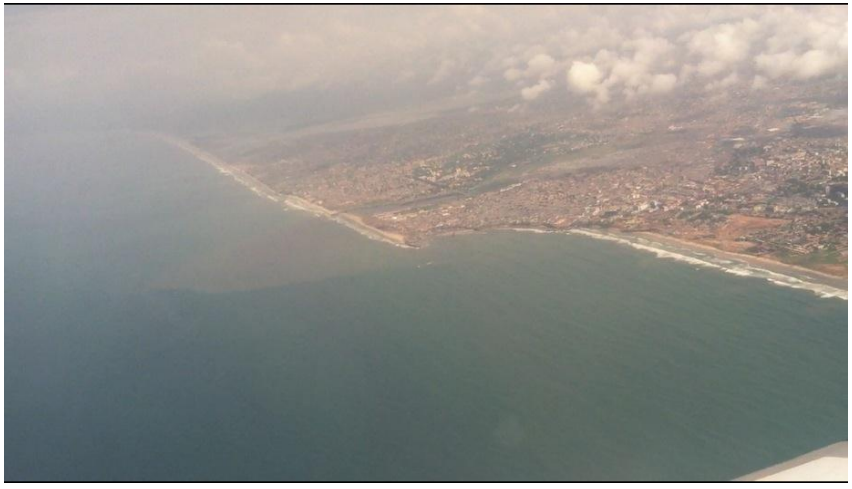


Which of these exposures poses the greatest risk?

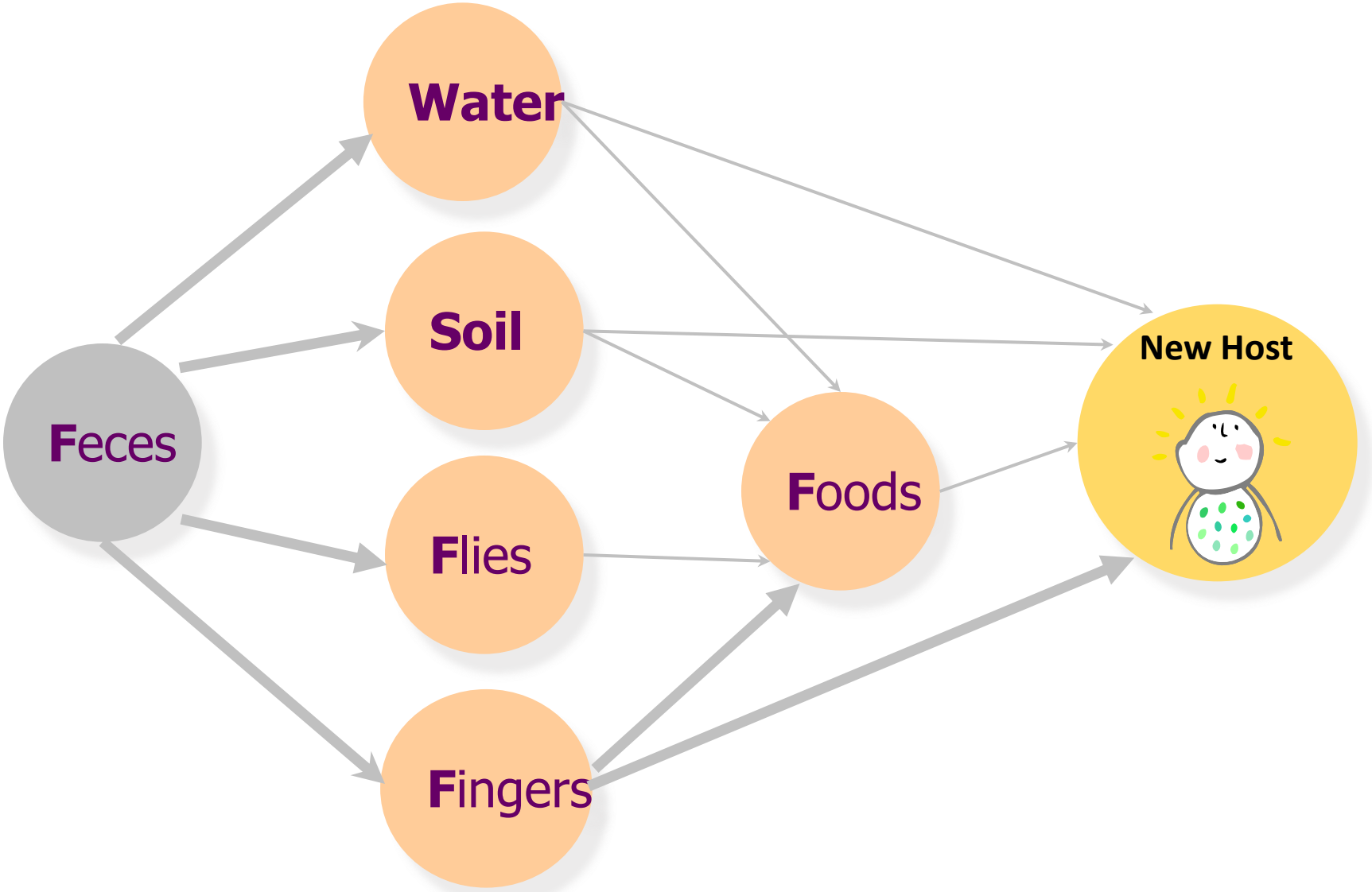
Contact with flood water?

Piped drinking water?

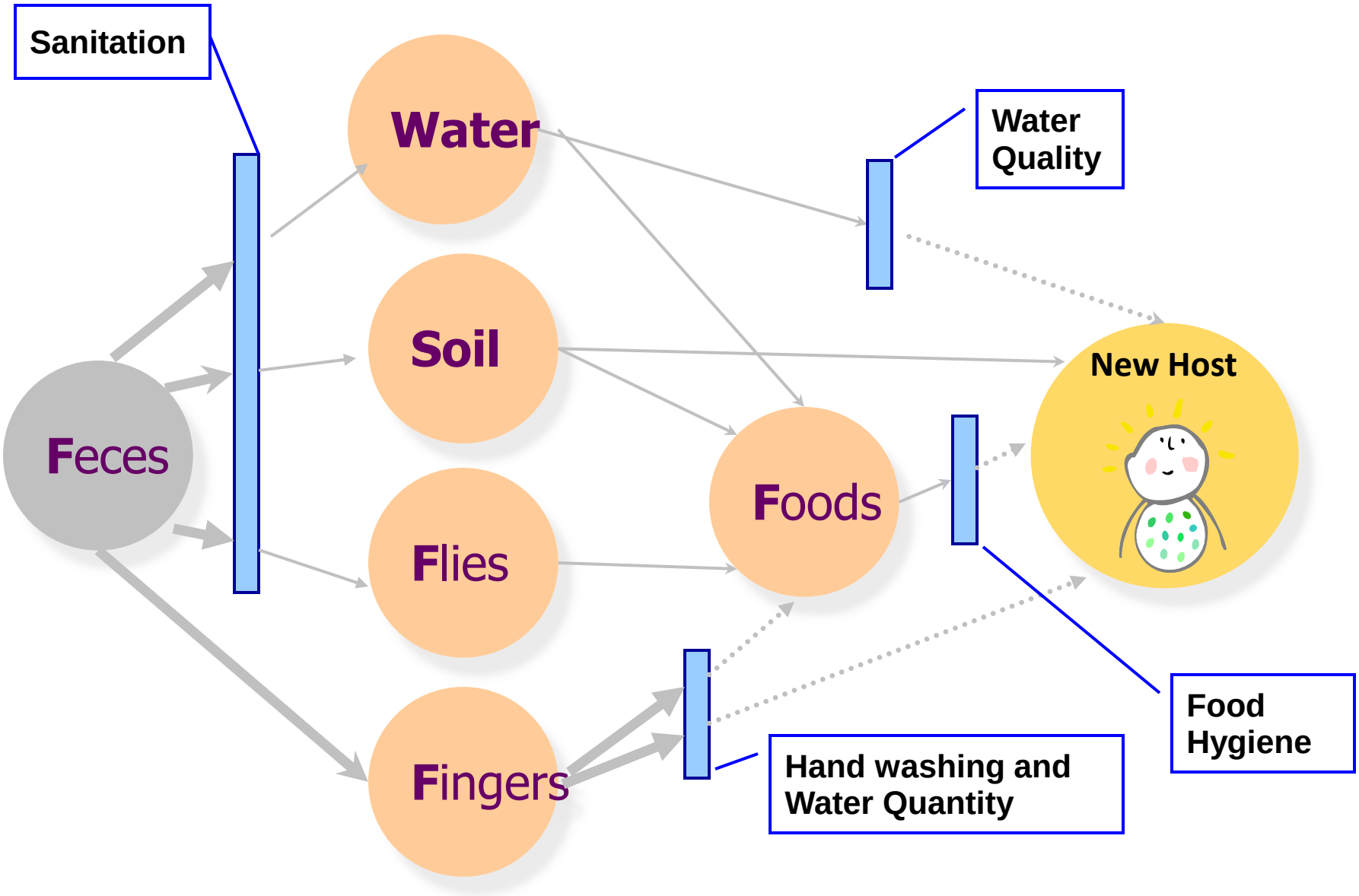
Wastewater-irrigated produce?

Using a public latrine?

Contact with an open drain?

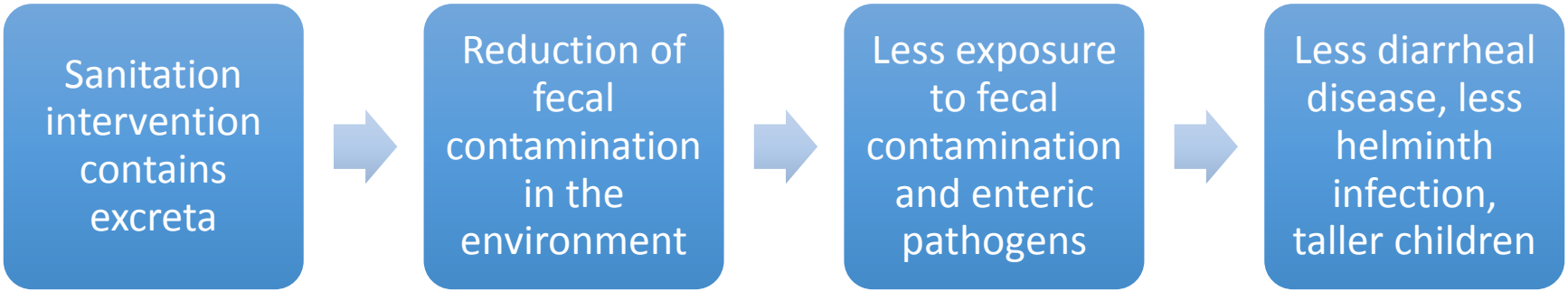


Fecal Transmission Pathways



Interrupting Fecal Transmission

Expected Impact of Sanitation Interventions



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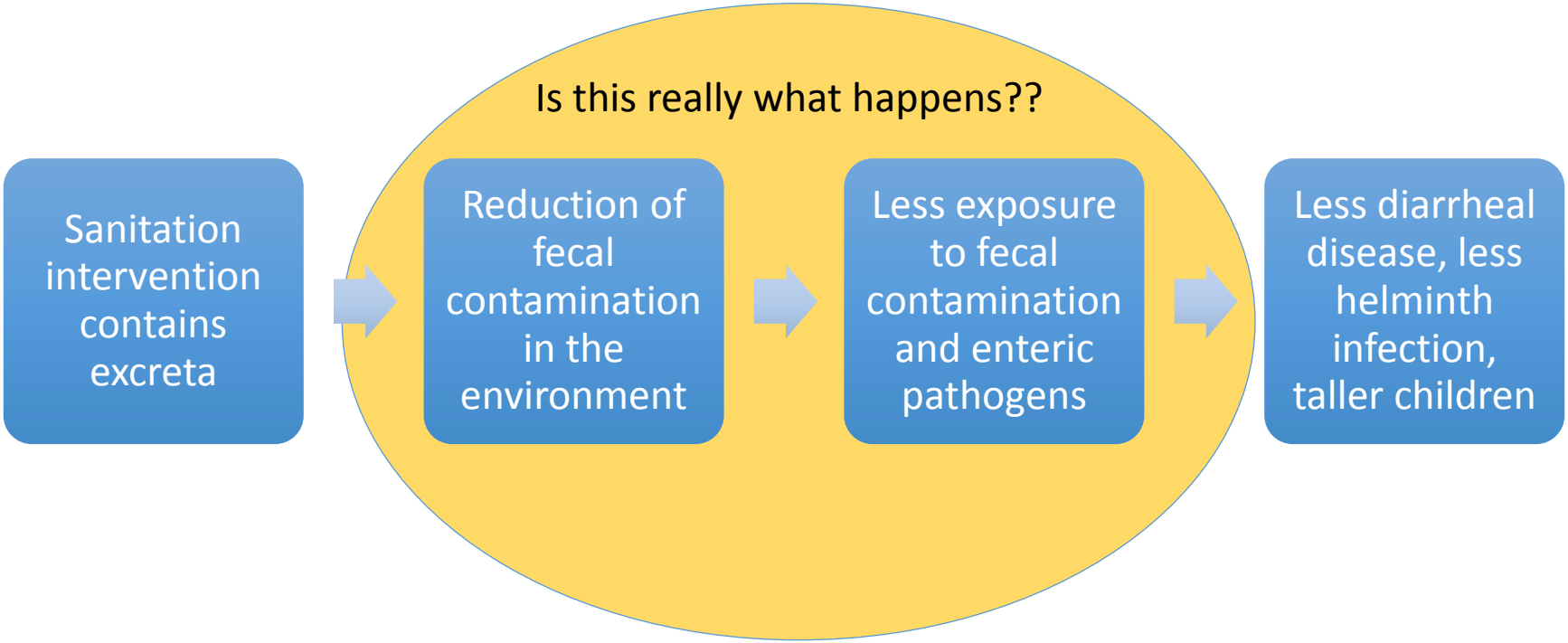

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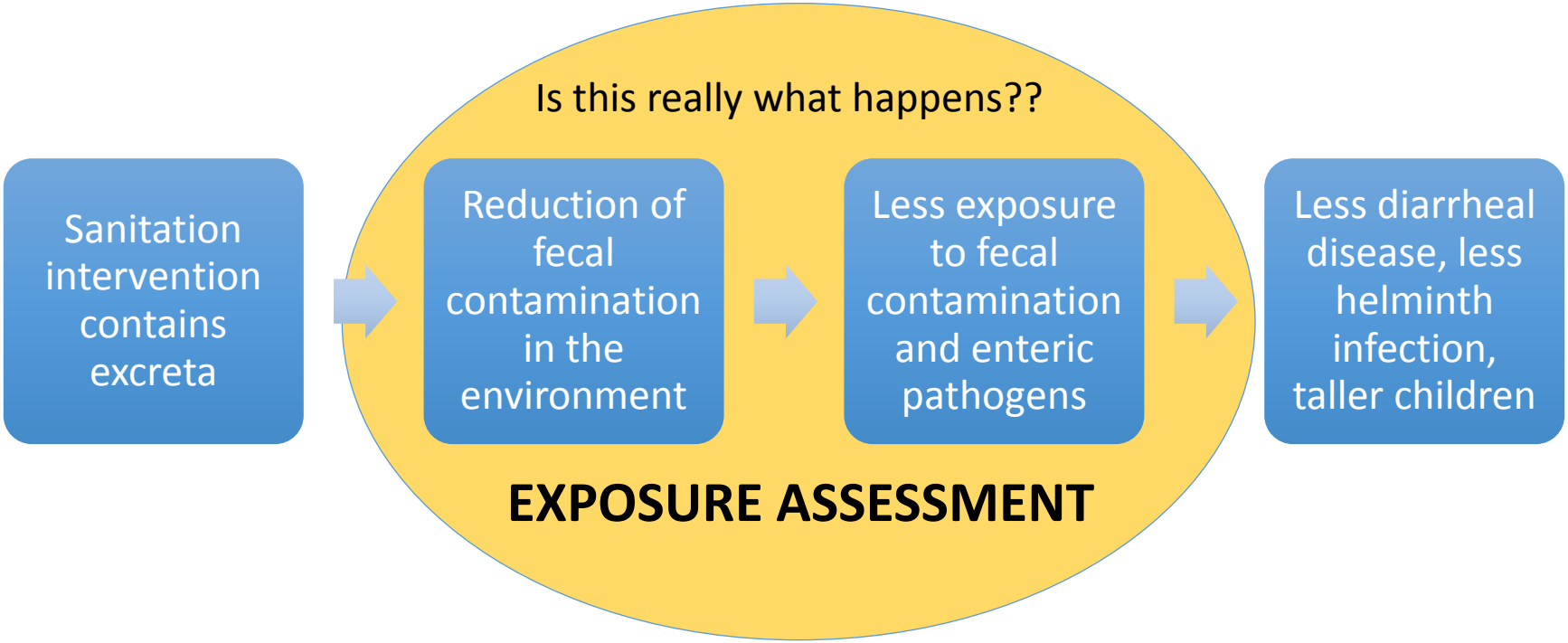
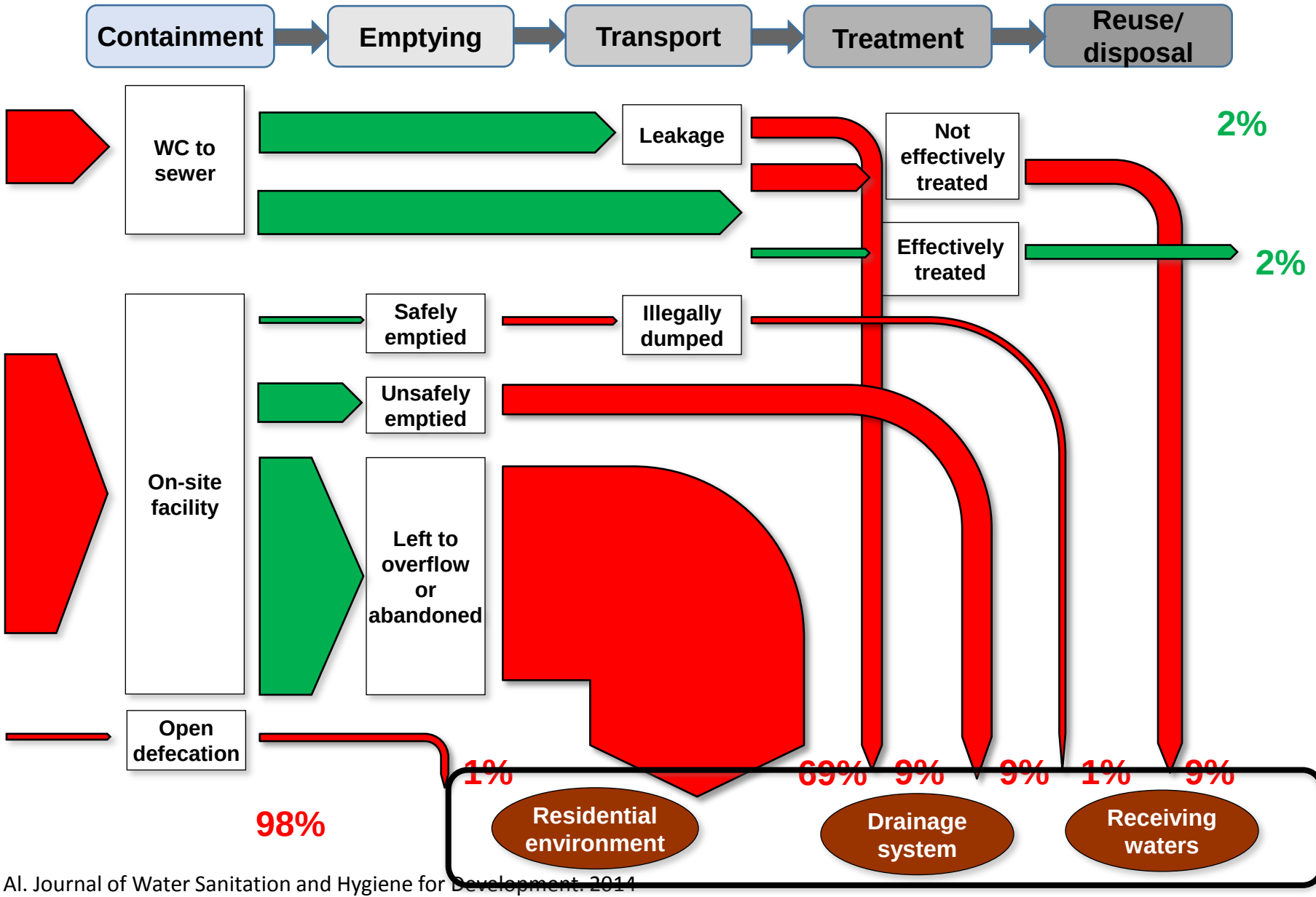


Shit Flows Analyses show that Fecal Sludge is NOT Contained – Reservoirs in Urban Environment



Peal et. Al. Journal of Water Sanitation and Hygiene for Development. 2014

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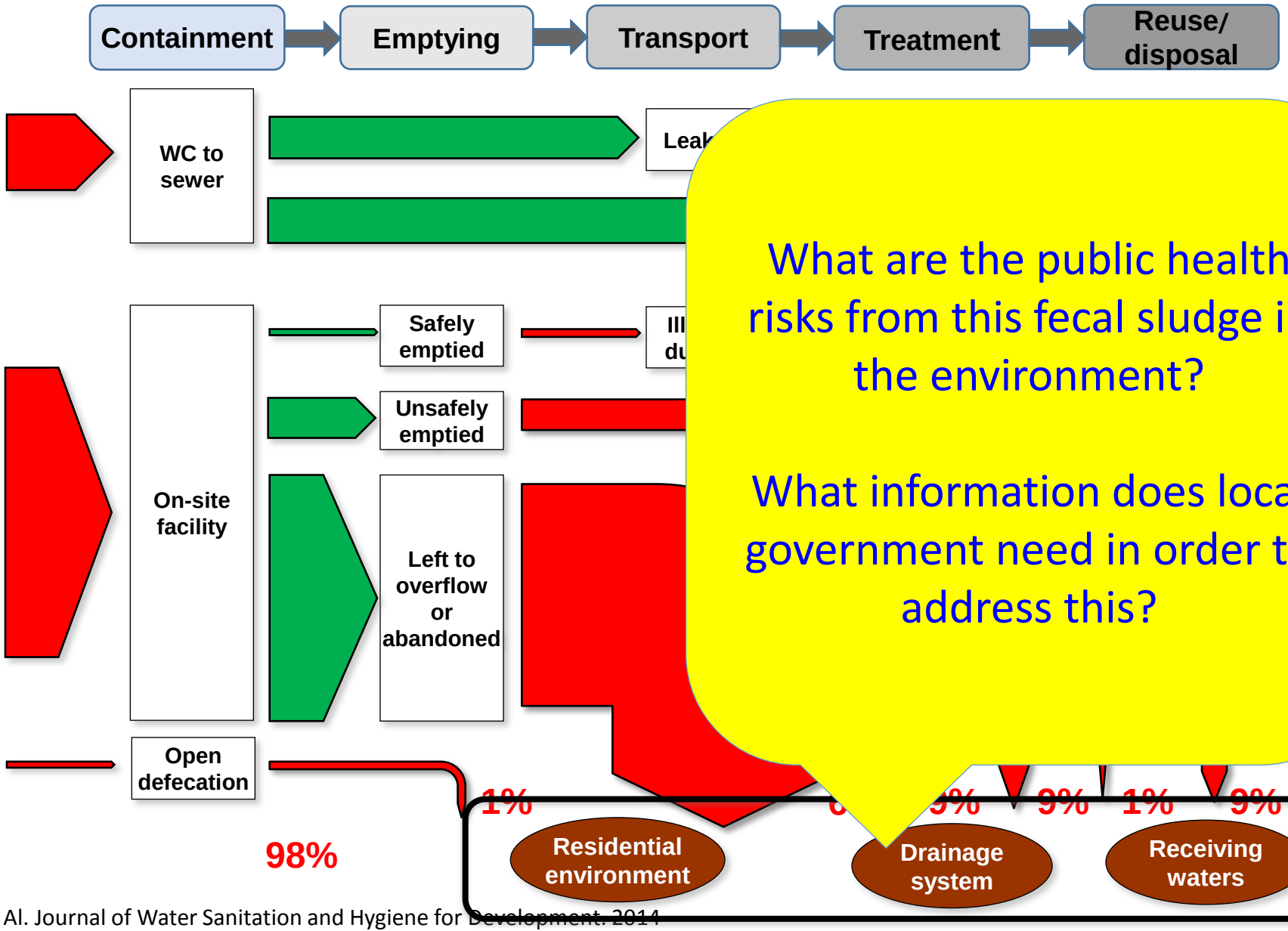

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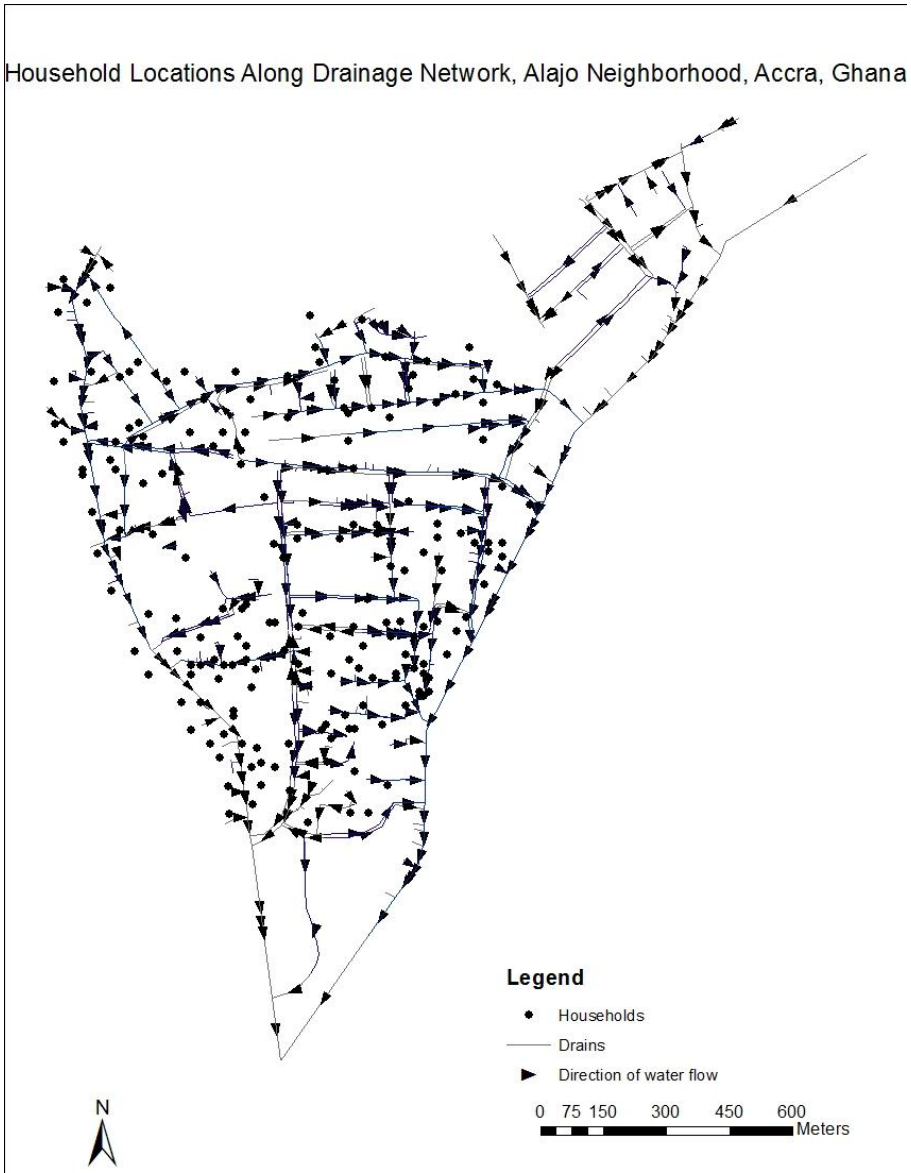
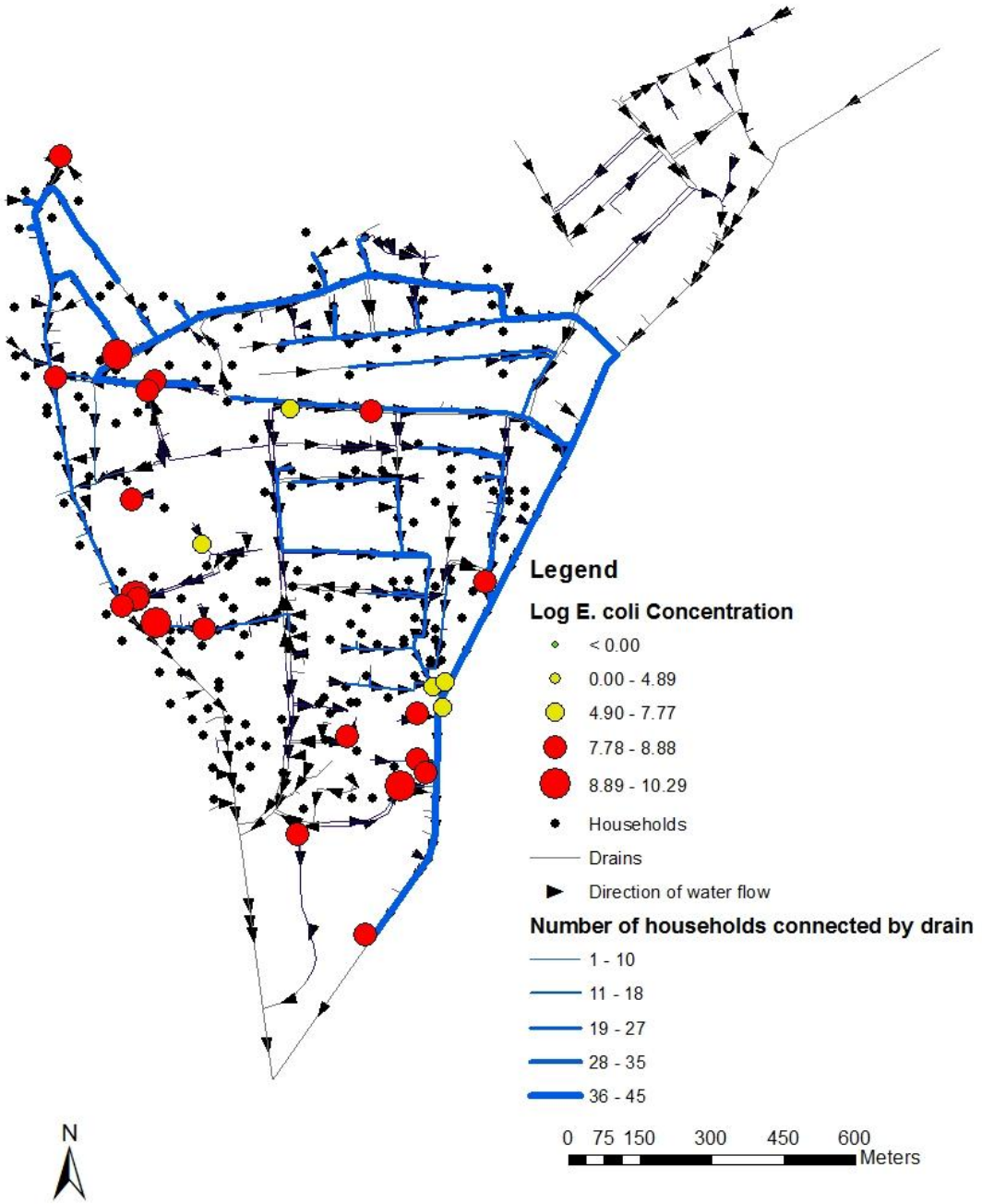
Spatial Analyses – **Where** in the city/neighborhood does fecal sludge concentrate?

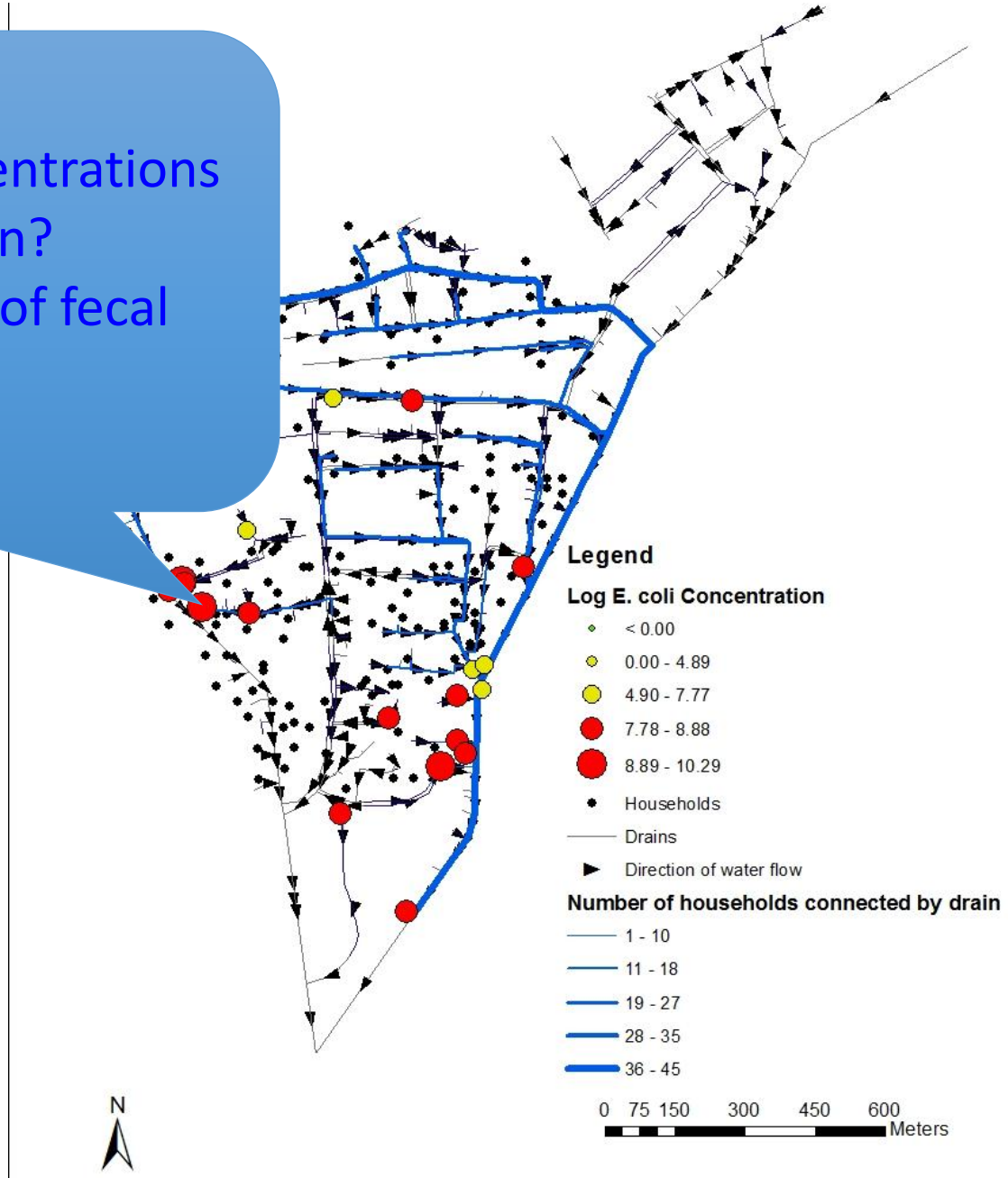


Drainage Network, Direction of Flow, and Drain Contamination

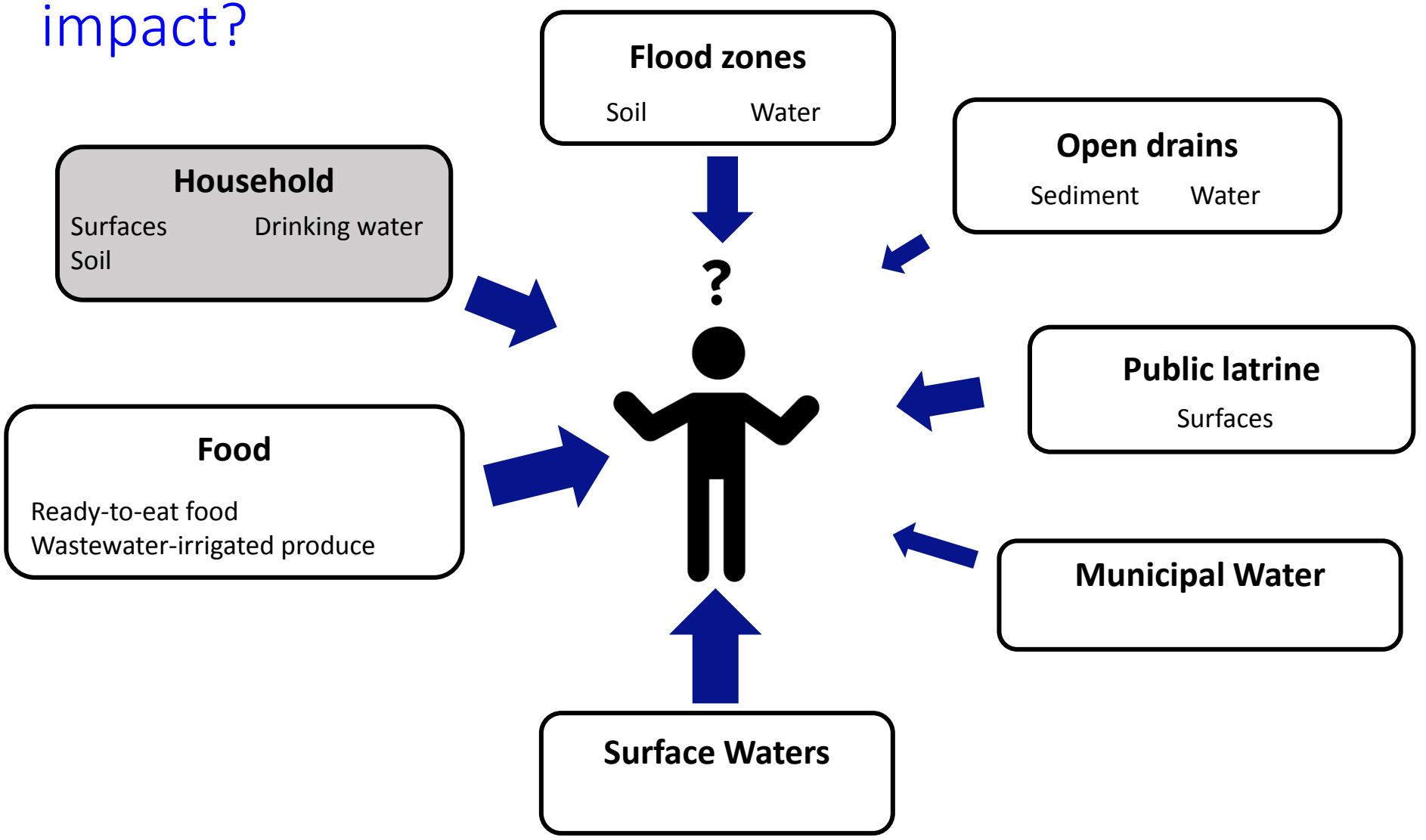


Drainage Network, Direction of Flow, and Drain Contamination

Where are the highest concentrations of fecal contamination?
Using *E. coli* as a measure of fecal contamination



How should policy makers prioritize public sector sanitation investments to have the greatest health impact?



Confused designed by Jessica Look for The Noun Project

SaniPath Rapid Assessment Tool Goals

Based on in-depth risk assessment in Accra, Ghana

Rapid Tool tested in Vellore, India (2014), Maputo, Mozambique (2015) + two additional cities (TBD)

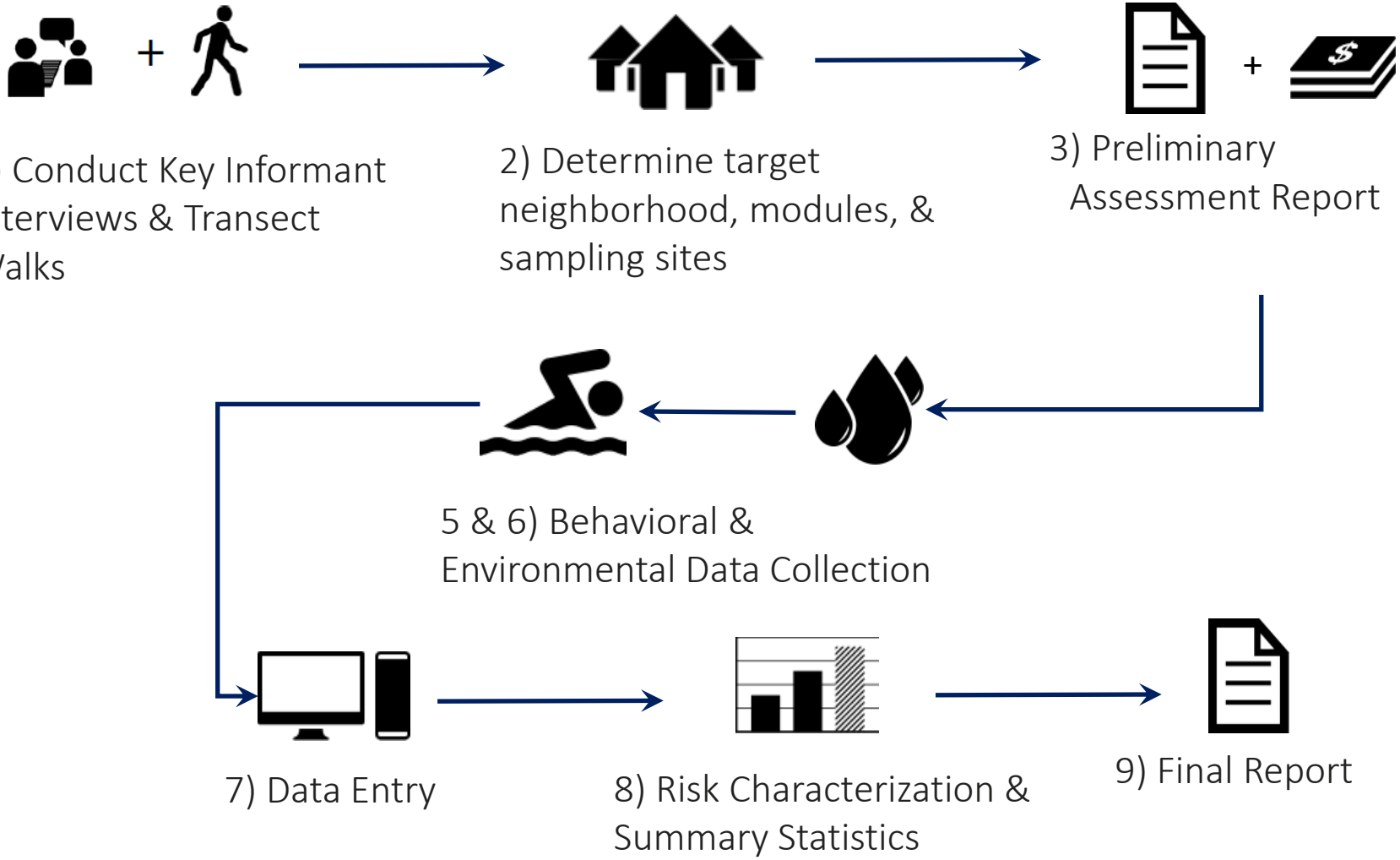
Guide users through the collection of relevant data to inform their understanding of relative risks of exposure

Provide users with easy to use software for data entry that can be customized for different contexts

Generate data on exposure to fecal contamination in **low-income, urban neighborhoods**

Synthesize these data to guide community, government, and service providers in their DECISION-MAKING process and ADVOCACY for sanitation demand and action

The Rapid Assessment Process



Sarah Abraham, Martha Ormiston, Gilad Fried, and Juan Pablo Bravo from The Noun Project created the icons interview, neighborhood, water, and computer. Schematic created by Suraja Raj

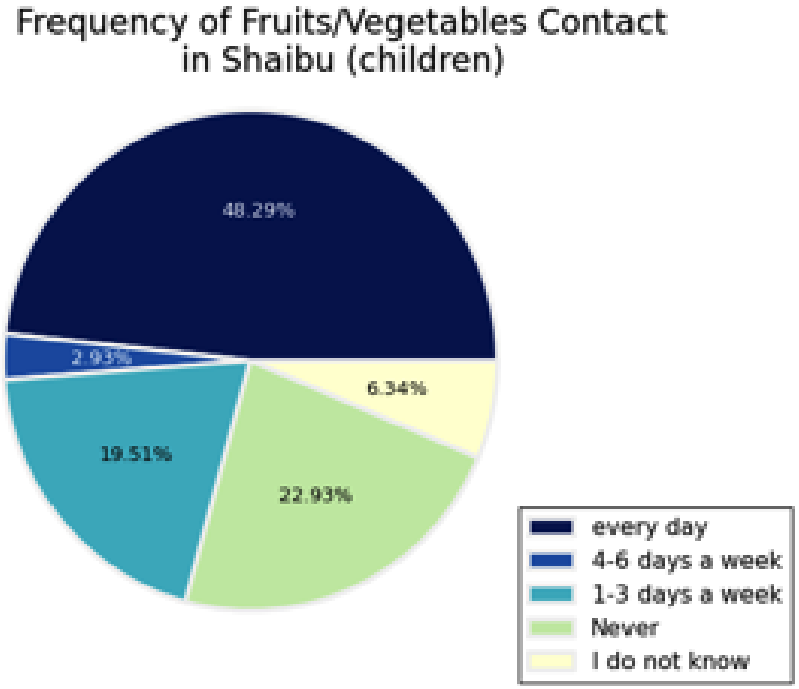
Data Collection Methods

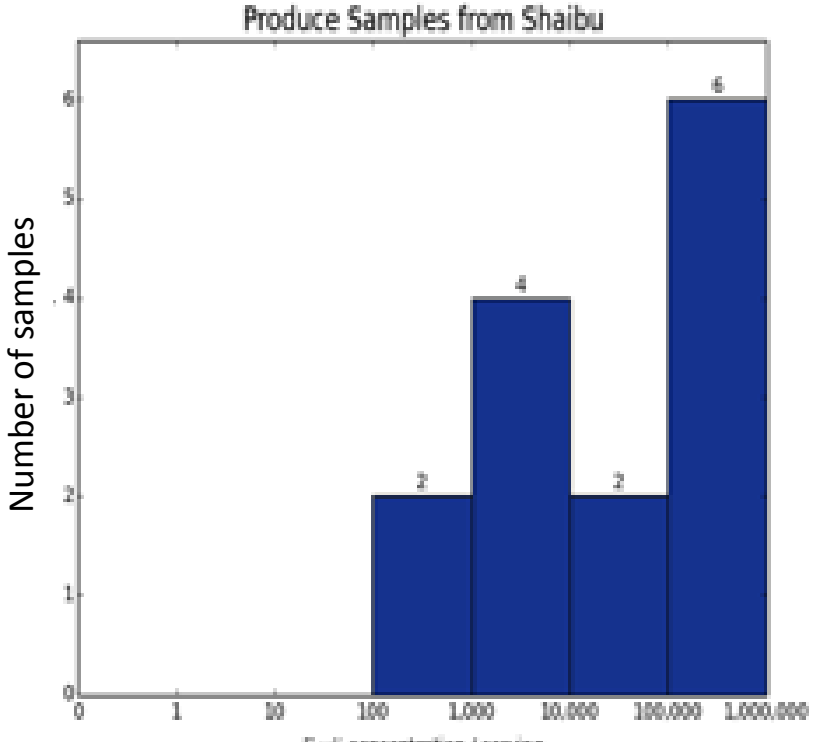
- Exposure Data – Survey data on reported water and sanitation behavior and practices
- Environmental Fecal Contamination Data
  - Collect most relevant environmental samples from the public domain based on information about exposure
  - Analyze for common microbial indicator of fecal contamination *E. coli*

Resources Needed

- Experienced survey enumerators and lab technicians
- Lab facility
  - Incubator
  - Access to basic lab supplies (gloves, etc.)
  - IDEXX/Membrane filtration capacity
- 6-8 weeks for data collection
- 1-2 GPS units
- Transportation
- Computer

SaniPath Rapid Assessment Tool Outputs

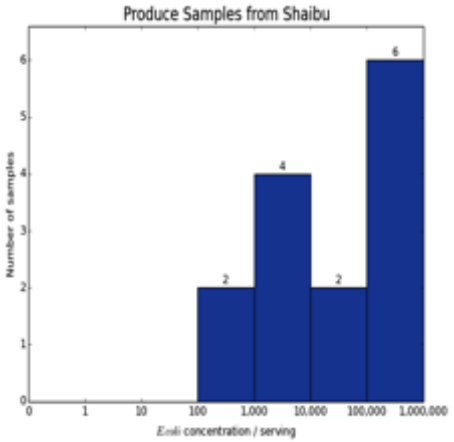




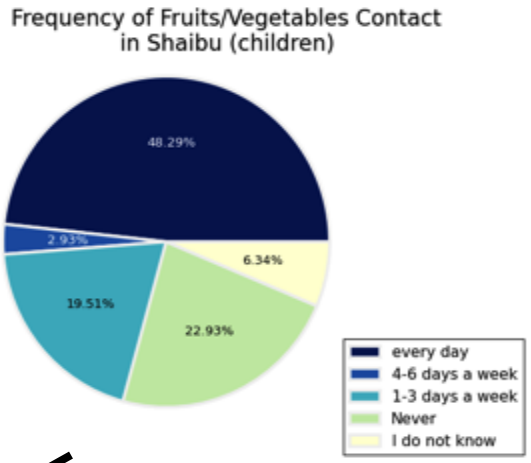
E. coli concentration/serving

Environmental and behavioral data are combined to estimate exposure to fecal sludge via specific pathways

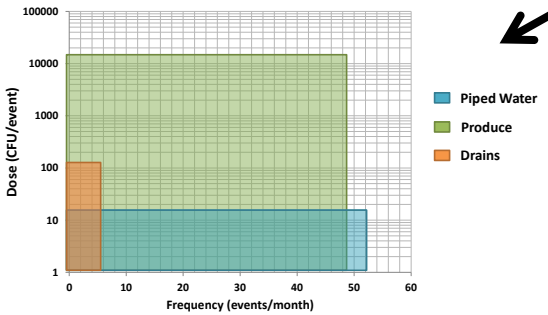
Environmental Contamination



Behavior Frequency

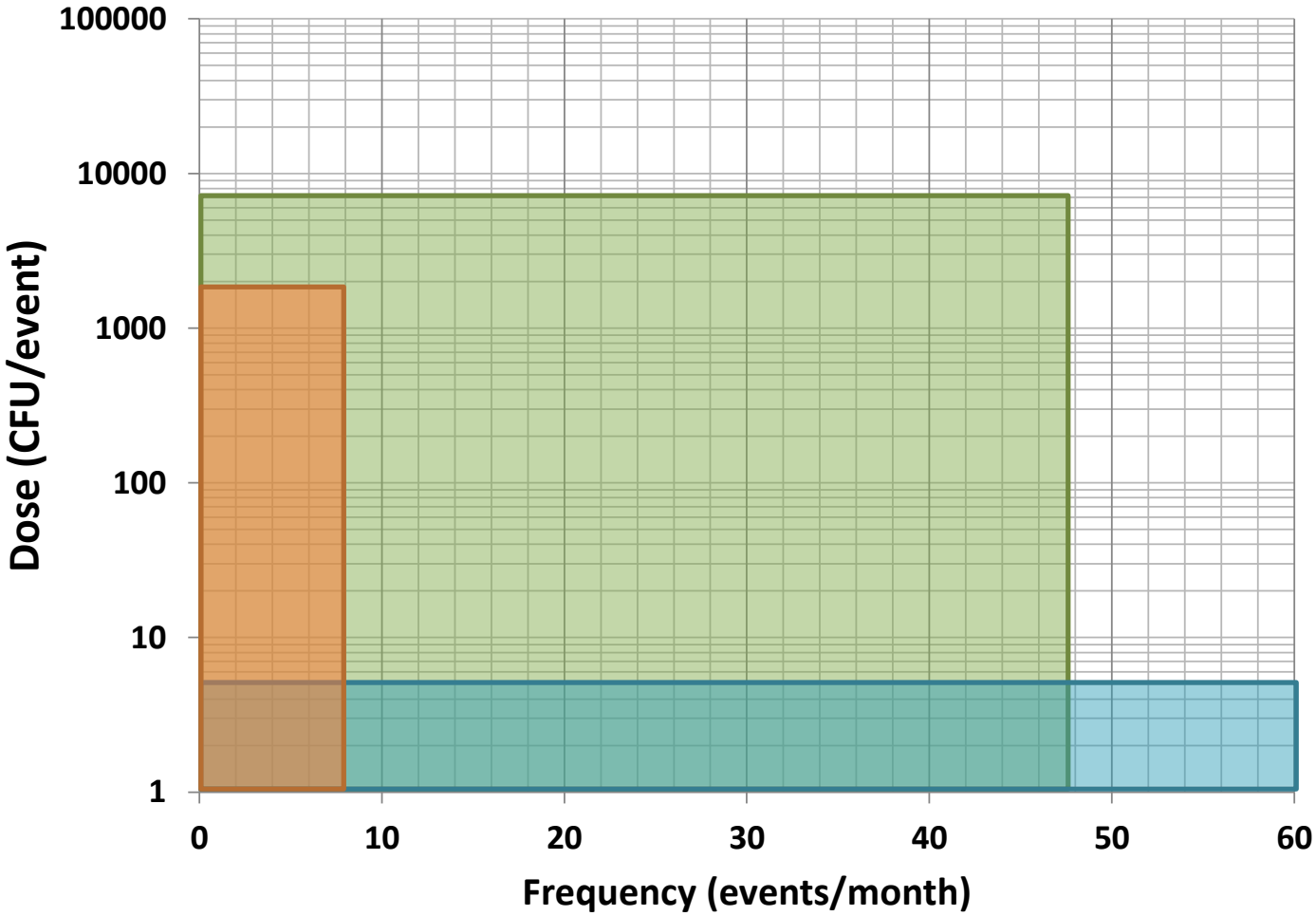


Other parameters: intake volumes, duration of exposure, etc.

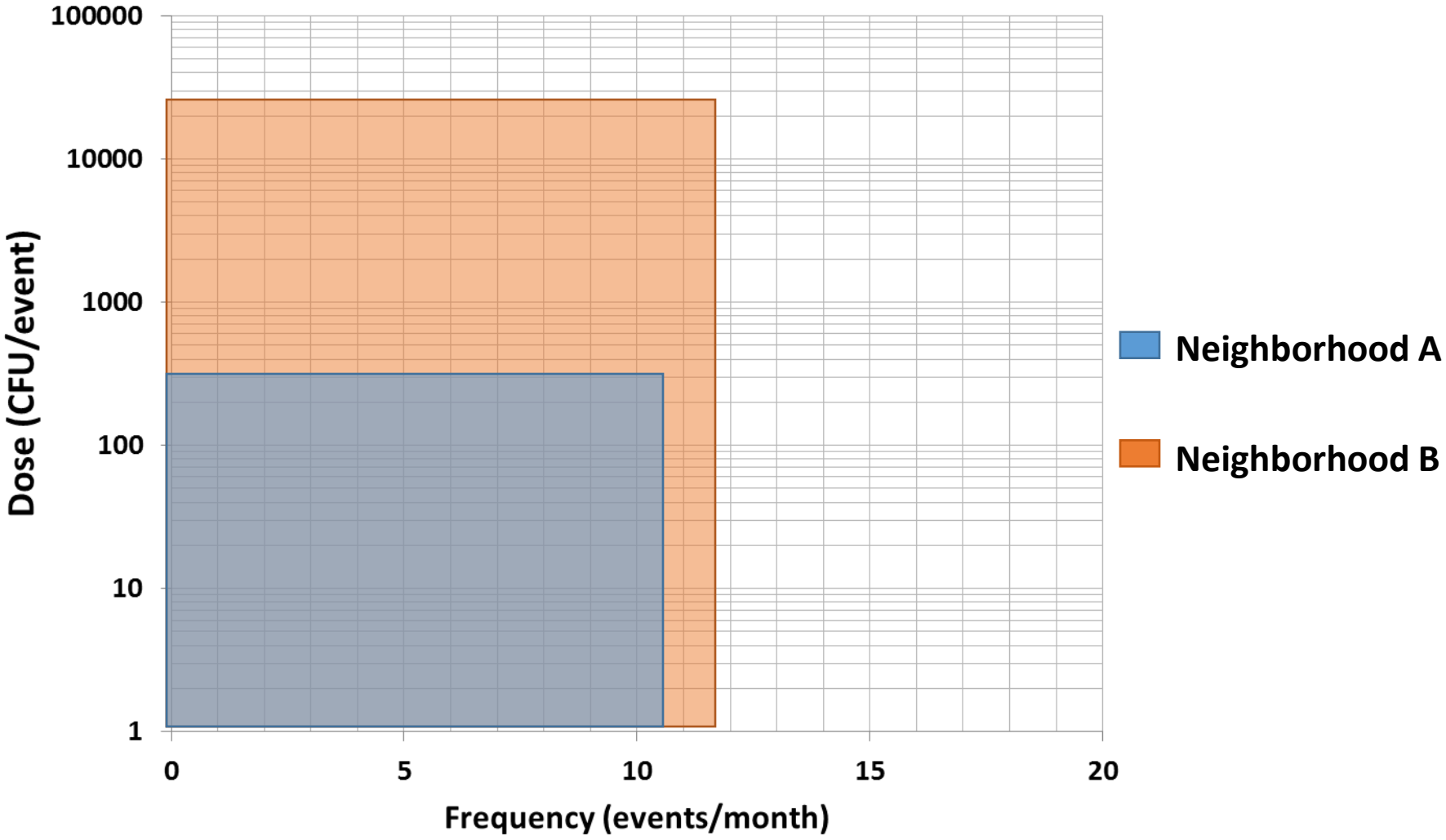


Risk of Exposure to fecal sludge

Tool Output: Comparing Risk of Exposure to Fecal Sludge from Three Pathways in One Neighborhood



Tool Output: Comparing Risk of Exposure to Fecal Contamination from **One Pathway** in Two Neighborhoods



Additional Output

- With additional resources (GIS capacity, etc.):
- Mapping
  - Drainage network and flow mapping
  - Exposure maps

How can you use this public health information?

- Understand where fecal contamination is concentrated in your city
- Understand the contribution of behavior and fecal sludge contamination to public health risk
- Understand which “pathways”, if intercepted, provide the greatest potential for reducing exposure to fecal sludge and disease causing agents – guide priorities for FSM interventions
- How can you use public health information in context with tools on sludge flow diagrams, economic analyses, stakeholder assessment, etc. to guide sanitation planning
  - Advocacy for sanitation demand and action
  - Reduce inequities in sanitation-related risks and services
- Monitor public health impact of FSM interventions.

Join our SaniPath Rapid Assessment Tool Users Group!

- Share your experience using the tool and suggestions for revisions
- Receive updates on latest tool versions
- Receive troubleshooting advice on tool software
- Contact us at: http://www.sanipath.com/
  - Free download of tool

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Acknowledgements

Bill & Melinda Gates Foundation

Erica Coppel, Radu Ban, Alyse Schrecongost

Center for Global Safe Water at Emory University

Clair Null, **Peter Teunis**, Monique Hennink, Kelly Baker, Amy Kirby**, Kate Robb, Heather Reese, Katherine Roguski, Suraja Raj,** Megan Light, Steven Russell, Deema Elchoufi, **Andrew Yuke Wang**, **David Berendes**

Eddy Perez

Water Research Institute- Joseph Ampofo

TREND- Nii Wellington

Research Triangle Institute -Matthew Scruggs, Megan Tulloch, Amir Mokhtari, Stephen Beaulieu

Improve International - Susan Davis

Christian Medical College, Vellore – Gagandeep Kang

OPM/WEDC- Rebecca Scott

WSP – Isabel Blackett

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Learning Objective 3: Public Health Risk Assessment

Group Activity

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Part 1: Introductions

Discuss amongst yourselves what information is needed in order to make decisions on FSM interventions. To what extent do you need to understand public health? Share perspectives from your different roles. If all the group members come from similar backgrounds, challenge yourselves to think about the decision making process from the perspective of different people. For example:

Policy Makers- Ministry of Health, Ministry of Water Resources and Agriculture, Minister/Secretary of Local Government, Development Partners, Mayor, Community Leader
Funders- Government, Foundations, Private
Implementers- NGOs, INGOs, etc.
Researchers- Universities, Institutions
Engineers- Universities, Private or Government-contracted

Part 2: Understanding Risk of Exposure

- Examine the pie charts and histograms first. Then examine the risk plots. Relative to each other, which pathway contributes greater risk of exposure to the population of Shiabu?
  - Examine the axes, what drives this risk-- behavior or environmental contamination?
- What conclusions can you make from these risk plots? How do they differ from conclusions you may make from the pie charts and histograms?
- To what degree does the SaniPath data help with decision-making from Part 1, and where do gaps remain?
- How could you use this information along with the other tools in the WSP diagnostic toolkit?

Part 3: We welcome your Feedback!

We are continuously improving and building upon our Rapid Assessment Tool.

- Is this tool useful?
- What additional public health information do you need for sanitation/FSM decision-making?
- Are you interested in using this tool?
  - Free download: www.sanipath.com

Supplemental Information

Interpretation of Exposure Risk Plots

Risk Plot Overview

- The SaniPath Rapid Assessment Tool software automatically produces graphical representations of exposure risk (see plots on previous slides).
  - The exposure frequency is plotted on the x-axis. These data are collected from the behavioral surveys.
  - The dose (CFU/event) is plotted on the y-axis. These data are collected through environmental sampling and weighted by intake value.

Interpretation of Risk Plots

- The larger the area of the greater, the higher the risk.
- Users are able to compare the relative risk of exposure to fecal contamination for each pathway and across neighborhoods within a city.
- The boxes allow users to visualize the drivers of risk (for example, if frequency of exposure is the main driver of the risk vs. the magnitude of the contamination level).

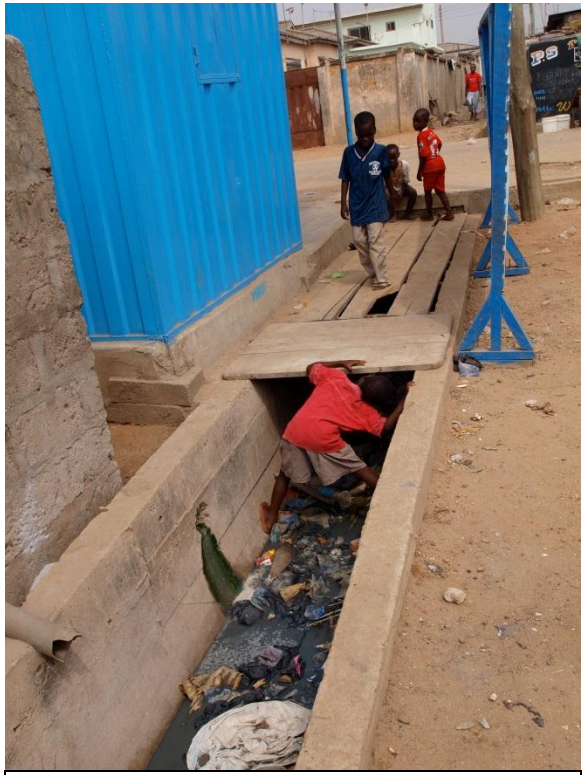
Intake Value

- The intake value is defined as the volume ingested per exposure event.

- To determine the intake value, we first define the event. We then define the following parameters for children and adults.
  - Exposure Time Unit
    - minutes, days, events
  - Duration of Event
    - in minutes, or not applicable for some exposures
  - Intake Volume
    - in mL

Age Group

- Given differences in body size and behaviors, separate intake values are calculated for children and adults.



Child entering a drain to retrieve a ball

Woman washing above a drain

We assume that children and adults come into contact with drains differently. For example, a child may intentionally enter a drain and may stay in the drain longer. An adult may incidentally be exposed to drain water while working near a drain.

Defining the Event

- **Drain Water**
  - Event=entering a drain for any reason (accidental, incidental or intentional)
- **Drinking Water**
  - Event= one day of drinking water from a municipal source

Exposure Time Unit and **Duration of Event**

- Exposure Time Unit
  - Some exposures are calculated per day, while others are calculated per event.
    - Drain exposure is calculated in terms of number of drain contact **events per month.**
    - Municipal drinking water exposure is calculated in terms of the number of **days per month** that municipal water is consumed (regardless of the number of times in one day water is consumed).
- Duration of Event
  - For some exposures pathways, like contact with surface water, the duration of event is used in addition to the intake time unit.

Intake Volume and mL ingested/event

- Intake Volume = volume (in mL) that is assumed to be ingested per event
  - Volumes were determined based on a combination of EPA values, literature review and SaniPath Phase 1 data

Exposure Pathway	Age Group	Intake Volume (mL)	Exposure Time Unit	Duration of Event	mL/ Event	Rationale	Assumptions
Drinking Water	Adults	1,043	day	n/a	1043	US EPA value for drinking water consumption per day by adults. Similar averages found in literature review of studies in developing countries.	When participants site how many days per week they drink municipal water, we assume that all of their water consumption on that day is from the municipal source.
	Children	414	day	n/a	414	Same as above but for children	Same as above
Drain Water	Adults	0.06	event	n/a	0.06	Intake volume taken from the US EPA value for an adult wading in water : 3.7ml/hour.	-Any event is likely to lead to high exposure. -There is little or no information about the duration of time adults spend in drains. Therefore, one minute is used to signify 1 drain entry event.
	Children	1	event	n/a	1.0	Inflation of adult US EPA wading value	Same as above with the additional assumption that kids spend more time in drains and have greater contact with drain water.

Calculation of Dose

Exposure Pathway	Age Group	mL/ Event
Drinking Water	Adults	1043
	Children	414
Drain Water	Adults	0.06
	Children	1.0

- The mL/event is multiplied by the average concentration of *E. coli* per 1mL from the environmental samples from the relevant pathway.
- The dose is the number of colony forming units (CFU) of *E. coli* ingested per event.

mL ingested / event x **average *E. coli* / mL** = **dose (CFU *E. coli* ingested / event)**