

A health risk assessment of wastewater use in Accra, Ghana



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Background

- Food hygiene and food safety are major public health concerns – 1.8 million diarrhoea related deaths attributed to contaminated food and drinking water
- Risk factors for produce contamination are diverse – may include wastewater irrigation and market practices.
- Increasing use of wastewater for urban agriculture due to rapid urbanization, and increasing competition for water.
- Current WHO guidelines on wastewater use recommend a multiple-barrier approach to protect consumer and farmer health

Research Objectives

1. To determine the risk factors for salad produce contamination at different entry points of the food chain
2. To assess whether knowledge and awareness of wastewater use for urban agriculture influenced buying and consumption of produce grown on wastewater, and also whether it affects adoption of health protective measures

Study design and data collection

Cross-sectional study design with mixed methods



1. Questionnaires - 582 participants (farmers, market vendors, street food vendors, chefs at restaurants & hotels)



2. Observations, > 450 hr observations, 150 participants (farmers, market vendors, street food vendors)



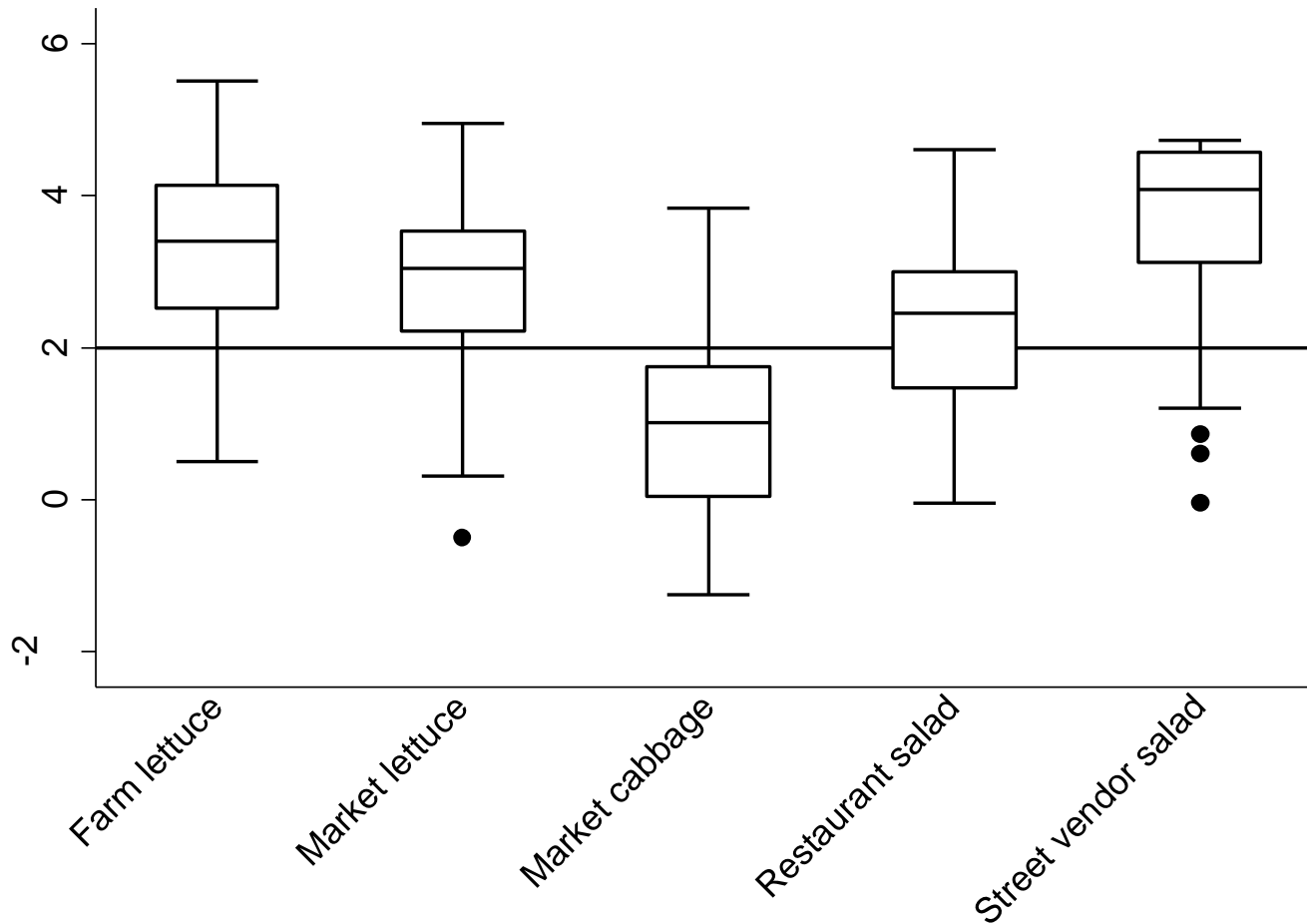
3. Focus group discussions - 6 FGDs (Farmers, market vendors)



4. Environmental sampling & lab analysis: > 800 samples (Irrigation water, farm soil, raw produce (cabbage & lettuce), ready-to-eat salad)

Microbes : *E. coli*, norovirus & adenovirus

Produce quality along the food chain

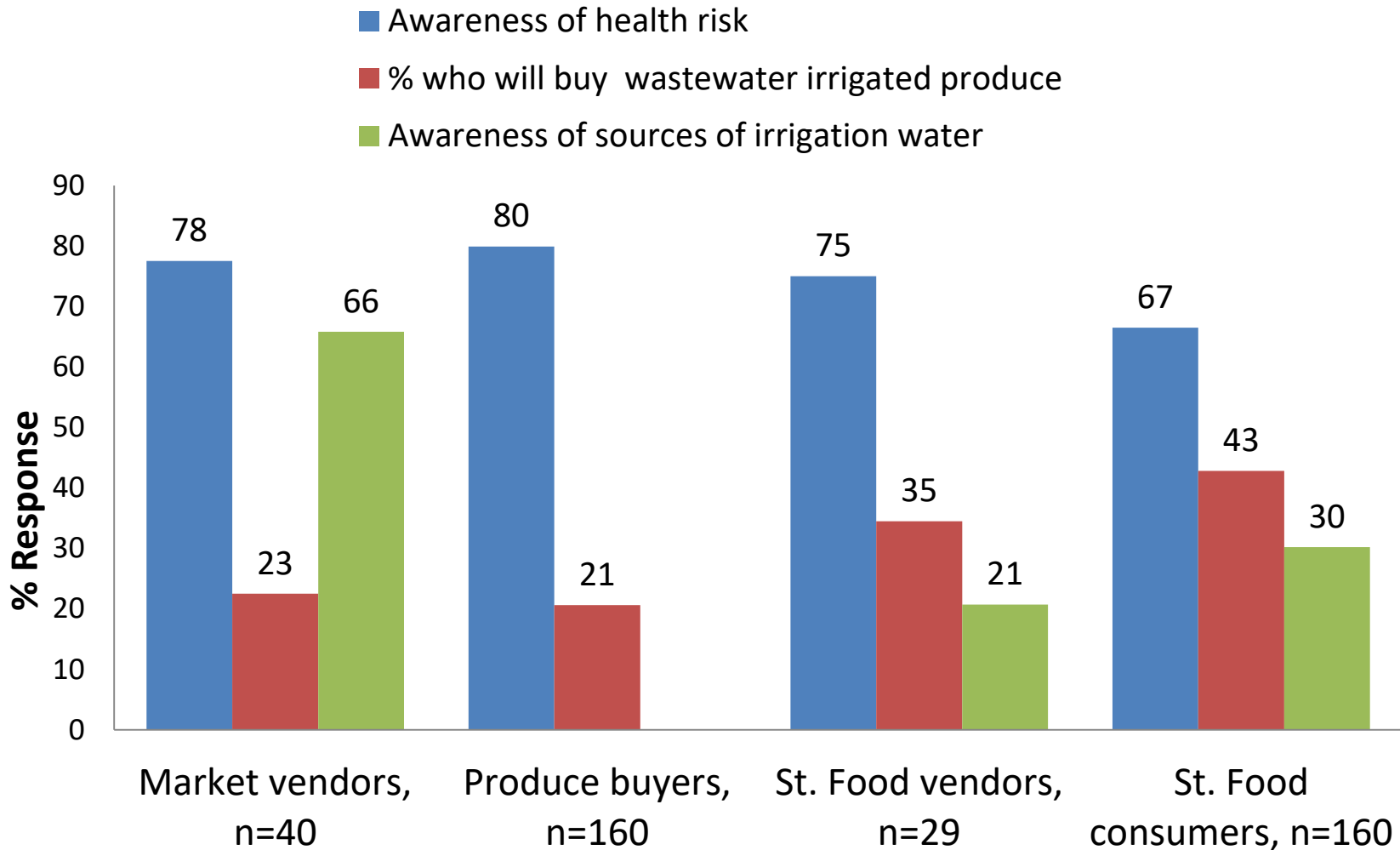


Solid horizontal line: limit of *E. coli* concentration classified as microbiologically satisfactory for consumption (% exceeding 2 Log *E. coli*/g - street vended salad, 90% (N=59), farm lettuce, 88% (N=159), market lettuce, 80% (N=134), restaurants salad, 60% (N=20), market cabbage, 18% (N=129)).

Risk Practices

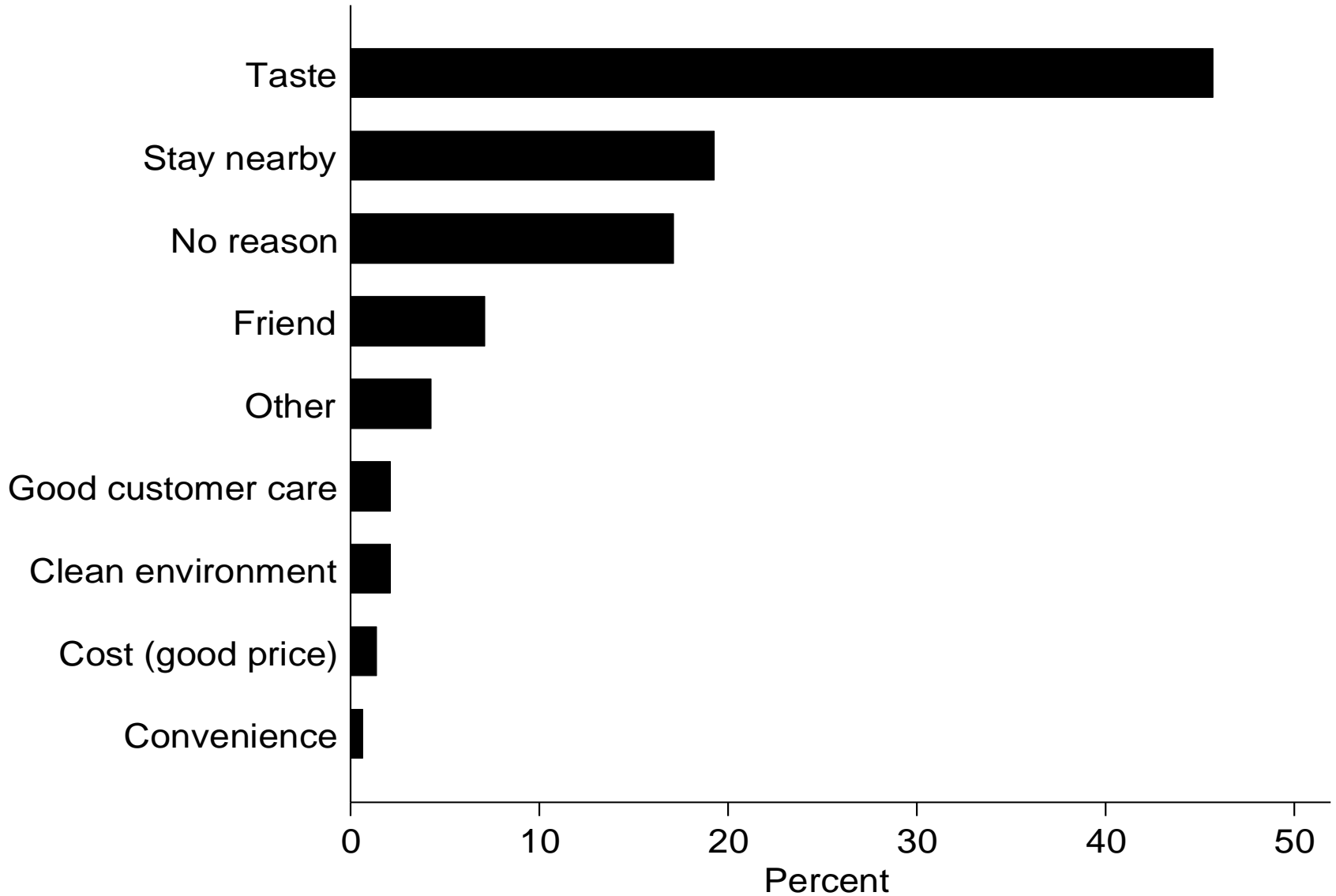


Perceptions of wastewater use for urban agriculture

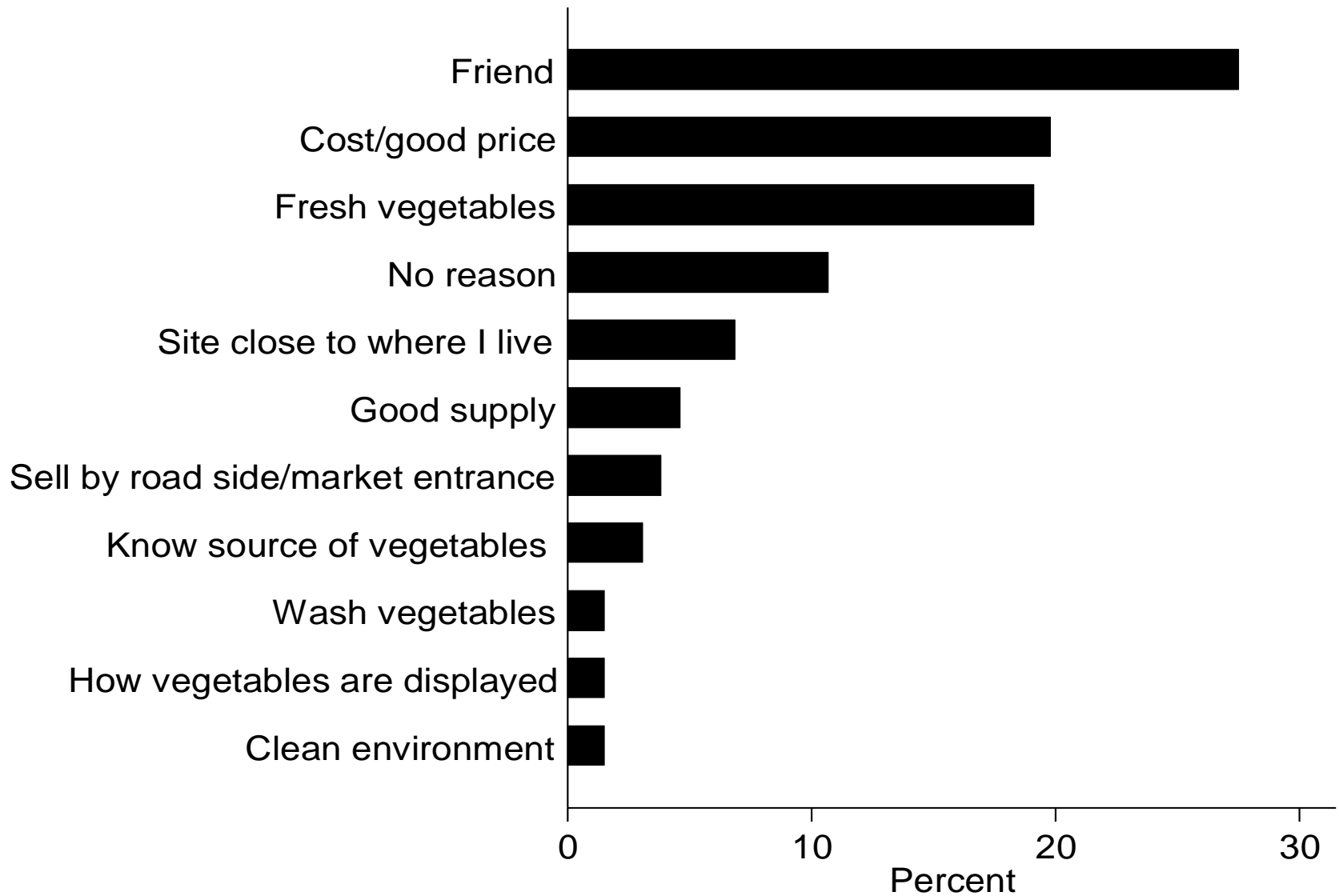


- Street food consumers who are **aware of the health risk of wastewater irrigation** are **2 times** as likely not to buy prepared salad compared to those who are unaware
- Domestic consumers who are **aware of the source of irrigation water for salad** are **8 times** as likely not to buy wastewater irrigated produce compared to those who are unaware

Main factors influencing street food consumers to buy prepared salad from vendors (N=160)



Main factors influencing domestic consumers to buy produce from market vendors (N=160)



How to reduce risk

1. Wastewater treatment/crop restriction (where resources permit)
2. Health education/inspection, enforcement of food safety byelaws
3. Promotion of interventions that would result in direct benefits to producers and vendors (loan/credit schemes, recognition/support to vendor and farmer associations, land security, etc.)
4. Regulators to award safety or health certificates to those who comply with safety guidelines
5. Prepare salad yourself or buy freshly prepared salad

Concluding messages

1. Produce contaminated at all domains with street vended salad the most contaminated – more contaminated than those irrigated at the farms.
2. Interventions at farms are necessary, but adequate post-harvest measures at markets and food kitchens regarded as more critical.
3. Awareness of health risks alone may not significantly influence positive behaviour change on food safety measures, or adoption of health protective measures

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