Understanding the Links between WASH & Child Nutrition - Part II

Thursday, November 17, 2022 | 8:30-9:30 am ET

USAID FROM THE AMERICAN PEOPLE

PRO-WASH
Practices, Research and Operations in Water, Sanitation and Hygiene

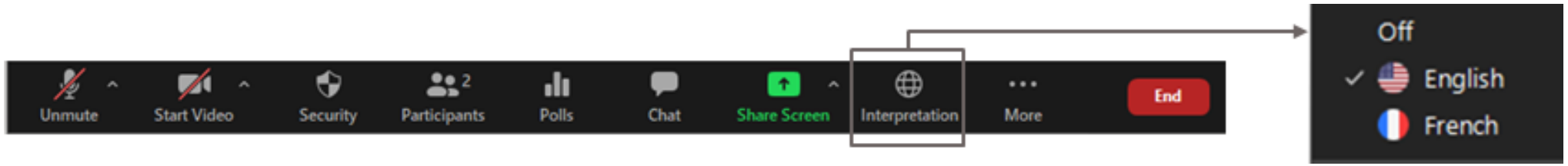
BEFORE WE BEGIN…

Everyone must select a language!

Click “interpretation” at the bottom of your Zoom window and select English or French.

Chacun doit choisir une langue !

Cliquez sur « interprétation » au bas de votre écran Zoom et sélectionnez anglais ou français.



Post your questions in the chat box at the bottom of your screen.

MODERATOR & PRESENTERS

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Senior WASH Advisor

PRO-WASH, Save the Children

Lominito Lomoru

Health Systems Strengthening Advisor, Turkana, Kenya

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USAID/Nawiri Consortium and Location

APHRC African Population and Health Research Center

BOMA PROJECT

Caritas LODWAR

RTI INTERNATIONAL

Save the Children

MERCY CORPS

Nawiri Project Overview

Goal: Persistent Acute Malnutrition is Sustainably Reduced in Samburu and Turkana

01 Purpose 1: Vulnerable households maintain food security despite exposure to shocks & stresses

02 Purpose 2: Vulnerable households have low disease burden

03 Purpose 3: Stable & resilient nutrition enabling environment

04 Purpose 4: Formal institutions monitor, learn and adapt to more effectively manage and scale interventions to prevent and respond to acute malnutrition

Pathway to Sustainable Reductions in Acute Malnutrition for "471,361" participants in Turkana and Samburu

P1: Access to nutritious diverse food throughout the year (incl. in times of shocks & stresses)

P2: KAP on Health & Nutrition & access and ability to utilize services

P3: Agency for decision-making, involvement in governance systems

Consumption smoothing during severe shocks and stresses

P2/P3: Agency over her sexual & reproductive health

P1: Education, Life Skills & HH Resilient Livelihood opportunities

P3: Sustainably Managed Natural Ecosystem Services

P2: Consistent Access to Water and WASH services

P 1/P2/P3 Transformative Gender & Social Norms that

P4: Good Governance

P3: Safe, Secure, & Nurturing Environment (Conflict

P3/P4: Government, private and civil society actors prioritize and integrate adolescent health and nutrition in planning and budgeting and provide a responsive and inclusive enabling environment, and contextually relevant nutrition services

Pathogen transmission to children under two in Turkana South and Samburu North, Kenya

Presented by:

Abby Harvey, UC Berkeley

John Mboya, UC Berkeley & IPA

Principal Investigators: Amy Pickering, Angela Harris, Sammy Njenga

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SCALE Strengthening Capacity in Agriculture Livelihoods and Environment

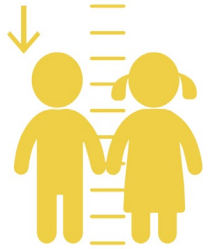
PRO-WASH Practices, Research and Operations in Water, Sanitation and Hygiene

Background & Motivation

Background
Addressing malnutrition in young children is vital

Malnutrition in children under 5

Stunting



149.2 million

Wasting

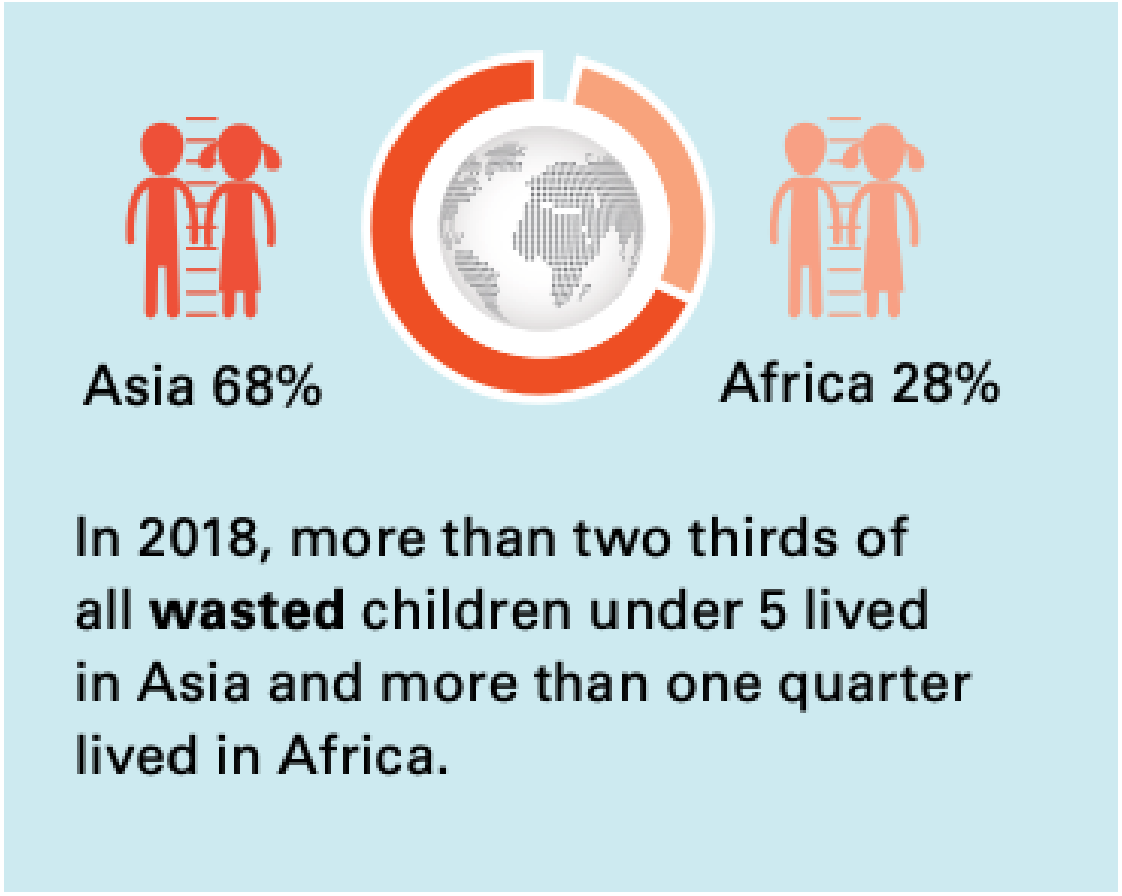
45.4 million

- Malnutrition occurs primarily between birth and 5 years of age
- The first two years of life are vital to long-term child nutrition, cognitive development, and later health and educational outcomes
- Forms of child malnutrition such as stunting and wasting that develop in the first two years of life have been shown to persist into adolescence and adulthood
- Moderate and severe wasting increase child mortality

Worku, B. *et al.* The relationship of undernutrition/psychosocial factors and developmental outcomes of children in extreme poverty in Ethiopia. *BMC Pediatrics* **18**, (2018).
Mwene-Batu, P. *et al.* Long-term effects of severe acute malnutrition during childhood on adult cognitive, academic and behavioural development in African fragile countries: The Lwiro cohort study in Democratic Republic of the Congo. *PLOS ONE* **15**, e0244486 (2020).
UNICEF, World Health Organization, The World Bank. Levels and trends in child malnutrition: key findings of the 2021 edition of the joint child malnutrition estimates. 2021.

Background

1 in 5 deaths among children under 5 are attributed to severe wasting



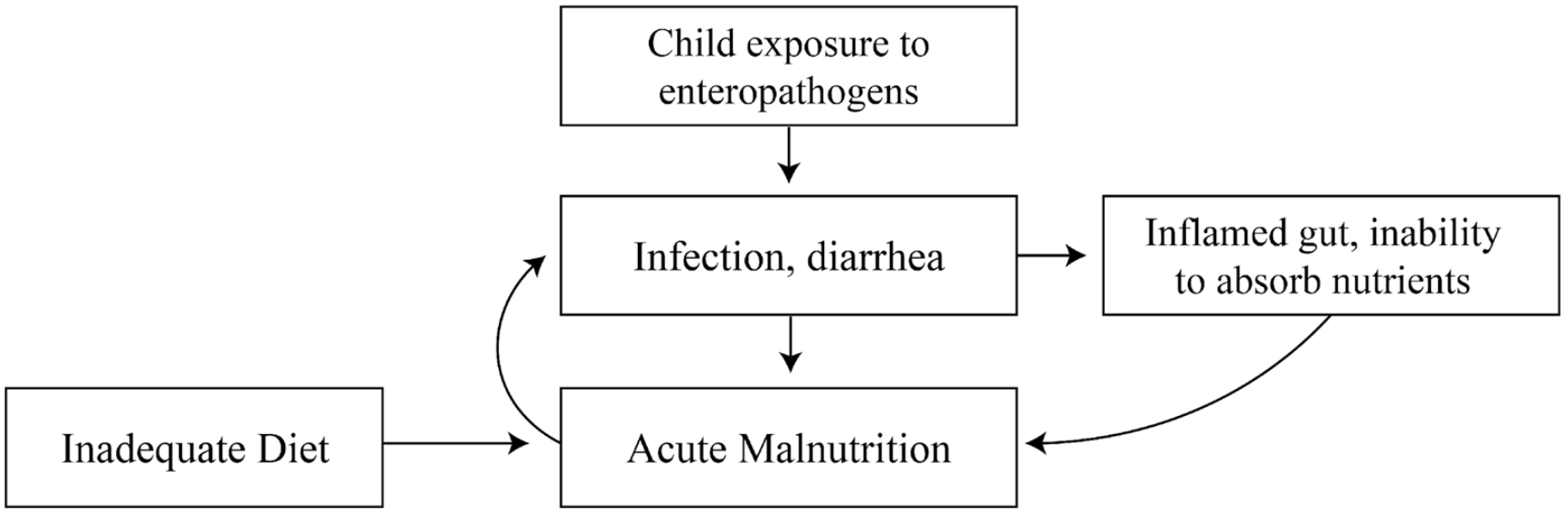
Wasting is particularly a problem in areas with conflict and climate shocks (e.g. drought)

Jonah, Sambu, & May. A comparative analysis of socioeconomic inequities in stunting: a case of three middle-income African countries. Archives of Public Health. 2018.
Data and Analytics Section of the Division of Data, Research and Policy, UNICEF New York together with the Department of Nutrition for Health and Development, WHO Geneva and the Development Data Group of the World Bank, Washington DC. March 2019
UNICEF, World Health Organization, The World Bank. Levels and trends in child malnutrition: key findings of the 2021 edition of the joint child malnutrition estimates. 2021.

Background

Enteric pathogen exposure contributes to malnutrition

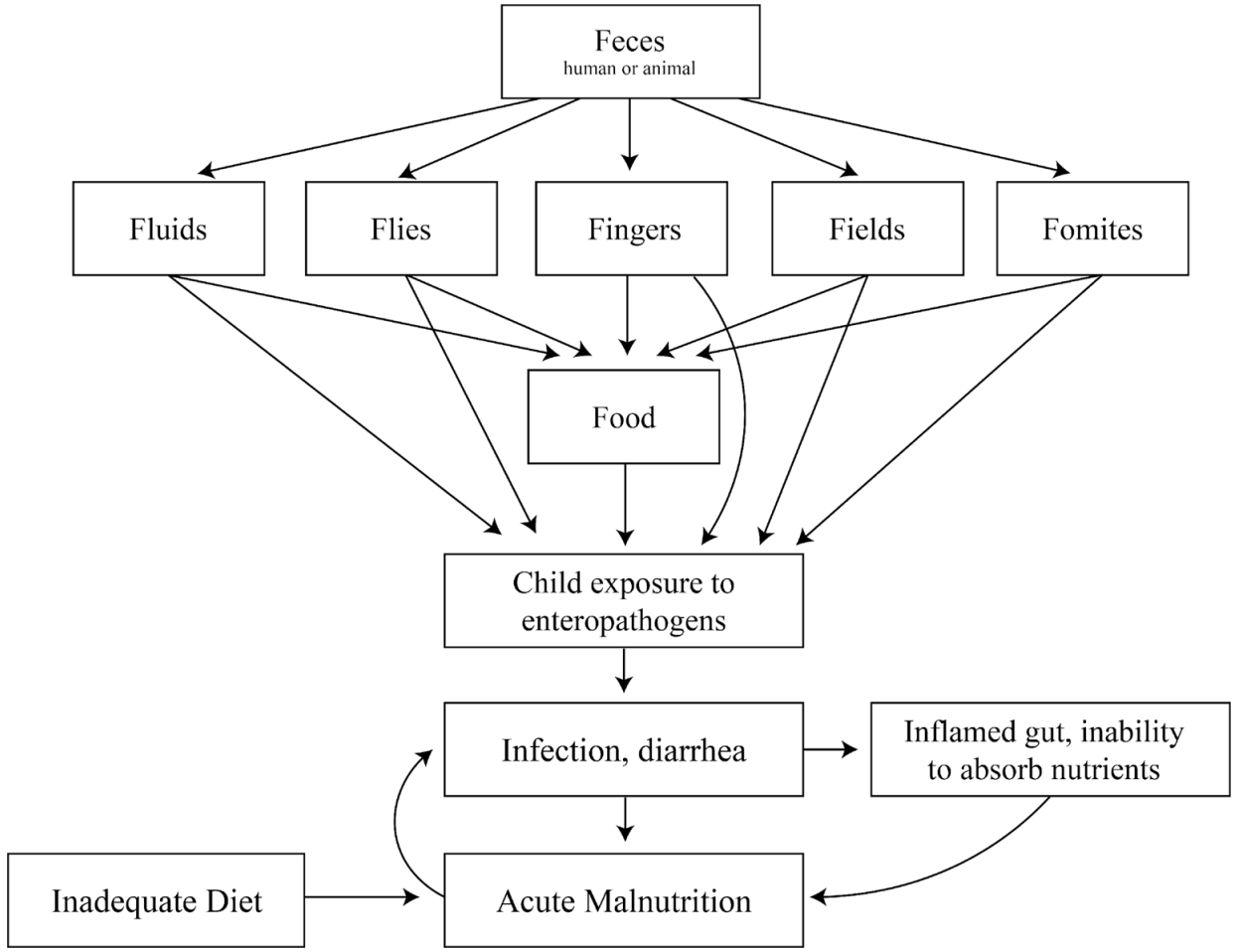
Malnutrition can be driven both by lack of adequate diet and by pathogen exposure



Budge, S., Parker, A. H., Hutchings, P. T. & Garbutt, C. Environmental enteric dysfunction and child stunting. *Nutrition Reviews* **77**, 240–253 (2019).
Guerrant, R. L., Oriá, R. B., Moore, S. R., Oriá, M. O. & Lima, A. A. Malnutrition as an enteric infectious disease with long-term effects on child development. *Nutrition Reviews* **66**, 487–505 (2008).

Background

Children exposed to enteric pathogens through the environment



Research Question

How are children under 2 in Turkana and Samburu Counties, Kenya, exposed to enteric pathogens?

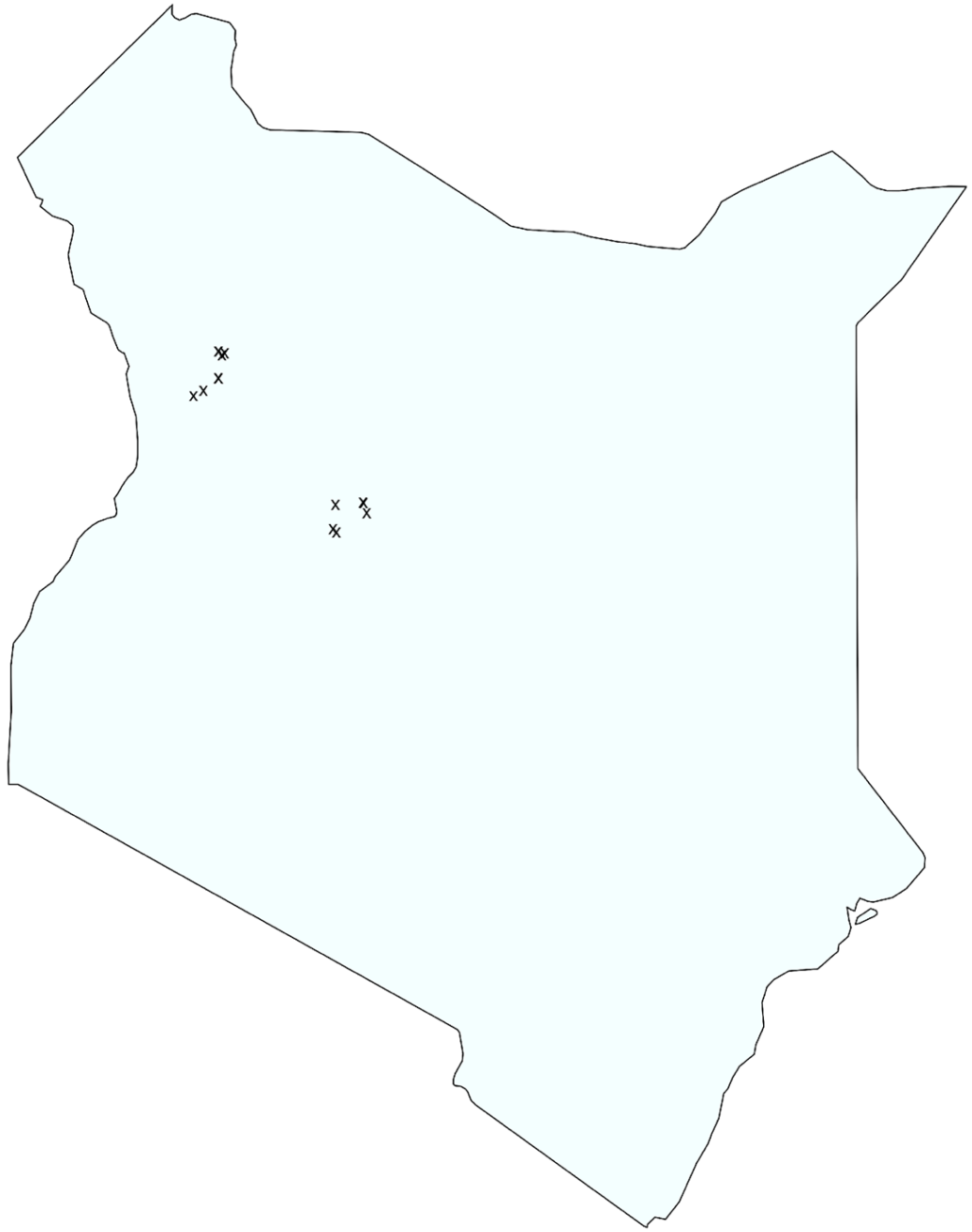
Research Objectives

1. Determine pathogen profiles of child fecal, soil, and food samples **(not presented today)**
2. Longitudinally sample young children (0-6 months) to identify first exposure to enteric pathogens **(not presented today)**
3. Quantify *E. coli* contamination levels in household environmental reservoirs
4. Identify dominant exposure pathways, and understand differences by child age
5. Recommend interventions for piloting in collaboration with the study community

Background

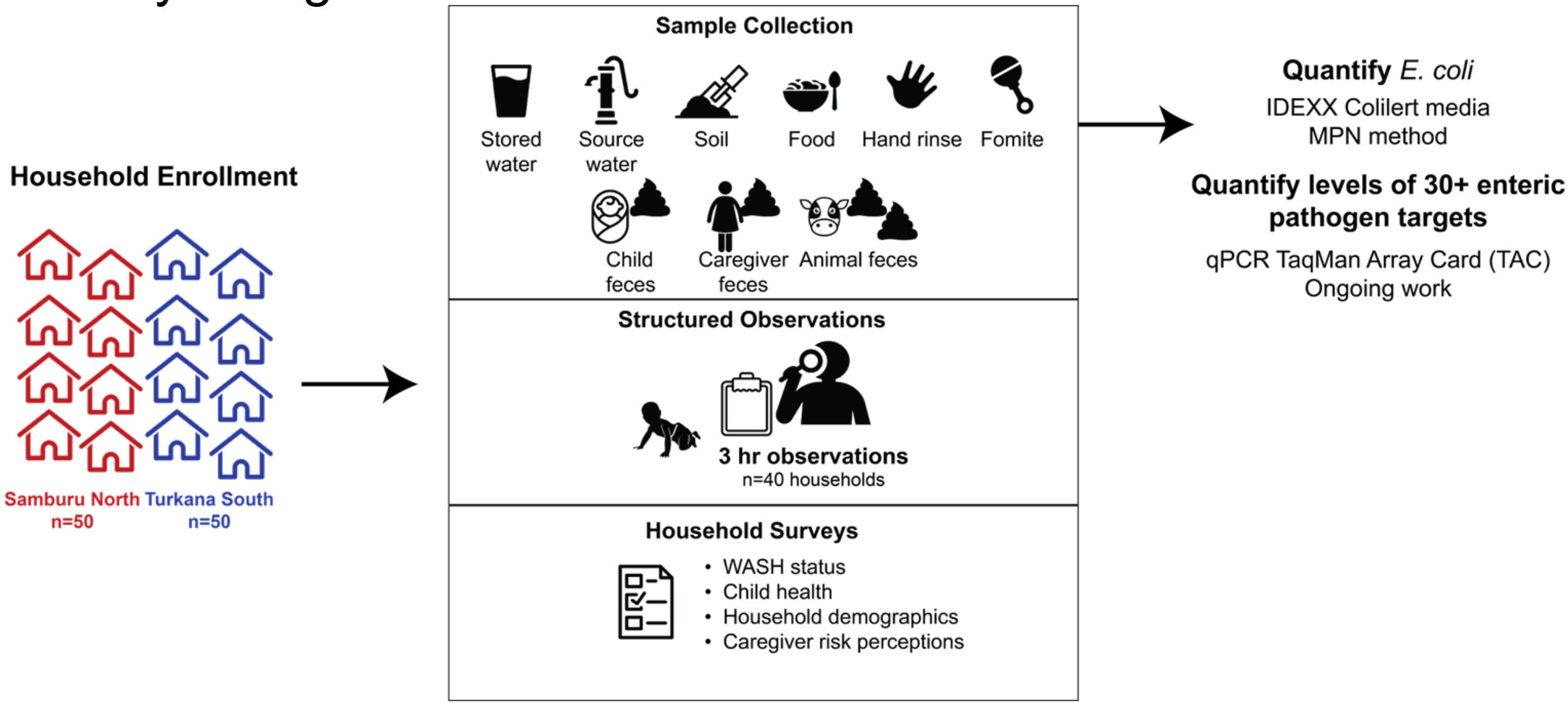
Study Site

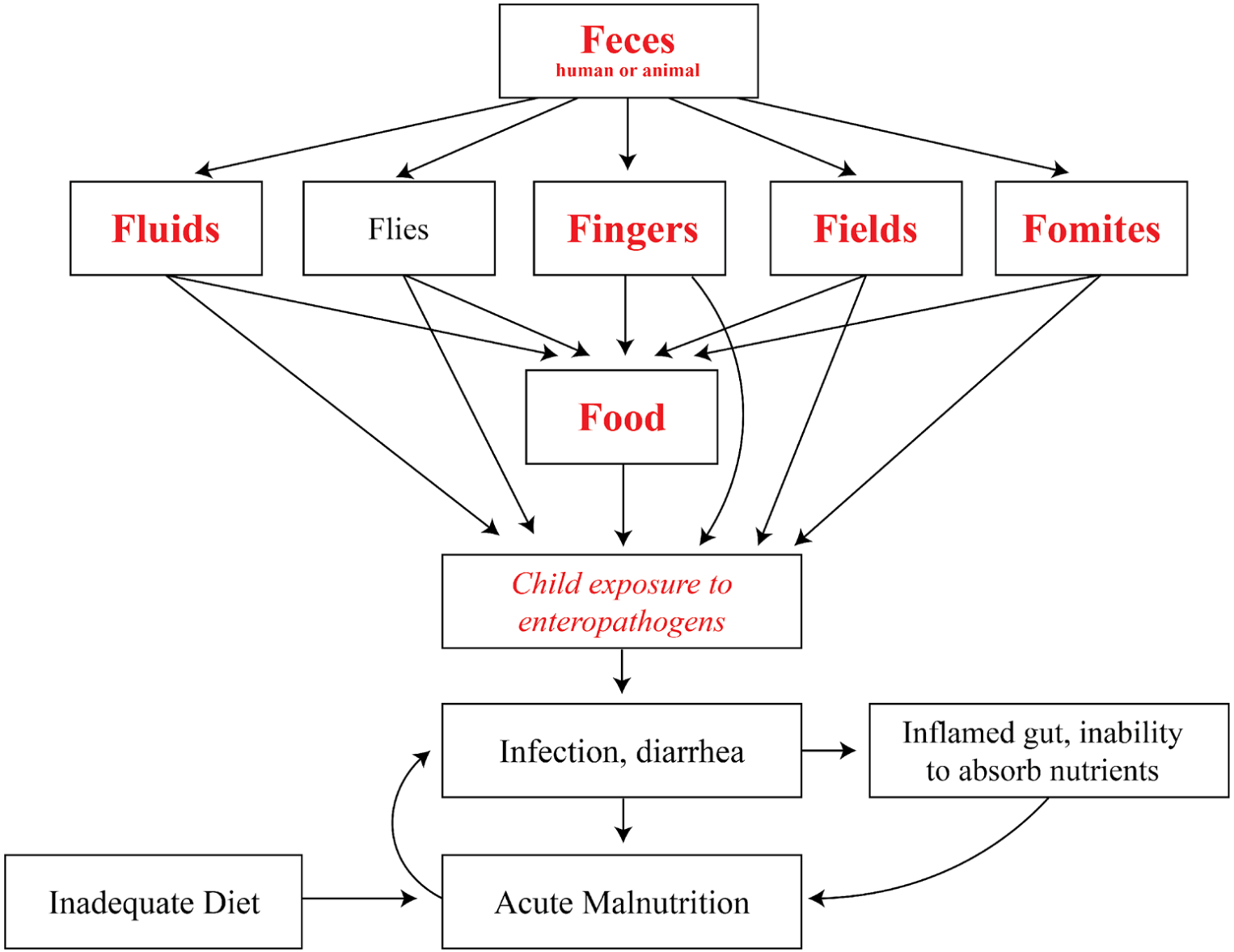
- **Turkana South** and **Samburu North** sub counties, Kenya
- Rural, low-income setting
- Pastoralist and agro-pastoral communities with high livestock ownership
- <5% have access to improved sanitation
- High rates of gastrointestinal illness in children
- GAM prevalence:
  - 16% Samburu
  - 26% Turkana



Methods

Study Design

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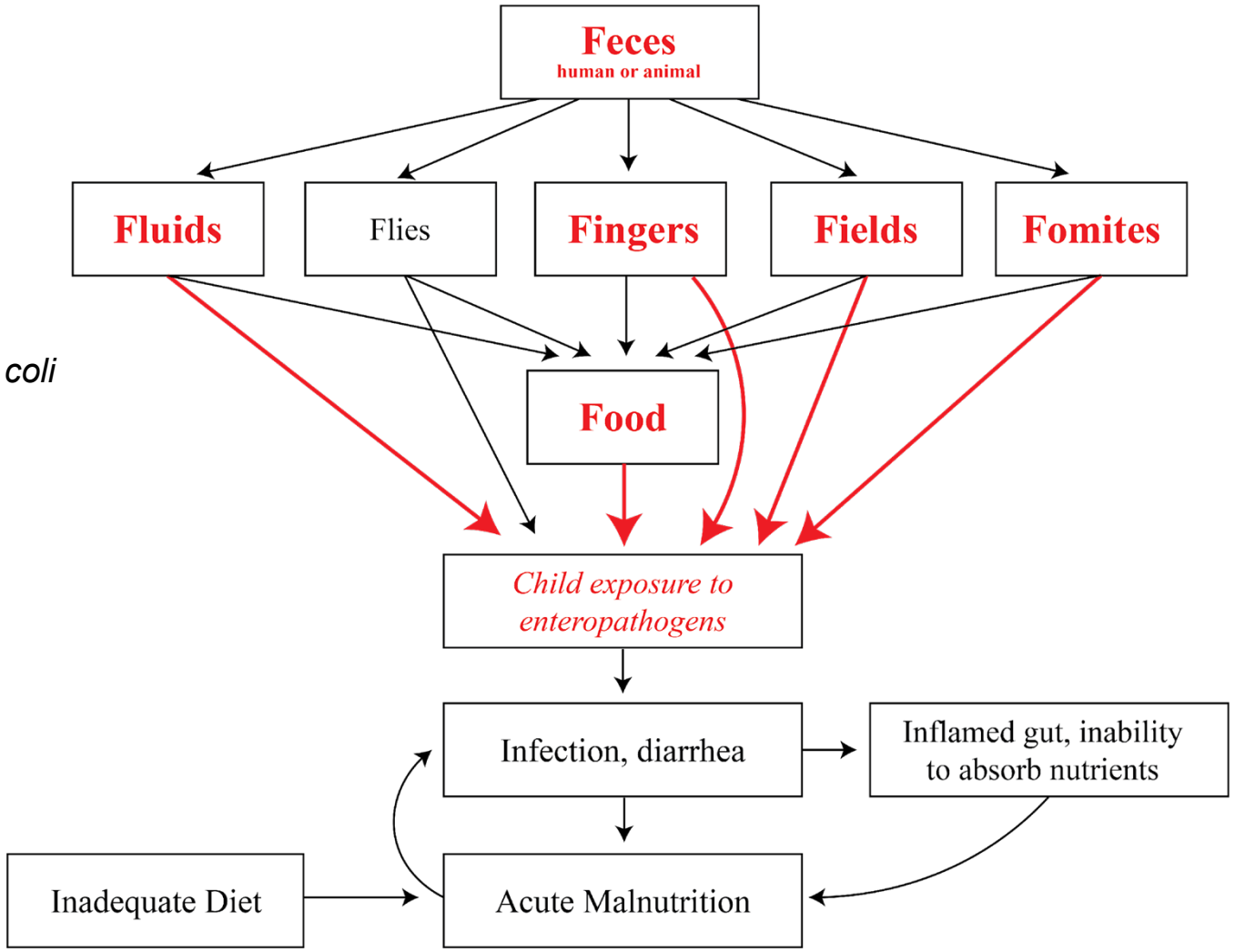
human or animal
Fluids
Flies
Fingers
Fields
Fomites
Food
Child exposure to enteropathogens
Infection, diarrhea
Inflamed gut, inability to absorb nutrients
Inadequate Diet
Acute Malnutrition

Quantitative Microbial Risk Assessment - QMRA

Modeling child exposure to *E. coli*

- *E. coli* concentrations
- Child behavior
- Parameters from literature



Results

Results are preliminary and may change after further analysis

Household characteristics

0

Households treat drinking water

41%

Have latrine

4%

Have handwashing station

64%

Below Kenya poverty line

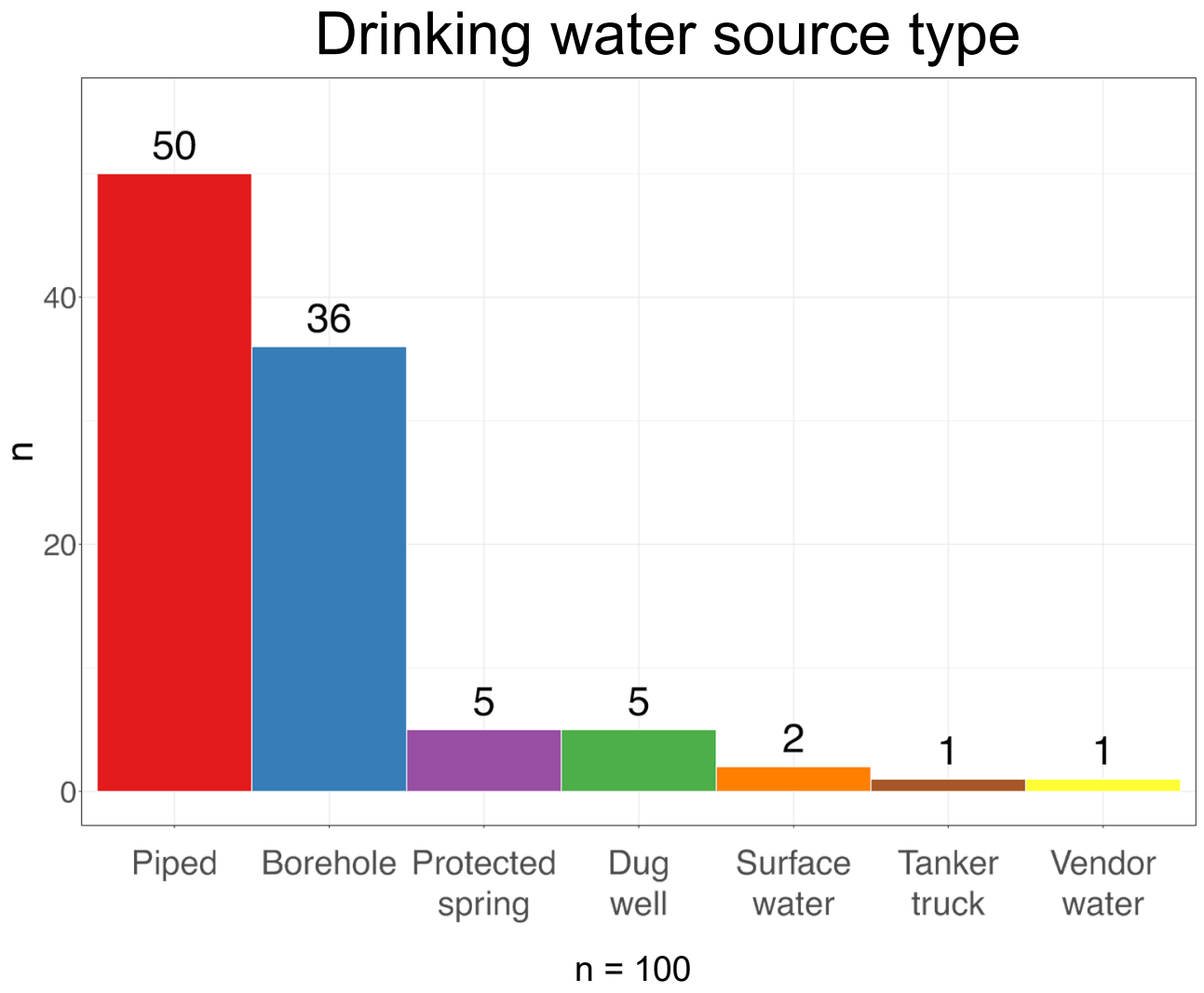
66%

Below Kenya food poverty line

86%

Own livestock

Limited water access in study regions

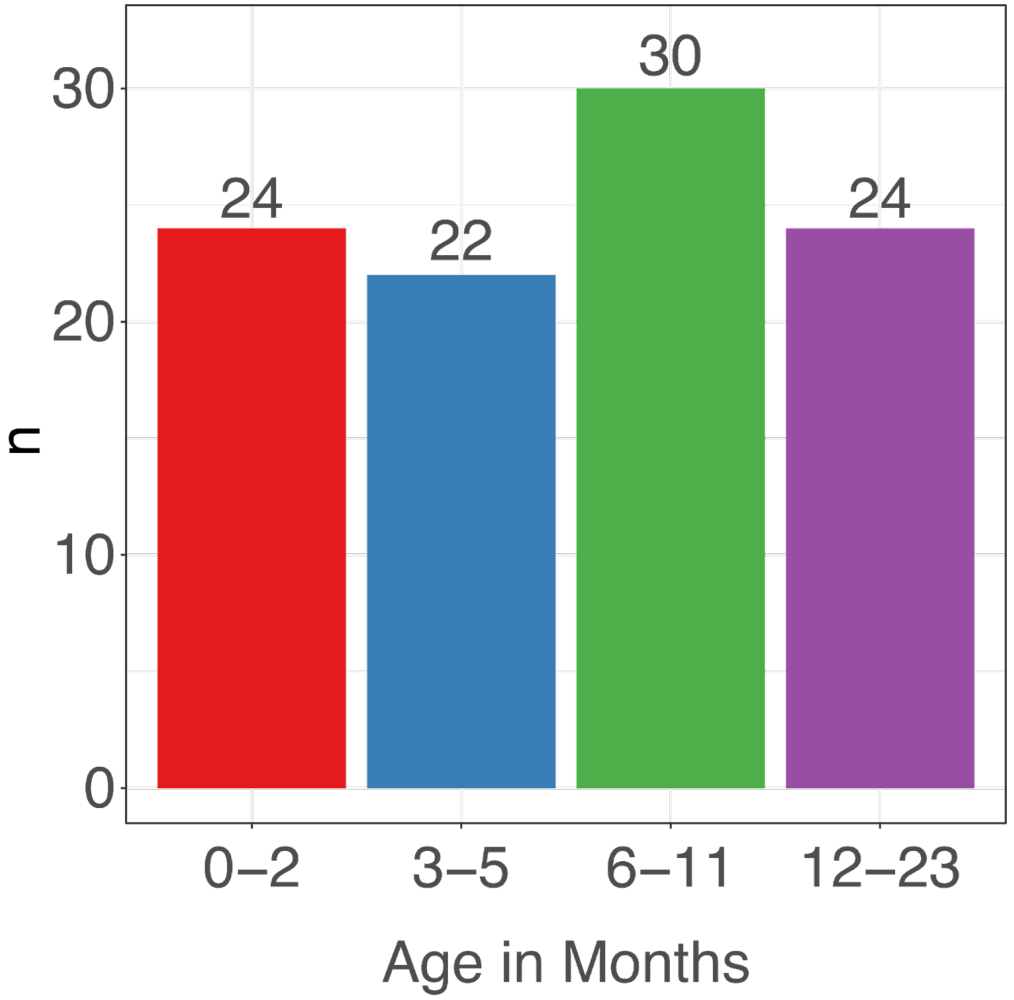


66%

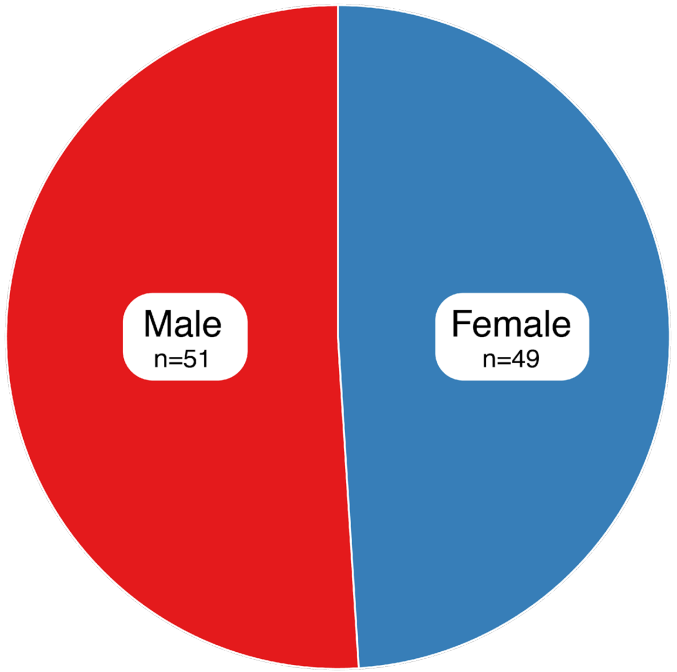
Source not available when needed in last 2 weeks

50% source was out of water
8% lack of fuel/electricity

Child Enrollment

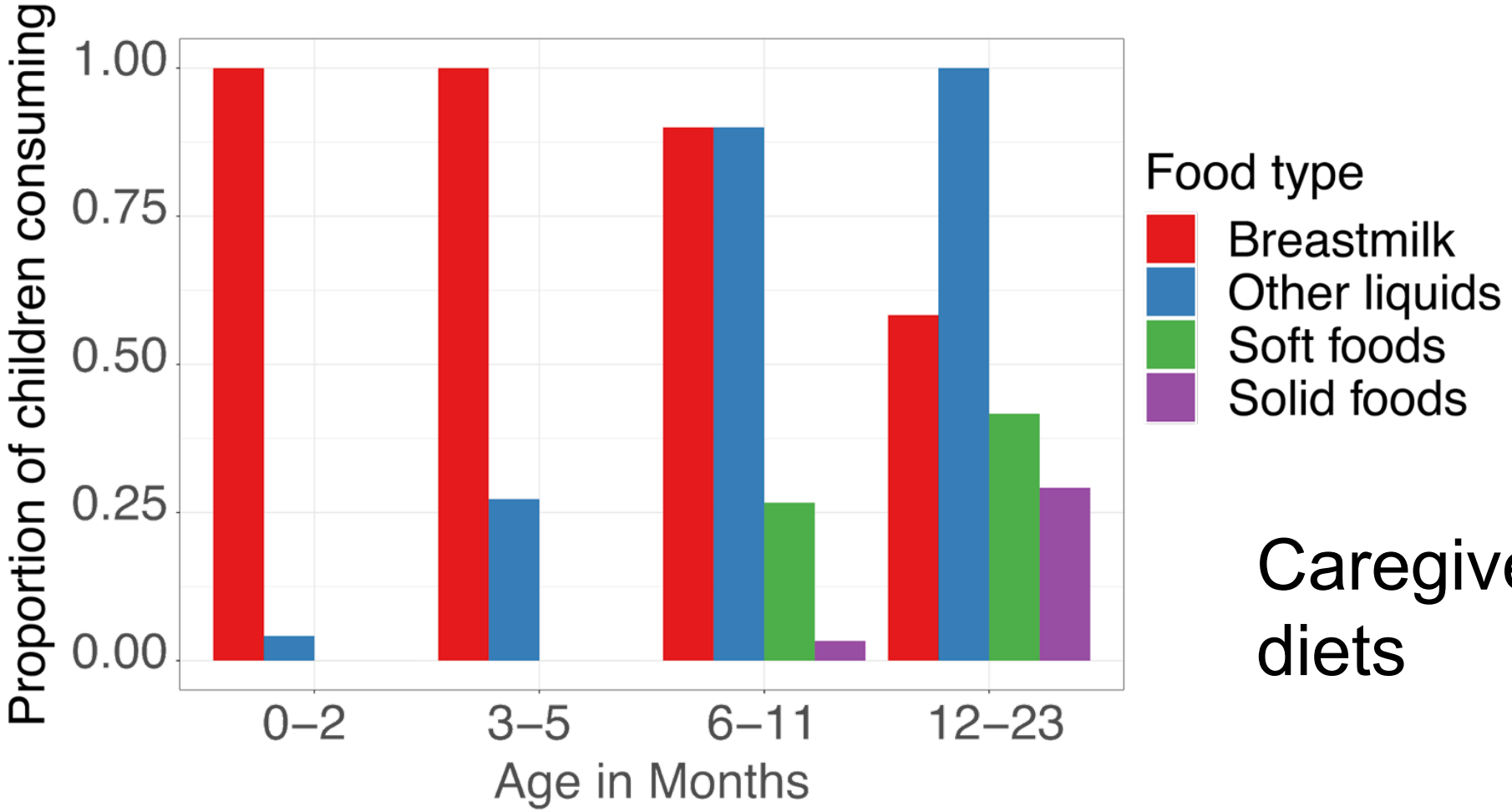


Child Gender



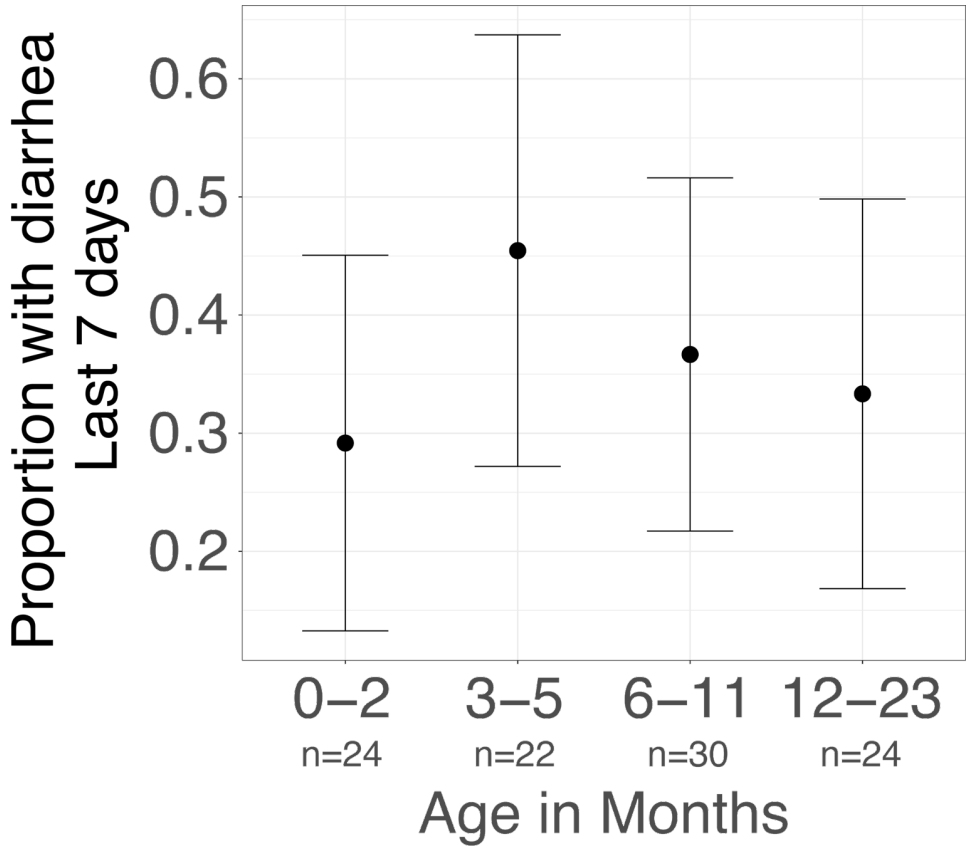
Samburu: 50
Turkana: 50

Child food consumption & health

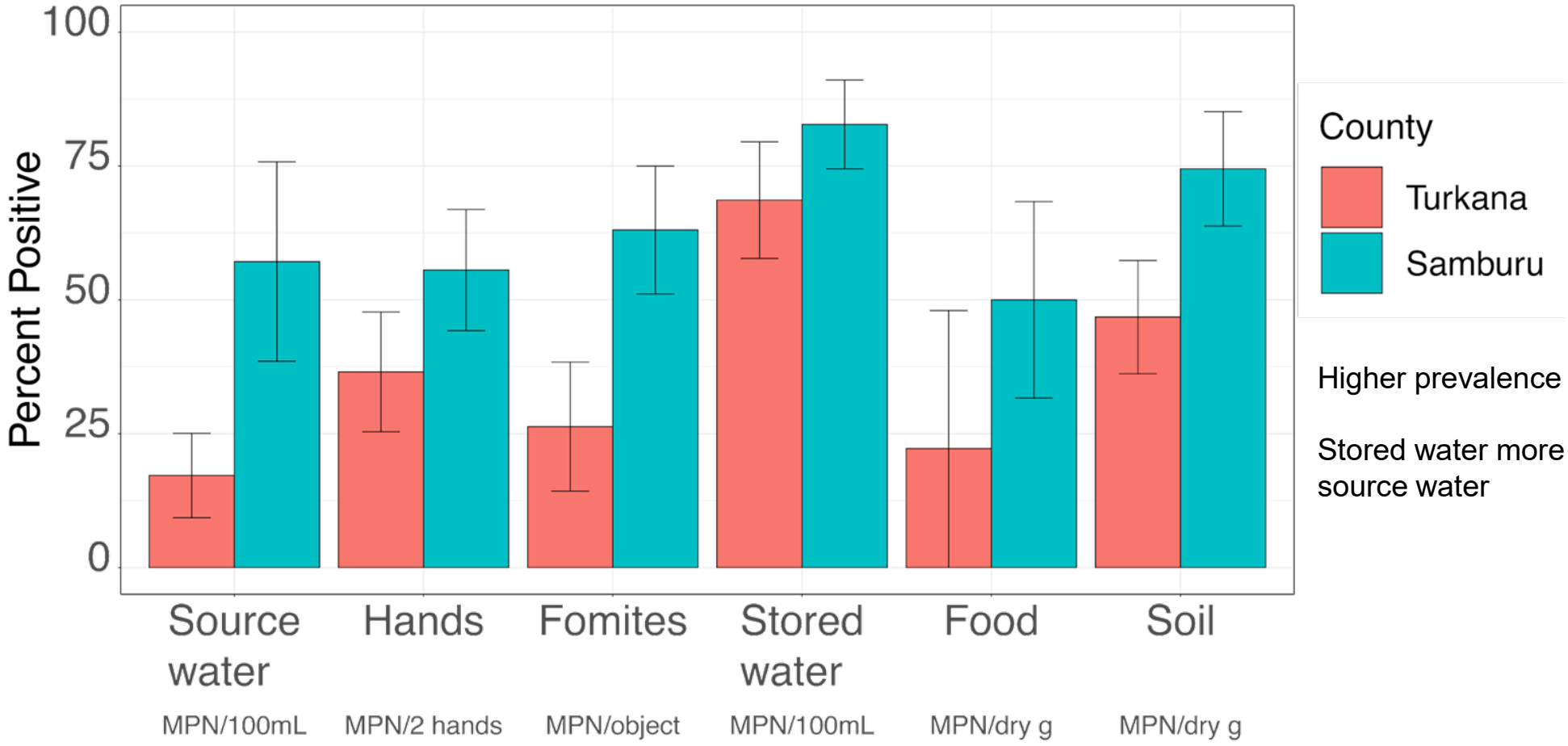


Caregiver-reported diets

Child food consumption & health



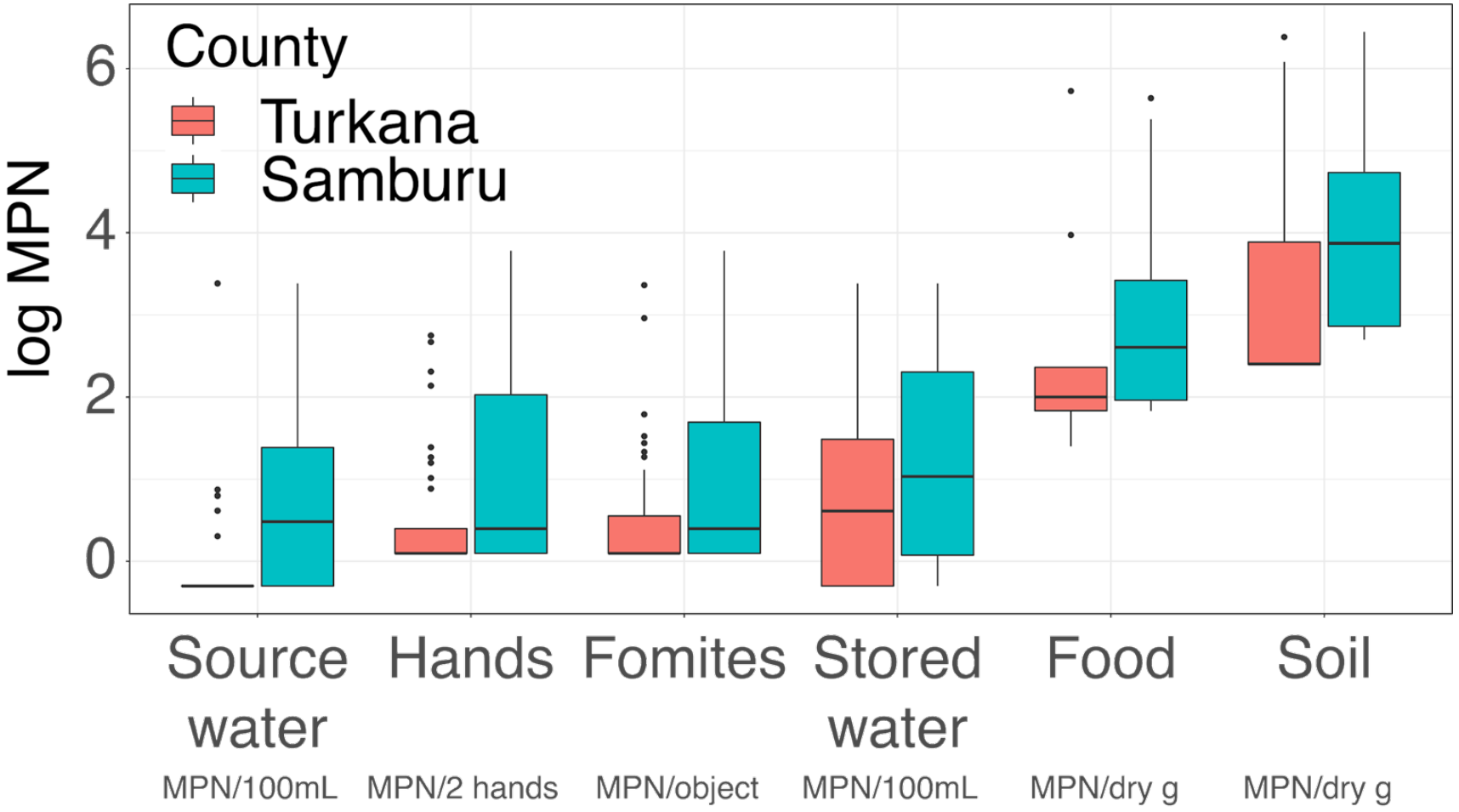
E. coli (proportion contaminated) in household environmental reservoirs



Higher prevalence in Samburu North

Stored water more likely to be contaminated than source water

E. coli levels in household environmental reservoirs

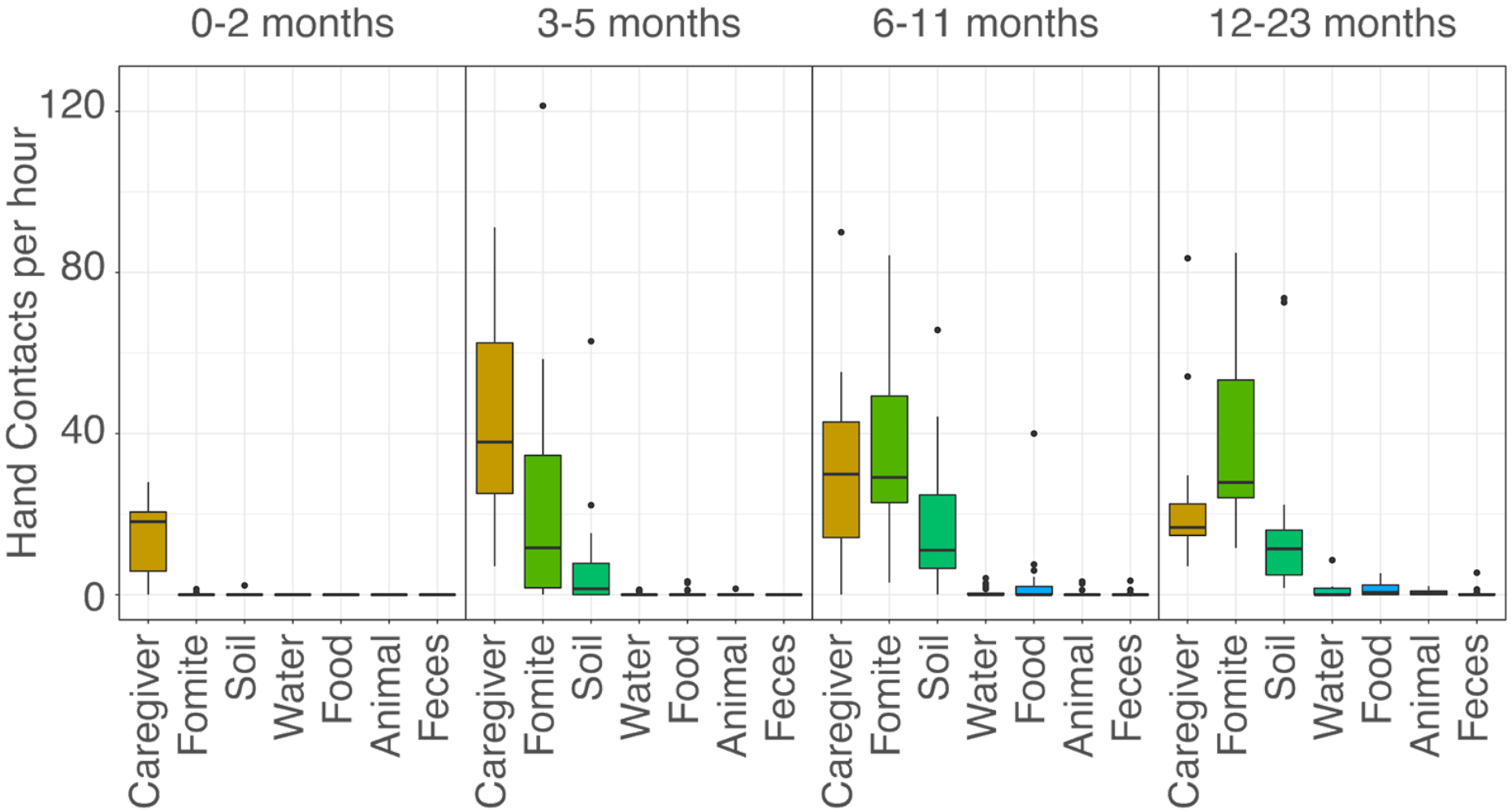


Higher levels in Samburu North

Higher contamination in stored vs source waters

High levels in food

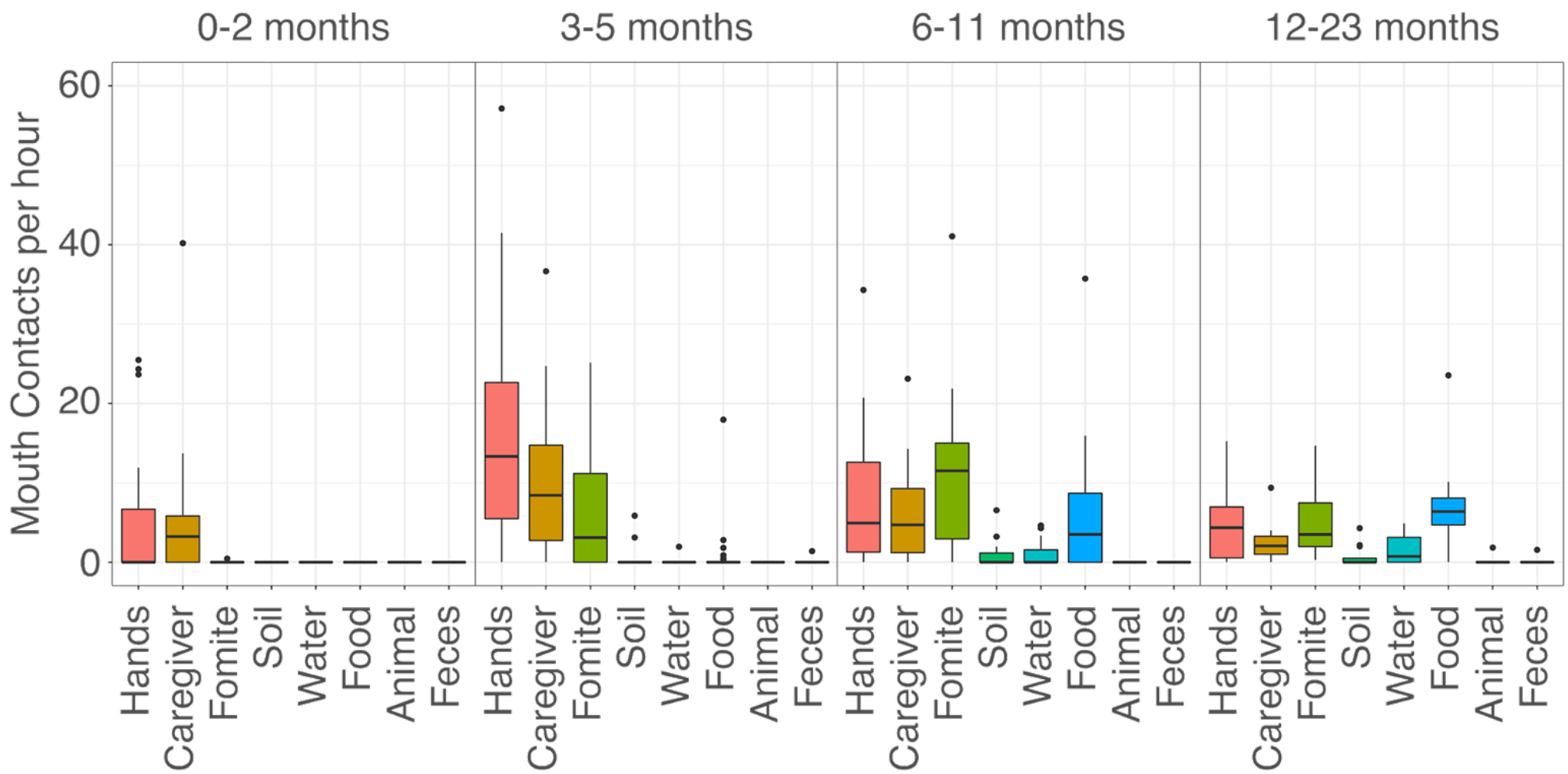
Child behavior – hand contacts with various objects



Frequency of hand contacts increases with age

Transition from mostly contacting caregiver to contacting fomites & soil as children age

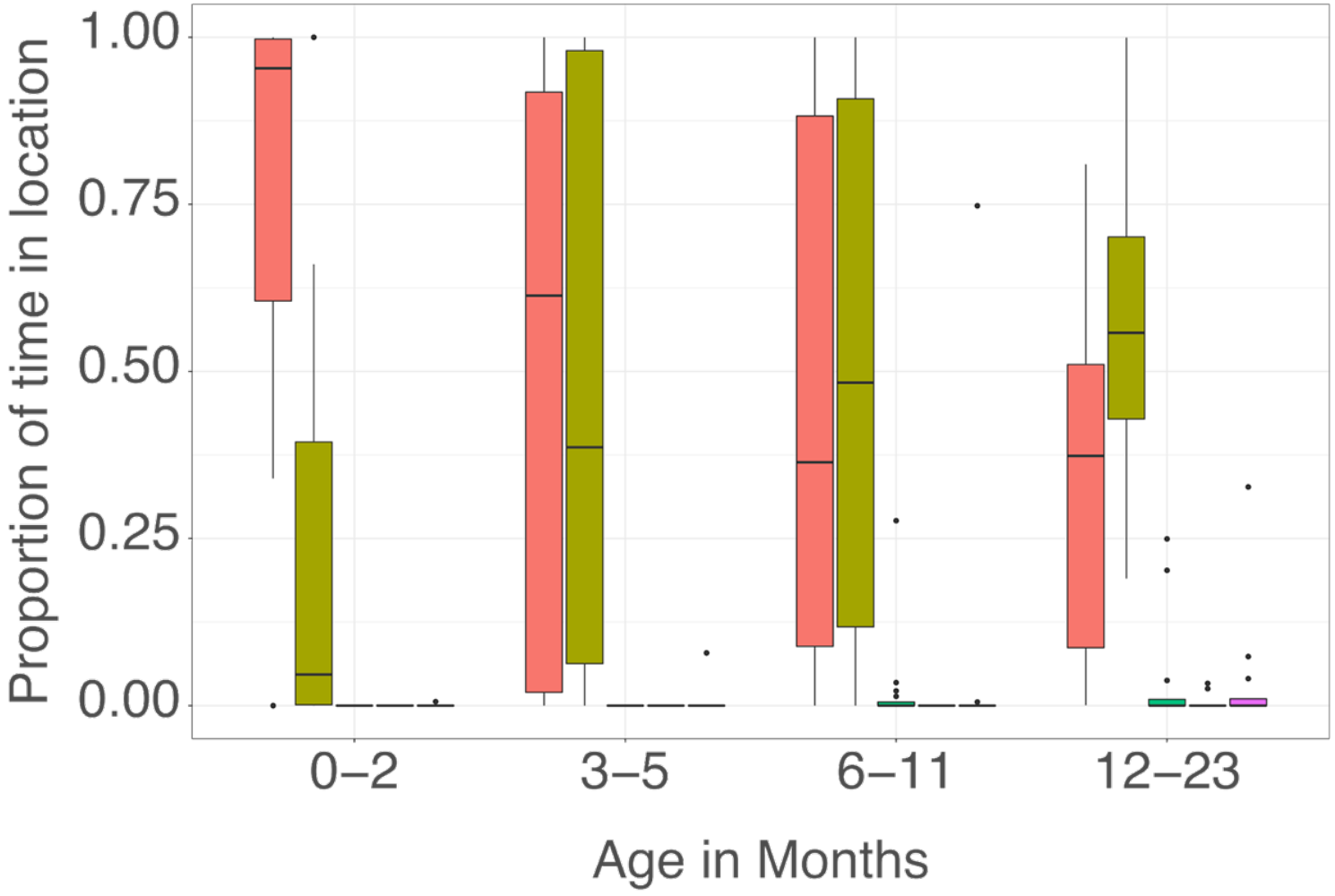
Child behavior – mouthing objects



Mouthing behaviors peak around 3-6 and 6-12 months

Frequent mouthing of child's hands

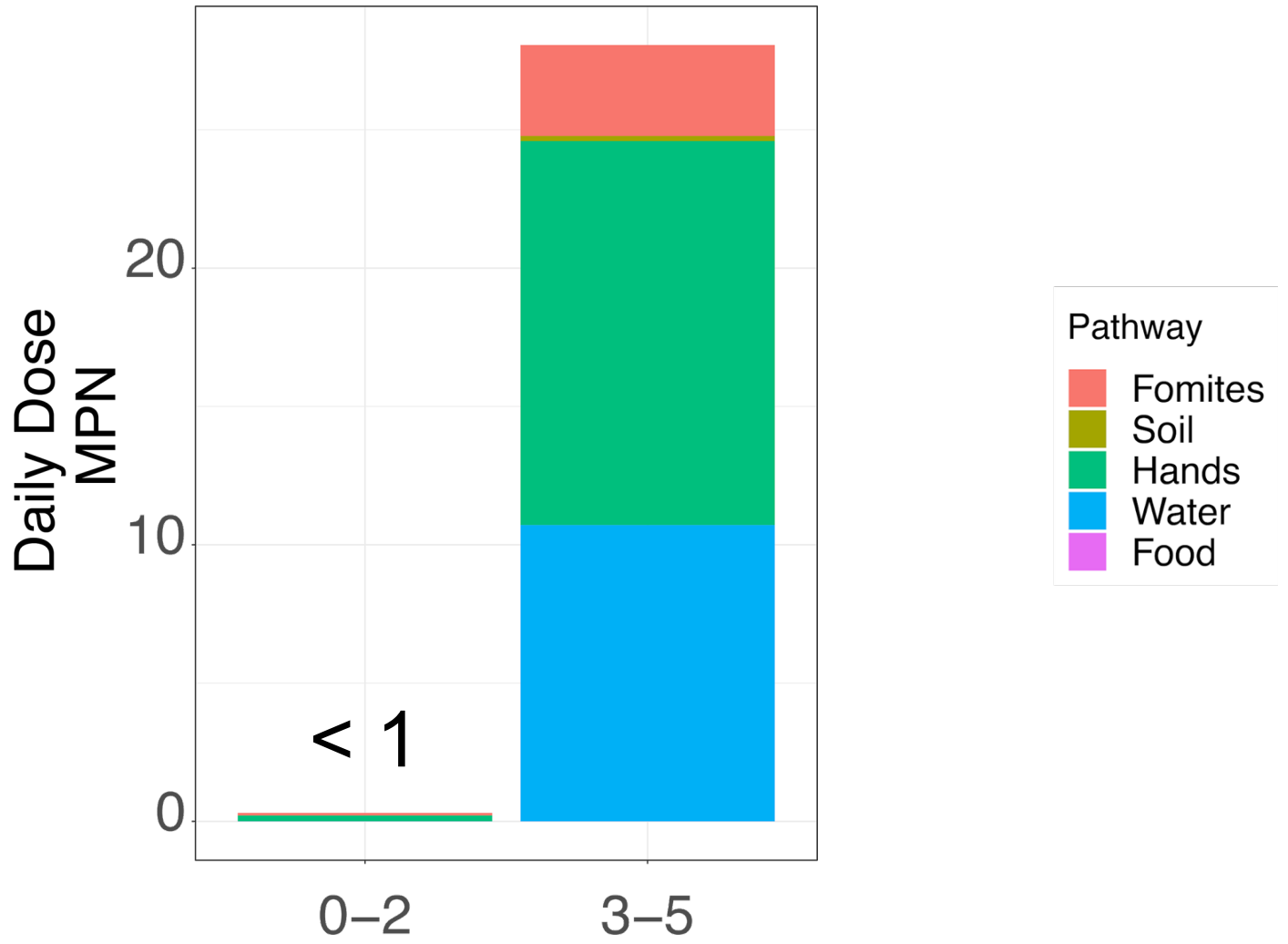
Where do children spend their time?



Data collected between 9am & 3pm

Location
- House
- Courtyard
- Field/bush
- Animal pen
- Other

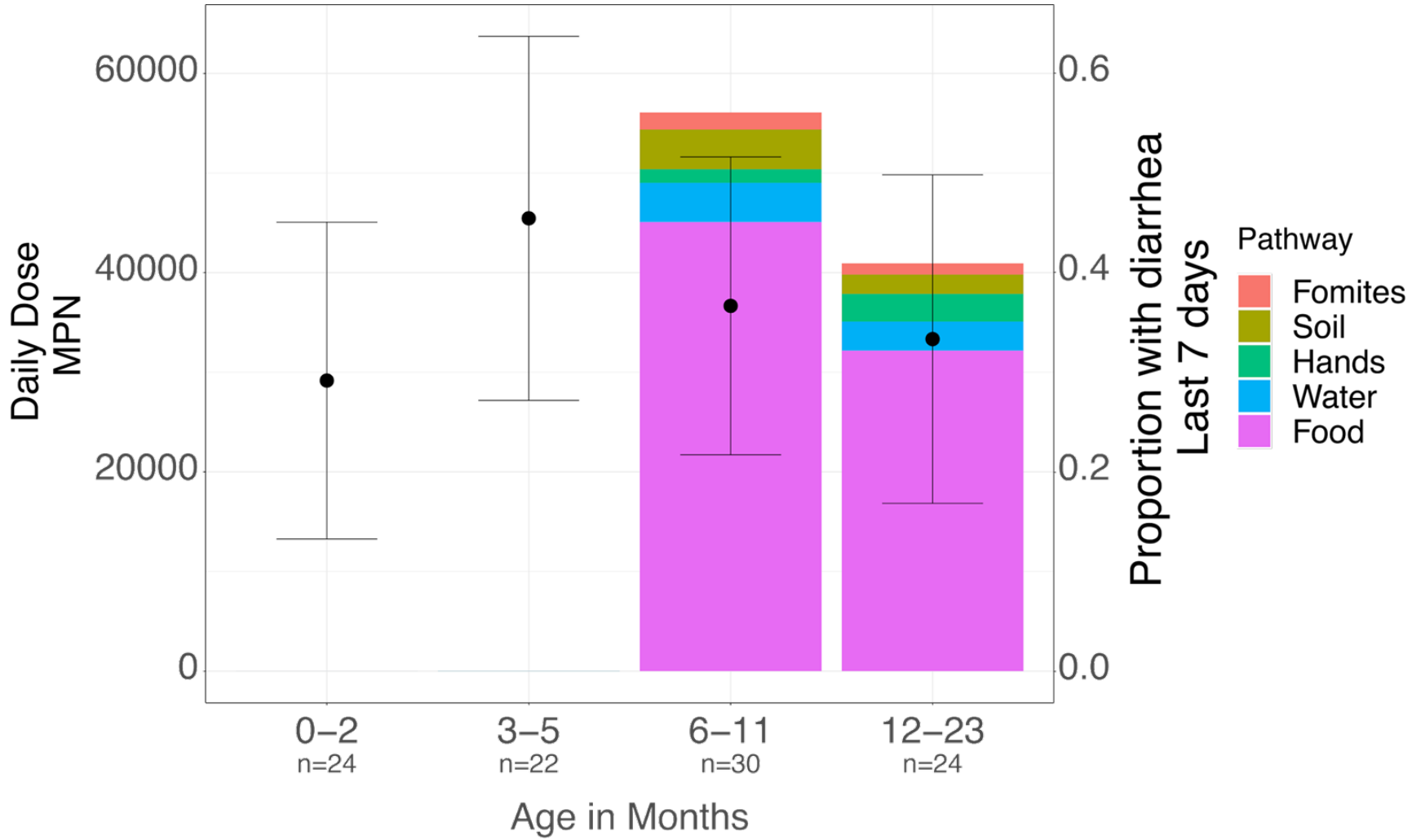
QMRA: Food, hands, and water are dominant exposure pathways



Children over 6 months are exposed to highest *E. coli* levels

Food dominant pathway for children who consume food

Diarrheal prevalence high even in age groups with low *E. coli* doses

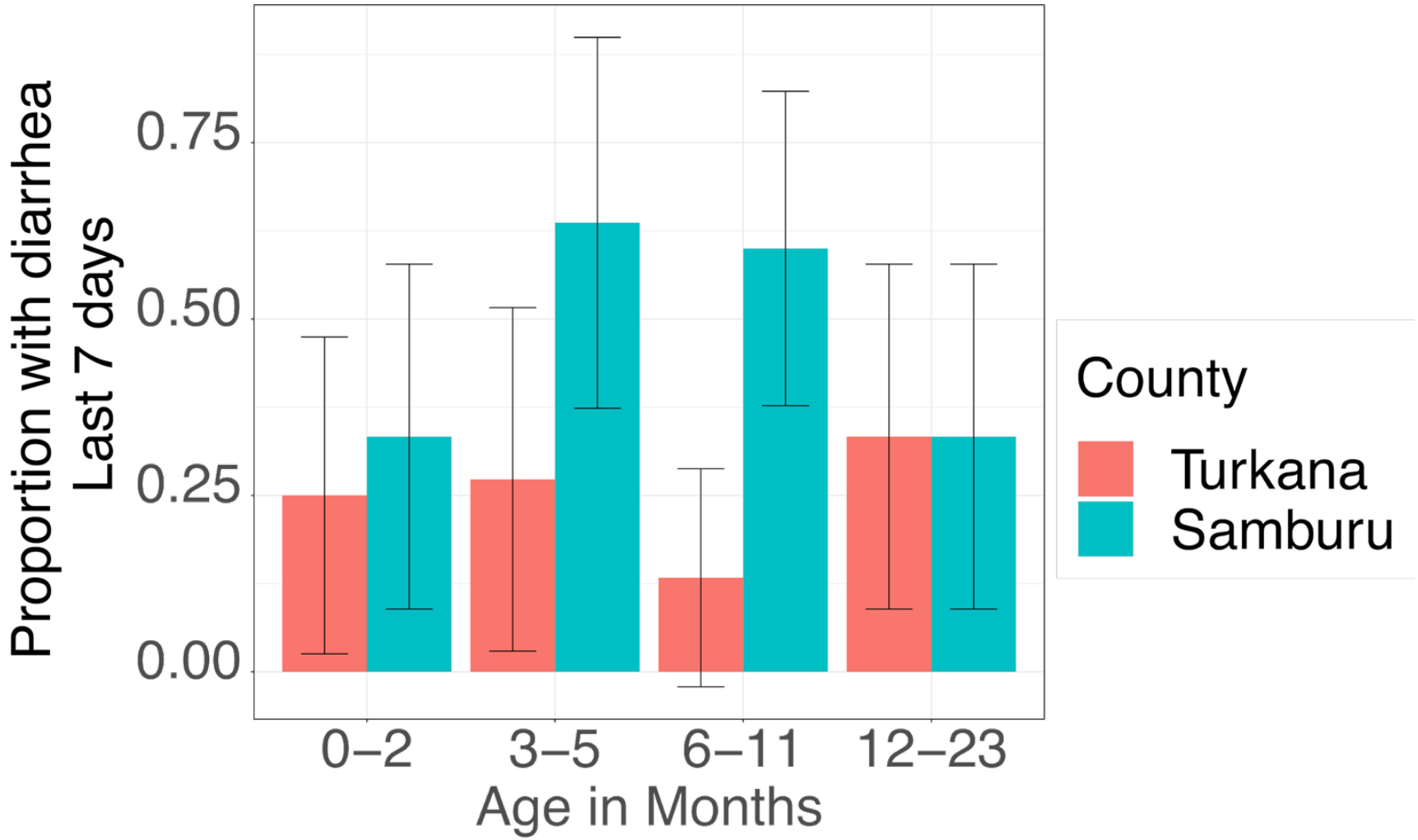


Infectious Dose is plausible for many pathogens

EHEC: <100 cells
O157:H7 <100 cells
Shigella: <100 organisms
Campylobacter: 500 organisms

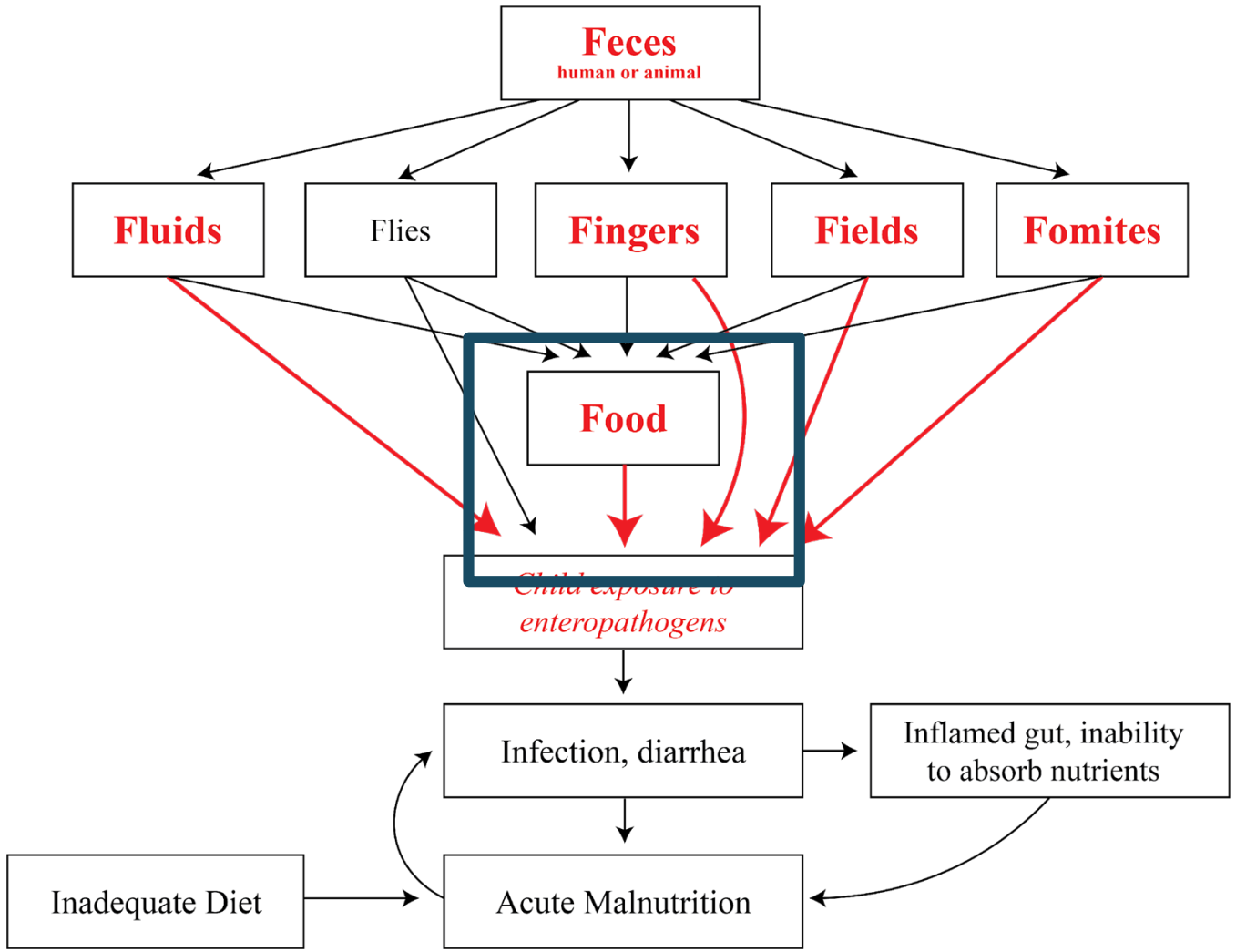
Giardia: 25-100 cysts
Cryptosporidium: ~100 oocysts
Norovirus: 18 cells

Differences between counties



Food most important pathway in both sites

Hands and water relatively more important in Turkana


Feces
human or animal
Fluids
Flies
Fingers
Fields
Fomites
Food
enteropathogens
Infection, diarrhea
Inflamed gut, inability to absorb nutrients
Inadequate Diet
Acute Malnutrition

Food hygiene & storage practices

28 food samples collected

9 Turkana South
19 Samburu North

In food preparation area

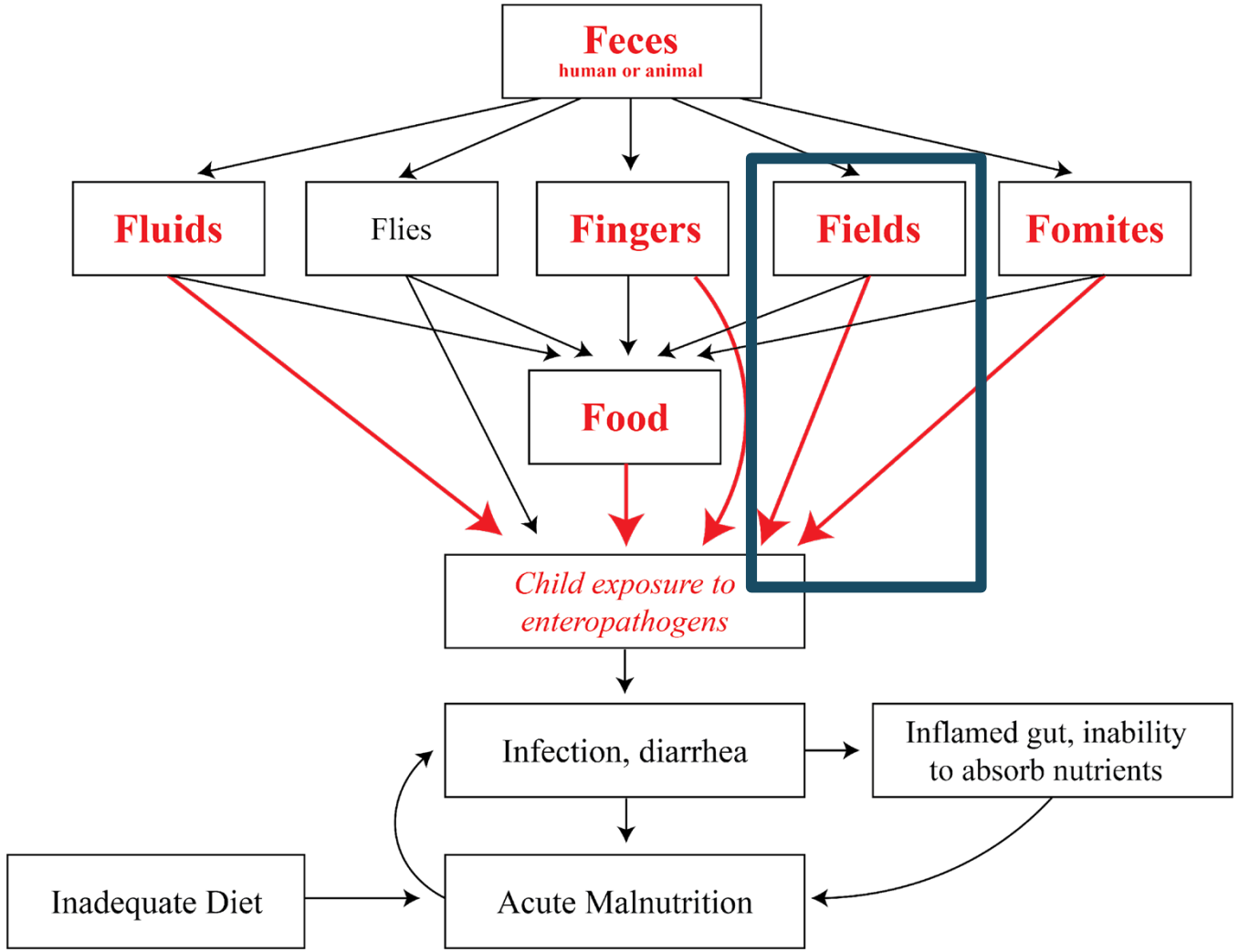
Flies	Trash	Animal feces
54%	43%	21%

46%
Food stored uncovered

43%
Food stored on ground

64%
Food not reheated before serving

57%
Food cooled without lid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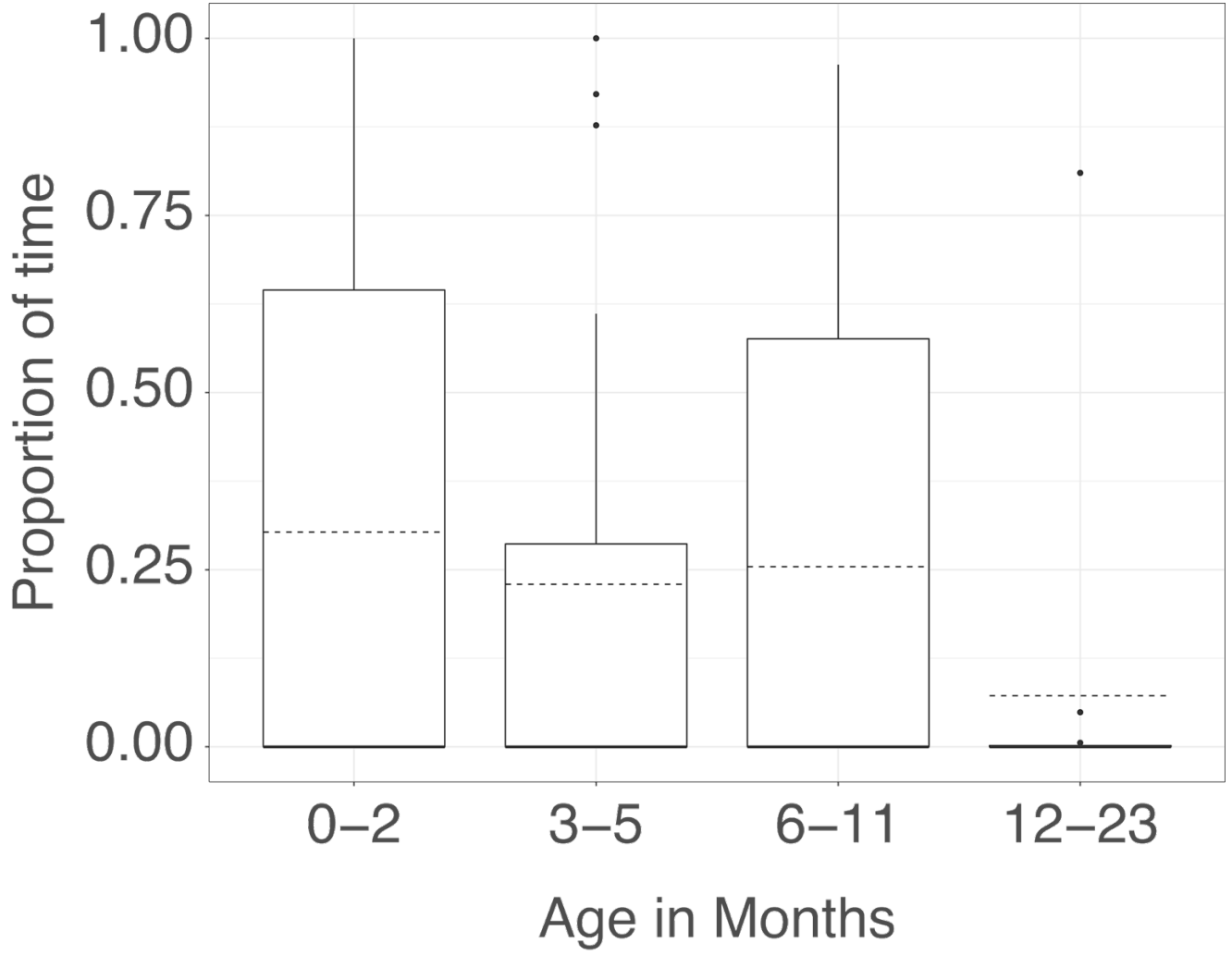
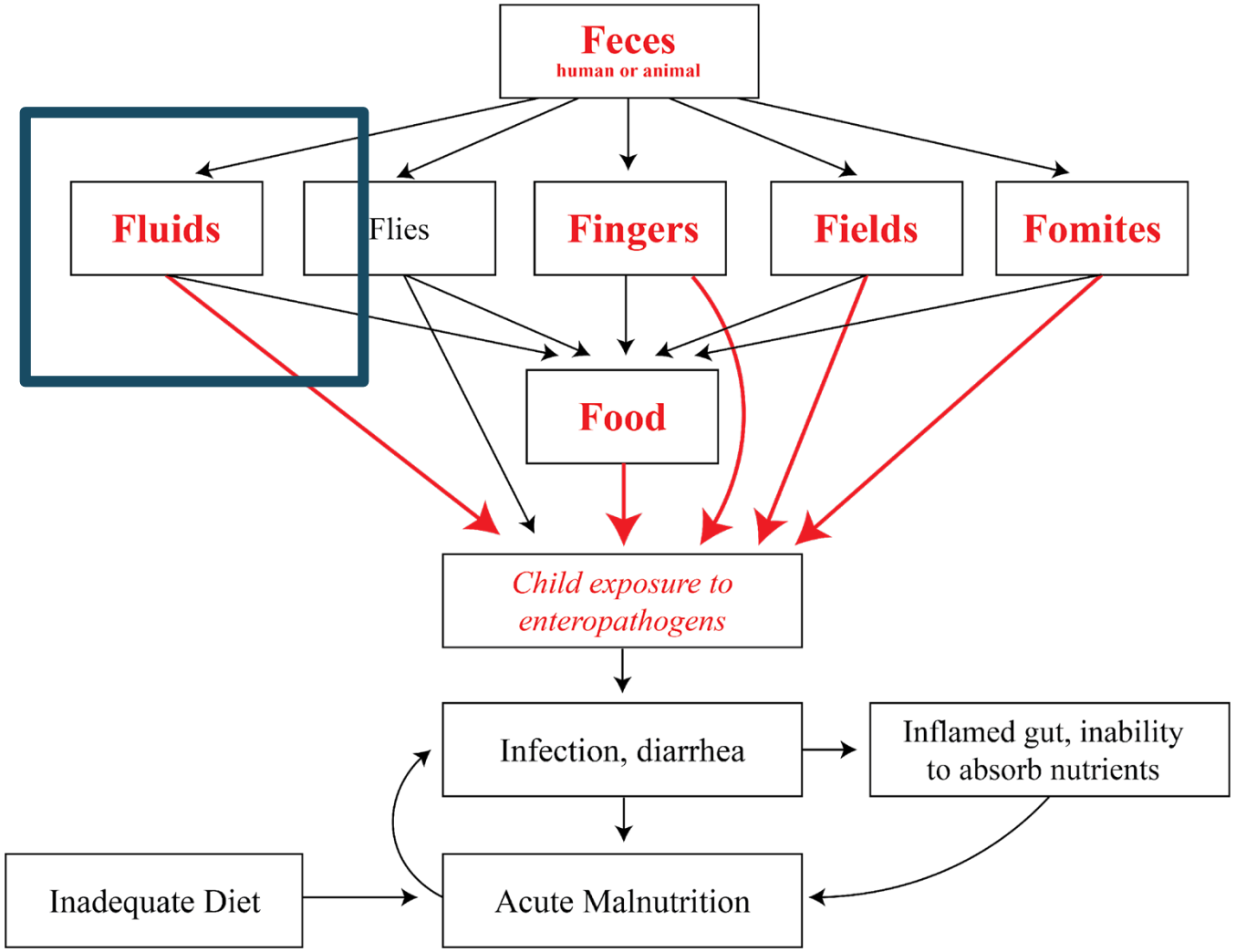
Time spent on improved flooring

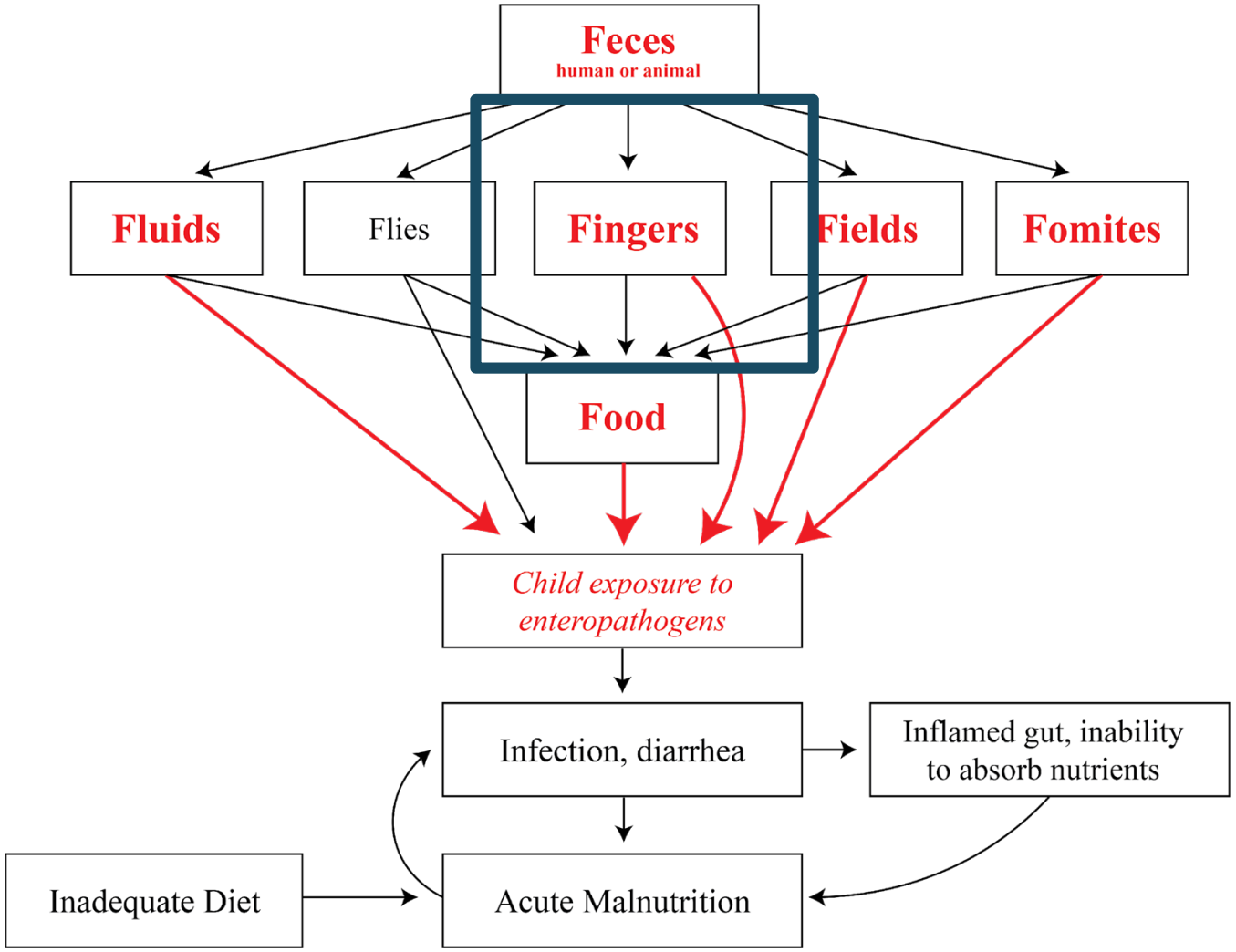


Stored water more contaminated than source water

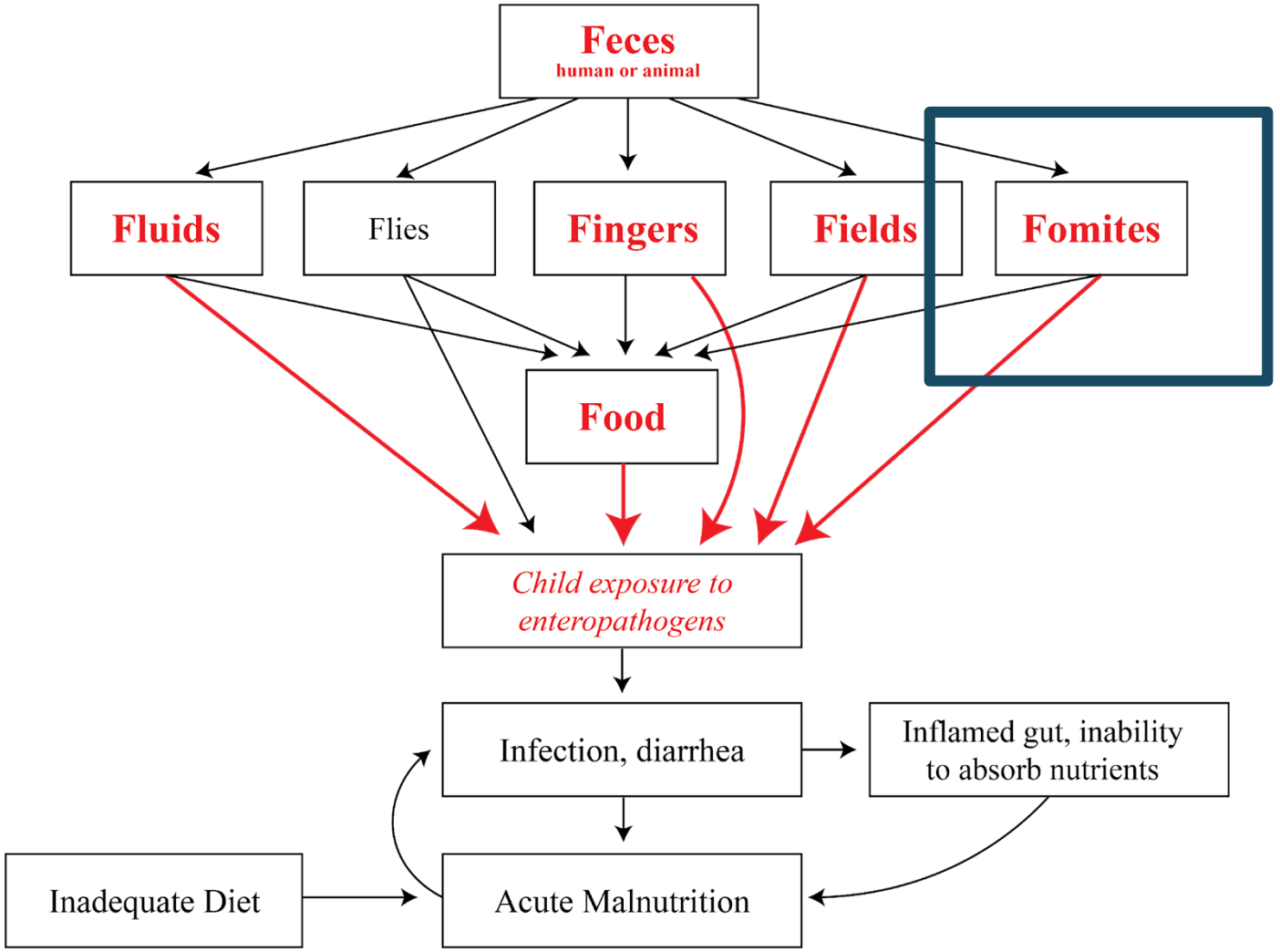
Median water age of 10 hours

Primarily stored in jerrycans on the ground indoors

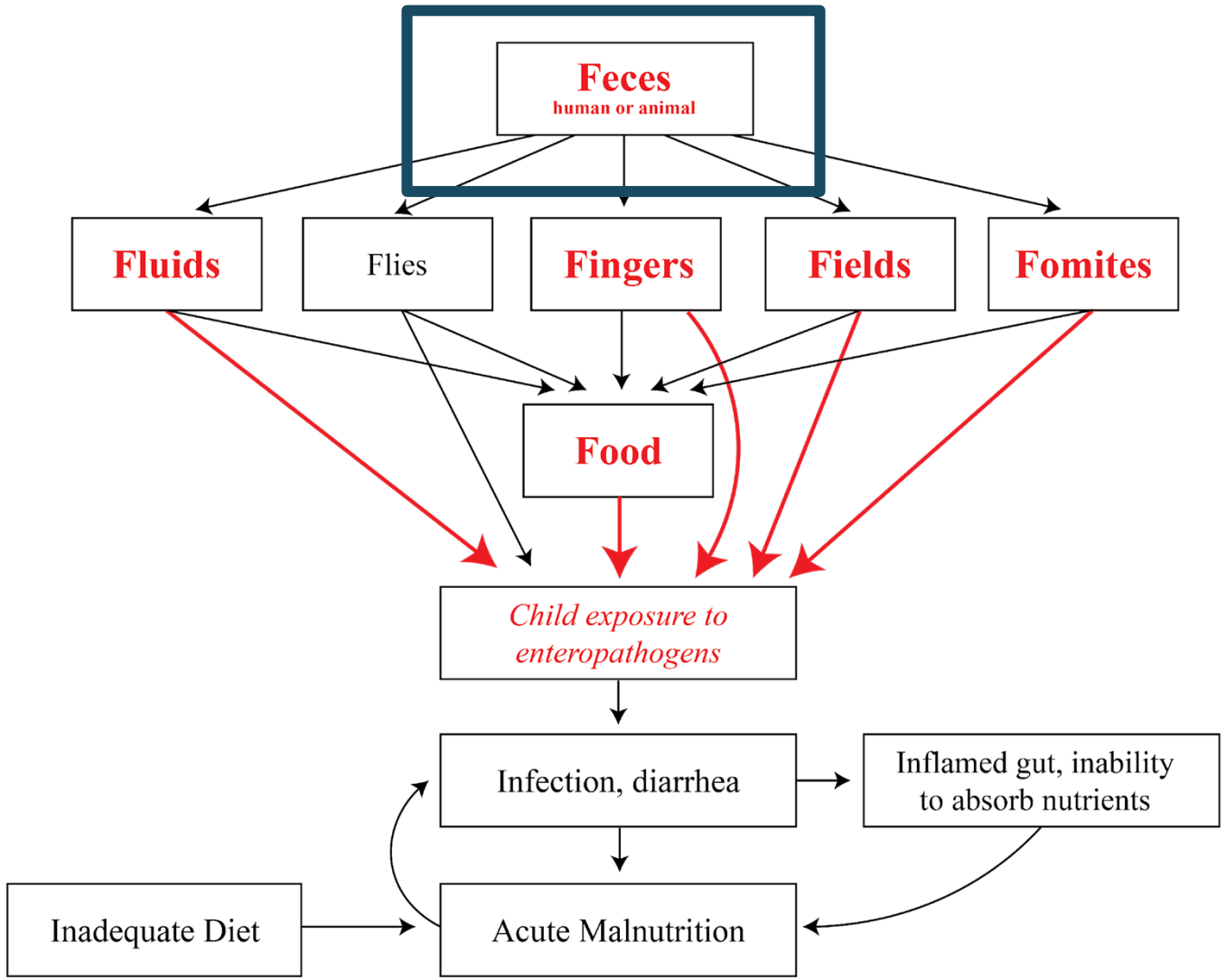




Only 4% of households have handwashing facilities



Kids are mouthing household objects, often picked up from the ground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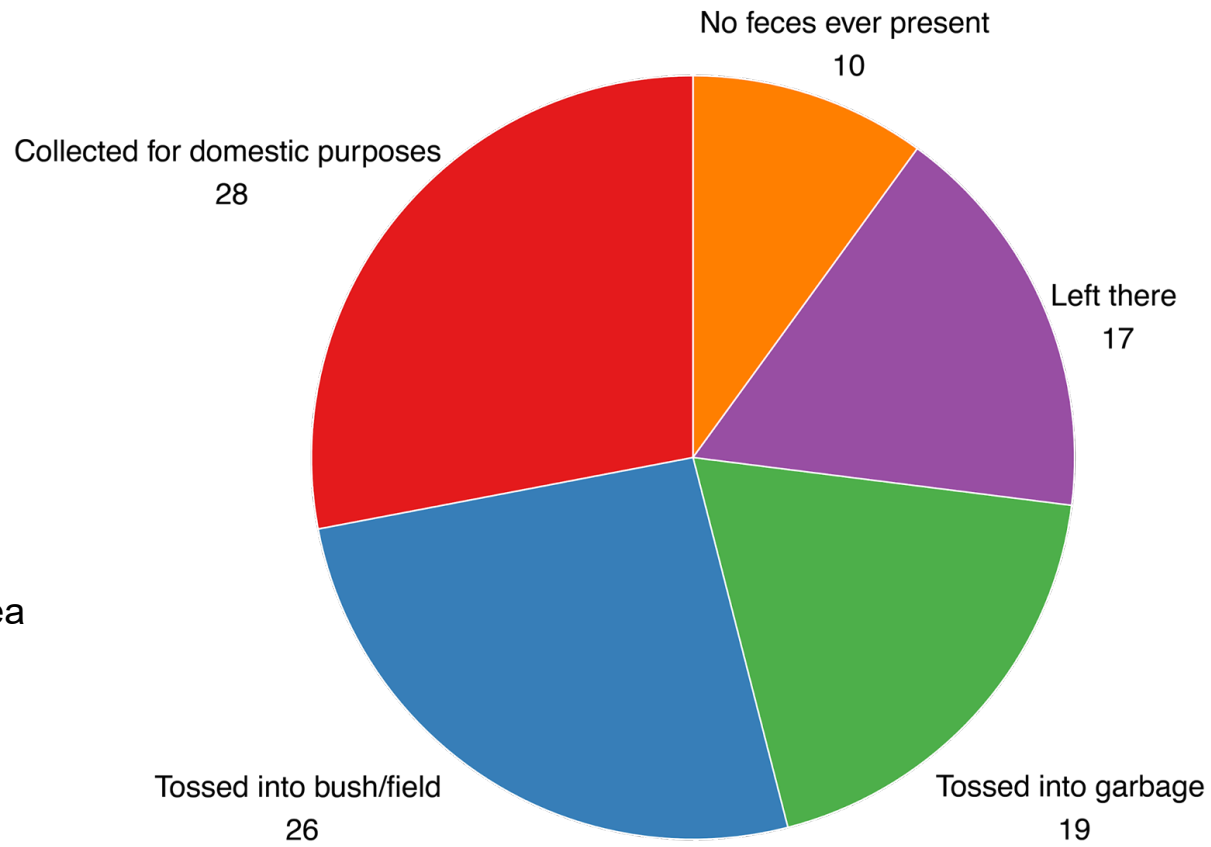
Animal ownership & sanitation practices

86%
Own livestock

77%
Animals enter home

35%
Animals enter sleeping area

Disposal of animal feces in the compound

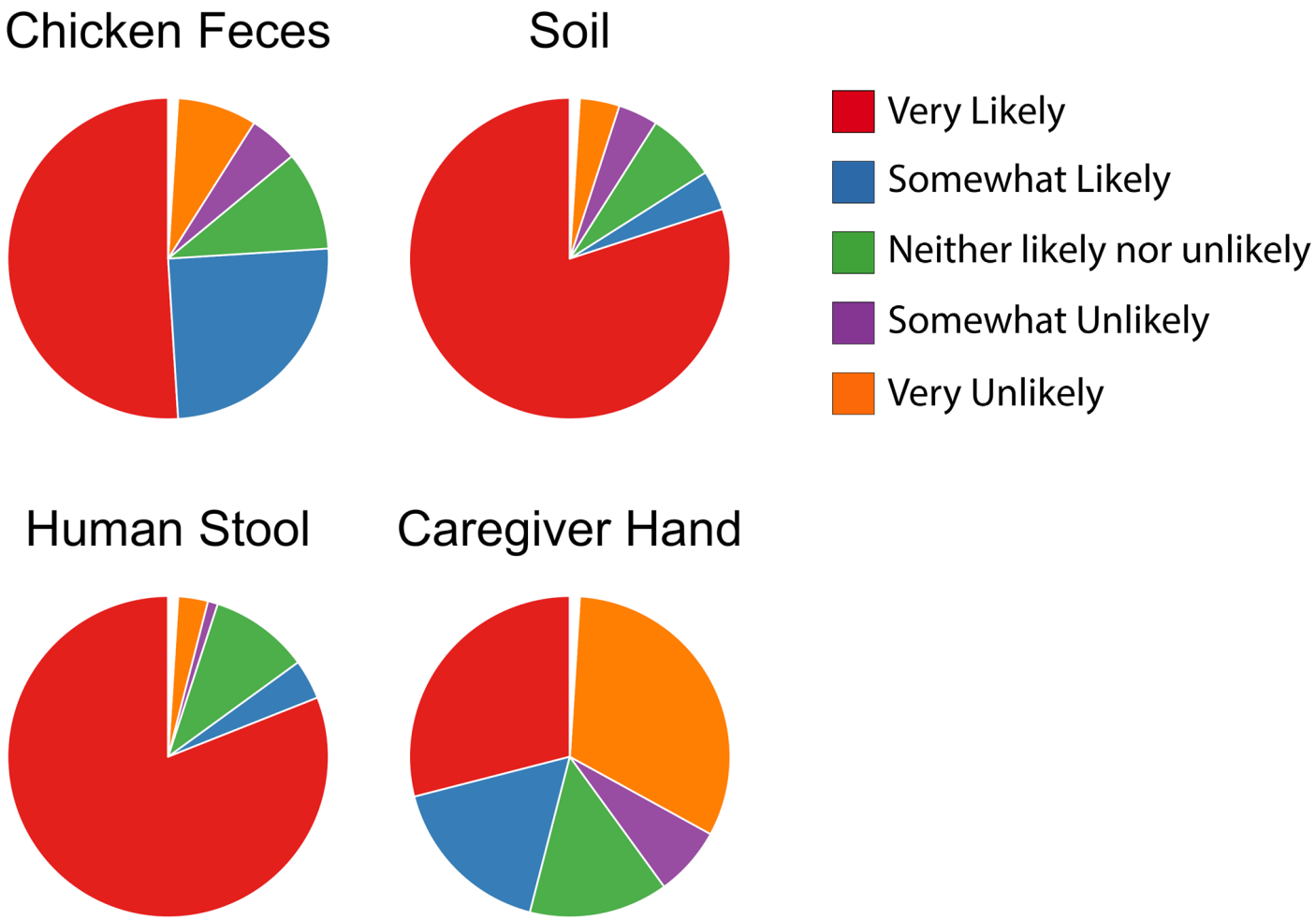


98%
Observed animal feces in courtyard

21%
More than one type of animal feces present

Caregiver risk perceptions

How likely is your child is to get diarrhea after contacting…



Recommendations

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Conduct focus group discussions with community members to determine best interventions

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Intervention	Ideas	Priority	Who?	Stakeholders
Food Hygiene & Safety	Engage Community Health Volunteers (CHVs) on how to improve food hygiene Potential food hygiene practices: • Store food in sealed containers • Fully cook foods and reheat before serving • Boiling / cleaning utensils and surfaces • Drying racks for utensils (can be locally made)	HIGH	Caregivers CHVs	Government NGOs

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Child Hand Hygiene	Explore methods easiest for caregivers to wash child hands Enabling environment for handwashing	MEDIUM	Caregivers CHVs	Government NGOs

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Drinking Water	Explore best strategies for chlorinating water	MEDIUM	Government NGOs	Evidence Action Government

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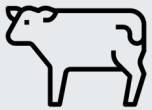
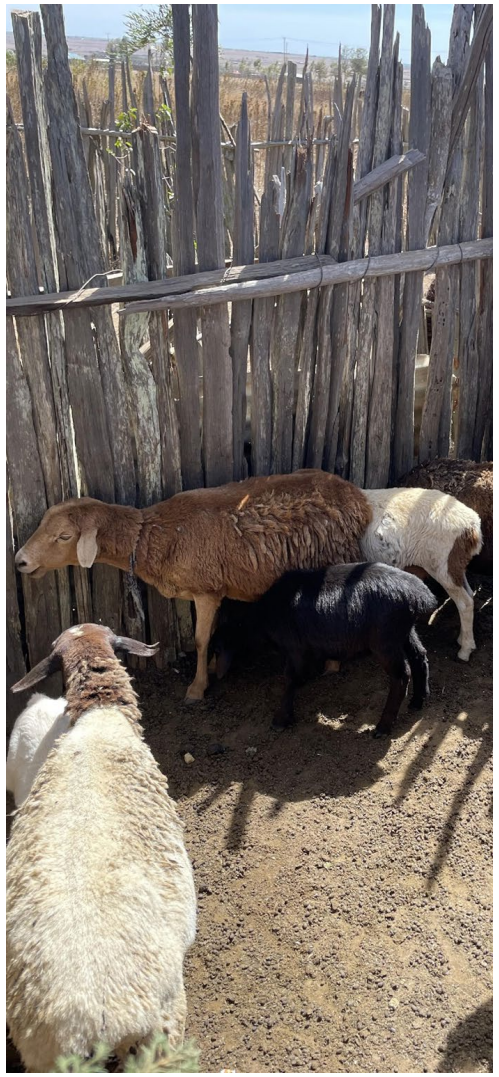
Animal feces 	Get input from community members on potential strategies for keeping animals out of the house and sleeping area	MEDIUM	Caregivers Livestock handlers	Government NGOs

Results are preliminary and may change after further analysis

Conclusions

Conclusions

- Multiple pathways are important for exposure to *E. coli*
- High diarrheal illness in youngest age groups with lower *E. coli* exposure – still important to interrupt transmission to these age groups.
- Obtain community input when designing programs or needed infrastructure
- Engage government to explore options for community-level infrastructure or services



Acknowledgements

Funding from PRO-WASH

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Estelle M. Sidze, Research Scientist, APHRC
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Valerie Flax, Senior Research Public Health Analyst, RTI International
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Benard Chieng, Laboratory Analyst, Kenya Medical Research Institute
Sylvie Araka, Laboratory Analyst, Kenya Medical Research Institute
Abby Harvey, Graduate Student Researcher, UC Berkeley
Jeremy Lowe, Graduate student, UC Berkeley

Q&A Session

Thank you!

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Part III on December 6, 2022

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