# How informal waste collection improves public health and reduces urban flooding: Evidence from Accra

Ignacio Banares-Sanchez and Yoshiki Wiskamp

- This brief outlines the initial findings from a survey of 1,800 households in Accra, Ghana. The survey is part of a study that seeks to advance our understanding of informal waste collection markets and explore how various market design policies might improve them.
- Among surveyed households, 80% rely on informal waste collection services, even in areas where formal collection is available. Informal waste collectors charge lower prices than formal companies, provide collection services more frequently, and rely on day-to-day payments rather than weekly or monthly fees.
- Evidence from a survey experiment suggests that collection frequency and price are the key determinants influencing households' choice between different waste disposal options. Low-income households respond the most to changes in price. Small price reductions may lead to large increases in collection rates for this sizeable population group.
- Access to and usage of informal waste collection are associated with better public health outcomes and reduced flooding experiences.
- It is challenging to monitor reduced flooding due to improved solid waste management with satellite data.On-the-ground measures seem to be needed.

POLICY BRIEF GHA-23147

JANUARY 2025

This project was funded by IGC Ghana

**theigc.org**

DIRECTED BY

FUNDED BY

# Introduction

In developing cities worldwide, from the sprawling urban centres of West Africa to Asia's megacities, waste generation has increased to unprecedented volumes. Outpaced by rapid urbanisation, inadequate infrastructure, financial stress, and poor governance, formal solid waste management services provided by municipal governments directly or via contracted private companies are falling short of the needs of the growing population. As a result, citizens resort to the indiscriminate dumping of waste in open drains, illegal disposal in unregulated dumpsites, and burning. These behaviours are associated with several threats to humans and nature. Waste burning is a key source of local air and water pollution. Solid waste left uncollected in open dumpsites is linked to air, groundwater, and soil degradation and is a source of GHG emissions. Furthermore, blocked drains are behind the chronic floods hitting the poorest urban areas during heavy rain periods. Urban flooding harms human lives, damages buildings, roads, and household assets, and disrupts economic activity, leading to income loss for workers and firms.

> **The municipal public service delivery gap has been filled by informal door-to-door waste collectors who now play a crucial role in managing waste, particularly in lower-income neighbourhoods.**

In the city of Accra, more than 50% of households rely on these informal door-to-door waste collectors, known as "Borla Taxis," who travel across the city from the poorest to relatively affluent neighbourhoods, loading their tricycles and disposing of the collected waste at the end of the day in designated landfills.

In this brief, we provide descriptive evidence of the importance of informal waste collection in reducing health and environmental damage such as flooding. We also document why informal waste collectors have become the main choice for household waste disposal.

# Overview of the research

The importance gained by alternative service providers such as Borla Taxis in Accra raises several questions: Does informal collection improve citizens' welfare? How should governments and formal monopolies, the initial providers of waste management services, interact with informal providers? And what policies can municipal governments implement to improve waste collection markets under this new scenario?

In this study, we conduct surveys with households and waste collectors in Accra to understand how informal waste collection and disposal markets work and how they can be improved to increase collection to full coverage across Accra

and raise recycling rates. Our study area is the main Accra metropolis within the Greater Accra Metropolitan Area, which spreads across 13 municipal districts, 124 localities, and 2,820 enumeration areas (according to the 2021 Population and Housing Census).

Our population of interest is low- and middle-income households, which may be underserved by formal waste management providers. Based on the 2010 Population and Housing Census, we randomly select 150 enumeration areas (EAs) across low- and middle-income EAs and survey 12 households within each EA to form a sample of 1,800 households.

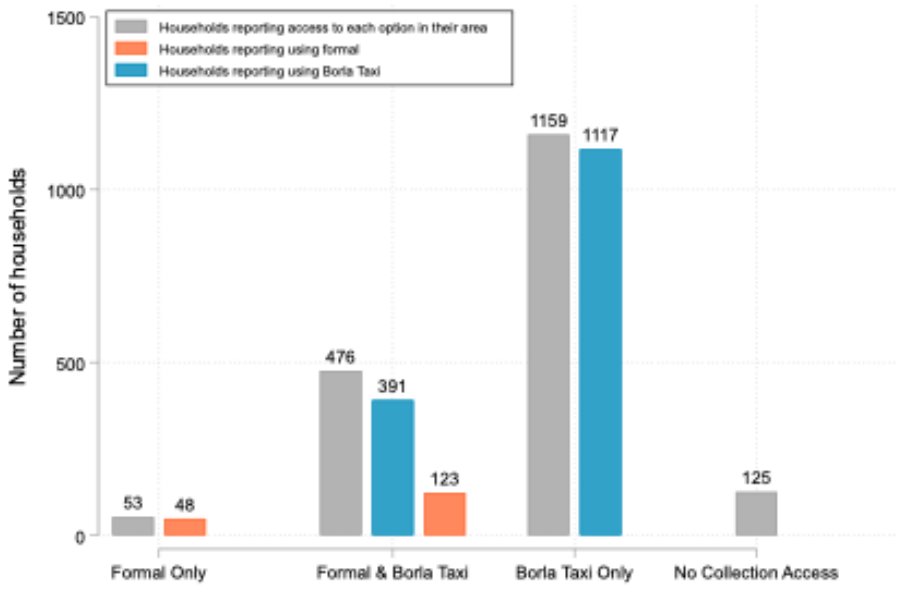


# Key findings

## Supply and demand for waste collection

Borla Taxis are the main waste disposal choice for 80% of the households in our sample, partly because they serve more areas than formal collectors. Figure 1 shows that formal companies do not reach 1,159 households in our sample. These households solely have access to informal collection services provided by Borla Taxis. Otherwise, they must dump their waste in communal containers, in the street, in gutters, or to burn. Most households report using Borla Taxis. Interestingly, 476 households in our sample report having access to formal and informal collection in their area. 391 (82%) of these households use the service provided by Borla Taxis, while only 123 (26%) use the available formal provision in their neighbourhood. Finally, 125 households report no access to collection services at all. These households dump at communal containers if available, burn, or dump indiscriminately.

**FIGURE 1: Waste collection access and usage**



Why are households predominantly choosing to dispose of their waste via Borla Taxis? If Borla Taxis are providing a good service, what are the consequences of not having access to or using them?

To answer the first of these questions, we conducted a survey experiment with 720 randomly selected households in our sample. We showed eight cards like the one depicted in Figure 2. These cards included household waste disposal options and randomly selected different values for their key characteristics: price, time cost, frequency, and need to sort.

**FIGURE 2: Choice cards used to understand waste disposal choices**

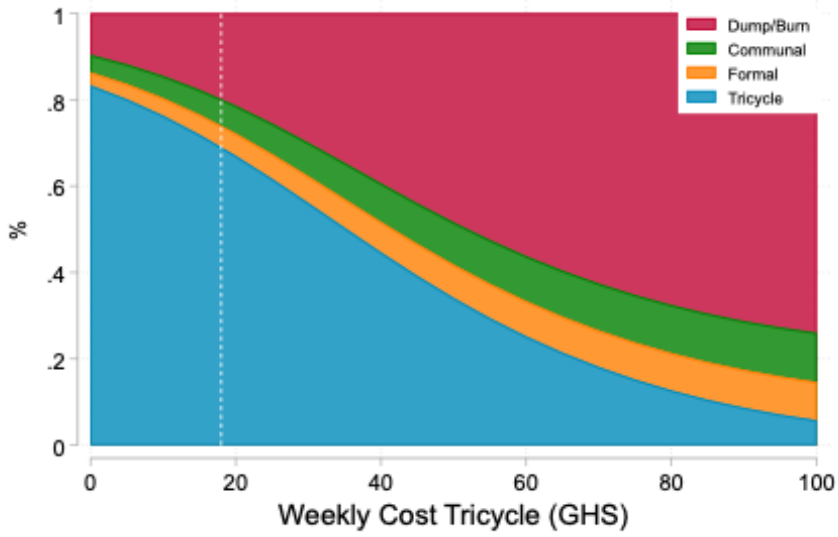
| | *Borla Taxi* | *Formal Truck Collector* | *Communal Container/ Open* | *Burn/Dump* |
|---|---|---|---|---|
| *Frequency* | **Everyday** | **Every 14 Days** | **Everyday** | **Everyday** |
| *Weekly Collection Price* | **10** | **10** | **5** | **0** |
| *Time Lost* | **10 min** | **5 min** | **15 min** | **5 min** |
| *Need to Sort* | **No** | **No** | **Yes** | **No** |
| **Your Choice** | ☐ | ☐ | ☐ | ☐ |

The choices made by households in these scenarios paint a clear picture. Price and collection frequency are the key determinants influencing the choice between different waste disposal options. Higher prices negatively affect households' willingness to choose a disposal option; a lower frequency (higher number of waiting days) also has a smaller negative effect. Time is costly, particularly when deciding to burn or dump. Our estimate for the need to sort waste or not is noisy, but waste sorting does not seem to deter households from choosing one option or another. On the contrary, households seem more willing to use a disposal option that requires waste sorting.

How do these preferences then translate into actual choices? Household responses in our survey showcase that Borla Taxis provide their collection

service with much higher frequency than formal companies and with no additional time cost. They also offer a cheaper weekly price. Communal containers, which are not available everywhere in Accra, are relatively far away in walking time for most households in our sample. They also require a disposal fee, which is not much smaller than Borla Taxi's fee for door-to-door collection. We estimate waste disposal choices for different collection prices charged by Borla Taxis (Weekly Cost Tricycle in the figure) using the data recorded in our survey and the results of our experimental exercise. Figure 3 displays the results. At current prices (slightly below GHS 20 weekly on average), Borla Taxis dominate the market. However, significant improvements can be achieved by lowering prices and expanding their operating areas.

**FIGURE 3: Waste disposal choices at different Borla Taxi (Tricycle) prices**



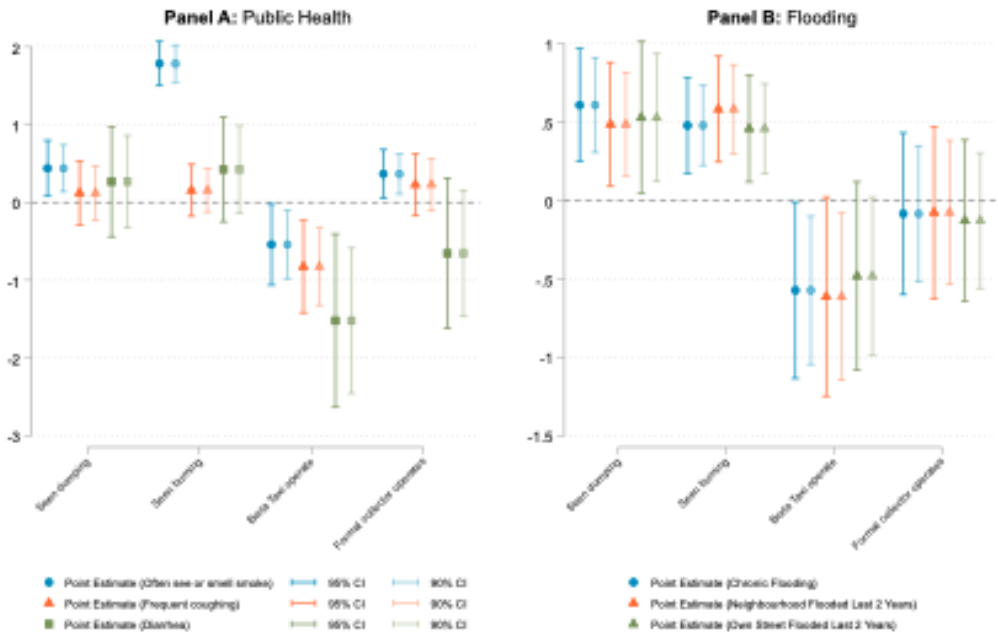

These descriptive results show that the service provided by informal collectors is much more attractive for households. Our analysis shows that reductions in collection prices will further increase informal waste collection shares, displacing detrimental behaviours such as burning and dumping.

## Waste dumping, public health, and urban flooding

What are the potential consequences of an expansion of informal waste collection services? This section analyses the relationship between informal collection and some of the most important damages associated with improper waste disposal. We asked households about their experiences with common symptoms and diseases related to waste burning and open dumping. We also included questions on flooding experiences in their area. We asked households whether their neighbourhood floods when it rains heavily and whether they have experienced flooding in their neighbourhood and streets in the last two years.

In Figure 4, we report the results of our analysis, examining the relationship between waste collection access, flooding, and health indicators. If households report seeing neighbours burning or dumping, there is a higher probability of them also seeing or smelling smoke and experiencing frequent coughing and diarrhoea. However, Borla Taxis collection is associated with a lower probability of seeing and smelling smoke and experiencing coughing and diarrhoea. Conditional on Borla Taxis operation, formal collection is not associated with changes in health outcomes (Panel A). The pattern we observe for flooding is very similar. Seeing burning and seeing dumping are both associated with a higher probability of experiencing flooding during rainy periods. Access to Borla Taxis is associated with a lower probability of experiencing flooding, while formal collection does not change the probability of experiencing flooding, conditional on informal collection access (Panel B). The conclusions from this analysis, while correlational, are compelling. Dumping and burning are associated with negative health outcomes and flooding experiences. Access to informal door-to-door collection is associated with a lower incidence of negative health outcomes and flooding. Access to formal collection does not seem to alter health and flooding outcomes.

**FIGURE 4: Relationship between waste collection, health, and flooding**



## Monitoring urban flooding using satellite data

Can policymakers measure flooding events and assess how they change with improvements in solid waste management? We conjecture that improvements in how Borla Taxis operate and reductions in collection prices will influence flooding events in Accra. Local policymakers may wish to retrieve data on flooding events during heavy rain periods to monitor these changes.

We obtained radar data from the Copernicus Sentinel-1 mission and used the European Space Agency's (ESA) algorithms to detect urban flooding over Accra during the last two years. We could only obtain a limited number of images due to the need for a satellite to be over Accra when a heavy precipitation event occurs. Applying ESA's urban flooding algorithm, which considers the position of buildings and the city's elevation profile, we detected flooding on seven days. Figures 5 and 6 showcase an example. On 25 October 2020, there was a heavy rain period with precipitation exceeding 20 mm/hr, a value after which it is common to observe flash flooding (Figure 5). The map in Figure 6 displays the EAs that experienced some flash-flooding according to satellite data.

We crosscheck how well our satellite-based measures predict actual self-reported flooding. Using the field measures of chronic flooding and flooding experiences during the last two years reported by 1,800 households across 150 EAs, we can correctly predict close to 50% of cases. These are EAs where households report no flooding and satellite images detect no flooding over the last years (28%) and cases where both datasets show flooding (21%). Reassuringly, only 11% of cases are false positives (predictions of flooding not confirmed by our survey). In 39% of EAs, households reported experiencing flooding during our survey that we could not detect using satellite data. This may be due to the low time coverage of Sentinel-1, which passes by with low frequency, or due to imprecisions in the detection algorithm.

While promising, this analysis suggests satellite-based flooding measures should be complemented by on-the-ground measures from monitoring stations or quick surveys in flood-prone areas. This will allow us to monitor whether solid waste management improvements continue to translate into a lower risk of flooding.

**FIGURE 5: Heavy precipitation during 25 October 2020**

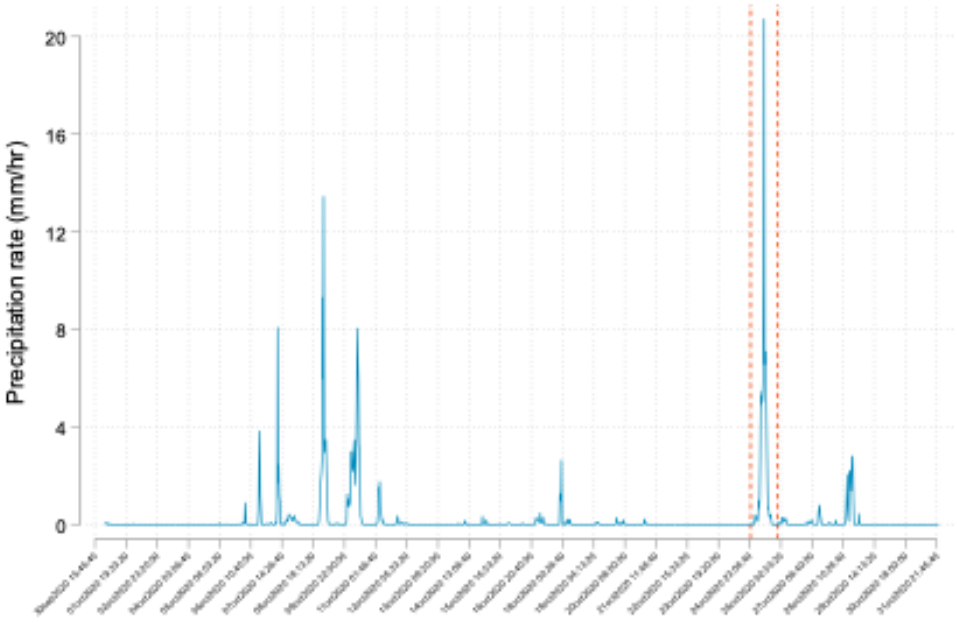
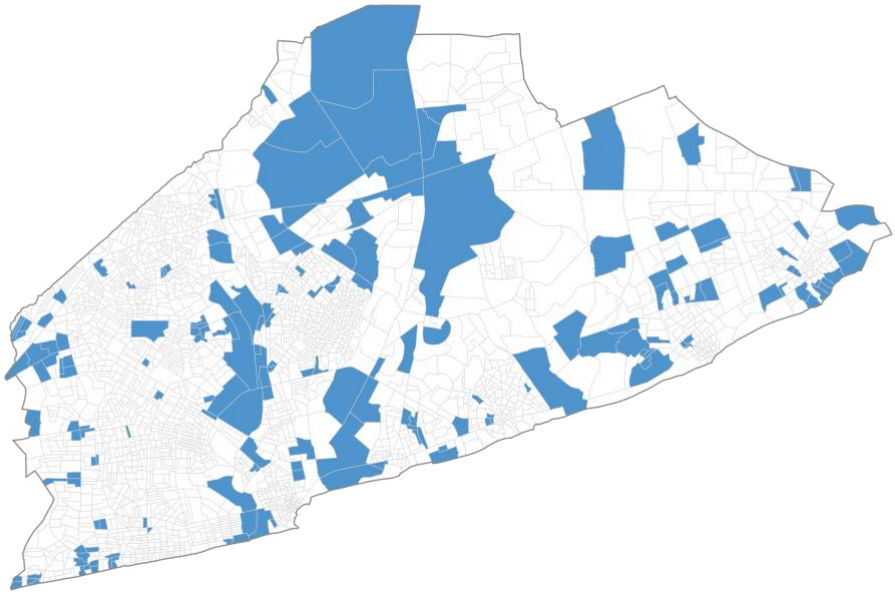



**FIGURE 6: Areas that experienced flash-flooding according to satellite data**



## Policy Recommendations

- Informal service providers represent the main choice for household waste disposal in Accra, particularly for lower-income households. They offer a better service than other options, and, importantly, they displace polluting behaviours such as waste burning and indiscriminate dumping. Still, their unregulated nature and the competitive structure of the informal market means there is scope for municipal governments to leverage their successful activities and improve collection and recycling rates.
- Informal collectors rely on formal companies to recycle and dispose of their waste. If they are to become the city's main provider of collection services, municipal governments should seek to integrate informal collectors with formal counterparts in the solid waste management chain. Even without formalisations, lowering the costs that Borla Taxis pay or facilitating their access to revenue from recycling may help expand their operations and lower their prices, progressively increasing collection shares.
- Better waste management via informal collectors is associated with better health outcomes and a lower incidence of flooding. While satellite-based data and urban flooding algorithms might be useful in monitoring progress, they are still unreliable beyond 50%. Thus, governments may want to develop on-the-ground data resources to monitor the incidence of flooding across neighbourhoods in Accra. Good data can help steer waste collection efforts towards neighbourhoods with more severe flooding.