

# Maximizing Sludge Sourcing From Low Income Communities



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**PIVOT**



# Mombasa, Kenya

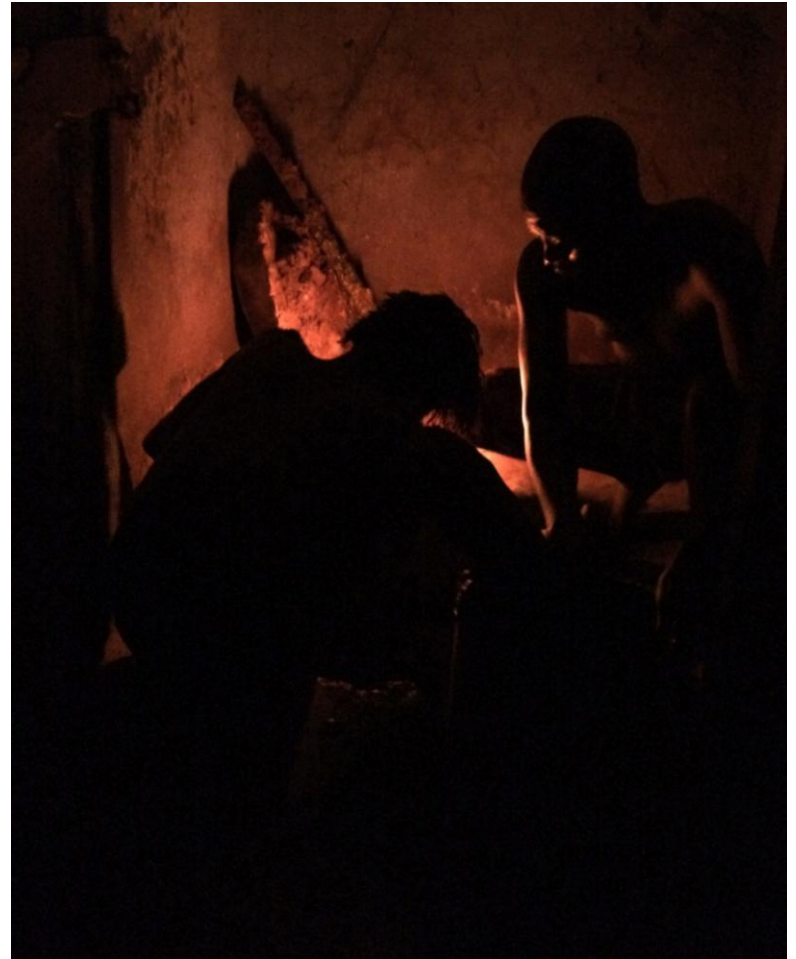


Population: 913,334

- 2% sewers
- 37% septic tanks
- 60% Latrines
- Latrines emptied manually
- ~490 tons/day generated in slums

# Objectives

- Build relationships with pit latrine emptiers
- Identify and implement collection opportunities
- Experiment with incentives that encourage safe emptying and disposal at WWTP

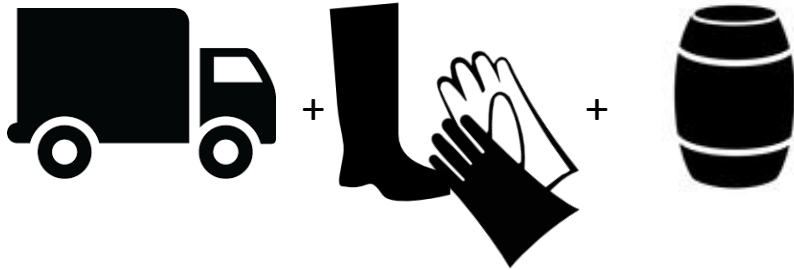




# Incentive Trial

Pivot Provides transport, PPE, containers, and training

Emptiers Bring Sludge to Focal Point



Emptier  
Baseline  
Surveys



10 Week Trial  
Treatment: Chaani  
Control: Portreitz

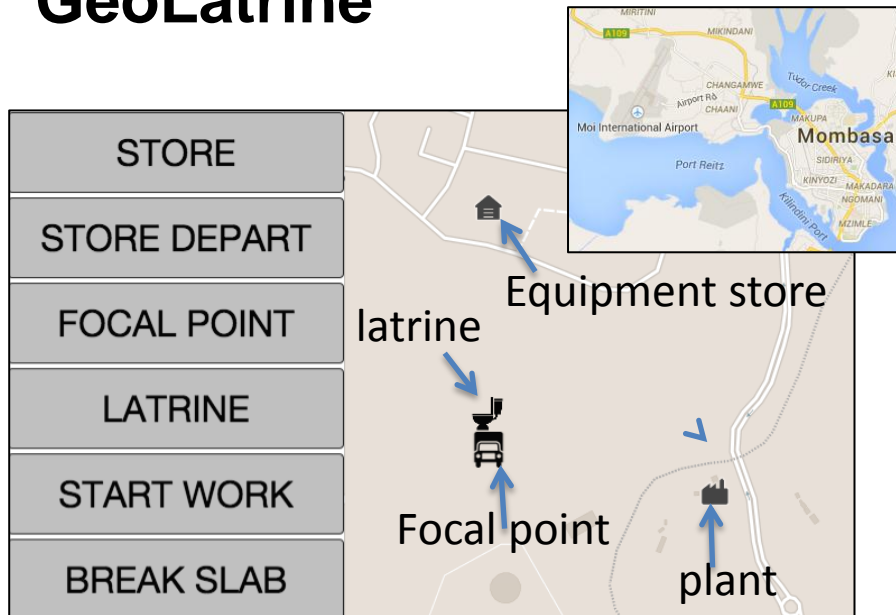


Emptier &  
Household  
Follow Up  
Surveys



# Supply Chain Analysis

## GeoLatrline



## Surveys and Focus Groups



## Households and Emptiers

### Mobile Web App

- logistics tracking
- emptying activity, location, time
- Volume Transported



Local Entrepreneurs

Capacity: ~8140 L

\$0.05/L

**\$ 57.25/ton**

Company 1

Capacity: 1325 L

\$0.062/L

**\$ 56.93/ton**

Company 2

Capacity: 2840 L

\$0.063/L

**\$48.80/ton**

Company 3

Capacity: 3000 L

\$0.11/L

**\$ 105.58/ton**



Vacuum Truck and Transfer Station

15,000 L Transfer Station

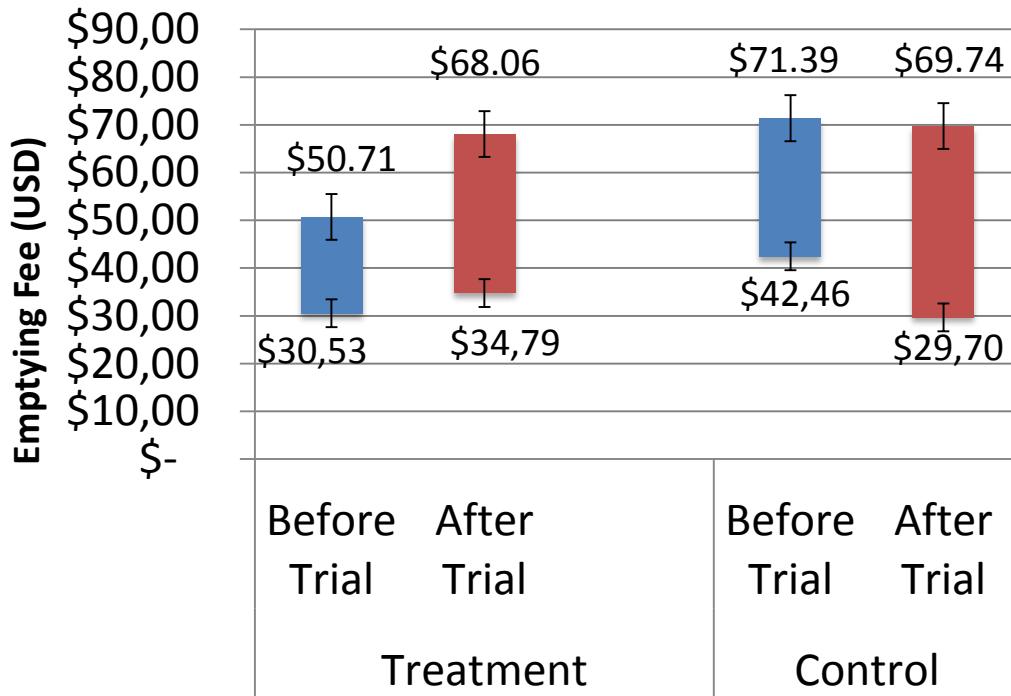
**Estimated: \$ 42.80/ton**



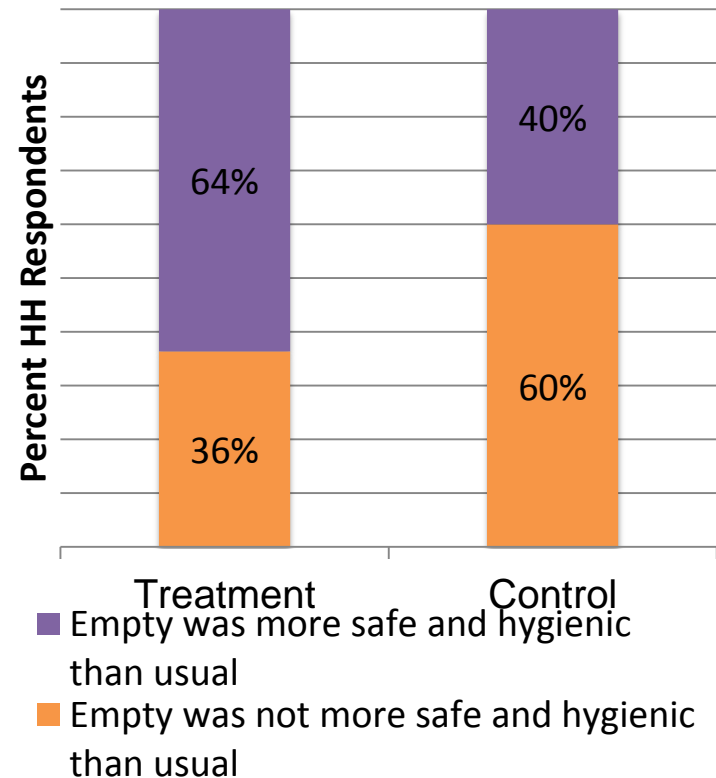
Transportation costs not covered by fuel revenues

# Pit Emptiers Can Increase Revenue by Offering Safe Sludge Disposal

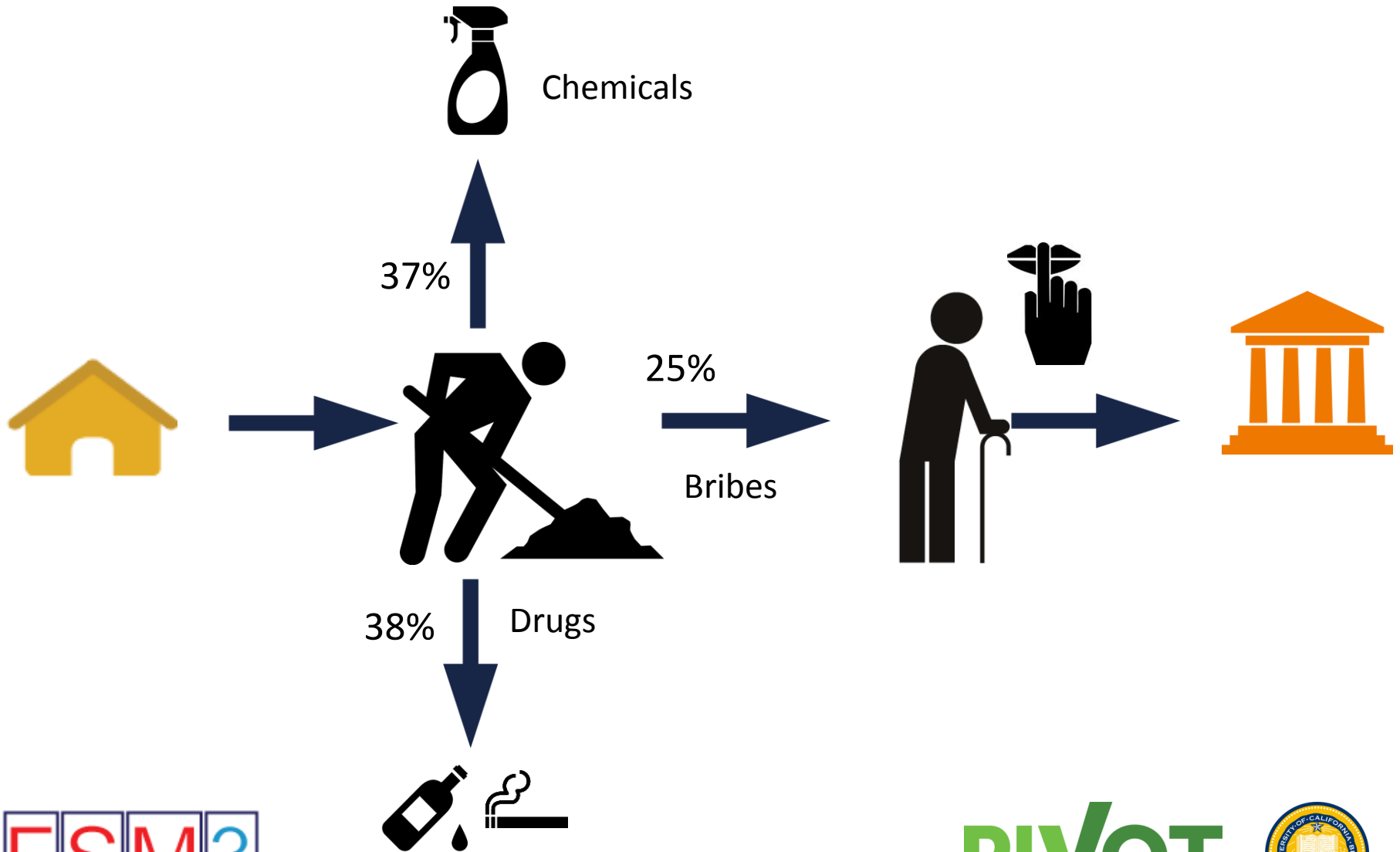
## Household Payment For Emptying Services



## Household Perception of Emptying Service



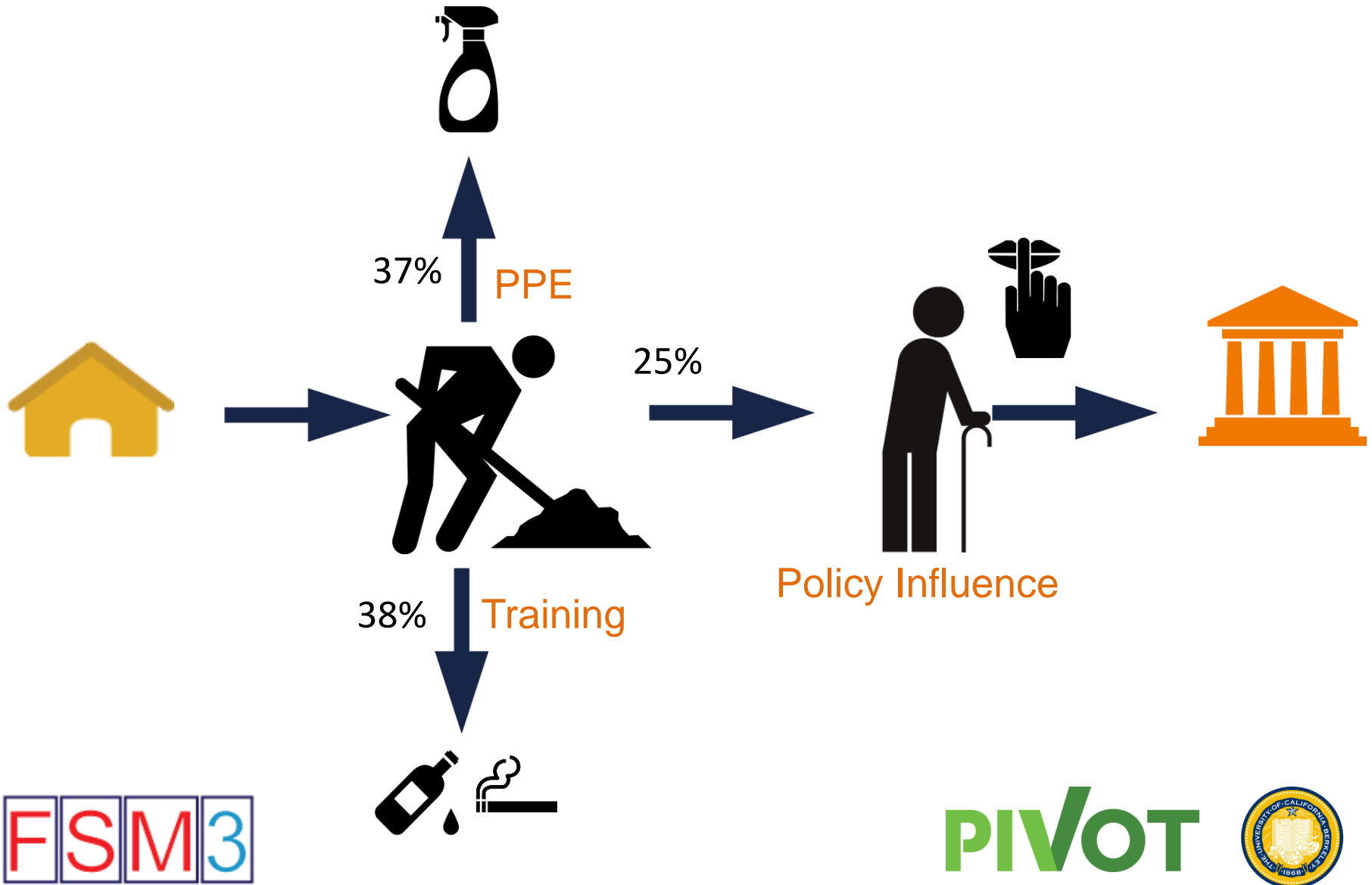
# Pit Emptying Overhead Costs





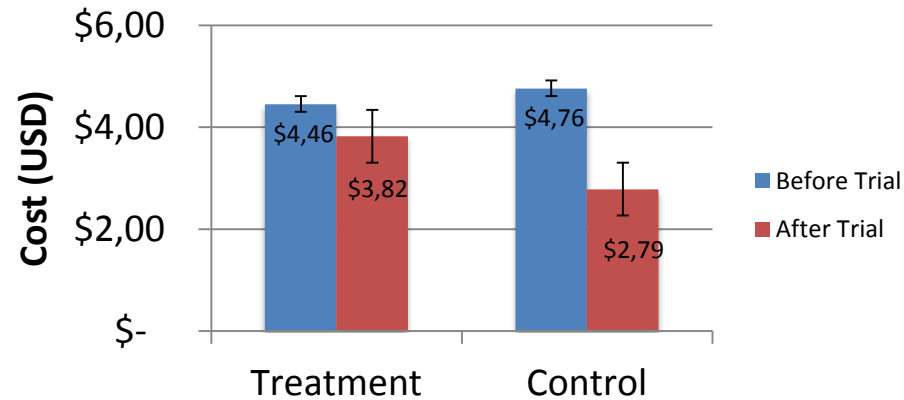


# Reducing Pit Emptying Overhead Costs

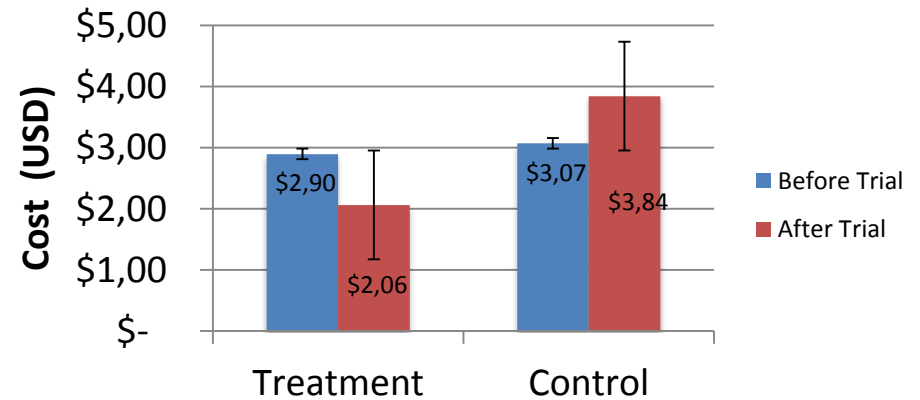


# Incentive Programs may help Reduce Pit Emptying Overhead Costs

Average Cost of Disinfectants used during Emptying



Average Costs of Drugs Consumed during Emptying



**“I like transporting sludge away from the community because a clean environment is a better life”**



**Charo Silas, Manual Pit Emptier**

# Key Findings

- Potential to cover transportation costs
  - Increase emptier revenue
    - Training/empowering = better service
  - Reduce emptier overhead costs:
    - PPE provision
    - Training
- Identification of hidden actions and new stakeholders in the supply chain
  - Bribes to local leaders





# Future Directions

- Decrease costs for emptiers via
  - Household Marketing
  - Sludge pumps
  - Policy advocacy
- Alternative cost structure modeling
  - Incentives for households, truck companies, and local leaders



# Thank You



School of  
Public Health

UNIVERSITY OF CALIFORNIA, BERKELEY

BILL & MELINDA  
GATES *foundation*



PIVOT

