

Cooking up a storm

Community-led mapping and advocacy with food vendors in Nairobi's informal settlements

Sohel Ahmed, Edwin Simiyu, Grace Githiri,
Alice Sverdlik and Shadrack Mbaka

Working Paper

June 2015

Urban

Keywords:

Urban food security, enumerations,
informal settlements, urban poverty

About the author

Sohel Ahmed (*corresponding author*) is a research associate at the Development Planning Unit (DPU) of University College London (UCL). sohel.ahmed@ucl.ac.uk

Edwin Simiyu has served as a program officer specialising in mapping and surveying at Muungano Support Trust (MuST) since 2010. He holds a Master's in Geographic Information Science from the University of Nairobi.

Shadrack Mbaka has served as the Communications Officer at MuST for 4 years, after earning a B.A. in communication and media studies at Egerton University. He is also the editor of Muungano wa Wanavijiji's blog (<https://muunganosupporttrust.wordpress.com>)

Grace Githiri was a Graduate Assistant at MuST and a Research Intern at UN-Habitat. She is presently a Master's candidate in Sustainable Urban Development at the University of Nairobi.

Alice Sverdlik is a PhD student in City and Regional Planning at UC Berkeley, currently conducting her fieldwork in Nairobi's informal settlements. sverdlik@berkeley.edu

Produced by IIED's Human Settlements Group

The Human Settlements Group works to reduce poverty and improve health and housing conditions in the urban centres of Africa, Asia and Latin America. It seeks to combine this with promoting good governance and more ecologically sustainable patterns of urban development and rural-urban linkages.

Acknowledgements

We acknowledge the outstanding contributions by Muungano wa Wanavijiji, particularly Julia Wacera, Nancy Njoki, Pauline Waigumo, Jane Wacera, Jane Wanjiru, Peter Mutunga, Antony Waweru, Willy Maina, Joseph Muendo, Baba Mark, and national leaders Rashid Mutua and Joseph Muturi. Their vision and dedication have been essential in generating all the findings reported in this paper. Research will continue in additional informal settlements during 2015, while building upon our past collaborations with food vendors. Profound thanks are also due to the Ghana Federation of the Urban Poor, People's Dialogue for Human Settlements, Irene Karanja, and Jack Makau for their support since the beginning. We received extremely valuable support from Professors Julio Davila, Muki Haklay and Adriana Allen at UCL; Eric Fèvre at the University of Liverpool; Faith Karanja at the University of Nairobi; and Jason Corburn at UC Berkeley. Finally, we are deeply grateful to IIED researcher Cecilia Tacoli for her insights, mentorship, and unwavering enthusiasm.

The project was made possible by funding from the Department for International Development (UKAID). We also acknowledge the Medical Research Council, Natural Environment Research Council, Economic and Social Research Council, and Biotechnology and Biosciences Research Council for the funding received for this project through the Environmental and Social Ecology of Human Infectious Diseases Initiative (ESEI), Grant Reference: G1100783/1.

Published by IIED, June 2015

Sohel Ahmed, Edwin Simiyu, Grace Githiri, Alice Sverdlik and Shadrack Mbaka. 2015. *Cooking up a storm: Community-led mapping and advocacy with food vendors in Nairobi's informal settlements*. IIED Working Paper. IIED, London.

<http://pubs.iied.org/10734IIED>

ISBN 978-1-78431-196-4

Printed on recycled paper with vegetable-based inks.

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org

 @iied

 www.facebook.com/theIIED

Download more publications at www.iied.org/pubs

Food security is rarely prioritised in African cities, and food vendors are similarly ignored or stigmatised, despite providing a range of affordable, accessible meals. Furthermore, past research and urban policies usually overlook food hawkers selling *inside* informal settlements. Based on participatory research in Nairobi, this paper aims to address the invisibility of vendors in informal settlements and to inform more appropriate, inclusive urban food security strategies. Balloon-mapping and other novel mapping techniques were combined with focus group discussions to explore vendors' practices, challenges, and opportunities for promoting food safety. Our detailed maps, vivid narratives, and community-led strategies may cook up a storm that can create safer foods and more secure livelihoods, with benefits extending across African informal settlements.

Contents

Executive summary	4	3.2 Rapid mapping of food vendors: Spatial distribution and linkages with environmental health and infrastructure provision	20
1 Background	6	4 Discussion: Unfolding the opportunities, challenges and policy/practice gaps	26
1.1 Food vendors and food security in African cities	6	4.1 The challenges of food vending in informal settlements	26
1.2 How this study was initiated and shaped by residents in African informal settlements	9	4.2 Opportunities and priorities	28
2 How did the community do it? Participatory mapping with and for the community	10	4.3 Utopian laws on paper vs harsh reality: Wide gaps between policies and practices	30
2.1 Federations of the urban poor and community-led mapping in the global South	10	5 The journey does not end here: From discussion and mapping to transformative action	32
2.2 Community-led mapping of food, infrastructure and the environment in Nairobi's informal settlements	11	6 Conclusions: Key findings and priorities for action—research and advocacy	34
3 What did they find? Local spatial knowledge on food and environmental health	17	References	36
3.1 Narratives on food-vending activities: Diversity in typology, working hours, locational benefits and challenges	17	Related reading	38

Executive summary

Although the 2008 food crises briefly revealed the importance of promoting urban food security, it is rarely recognised as a key concern in African cities. Policy makers usually overlook food security in urban areas, viewing it as only a rural issue, and urban food vendors are typically ignored or even stigmatised. However, these workers offer a wide array of affordable, accessible meals, which are often a mainstay for low-income households struggling with rising food and fuel prices. Food vending is also a vital livelihood strategy in African cities, especially for female traders who may have few other income-generating options. Yet food vendors' key contributions to African urban economies and to sustaining households in informal settlements are usually disregarded by policymakers or past researchers. Instead, food vendors are frequently criminalised as a public health nuisance, while previous studies mainly focus on African food vendors in markets or the Central Business District (CBD). Existing research has failed to consider hawkers *inside* informal settlements, including their particular challenges in maintaining food safety and coping with pervasive environmental hazards.

This paper discusses a participatory mixed-methods project in Nairobi that seeks to address vendors' invisibility in African informal settlements and to develop innovative interventions. Research was conducted in 2013–2014 by the Kenyan Federation of the Urban Poor, *Muongano wa Wanavijiji*, assisted by Muungano Support Trust (MuST), the International Institute for Environment and Development (IIED) and the Development Planning Unit (DPU) of University College London (UCL).

Working closely with residents, the partners mapped food vendors in three informal settlements and analysed the associated environmental concerns. A range of novel mapping techniques were used, including community-led paper mapping, low-cost aerial photography (balloon mapping) and a mobile phone application. Focus group discussions (FGDs) with vendors and livestock keepers further explored daily practices, challenges, and opportunities for improving food safety. Nairobi has approximately 175 informal settlements with 2.5 million residents, representing 60 per cent of the

city's population but occupying just 6 per cent of the land. We examined how food vendors are affected by informal settlements' physical constraints, such as poor roads, inadequate water reticulation, minimal sewerage and congested public spaces.

Our findings reveal the variety of foods sold and their benefits to residents of Nairobi's informal settlements, as well as multiple challenges facing these vendors and livestock keepers. We highlight the pivotal role of locational factors, including vendors' access to infrastructure, levels of insecurity and proximity to various hazards. Inadequate infrastructure and services may pose several threats to food safety and livelihoods, such as the following concerns:

- Selling foods near uncollected rubbish, without adequate water and sanitation and with only improper storage or non-existent refrigeration can all promote food contamination.
- Some vendors sell near water taps, but they may lack the money or time to wash their foods, utensils or hands thoroughly.
- Inadequate public lighting and elevated levels of insecurity can also prevent vendors from selling after dark.

Nevertheless, street foods do provide multiple benefits to customers in terms of affordability and accessibility in addition to offering key opportunities for female traders. Although food vendors encompass women or men, old or young residents, many are female traders who are more likely to sell fresh produce or certain cooked foods such as *githeri* (beans and maize stew). Mothers with small children are often less able to travel and, more generally, women may have few livelihood alternatives due to their limited skills or access to capital. As a result of these constraints in resources, training, transport and access to childcare, as well as gender norms that already link women with cooking, selling food in their communities can be an especially crucial income-generating activity. Demonstrating the importance of food vendors can foster women's empowerment via greater recognition of their contributions. Analysing the gendered or other differences among vendors can

also inform strategies to reduce poverty and promote gender-equitable initiatives.

Vendors are deeply embedded in informal settlements, but we suggest that the very advantages of convenience and proximity to their fellow residents can also generate health risks that will require holistic interventions. Future initiatives to promote food security will need to be tailored to diverse food vendors and should reflect the contextual specificities of their informal settlements. Vendors' needs may differ significantly based on food type, such as cooked meals, fresh produce, packaged goods, and dried beans or cereals. Other differences may include sellers' levels of mobility and methods of display: some are mobile hawkers while others sell items on the ground or from fixed sites (kiosks). Traders' interactions with livestock keepers and other residents are again highly complex, requiring careful consideration when proposing any future initiatives. During our FGDs, residents often prioritised the following interventions:

- Adequate water, sanitation, drainage and regular rubbish collection
- Offering sheds and adequate storage, in order to promote food safety as well as allowing vendors to continue operating along the streets
- Vendors, livestock keepers and other residents can also help to develop appropriate designs for markets, waste disposal points and other community-led solutions to transform public spaces.

Via mapping, advocacy, and newly-established vendor groups, residents gained in confidence and demonstrated that food vending is a major lifeline in their settlements. In 2013, the project led to the creation of a pioneering Food Vendors' Association (FVA), comprised of traders working across Nairobi's informal settlements. The FVA has sought to improve local environments and to forge an advocacy platform, thereby overcoming vendors' long-standing invisibility and isolation. Several participants themselves recognised the significant potential of using mapping tools to transform vendors' status and increase their public profile.

Additionally, our discussion indicates that existing Kenyan laws and policies are highly inappropriate and exclusionary to vendors and livestock keepers. City governments usually ignore vendors or blame them for unsafe foods, rather than recognising the systematic failure to provide services or to ameliorate living conditions. Food vendors in these settlements are also invisible in official statistics, much as informal settlements and informal workers more generally are often marginalised. Without sound housing and land tenure policies, as well as improved incomes, services and infrastructure, the urban poor will remain at elevated risk of food insecurity.

Although vendors in informal settlements are often overlooked, we argue that they can provide a central entry point for equitable food policy, practice and action—research in African cities. The close interrelations between vendors, environmental hazards and service deficits in informal settlements, as well as food's multiple links to community well-being, together make it critical to support this previously hidden trade. Our innovative mapping and vivid local narratives may provide the foundation for interventions that can recognise and support street foods in informal settlements. These community-led strategies may cook up a storm that could create safer foods and more secure livelihoods, with benefits extending across African informal settlements.

1

Background

1.1 Food vendors and food security in African cities

Food insecurity is a constant concern for the urban poor and demands a range of innovative, multi-dimensional solutions and greater political will in African cities. Multiple pressures are converging to threaten food security, which is defined as “... *when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life*” (FAO 2010: 8). Nowhere is the challenge more acute than in African cities, with widespread poverty, unresponsive local governance and insecure informal livelihoods that contribute to endemic food insecurity. Following Structural Adjustment Programmes (SAPs) in African cities, food insecurity became “... *a chronic problem experienced mainly by the poor, rather than a series of short-term acute crises*” (Maxwell 1999: 1950). Interventions are especially vital in light of the recent increases in food and fuel prices as well as the threat of climate change, all of which may only exacerbate existing inequalities (Ruel *et al.* 2010, Tacoli *et al.* 2013). This paper discusses the findings from a participatory action–research project with food vendors in Nairobi’s informal settlements, which can promote food security and motivate holistic interventions in African cities.

National and local leaders often overlook urban food security, thus missing the transformative potential

of creating inclusive, equitable urban food systems. Municipal policy makers in African and other cities usually neglect the importance of urban food security, although Dar es Salaam is an exception.¹ Viewing food security as only a rural issue, national decision makers typically focus on rural food production, food stocks and macroeconomic interventions (Cohen and Garrett 2010). But facile divisions between rural/urban food systems are misplaced, and food security is a challenge that transcends geographic scales and sectoral divides (Godfray *et al.* 2010, Misselhorn *et al.* 2012). Urban food systems have “... *profound effects on a host of other sectors*”, such as public health, energy, water, transport and economic development (Morgan 2009: 341). Promoting urban food security can also reconnect cities “... *socially, economically and environmentally with their surrounding regions*” (Sonnino 2009: 434). Using multi-sectoral approaches and recognising rural–urban linkages, policies to improve urban food security can thus bolster health, support rural livelihoods and undergird holistic city planning measures.

In Nairobi and other cities of the global South, the urban poor often face entrenched food insecurity, malnutrition and overwhelming food expenditure. A study of 20 low- and middle-income countries found extremely high levels of food expenditure among the urban poor, ranging from 48 per cent of household expenditure in Guatemala to 74 per cent in Tajikistan (Cohen and Garrett 2010: 469). These findings are echoed in Nairobi, where low-income households typically devote most of their expenditure to food but are often

¹ Officials in Dar es Salaam have supported urban agriculture and offered farmers support such as training and marketing assistance (Sonnino 2009: 430–431). See the overview on urban food security by Sonnino (2009) as well as a review focusing on the food, fuel and financial crises in poor households (Ruel *et al.* 2010).

food-insecure and malnourished. Food expenditure accounted for 52 per cent of total household income and 40 per cent of total expenditure in Nairobi's informal settlements of Korogocho, Mukuru, Viwandani and Dandora (Amendah *et al.* 2014). In Mukuru, as much as 60 per cent of monthly household expenditure went on food and cooking fuel (University of Nairobi 2012: 27).² Malnutrition remains prevalent in Mukuru, as more than 40 per cent of 160 children surveyed in 2007 were stunted and 30 per cent were underweight (Muoki *et al.* 2008: 393). Similarly, survey data in Korogocho found that an estimated 64 per cent of households were severely food insecure in 2011, while fewer than 8 per cent were food secure (Kimani-Murage *et al.* 2014: 6). Combating such widespread food insecurity will require equitable, inclusive strategies, including greater recognition of urban food vendors who are often the mainstay of poor households.

Vended foods differ widely, but can offer major benefits to low-income consumers who may lack the time, money and facilities to cook for themselves. Street foods can be classified by type of meal, as single food items or beverages, by level of processing, and by cooking method (Steyn *et al.* 2014). These goods can "... contribute significantly" to local diets, especially among the urban poor, since street foods "... are convenient, cheap and easily accessible" (Steyn *et al.* 2014: 1372). Their convenience and affordability are reflected in the widespread, frequent consumption of street foods in African cities. A 2001 report showed that in Korogocho, Nairobi, almost 70 per cent of men, 86 per cent of women and 86 per cent of children consumed street foods as their main source of non-home prepared foods (Van't Riet *et al.* 2001: 517). Households in Kumasi, Ghana, often buy small amounts of street foods, thereby reducing the pressure on mothers who cannot cook as frequently for their children (Clark 2013: 736). Selling patterns can also change throughout the day, as some vendors prepare lunches for workers in Nairobi's industrial area, while others mainly sell in the mornings or evenings (Mwangi *et al.* 2001). Our research sought to capture these complex temporal patterns and variety of food types, as well as comparing the challenges facing vendors in three of Nairobi's informal settlements, as discussed later.

Street foods are a critical element of informal urban economies – especially for female traders – but it is also essential to capture the many differences between these workers. Street food-related activities generate an estimated US\$100 million in Accra, Ghana (Shapouri *et al.* 2009) and may account for 40 per cent of food purchases among low-income families (Cohen and Garrett 2010). Food vendors are predominantly female in African and Asian cities, with women involved in 90 per cent of Filipino street food business, 81 per cent in Zimbabwe, 67 per cent in Nigeria and 53 per cent in Senegal (Proietti *et al.* 2014: 144). Although food vending is especially common among women, there is also a gendered hierarchy among food vendors. Women in southern and western African cities, "... albeit crucial to urban food supply, mostly occupy the least lucrative niches" of these food trades (Porter *et al.* 2007: 119). Furthermore, food vendors may vary in their access to credit or other inputs, their level of education or training, their participation in trader organizations, and their level of cooperation with or antagonism towards urban authorities and the police. As analysed below, other axes of difference in Nairobi's informal settlements may include mobile vs stationary vendors, proximity to water points or other infrastructure, vulnerability to floods or other hazards, and method of display (on the ground, kiosks or small restaurants called 'hotels').

We will explore vendors' contributions and challenges in three Nairobi settlements (see Box 1) and propose interventions to help overcome past neglect of food vending in informal settlements. While there has been extensive research on African food hawkers in markets or Central Business Districts (Brown *et al.* 2006, Porter *et al.* 2007, Hansen *et al.* 2013), few studies have examined food traders *inside* informal settlements. African food vendors rarely receive policy recognition, and Kenya's existing policies and legislation are often inappropriate or overlook vendors in informal settlements altogether (see Section 5). Our analysis highlights these vendors' particular concerns, such as how to ensure food safety and livelihoods in the face of major environmental hazards. We also provide new insights by exploring hawkers' spatio-temporal patterns over the day and tracing their relations with local livestock keepers. We thus fill existing gaps in the literature on urban food security and vendors, in addition to utilising participatory, mixed-methods approaches to collaborate with Nairobi residents and develop new initiatives.

² In Mukuru kwa Njenga, rent averaged 20 per cent of monthly expenditure, water 9 per cent and electricity 4 per cent; cooking fuel accounted for 20 per cent and food and clothes totalled Ksh. 3,550 or 47 per cent of monthly household expenditure (University of Nairobi 2012: 27).

BOX 1: CASE STUDY SITES: MATHARE, KIBERA AND MUKURU

Nairobi has approximately 175 informal settlements, comprising 2.5 million residents, representing 60 per cent of the city's population but occupying just 6 per cent of the land. The main informal settlements include Mathare, Kibera and Mukuru, which were the study sites for this research.

Mathare

Mathare is Nairobi's second-largest informal settlement (after Kibera), with an estimated population of 200,000 residents, who struggle with highly inadequate provision for water, sanitation, healthcare and education. Mathare Valley occupies just 0.89km² of land and is located about 5 kilometres northeast of Nairobi's city centre. Prior to the 1950s, the valley was largely settled by an Asian population and was used as a stone quarry for building blocks. In the 1950s, a demographic shift occurred as it was overrun by anti-imperial Mau Mau rebels and used as a location to hide weapons. Although Mathare remained sparsely populated until Kenyan independence in 1963, its population grew rapidly as Kenya underwent a major rural–urban migration that has continued almost unabated.

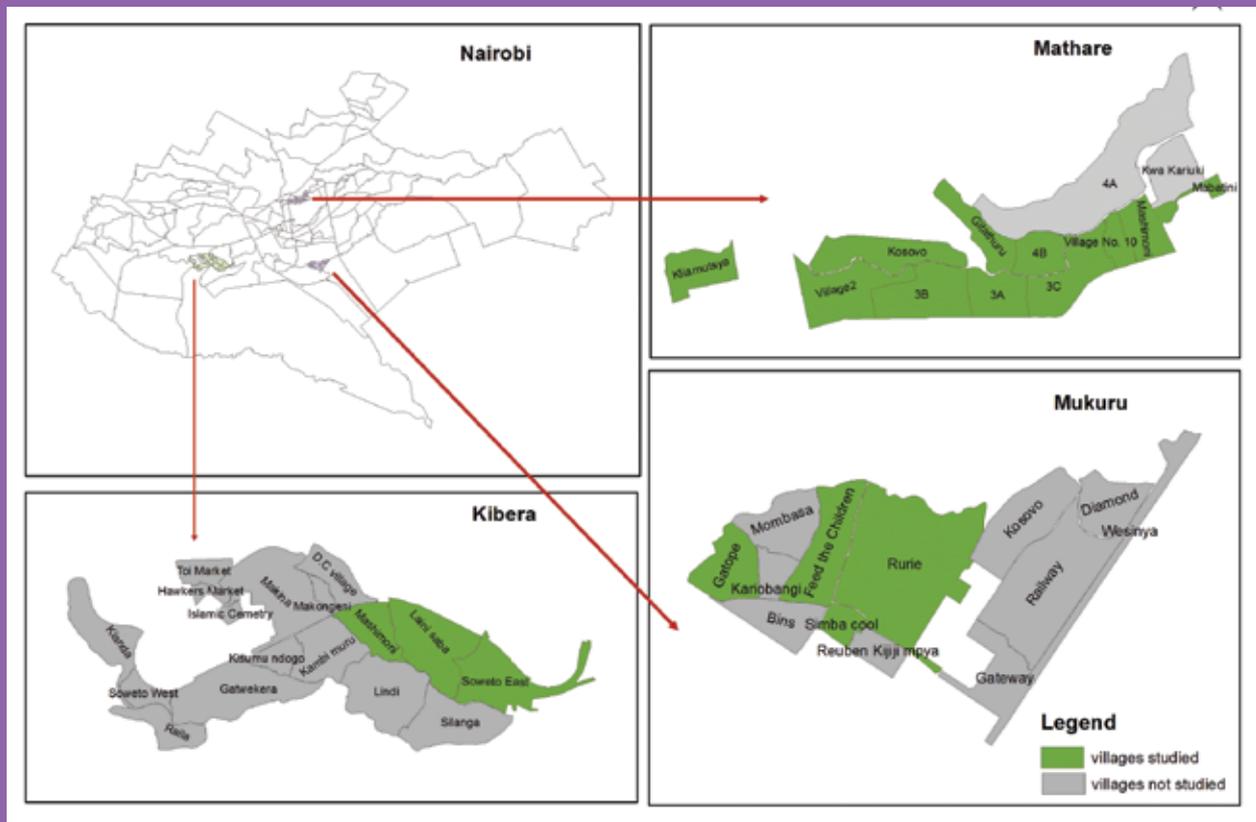
Today, Mathare is comprised of 13 villages (Mashimoni, Mabatini, Village No 10, Village 2, Kosovo, 3A (Bondeni), 3B, 3C, 4A, 4B, Gitathuru, Kiamutisya and Kwa Kariuki) located along the Mathare and Nairobi rivers. The food safety study was conducted in 11 villages of Kosovo, Village 2, 3B, Bondeni, 3C, 4B, Kiamutisya, Mashimoni, Village No.10, Mabatini and Gitathuru.

Kibera

Located about five kilometres from the city centre, Kibera is the largest informal settlement in Nairobi and is often called the largest in Africa. The 2009 Kenyan census reported Kibera's population as just 170,070, contrary to previous estimates of one or two million people. Based on Muungano's profiles carried out in late 2013, Kibera has an estimated population of 341,493 residents. The settlement is made up of 14 autonomous villages (Soweto East, Laini Saba, Mashimoni, Silanga, Lindi, Kambi Muru, Kisumu Ndogo, Gatwekera, Raila, Soweto West, Kianda, Makina, Makongeni and D.C. Village), and the food safety study was conducted in the villages of Soweto East, Mashimoni, and Laini Saba.

Mukuru

Mukuru is located in Nairobi's industrial area and is bisected by the railway, with Mukuru kwa Reuben to the west and Mukuru kwa Njenga to the east. Recent research by Muungano and the University of Nairobi suggests that Mukuru's population is nearly 200,000 (AMT *et al.* 2014). 'Mukuru' literally means 'dumpsite' in Kiswahili and is the site of an old quarry; it subsequently served as the main source of stones used in the construction of the surrounding factories. Parts of the area later became a dumpsite for industrial as well as household wastes. The settlement pre-dates Kenya's independence and can be traced back to Reuben, a white farmer who used to keep livestock in the area and after whom Mukuru kwa Reuben is named. Reuben employed a few Kenyan workers, including Cucu Gatope, who built shelters on the land with her three daughters. The village of Gatope (or Gatoto) in Mukuru kwa Reuben is named after her, and as the area grew, other villages were formed with their particular histories. The food safety study was conducted in the four villages of Simba Cool, Rurie, Feed the Children and Gatope.



1.2 How this study was initiated and shaped by residents in African informal settlements

The roots of this research project trace back to 2012, when an exchange visit was held in Accra between members of the Kenyan and Ghanaian urban poor federations. Its goal was to reflect on urban food security, including whether and how to develop future initiatives in their communities. During the first session, participants discussed the rising food prices, their desire for government subsidies and their aim to secure land for urban agriculture activities. But these goals were abandoned because of the major practical obstacles, and reflections shifted to food vendors, who were perceived as highly exploitative of their customers. However, this view changed radically when several women, initially timidly and then quickly more confidently, said that they were street vendors (some of them full-time, others part-time) and declared that food vending was a vital income-generating activity for women in informal settlements across Accra and Nairobi.

Following these discussions, food vendors realised the need for additional data to help transform the negative perceptions they encountered. In particular, female food traders wanted to lead and engage in these discussions and mapping activities. They decided that mapping informal settlements' food consumption spaces, tracing vendors' interactions with the local environment and exploring their access to infrastructure would be the major entry points to increasing urban food safety. Vendors realised that such grounded explorations could help in a recognition of food vending as a viable, significant livelihood opportunity and a source of affordable, accessible meals. These initial conversations also helped to highlight hawkers' roles in improving local environments, such as daily practices of cleaning kiosks or nearby drains. Some vendors were already members of the Kenyan Federation of the Urban Poor (Muungano wa Wanavijiji), while other traders subsequently joined the federation during the research project. In turn, the study aimed to emphasise vendors' agency and organise these workers in advocating for community-led infrastructure upgrading.

The mixed-methods project combined participatory mapping with qualitative research, both of which employed strong community inputs. Research was

spearheaded by Muungano wa Wanavijiji with support from the Muungano Support Trust (MuST),³ the International Institute for Environment and Development (IIED) and the Development Planning Unit (DPU) of University College London (UCL).

This study was also supported by the ongoing Urban Zoo project, and findings are informing the Urban Zoo's research activities, methodologies and data collection.⁴ Research was conducted in 11 villages in Mathare, four villages in Mukuru and two villages in Kibera (see Box 1). Community-led mapping activities helped to uncover vendors' selling locations, spatial patterns and the environmental hazards they encounter. Focus group discussions (FGDs) further explored how food vendors are affected by the physical constraints in informal settlements, such as poor roads, inadequate water reticulation, minimal or non-existent sewerage and congested public spaces. These constraints can also lead to major food safety challenges such as contamination, inadequate hygiene and poor food-handling practices (Simiyu 2014).

The project's findings and participatory approaches were critical in helping residents to identify priorities for further action by both the community and government. Key findings from the FGDs with vendors and livestock keepers are synthesised, as well as a range of innovative mapping techniques (see Sections 2 and 3). The discussion and recommendations seek to generate appropriate, inclusive and integrated strategies that can promote food safety and food security in informal settlements (see Sections 4 and 5). Findings indicate that food vendors play several vital roles in Nairobi's informal settlements, while also struggling with broader challenges such as inadequate infrastructure and services. By working in informal settlements, hawkers can reduce their daily transport costs and more easily combine their livelihoods with childcare (especially important for working mothers). They are also physically close to their customers, who may value the convenience of buying from a nearby kiosk or mobile vendor. With a thriving array of vendors, residents may enjoy enhanced access to food throughout the day or night. But just like other residents of informal settlements, food hawkers are strongly affected by prevailing insecurity, poor infrastructure and inadequate services. A study of food vending can help to reveal deeper challenges in informal settlements, while we argue in our conclusions that future interventions can create benefits for vendors and consumers alike.

³ <http://www.mustkenya.or.ke/>

⁴ Funded primarily by the Medical Research Council (MRC-UK), other UK research councils and the UK government's Living With Environmental Change Initiative, this is a 5-year research programme on the 'Epidemiology, ecology and socioeconomics of disease emergence in Nairobi' (short title: Urban Zoo). The Urban Zoo project is led by Professor Eric Fèvre from the Institute of Infection and Global Health (IGH) at the University of Liverpool, who is also currently jointly based at the International Livestock Research Institute (ILRI) in Nairobi, Kenya. The project is organised around 12 partner institutions in the UK and Kenya (for more details, see the project website: <http://www.zoonotic-diseases.org/home/research/urbanzoonoses>). Its overall objective is to understand the mechanisms that may lead to the introduction of pathogens into urban populations and their subsequent spread in Nairobi. The focus is on livestock as sources of these pathogens through the close interactions between livestock, their products and residents of informal settlements.

2

How did the community do it? Participatory mapping with and for the community

2.1 Federations of the urban poor and community-led mapping in the global South

Despite being the majority in cities of the global South, low-income households and informal settlements are mostly 'invisible' in city plans and policies, thus invariably excluded from infrastructure or service provision (Patel *et al.* 2012, Appadurai 2001). To challenge this long-standing state failure and indifference, a network of urban poor federations known as Slum/Shack Dwellers International (SDI) was formed in 1996 and is currently active in 33 countries of Latin America, Asia and Africa, although the journey started with India's National Slum Dwellers Federation (NSDF) in 1974 (Patel *et al.* 2012). The Kenyan affiliate Muungano wa Wanavijiji has adopted SDI's key rituals of daily savings, livelihood or shelter loans, community-led upgrading, and ongoing

advocacy for enhanced recognition and inclusion of the urban poor.

Inspired by the motto of 'When in doubt, count!', SDI has also developed innovative and highly detailed enumerations of informal settlements at citywide scale. Enumerations include community-led settlement profiling, vacant land surveys, mapping of infrastructure, housing and services, and extensive household-level demographic data collection. Furthermore, residents have collected oral narratives exploring community histories, population dynamics and past struggles, as well as up-to-date mapping of settlement boundaries and structure maps (Patel *et al.* 2012, Karanja 2010, Makau *et al.* 2012). Partly thanks to Geographic Information Systems (GIS) in the form of ubiquitous GPS-enabled mobile phones and satellite images, SDI affiliates have gained legitimacy and traction in their negotiations with local governments. Using extensive data to bolster their demands to halt evictions, improve service delivery and implement upgrading or resettlement projects, SDI groups are promoting more responsive and accountable urban governance.

Moreover, mapping and enumerations increase residents' confidence and self-awareness, as well as creating locally verified datasets that can be regularly updated (Makau *et al.* 2012, Patel *et al.* 2012).

SDI's mapping efforts have parallels with what is classically known as participatory or community-led mapping in cities of the global North or South. This is similar to Participatory GIS (PGIS),⁵ and a discussion by WaterAid (2005) helps highlight its main features and goals:

“Community mapping is [a] process carried out by the community for the community. [I]t enables communities to map details of where they live and surrounding infrastructure. It is a way of encouraging and empowering communities to take action for themselves ... It not only puts them in a strong position to represent themselves with NGOs, local and national governments, but the very process itself can skill and build capacity within the community. That enables the community to establish for itself what problems it faces, and to begin to look for and implement solutions.” (WaterAid 2005: 4–5)

In sum, SDI's processes inspire residents to map and identify their major concerns, which provide an important aid to community discussions about the magnitude of these issues, their locations and how much they can tackle themselves before seeking state or NGO support. Mapping the unmapped – capturing formerly invisible places and marginalised people – has significantly amplified poor households' voices in challenging the unequal politics of urban development in the global South.

Accurate, up-to-date maps rarely exist for informal settlements in Kenya, but Muungano has already profiled and mapped 174 settlements in Nairobi and enumerated more than 50,000 inhabitants (Karanja 2010, MuST 2014). With support from MuST and SDI, such initiatives have allowed them to negotiate with local governments and promote successful pilot projects to enhance service delivery. For example, after gathering data in Mathare's village of Kosovo, Nairobi City Water and Sewerage Company established individual water connections (Karanja 2010: 221). Such enumeration and mapping data also helped prevent the eviction of households from an unrealistic 30-metre riparian reserve in Nairobi (Karanja 2010: 223, Figure 2) and

the eviction of 229 market traders from Aoko Road (Karanja 2010). These successes have boosted the confidence of community mappers, who can act as guardians and demonstrate local expertise, as explained by a mapper during our focus group discussion in Mathare: *“In Mathare, we've become a community of technicians! We would rather focus on the know-how and not rubber-stamp studies that did not involve the community.”*

2.2 Community-led mapping of food, infrastructure and the environment in Nairobi's informal settlements

In the settlements of Mathare, Kibera and Mukuru, the team combined focus group discussions (FGDs) with community-led paper and digital-mapping techniques. These included low-cost aerial photography (balloon mapping) to capture food vendors and to update maps of *infrastructure* (for example, footpaths and roads, electricity sources, public and private toilets) and *environmental hazards* (for example, steep slopes, flood-prone areas, open sewers and dumpsites). The mapping procedures and community processes are briefly discussed below.

2.2.1 Brainstorming and consensus building to decide on the key issues to be covered and the villages to be studied

The process started with a community brainstorming session exploring: 'what' was already known; 'who' to include; 'what', 'why' and 'where' to map (i.e., which villages to select in Mathare, Kibera and Mukuru); and 'what' tools and techniques were available. Such workshops also set out the need for and importance of data collection processes, as well as offering reflections on food vendors' conditions in each village. Another outcome of these meetings was to identify and train community teams on data collection methods, which equipped them with the necessary skills and tools.

In a subsequent community workshop, we verified key information from the initial session and planned how to harness local knowledge in a participatory way. Food vendors, customers and livestock keepers

⁵ Participatory GIS (PGIS or GIS-P) has gained wider acceptance and was derived but deviated from Public Participation GIS (PPGIS), originally in the global North, which did not consistently use GIS tools for the disadvantaged. PGIS has community involvement at its heart, in order to facilitate participation and enrich data collection that the community deems appropriate, thus embedding practical and appropriate GIS tools and outputs with Participatory Action Research (PAR) (Sieber 2006, Rambaldi *et al.* 2006, Johnson 2007).

were identified as the settlements' major food players, who were all affected by the food–environment nexus. Vendors were further disaggregated into those selling cooked foods, uncooked foods, vegetables and fruit. Participants also selected the 15 villages that would be mapped and investigated further in the research project. We aimed to create holistic narratives around food safety and access, as well as explore the links between vendors and environmental concerns in Nairobi's informal settlements. Our criteria led us to select areas that were most affected by flooding, that had various food-vending and livestock activities, and had greater exposure to environmental hazards.

2.2.2 Harnessing local knowledge through participatory techniques (focus group discussions+)

For several reasons, we decided to conduct focus group discussions (FGDs) rather than surveys with food vendors. Unlike surveys, which have limited space for exploring in-depth opinions, FGDs provide an open, inclusive setting for residents to develop their stories, explain their challenges or successes and identify key priorities for change. Focus groups can also explore

shared concerns, such as ensuring food safety and improving access to public spaces, infrastructure and services in Nairobi's informal settlements.

To thoroughly investigate street foods and to encourage community control of the research, we introduced 'focus group discussions plus' (FGDs+), which combined traditional FGDs with indoor *mental mapping* exercises (see Figure 1). During the FGD+ sessions, participants located themselves and community facilities on paper and digital maps, indicating where street vendors were concentrated and dispersed in each village. We involved vendors, consumers and livestock keepers for two reasons: first, to gather rich narratives about these actors' relations, food-vending practices and challenges, and people–place linkages; and second, to identify major issues for our subsequent mapping research (discussed below). Mental mapping was also used to select 15 villages for data collection, reflecting where residents had highlighted issues of greatest concern to them.

Reflections from vendors, customers and livestock keepers in the FGD+ sessions helped to capture the complex environment in which these groups operate. Food vendors discussed their livelihood activities and the ongoing challenges with poor infrastructure

Figure 1: A mental mapping exercise held in Bondeni, Mathare, with representatives from the other villages



or various environmental constraints (see Section 3 for these findings). Livestock keepers shared their experiences with food traders, including the use of vendors' wastes, such as vegetable scraps or other by-products. They also discussed the challenges in raising livestock as a result of insufficient pasture and space in Nairobi's dense informal settlements. Customers offered their opinions and feedback on food safety, as well as their typical food-purchasing patterns.

We subsequently conducted a short FGD+ with livestock keepers and vendors selling various categories of foods across the mapped villages, which helped to triangulate the findings of the individual group discussions. The FGD+s also explored the food types sold in these settlements, vendors' opening and closing hours and the food safety situation, such as past cases of contaminated foods or disease outbreaks (as discussed in Section 3). Consequently, such narratives of everyday experiences guided the community to focus more on the food safety issues that required immediate attention.

2.2.3 Hybrid mapping on-the-ground

After the indoor mental/cognitive mapping exercises, we used community-led *digital and paper-mapping tools* outdoors to ground the claims and investigate competing uses of public spaces. For instance, main streets or paths are simultaneously used as playgrounds by children and spaces for livestock rearing, as well as for pedestrian traffic and other vendors' kiosks. We analysed their relations to food vendors (with attention to the type of food offered) and their proximity to infrastructure or dumpsites. Subsequently, we partnered with residents to map and survey the villages, using several methods. These included a mobile phone survey application that captured vending locations, food-vending types accompanied by a photo, observations on food safety in relation to vendors' practices (such as whether foods are covered or other handling issues), and aerial photography from cameras suspended from helium balloons. Balloon mapping (see Box 2) helped to create current, bird's-eye views of the local built environment for selected sites and along our transect walk.⁶ Training was provided whenever community mappers sought to use these tools and, stitched together, these photographs created an innovative, low-

cost alternative to satellite imagery. Further details on the mapping procedures are discussed below.

2.2.3.1 Paper maps

These consisted of both satellite and hard copy maps, which were prepared and printed for all the villages. Paper maps included the villages' basic facilities, as captured in prior community mapping processes by Muungano and MuST. Satellite imagery was also useful to orient the residents, who easily located themselves within the villages, and to interpret their settlements' features. These maps captured key features such as roads, existing sewer lines, manholes and drains, water lines and water points, power lines and power points, sanitation blocks and village boundaries (see Figure 2).

2.2.3.2 Mobile phone application for digital mapping

With the help of Android smartphones, we used a data collection application called Epicollect.⁷ This application helped create a rapid scan of vending activities in every village, using a short questionnaire on food typology, demographic data and visible food safety issues. Paper notes also accompanied both the paper and mobile mapping walks. Community research assistants were trained on how to gather these data using smartphones. Mobile phone use was complemented by a note, where the code given for every food vendor was recorded and also marked in the paper map. The notebooks also captured the information not captured in the questionnaire.

2.2.3.3 Balloon mapping

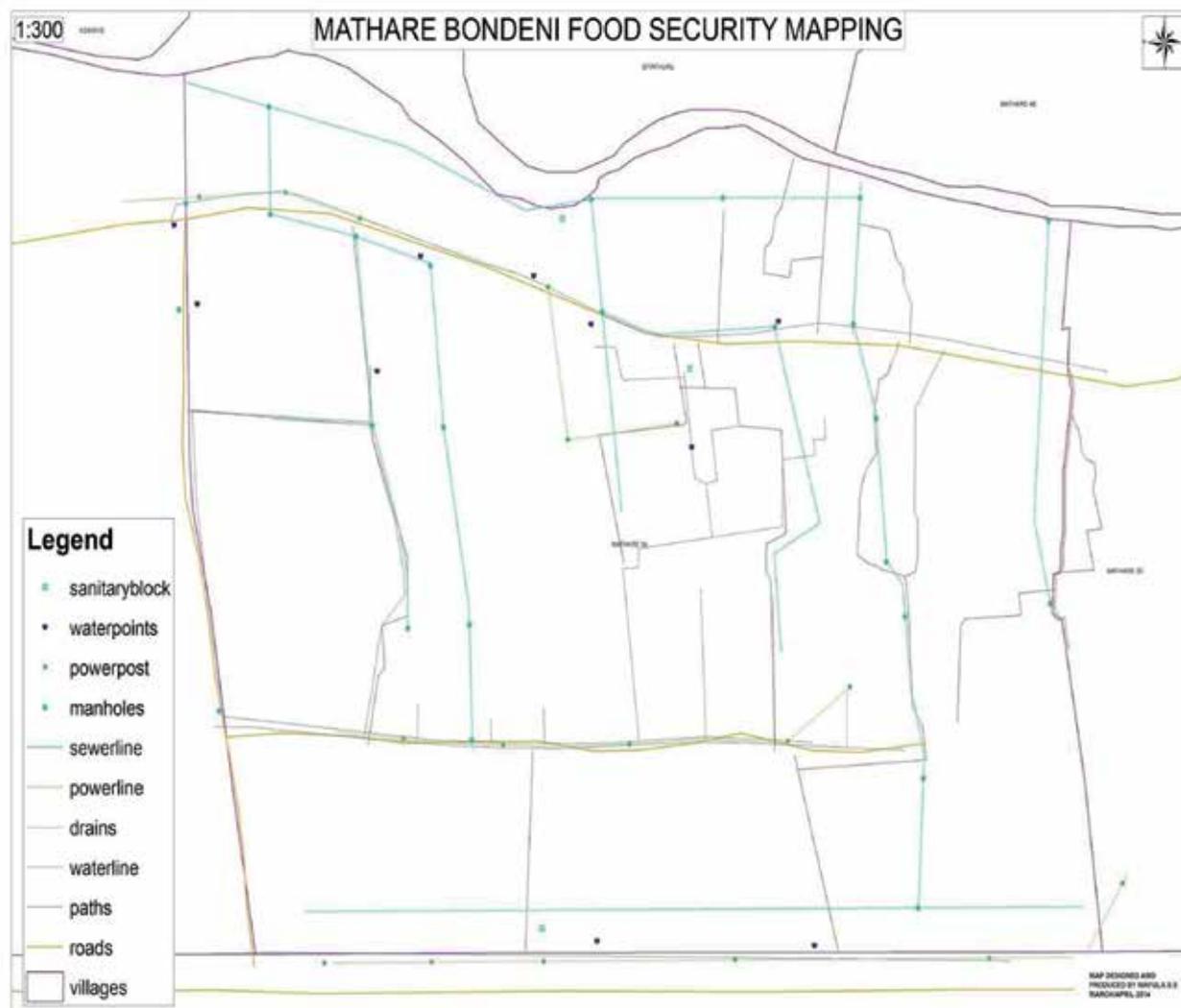
"I'm struck by how successfully a balloon can take an aerial map of my settlement. I am aware there is a hidden camera in the balloon, this is a noble innovation." Community observer of the balloon-mapping process in Bondeni, Mathare

Although satellite images are now ubiquitous in daily life (for example, for directions to unknown places and locating sites using Google Maps or similar web-based services), freely available maps are usually at least a couple of years old and informal settlements are obscured by clouds. Corporate or government

⁶ "A transect walk is a systematic walk along a defined path (transect) across the community/project area together with the local people to explore the water and sanitation conditions by observing, asking, listening, looking and producing a transect diagram. The transect walk is normally conducted during the initial phase of the fieldwork. It is best to walk a route [that] will cover the greatest diversity in terms of water resources and sanitation infrastructure. The transect walk is conducted by the research team and community members. The information collected during the walk is used to draw a diagram or map, based on which discussions are held amongst the participants." (Keller 2014).

⁷ Epicollect is a free, open-source application developed by Imperial College London for data collection purposes (with funding from the Wellcome Trust). It provides a web and mobile application to generate forms (questionnaires) and freely hosted project websites for data collection. Data are collected (including GPS and media) using multiple phones and all data can be viewed centrally using Google Maps, tables or charts (Aanensen *et al.* 2009). For more information on using Epicollect, see <http://www.epicollect.net/>

Figure 2: The paper map used for collecting and updating data on key features in Bondeni, Mathare.



interests do not concern themselves with compiling information on informal settlements, as noted above, let alone with collecting high-resolution, timely aerial views of such contentious places. Meanwhile, conventional data collection technologies can be highly unaffordable to these poor communities. Therefore, we decided that aerial photos with balloon mapping would be of enormous value in raising the visibility and public profile of Nairobi's informal settlements. Balloon mapping has produced accurate, up-to-date images of a part of the city that is not only *terra incognita* on official documents, but that is also rarely updated by corporate imagery services such as Google (see Box 2).

2.2.4 Sharing and triangulating the findings with the community

Following the community-led mapping and data collection sessions, the project team discussed, analysed and synthesised the information, after which there was an immediate *reflection and knowledge consolidation session* with the community. This well-attended discussion with livestock keepers and food vendors helped define residents' priorities and rank them by importance (discussed further in Section 4). Participants found our multiple tools not only very engaging but also extremely useful in updating the existing maps' features (for example, sewer lines, drains, water points, footpaths and dumpsites) and in mapping food-vending activities that can be affected by such infrastructure or local environmental hazards.

BOX 2: BALLOON MAPPING

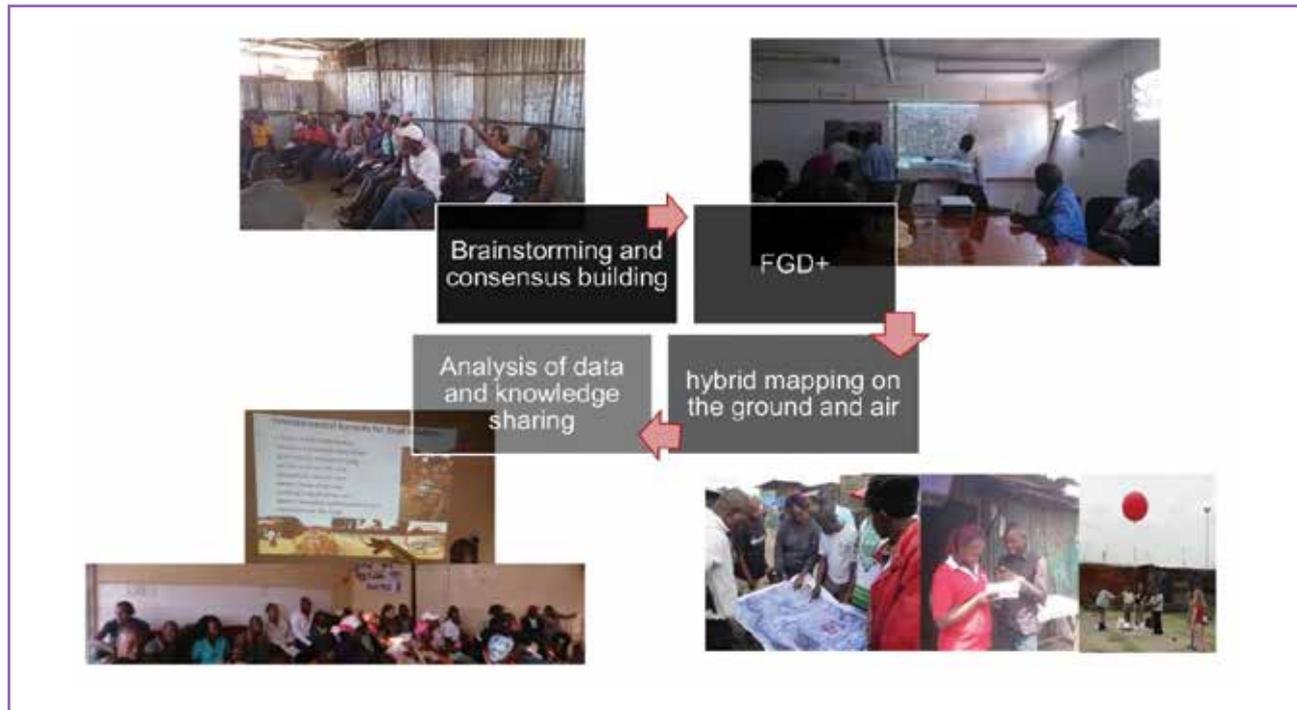
In response to the oil spill in the Gulf of Mexico, members of the non-profit American organization Public Laboratory for Open Technology and Science (PLOTS) partnered with concerned citizens to monitor coastlines during and after the oil spill. About 100,000 photos were taken using the balloon-mapping technique, utilising a cheap (typically, second-hand) digital camera, a large helium balloon and some string. Since then, international examples of balloon mapping for environmental and other community concerns have proliferated (Shubert 2014, Barry 2014). As a Do-It-Yourself (DIY) part of a wider citizen science movement, balloon mapping can be constantly updated and improved by PLOTS. It fits the ethos of participatory or community mapping more generally: let residents decide if the pictures taken by high-altitude balloons can be used in community maps; if yes, 'when', 'where' and 'how'.

Required materials: the 'how' part benefits largely from easy-to-follow illustrated manuals that come with the balloon kit. The essential elements include: a weather balloon (available from all-weather departments in any country); a point-and-shoot cheap camera that can take 'continuous shots' when slung from the balloon during the flight; high-strength string (similar to fishing line) with a reel (similar to kite reel); rubber bands; any 1–2 litre empty plastic bottle; zip ties; and tape. Except for the helium that is needed to inflate the balloon, all the materials in the balloon-mapping kits that can be bought from the PLOTS website for around US\$100 can be locally sourced, and mostly aim to (re)use customer goods such as water bottles and second-hand cameras for a definite (re)purpose.



However, our partnership aimed to take the tool to a different scale – extending beyond a small village or community – and entirely for the causes appropriated by residents of Nairobi's informal settlements. With a downward-facing camera slung beneath it, the balloon on a string had a maximum 90-minute flight over Mathare, creating 5,400 images. The team could then stitch the finest images together digitally to create a cheap replica of a satellite map. In turn, it enabled community members to show on maps where 'danger and dining meet'. These are images that can communicate complex settings at a scale conceivable by residents, yet beyond the limits of conventional cartographic maps and satellite images. This is grassroots mapping at its heart and we can call these 'community satellite images', as they can be tailored and re-used to create high-quality, affordable, real-time images for and by the community.

Figure 3: Key stages of the community-mapping process



Residents regarded this consolidated, updated knowledge base as a spur for further deliberation and dialogue (for example, opportunities for updating the Mathare Zonal Plan⁸). It also provided a platform for advocacy and policy action, which will help residents negotiate with public authorities for infrastructure planning and improved public spaces.

⁸ The Zonal Development Plan (2011) is a Mathare-wide participatory upgrading project, spearheaded by Muungano and city planning students from the University of Nairobi and UC Berkeley. For more information, see the SDI website: http://www.sdinet.org/media/upload/documents/Mathare_Zonal_Plan_25_06_2012_low_res-2.pdf

3

What did they find? Local spatial knowledge on food and environmental health

“The way we eat in informal settlements has changed over time; this is because we lack adequate cooking spaces in our shanties and more so we are prone to fire outbreaks. This is why we prefer ready-cooked food.”
(Respondent, focus group discussion, Mathare)

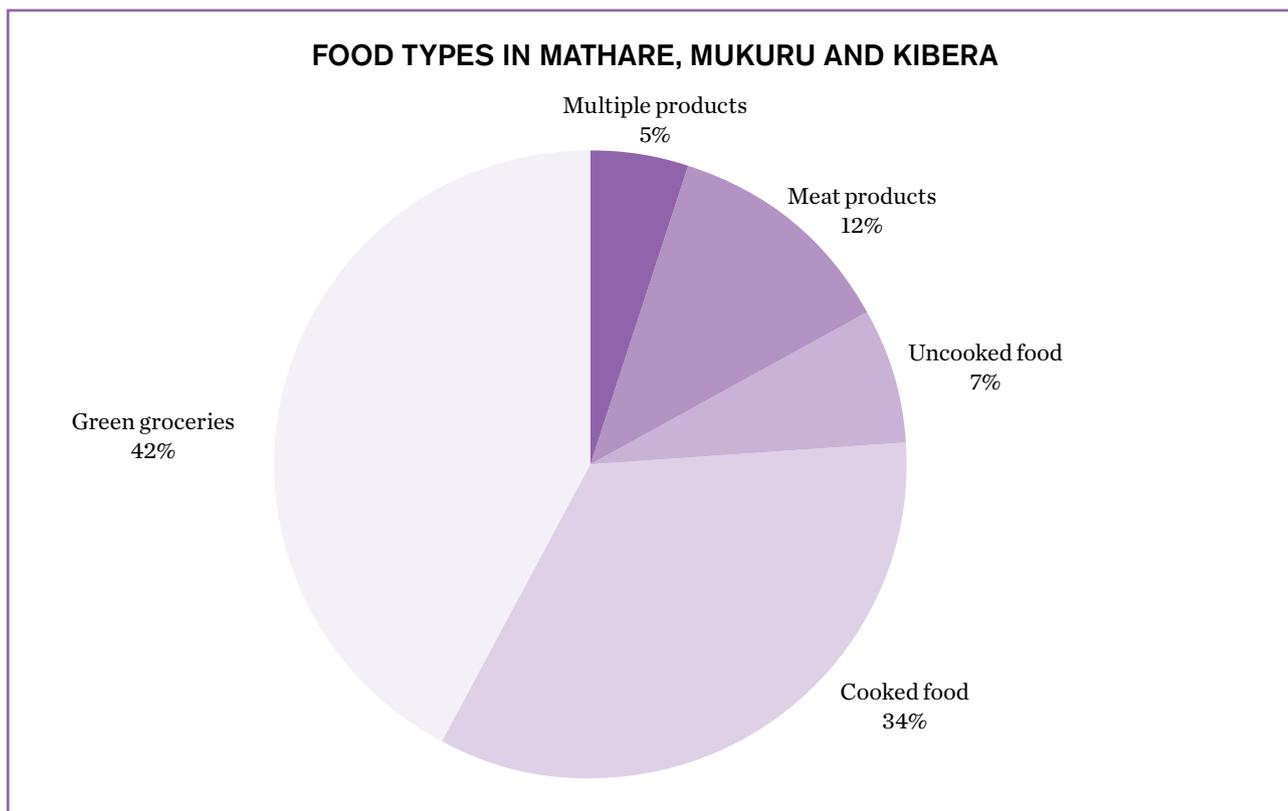
This section focuses on the results obtained in our participatory study. We explore the types of food sold by vendors and illustrate their spatial distribution, as captured during the mapping process. We also discuss key physical constraints to food safety and livestock keeping, and identify significant opportunities to improve food security in conjunction with enhanced infrastructure, services and governance.

3.1 Narratives on food-vending activities: Diversity in typology, working hours, locational benefits and challenges

Vendors' main food categories include uncooked foods (cereals, vegetables, fruit, raw meat, *omena*, milk), hot beverages (coffee, porridge, tea) and cooked foods (*githeri*, *ugali*, rice, roast meat and meat products, beans, chips, *chapatti*, *mandazi*).⁹ As shown in Figure 4, for the 660 vendors identified, green groceries and cooked foods accounted for three-quarters of the food sold in the three settlements, while meat products represented 12 per cent.

⁹ *Githeri* is a stew made of maize and beans; *ugali* is a staple starch made of maize flour; *mandazi* is a fried triangular doughnut; and *omena* is a type of fish.

Figure 4: Settlement-wide food typologies



3.1.1 Selling patterns, locational factors and security

Although most vendors operate between 5am and 10pm, their schedules may differ based on the level of security, street lighting, available stock and customer flows in their particular villages. For instance, Mathare's villages of Kosovo and Village 4B are considered the safest, and vendors operate until approximately 11pm. Location also plays a key role in street food sales; vendors on major streets are safer and have greater customer flows compared to hawkers who operate in the inner, narrow streets. Furthermore, ethnic composition can affect levels of security and food-vending patterns. Village 4B is safe for food vendors as it is composed mainly of one tribe; youth groups operating in the area are acquainted with these vendors and will provide security against any external aggression. However, outsiders who enter Village 4B may become victims of these youth groups, and their safety after 9pm is not guaranteed. Thanks to good reticulation of electricity and street lights, Kosovo offers a safe environment for food vendors and they can operate even after 11pm. In Mukuru's village of Simba Cool, vendors again sell late at night, especially *chapatti* vendors who operate 24 hours a day.

Competition for spaces is especially high along the main roads, since the greater volumes of people there help to increase sales of street foods. This results in conflicts among food vendors and also with owners of formal shops (if vendors sell in front of these shops). In Mathare, food vendors located in front of other shops must pay a monthly fee and conflicts may also erupt with livestock keepers who leave their animals to roam. In Kibera, spatial conflicts also occur between new and old vendors: every seller already has a vending site, leaving no space for newcomers. The spaces with sheds are protected through daily payments to youths, who guard the sheds at night. Failure to pay results in destruction or confiscation of the shed or structure.

3.1.2 Food safety and health concerns

FGD+ participants reported cases of food contamination and unsafe foods, commonly resulting in diarrhoea, stomach aches and vomiting. They also reported previous disease outbreaks – especially cholera, typhoid and diarrhoea – and diarrhoea is particularly lethal for children under the age of five. The causes of food contamination include the settlements' hazardous selling environments (characterized by open drains, open sewers, dumpsites, inadequate water and sanitation, etc.), poor hygiene by food vendors, and a lack of adequate storage facilities. As a result of

inadequate storage, vendors often experienced food spoilage and others complained of rodents (especially rats, which may eat food that is left in houses with inadequate storage facilities).

Vendors have also developed coping mechanisms to deal with poor storage, and these vary according to location and the type of food sold. For example, in Kibera and Mukuru, leftover *githeri* (a maize and bean stew) is boiled, dried and sold first on the following day. Similarly in Mathare, *githeri* is boiled and dried, but some also add pepper to it to hide the smell that leftovers may still have. When it spoils, vendors sell it to those who cannot judge the quality, or give it away to livestock keepers. Vegetable sellers store their leftover produce in crates or on top of sacks overnight. Fish and meat vendors usually buy their produce from outside the settlement in small quantities so as to sell it all, as the margin of loss is greater for these items. Fish vendors in Kibera deep-fry around half the fish and store it in buckets or cartons at night to ensure it lasts longer. Additives such as soda ash ('Magadi soda') are used particularly when preparing *githeri* and beans, in order to preserve foods and speed up their cooking times.¹⁰ *Githeri* vendors in Kibera use other additives, such as aspirin and peroxide; milk vendors will add water, peroxide, Blue Band margarine and baking powder to increase volume and thus increase profits. Although residents were unsure about the health impacts of such practices, they may have deleterious effects that deserve closer scrutiny.

3.1.3 Infrastructure conditions and environmental health challenges

Food vendors typically operate in hazardous areas alongside open drains, blocked sewers, rodents or other pests, uncollected rubbish heaps and dusty roads. These conditions can together create severe challenges to food safety and to vendors' livelihoods. Open drains in informal settlements are frequently clogged and overflow with solid wastes, causing a nuisance to customers because of the bad smells. Moreover, open drains act as breeding sites for mosquitoes and other disease vectors, which can result in outbreaks of malaria. Inadequate drainage can attract insects such as flies, which are also disease vectors, again increasing the risk of food contamination. Garbage heaps are

another nuisance, attracting insects and rodents, and these rats may get into foods and contribute to disease transmission. Poorly maintained sewers may overflow and discharge wastes onto roads or into other public spaces (especially during heavy rains), thereby disrupting sales or jeopardising food safety. These challenges confirm the FGD+ narratives of multiple pests and hazardous vending sites, and were also evident in our mapping exercises (see Section 3.2).

Dusty roads may cause food contamination by carrying disease vectors, as well as exacerbating the challenges of inadequate water provision and improper handling practices. The accumulation of dust on fresh produce and utensils means that vendors have to buy water to maintain cleanliness and the food's attractive appearance. However, water is relatively costly for low-income residents in Nairobi, leading food vendors to use water only sparingly. Unsurprisingly, such decisions compromise food safety, especially if the food is not cleaned properly or the containers in which it is sold and stored are dirty. Furthermore, water kiosks and taps are distributed unevenly in these settlements (see Figure 5); for instance, food vendors in Mathare typically have to walk long distances to obtain water. Others opt to buy from water vendors, which can reduce their profit margins as well as the quantity of water bought, again posing risks to food safety. While vendors were well aware of these hazards, they claimed to be accustomed to these challenges.

Vending spaces can also be polluted as a result of inadequate human waste disposal, and hawkers often struggle to cope with these broader infrastructure deficits. Especially at night, residents of Nairobi's informal settlements may resort to 'flying toilets' (plastic bags filled with human excreta). In turn, food vendors have to clear up these wastes and insanitary spaces before opening for business every morning. Vendors themselves often struggle to access sanitation during their workday, and this may be linked to food contamination and disease outbreaks (see below for a discussion on inadequate toilets). Yet vendors are unfairly blamed for selling unsafe foods, rather than recognising their understandable inability to tackle systemic challenges such as inadequate sanitation, minimal water and the lack of solid waste management in informal settlements.

¹⁰For a review of the additives, contaminants and other toxicological hazards found in street foods in the global South, see Proietti *et al.* 2014.

3.2 Rapid mapping of food vendors: Spatial distribution and linkages with environmental health and infrastructure provision

3.2.1 Spatial distribution of food vendors in public spaces

Figure 5 shows the mapped location of food vendors (as green dots) in selected villages of Kibera, Mathare and Mukuru. A total of 660 vending locations were captured during the mapping process. In Mathare, 318 food vendors were mapped; Mathare 3B had the largest number of hawkers and Mashimoni had the

lowest. In Kibera, a total of 176 vendors were mapped with Soweto East having the largest number at 98, while Laini Saba had just 76 vendors. In Mukuru, Rurie had the largest number and Feed the Children had the fewest vendors.

3.2.2 Food-vending types

Across the three settlements, 279 traders sold green groceries, representing 42 per cent of all food vendors in these areas, and 223 vendors sold cooked foods, accounting for about 34 per cent of vendors. Uncooked foods were the least commonly sold in the three areas, with only 46 vendors being mapped selling uncooked items. Some food vendors also sold a variety of products at the same stall, such as vegetables, cereals and chips. A total of 35 such locations were mapped in Mathare, Mukuru and Kibera.

Figure 5: Spatial distribution of vendors in 15 villages in Kibera (a), Mathare (b) and Mukuru (c).

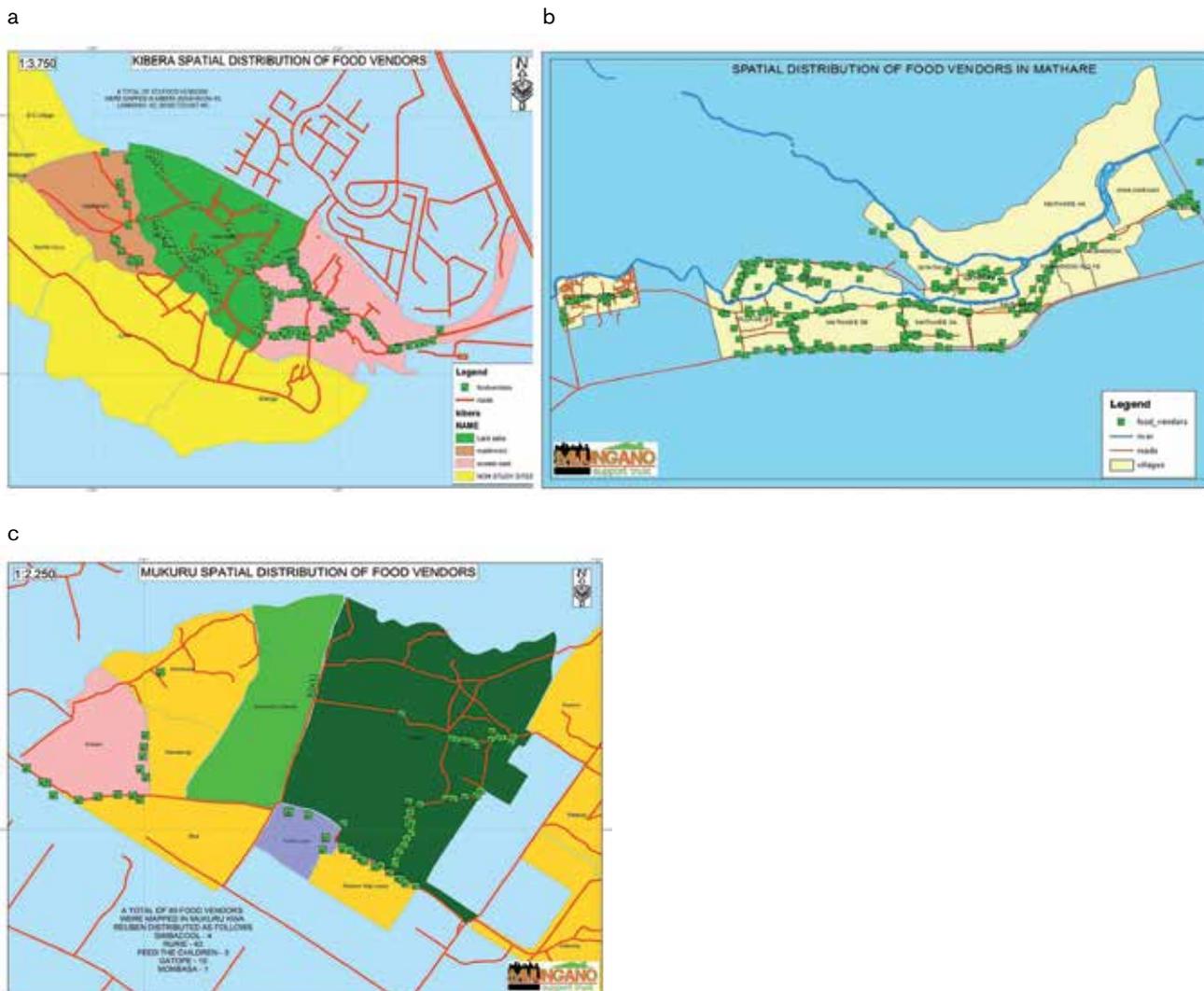
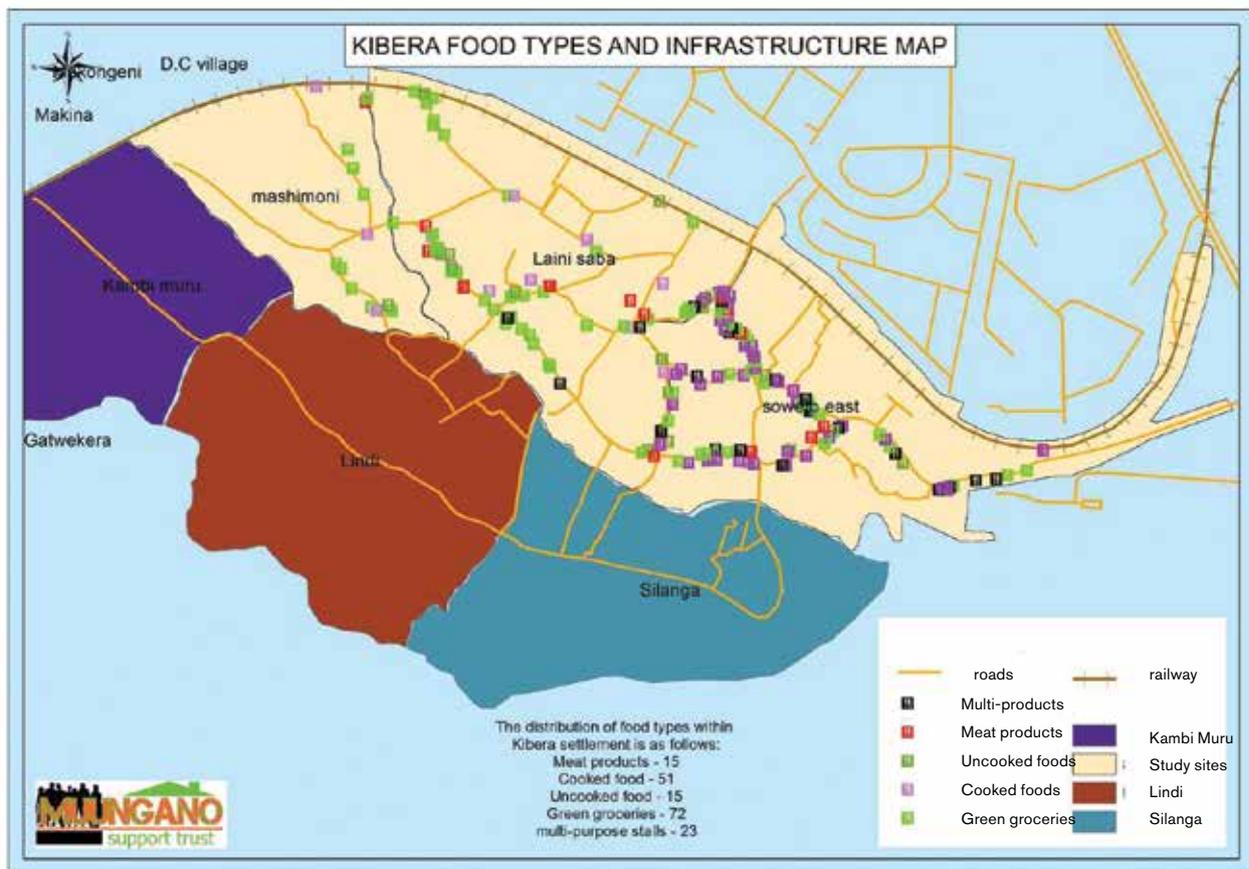


Figure 6: Food types and infrastructure provision in Kibera



As indicated in Kibera's food typology map (see Figure 6), vended items were categorized into four main types, namely meat products, cooked foods, uncooked foods and green groceries. Meat products in this case included raw meat, cooked meat and roasted meat sold in the settlement. Cooked foods refer to such items as *githeri*, chips, beans, rice, *chapatti* and *mandazi* (fried doughnuts), whereas uncooked foods refer to such items as sweet potatoes (*ngwaci*), arrowroot (*nduma*) and cereals. Green groceries, on the other hand, included both vegetables and fruit. In Mathare (see Figure 7), vendors dealing in green groceries are the majority, followed by those selling cooked foods, while those dealing with uncooked foods are the least common.

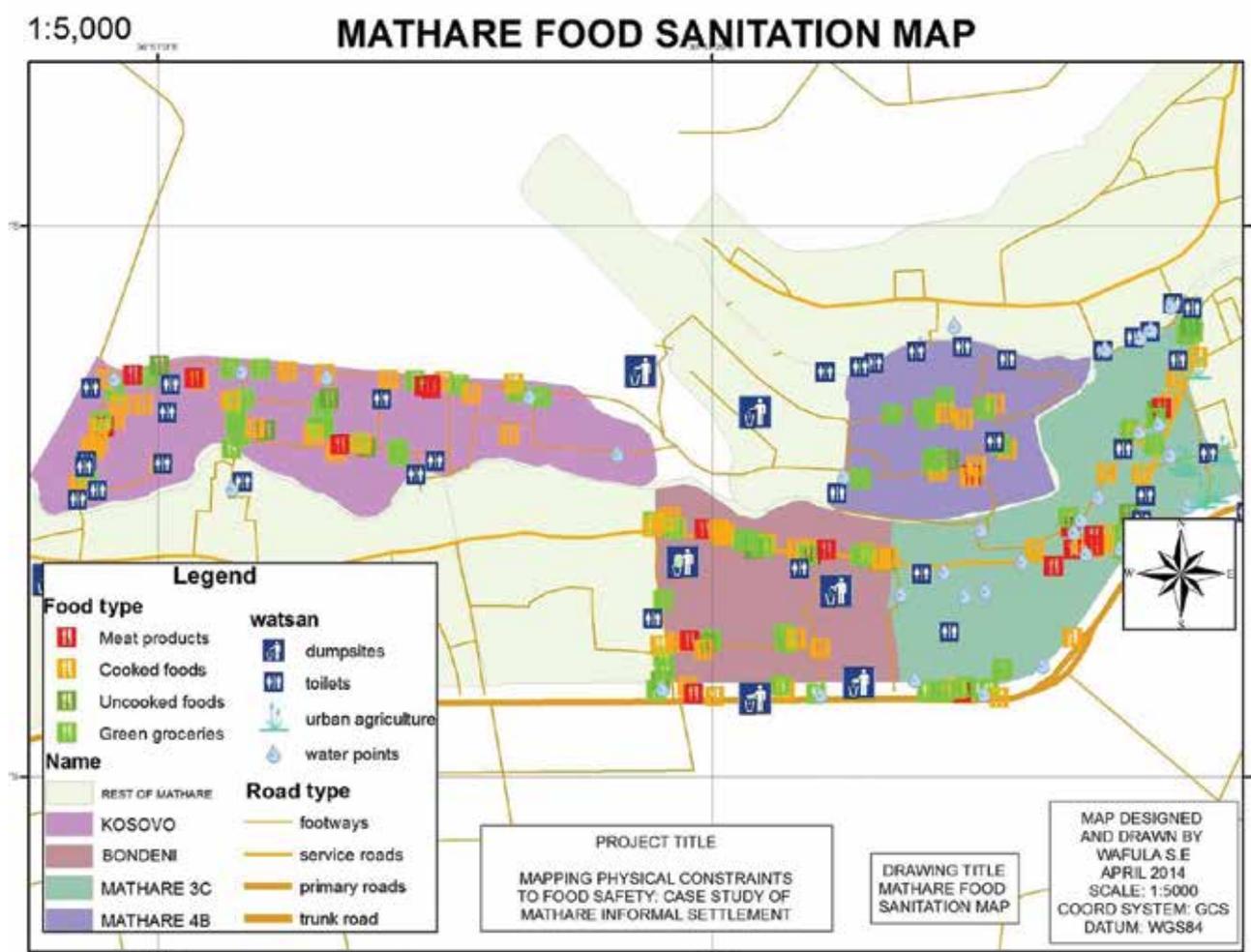
3.2.3 Observation and analysis of food vending and infrastructure provision

In all the study areas, we found a very strong link between food vending and infrastructure. For instance, in Kibera, out of the 176 mapped food-vending locations, 145 lie in close proximity to the road networks (that is, within five metres of any road segment). This represents about 82 per cent of all food vendors in

Kibera. In Kibera's village of Soweto East, vendors offering cooked foods are most numerous, which is an atypical result since vendors selling green groceries are the majority in Mathare and Mukuru. The predominance of cooked food vendors in Soweto East was explained by the extensive construction along the Soweto Highrise side; hence, most customers preferred ready-made food, as they have limited time to cook. Similar patterns of vendor proximity to roadside areas in Mathare are shown in Figure 7, where fresh produce sellers are the majority. However, in Village 4B, fewer vendors are evident, and there is just one meat vendor.

Figure 7 also shows the uneven distribution of water points within a section of the mapped villages in Mathare. It indicates that Bondeni has the worst water shortages and thus residents must pay higher water costs compared to Village 3C, where a number of food vendors are located close to a water point. Like Bondeni, Village 4B experiences water scarcity as there are only three water points located along its boundary. Most vendors sell within this settlement and must send someone to fetch water; these vendors' water costs must therefore exceed the typical retail prices.

Figure 7: Food types and infrastructure provision in Mathare



More generally, residents of Mathare experience highly inadequate access to toilets, thus creating challenges for vendors regarding access to sanitation and posing further risks to food safety (see Figure 7). For example, Bondeni village has only one toilet and food vendors cannot readily use it (especially during peak business hours, as this would mean leaving their vending kiosks unattended). Vendors must therefore choose other sanitation options, which compromise food safety, particularly in the absence of water and hand-washing facilities in Nairobi's informal settlements. We return to such pressing infrastructure challenges and residents' priorities for change in Section 4.

Although food vendors are often located near hazardous sites, which is seen as a nuisance for customers, we argue that vendors should not be blamed for wider environmental health concerns that are beyond their control. For example, large open drains along major roads such as Juja Road can create multiple threats to food safety and vendors' livelihoods, including flood risks, rats, mosquitoes and other disease vectors (see Figure 8; also see discussion in Section 4).

3.2.4 Livestock keeping

The main types of livestock found in the three settlements are cattle, pigs, goats, rabbits, ducks, sheep and hens, but a lack of space has created challenges in rearing these animals. For instance, the severe congestion in Mathare and Kibera has left only extremely limited areas in which to raise livestock. Where livestock keeping is observed, these are usually 'landless' practices (primarily poultry, such as hens and ducks), because separate plots of land are not required. Animals are typically accommodated in residents' dwellings, such as below staircases or in very small structures that adjoin the main shelter. Larger animals such as goats, sheep, cows or pigs that require separate structures are, therefore, not prevalent in the settlements (although they are still viewed as highly desirable). In turn, livestock keepers often allow larger animals such as goats, poultry and pigs to roam freely in the settlements, to seek their own food (see Figure 9).

Figure 8: Pictures of Mathare 3A from the ground and from the air



However, such practices can expose the animals to risks of theft, road traffic accidents and electrocution as a result of illegal electricity connections. Diseases are also easily spread by roaming livestock, especially poultry and goats, which were observed eating from dumpsites and even from open sewers (see Figures 9 and 10).

Figure 9: Livestock keeping and roaming practices in Mathare, as observed during mapping

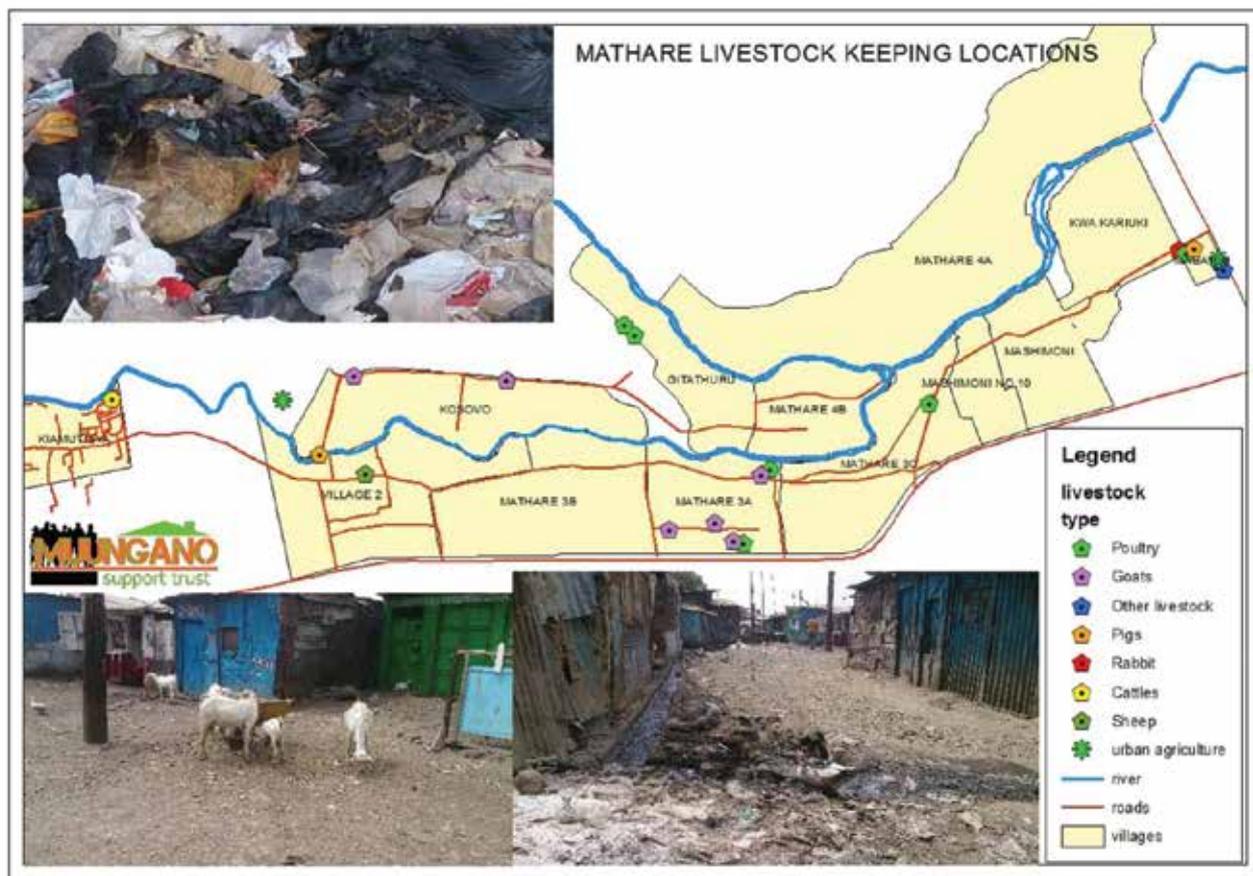


Figure 10: Examples of livestock roaming and keeping practices



Table 1: Common sites for livestock keeping in Kibera, Mathare and Mukuru

LIVESTOCK	PLACES KEPT
Goats	Zero grazing / rented or constructed houses
Ducks	Corridor structures
Chickens	Rented or constructed houses
Rabbits	Outside structures
Pigs	Outside structures

Roaming livestock can sometimes consume dangerous materials like plastic bags, which can result in their deaths. Also, these roaming animals might eat items belonging to the food vendors, who respond by hitting them or even killing them. This clearly indicates the intense conflicts between food vendors and livestock, which trace back to land constraints and competing spatial uses in Nairobi's informal settlements. However, practices in Mukuru differ from those in Mathare and Kibera, since Mukuru is relatively spacious, especially in areas bordering the Nairobi River. Some Mukuru residents keep several cows and can source livestock food from the riverbanks, hotels and food vendors. Vendors' leftover food in Mukuru is typically sold: a bucket costs Ksh.100, while a sack of vegetable leftovers is sold for Ksh.50 or is exchanged for livestock products. Residents have constructed shelters in their neighbourhoods for their animals, which even include open spaces. Structures are extremely important for livestock in Mukuru because of the high frequency of theft and the local authorities' ban on roaming livestock. Any animal found roaming in Mukuru is caught and the owner fined or jailed; however, this ban on roaming was not observed in Kibera and Mathare.

Animals are usually slaughtered within the settlements, but during disease outbreaks, everyday practices are disrupted. Instead, sick animals are slaughtered just before they die and are sometimes locked inside owners' structures for days or weeks. In cases of disease outbreak, residents do not consult veterinary experts but, rather, purchase drugs from chemists and agro-vets. Furthermore, slaughtered livestock are often improperly disposed of, as their remains or entire carcasses are typically dumped into rivers or alongside streets. Minimal veterinary treatment, unsafe foods consumed by livestock and inadequate disposal of their remains can all pose major risks to community health, as investigated further in our partner organizations' Urban Zoo project.¹¹

¹¹ See Footnote 7 for details on the Urban Zoo project.

4

Discussion: Unfolding the opportunities, challenges and policy/practice gaps

4.1 The challenges of food vending in informal settlements

Food traders in informal settlements are faced with an array of constraints, including poor physical infrastructure, environmental hazards and spatial conflicts. Street vendors must grapple with highly contested *public spaces*, as they sell from the same areas used for livestock grazing, playgrounds and commuting by large numbers of people. Vendors often compete for spaces along major streets and may pay formal businesses to use their frontages. On the other hand, given the high contestation for *private spaces* for shelter and food production or storage, there is little room available to keep livestock despite widespread interest in doing so. Many livestock keepers must enclose their animals because of the prevailing insecurity in informal settlements, while others have no choice but to co-habit with livestock due to inadequate space. Limited private space for cooking and the

high costs of food or fuel have also made vendors' items more appealing to customers, but such foods are exposed to various hazards on the street. As summarised in Table 2, our community-led mapping, observations and FGDs+ identified several overlapping threats to food safety and vendors' livelihoods, including:

- Inadequate solid waste collection, which can attract rats, mosquitoes or other pests that can all threaten food safety.
- Food safety is also threatened by informal settlements' dilapidated, meagre sanitation and expensive, contaminated or inaccessible sources of water.
- Uncovered, clogged surface drains can contribute to flooding risks, with associated health burdens.
- Floods can also hamper the transport of food and prevent vendors from working.
- The regular power cuts and blackouts in informal settlements can reduce physical security for both vendors and customers. When power cuts force

- vendors to close, their earning potential is curtailed, as is their customers' access to affordable foods.
- Vendors generally lack adequate shelter and storage facilities, while high humidity and temperatures often increase food spoilage. Some vendors use food additives, such as Magadi soda, which could pose long-term health risks to customers.
 - During disease outbreaks, vendors often suffer evictions or forced closures by city authorities. This not only threatens traders' livelihoods, but can also reduce access to food for the many residents who depend heavily upon vendors in their settlements.

Additionally, we identified multiple challenges facing livestock keepers that can have broader impacts upon community health, spatial conflicts and food vendors' livelihoods:

- Livestock faeces can contaminate vendors' foods, while livestock themselves may eat contaminated foods.
- Livestock diseases are difficult to control: owners may administer human drugs, keep their sick animals indoors, or use alternative remedies such as aloe vera, pepper and vitamins. Furthermore, sick animals are often sold or slaughtered before they succumb to their illnesses.

- Animals are slaughtered in settlements with inadequate waste disposal – as a result, their remains or entire carcasses may be dumped into rivers or alongside streets.
- Social and commercial exchanges in public spaces can cause conflicts, as food vendors, livestock keepers, playing children, water vendors, cart pullers and other residents often jostle to occupy limited space.

Thus, vended foods in informal settlements may pose several health risks, which stem largely from the environmental hazards and infrastructure deficits in these areas (see Table 2). For low-income food traders, these shortfalls in services and infrastructure can severely hamper livelihoods, particularly when combined with spatial congestion, inadequate storage and flood-prone vending sites. During our FGDs+, a participant noted that levels of security in their settlements can also play a key role in limiting vendors' selling hours and profits:

"My security and that of the settlement is a factor that dictates my vending hours."
Respondent, focus group discussion in Mathare

Table 2: Typical challenges identified by FGD+ participants in the three settlements

SETTLEMENT	COMMON CHALLENGES
Mathare	Relatively high cost of raw materials Inadequate water: expensive, inaccessible and/or unavailable Poor sanitation and lack of toilets near vending sites Open drainage channels and sewers, including near vending sites Dumping solid wastes in vending spaces, especially at night, and lack of designated disposal sites for vendors and general residents Stagnant water and poor solid waste disposal can promote insect and rodent breeding areas, which also contaminate foods Risks of fire due to congestion Spatial conflicts with livestock because some are left to roam; competition for space and customers among food vendors
Mukuru	Flooding of vending areas during the rainy season: wastes are carried by rainwater and settle in the food-vending spaces Water contamination due to informal water reticulation along sewer lines
Kibera	Flooding of food-vending spaces Lack of cooperation among vendors, especially regarding the cleanliness of vending sites Insect and rodent breeding areas, dirty water, uncollected solid waste and pests can all contaminate vended foods Frequent blackouts result in early business closures

Vendors' poverty and inadequate hygiene training may create further threats to food safety, including the use of various additives as discussed in Section 3.1.2. Our FGDs+ discovered other improvised practices, such as storing vegetables on rooftops or mixing spoiled and fresh meals together without customers' knowledge. Food hawkers have responded to their inadequate storage facilities and rising prices of inputs by re-using leftover items (even if they may have spoiled overnight in the absence of refrigeration), as noted below:

“High food prices have forced vendors to resort to old-school methods of food preservation such as smoking and salting fish, airing vegetables on rooftops and mixing fresh and spoilt foods (githeri), basically for fear of making losses.” Community leader in Kosovo, Mathare

Coping strategies may vary according to the type of food, as indicated above, but the shared goal is to preserve costly ingredients as long as possible in order to eke out a few extra shillings. While these deceptive practices may threaten the health of other community residents, we suggest that the deeper causes are structural and beyond vendors' control. Their tactics reflect the underlying challenges of high prices for food, fuel and other inputs, of inadequate storage and lack of refrigeration, and of pervasive poverty in informal settlements.

It is also important to highlight the benefits of street foods in informal settlements, as well as how seemingly advantageous vending locations may still threaten food safety. Street foods in informal settlements can offer convenience and affordability to consumers; selling in their settlements is also convenient for the vendors themselves. Working in informal settlements can reduce traders' transport costs or levels of police harassment compared to vendors in Nairobi's Central Business District (CBD). The benefits of working in their settlements can be particularly important for female vendors, who may otherwise struggle to combine their livelihoods with childcare and who appreciate the flexibility of working near their homes. However, the associated site hazards and minimal services may heighten the food safety challenges. For instance, our mapping exercises revealed how the spaces near environmental hazards can sometimes be *attractive* to food vendors and consumers because of reduced competition or lower costs. When purchasing foods, consumers in informal settlements may prefer lower prices to higher-quality items.

The locational benefits of vending in informal settlements are thus a double-edged sword, offering short-term gains in price or convenience but only perpetuating residents' poverty and exclusion. Consumers are forced to trade off food quality and safety for lower prices and accessibility, even if this exposes their foods to greater hazards. Food vendors themselves struggle with highly insecure livelihoods, largely as a result of the physical and spatial constraints discussed above. Finally, both vendors and consumers are caught in a deeper bind that reflects the structural challenges in African informal settlements. Such obstacles include residents' low incomes, poor access to infrastructure or services, and political exclusion. While selling in informal settlements can offer undeniable advantages, addressing these entrenched structural challenges will require future interventions, as discussed below.

4.2 Opportunities and priorities

Although vendors have already proved resilient in the face of multiple challenges, they may enjoy more secure livelihoods with policy support and additional community mobilisation. For example, a positive opportunity for transformation arose with the recent establishment of a Food Vendors' Association (FVA). FVA members are acting as change agents (Robertson 2014: 313), helping to integrate and scale up individual actions that can improve the use of public spaces for incremental and collective learning (see Box 3). The FVA has identified a key opportunity to enhance food safety by proposing monthly training sessions to raise awareness and improve vendors' hygiene, handling practices and cleanliness at their vending sites. In addition, they recommended clean-up exercises to foster collective responsibility among food vendors, livestock keepers and other residents, while also enhancing their local environments.

The street economy relies heavily on a strong sense of attachment to place, which is manifested in local solidarity and interdependence between vendors and livestock keepers. For instance, fresh produce vendors help to source foods for livestock (especially goats) and their vegetable recycling represents a set of innovative waste management strategies. Although rarely acknowledged, such vital practices help the actors to serve as 'zero waste/nutrient recyclers' within the community. Other social ties were highlighted in the FGDs+, as vendors stated that they did not sell milk with preservatives to families with children, and customers often provide social support, such as buying food from

BOX 3: NAIROBI'S FOOD VENDORS' ASSOCIATION (FVA)

The Food Vendors' Association was launched in late 2013, formed by the Kenyan urban poor federation Muungano wa Wanavijiji. Its members reside in four of Nairobi's informal settlements: Mathare, Huruma, Mukuru and Kibera. The FVA has championed food security issues in informal settlements and it seeks to improve access to infrastructure. Its rapid growth in membership – to almost 700 individual vendors and producers in just a few months – suggests there is great interest in this issue.

Members include women selling vegetables and cooked foods; residents operating butcheries; kiosk owners selling various foods and cereals; and livestock keepers. Members are organised into local groups that jointly buy maize flour and soap, as well as developing a savings scheme from which they can receive loans to expand their businesses (up to three

times the value of their savings). As expressed by one very motivated FVA member:

“Food Vendors' Association is not all about lobbying for the interests of food vendors, but establishing a strategic platform to champion issues of sanitation and improved basic infrastructure in the settlements, which have direct impacts on food safety.”

The FVA sees itself as a change agent taking a strategic initiative and championing issues of sanitation and other infrastructure in informal settlements. Its strategies will not only bolster livelihoods but also build upon and strengthen the deep social networks in informal settlements.

family members and neighbours. Relational strains do exist, as demonstrated by cases of theft, mishandled loans between customers and vendors, and conflicts between livestock keepers and food vendors. However, the social capital in informal settlements is still a significant asset (Moser 1998), and future initiatives can continue to strengthen relations between vendors and livestock keepers.

Residents in the FGDs+ identified other key opportunities (see Table 3), including:

- Designating solid waste disposal points in the settlements and signing a Memorandum of Understanding for rubbish collection with the county government (or other relevant agencies). This is an urgent concern since the current inadequate services have resulted in extensive waste accumulation, which attracts pests and disease vectors to the food vendors' sites.
- Improving water provision, including lobbying the Nairobi City Water and Sewerage Company on the need to reduce water connection fees and ensure an adequate reticulation of water supply. Since water prices are relatively high and distribution is uneven in informal settlements, improving water reticulation and promoting affordability are essential in addressing these challenges.
- Improving sanitation by offering additional toilet facilities and covering the open drains and sewers, as per Mathare FVA proposals.

- Detailed, settlement-wide data (through balloon mapping and other mapping and enumeration tools) can help to meet vendors' and residents' needs for dialogue and deliberation towards a sustainable, community-led layout of their settlements.
- Food for urban livestock should be sourced from shops, markets and food vendors, neighbours or acquaintances. Contrary to popular perception, vendors produce very little waste as their peelings and other leftovers are often consumed by livestock.

Such initiatives will not only promote access to affordable food but will also bolster self-employment, improve security on the streets and enhance quality of life more generally. Upgrading initiatives will strengthen the livelihoods of food vendors and livestock keepers, as well as improve access to infrastructure among their fellow residents. In addition, hygiene training for vendors and livestock keepers will offer a crucial complement to these physical interventions. Consumers will enjoy better access to healthier foods, thereby promoting long-term gains in community health and well-being. Alongside these vital improvements in infrastructure, service delivery and vendors' hygiene, we suggest it will be crucial to establish a more favourable policy framework.

Table 3: Common opportunities as identified by residents in the three settlements

SETTLEMENT	COMMON OPPORTUNITIES
Mathare	<ul style="list-style-type: none"> ▪ Provision of communal storage and cooling facilities ▪ Lobby the public health sector to issue free health certificates and licences ▪ Awareness raising regarding food safety ▪ Clean-up exercises ▪ Provision of designated dumpsites ▪ Lobby for water provision by the appropriate stakeholders ▪ Lobby the county government to cover open drains and sewers ▪ Engage stakeholders to enhance drainage and sewer provision ▪ Provision of sanitation facilities
Mukuru	<ul style="list-style-type: none"> ▪ Mobilise food vendors in the villages ▪ Promote vendors' responsibility and hygiene (for example, control waste disposal, develop good sanitation habits) ▪ Engage residents in sanitation initiatives, including behavioural change ▪ Create frequent forums to discuss food security and safety ▪ Possible engagements with lead agencies such as the Ministry of Environment and county government; lobby for financial support from nearby industries and county government
Kibera	<ul style="list-style-type: none"> ▪ Local administration involvement ▪ Youth support in solid waste collection ▪ Exchange visits for food vendors ▪ Street lighting, especially in Soweto East ▪ Centralised market

4.3 Utopian laws on paper vs harsh reality: Wide gaps between policies and practices

As in many African urban contexts, food vending in Kenyan informal settlements and other informal economic activities continue to "... encounter various legal barriers that prevent them from attaining their full potential" (Muraya 2006). We briefly review the relevant policy framework in Kenya, in order to underscore the inappropriate existing policies as well as the need for reforms that can better support food vendors and livestock keepers.

According to Public Health Act Cap 242: "Food must be prepared and stored in establishments approved for the purpose using clean and pathogen-free equipment and containers", but this is a major challenge in informal settlements. Instead, vendors' foods are prepared and stored along streets that may be prone to flooding or other hazards. The Act also stipulates that "... potable water be used in preparation of food", yet in informal settlements, access to water is problematic for several reasons. Few water points are available; water quality is poor due to leaking pipes and open sewers; and kiosks or water vendors are often unaffordable to the poor. Food hawkers therefore must limit their water consumption in order to reduce costs and the number of trips to fetch water.

The Act also stipulates that “... *food stores must be free of vermin such as rodents, flies and cockroaches.*” However, vendors in informal settlements lack adequate food storage facilities and usually keep their items at home. They often complained of rodents and cockroaches in their dwellings, as well as dust, rubbish and flies along the streets. “*Food handlers must be free of communicable diseases and must undergo regular medical check-ups*” is another requirement unfulfilled by the food vendors, who usually lack basic licences and access to medical care. Furthermore, “... *food products must not contain any harmful additives or foreign substances, including microbial toxins or chemical residues in concentrations injurious to health.*” Yet the research has indicated that food vendors often use additives such as Magadi soda and aspirin, which could be harmful to consumers.

Provisions in the Meat Control Act Cap 356:

“*Animals meant for slaughter must be free of communicable/zoonotic diseases, for example BSE, avian flu, FMD, rabies etc.*” Again, this is a problem in informal settlements: animals are not checked before slaughter and no ante-mortem inspections are conducted to prevent the slaughter of sick animals, as the Act stipulates. Furthermore, the Act states that “... *carcasses [must] be decontaminated before they enter the food chain and be protected from re-contamination through appropriate handling and storage.*” However, carcasses in informal settlements are often dumped into rivers, along the streets, or with other solid waste in open spaces. The carcasses are not decontaminated, and hence become health hazards associated with food contamination.

Pig Industry Act Cap 361: In relation to pig rearing, the Act stipulates that “... *pigs should be raised in confinement and fed with feeds free of disease pathogens such as salmonella.*” By contrast, pigs in informal settlements are often released and roam widely (although in some areas it is illegal to allow pigs to roam). In Mukuru, as discussed above, the majority of pig keepers must confine them to sheds built outside their houses.

Food, Drugs and Chemical Substances Act Cap 254:

The Act states that “... *appropriate drugs and antibiotics must be used to treat animal diseases and withdrawal periods allowed to prevent accumulation of drug residues in animal food products.*” However, livestock in informal settlements were found to be treated using local means, since veterinary services were deemed too expensive. These remedies included the use of pepper, human drugs and local herbs as well as other concoctions made by livestock keepers. Residents are thereby exposed to further health risks when consuming livestock products.

Comparing our findings against Kenyan legislation clearly reveals the absence of supportive mechanisms and underscores the need for future policy reforms. Livestock keepers and food vendors in Nairobi’s informal settlements are often ignored or scapegoated, thus obscuring the state’s systemic failure to provide basic services, to ameliorate living conditions or to develop equitable urban policies. These groups are also invisible in official statistics, similar to other informal workers and residents of informal settlements (Patel *et al.* 2012, Charmes 2012). But through the community-led mapping processes discussed above, residents documented how food vendors provide for their own needs and survive under difficult circumstances, without official recognition. Putting the substantial numbers of vendors on the map highlighted how these residents offer a vital lifeline and livelihood in informal settlements, but they still require supportive policies and interventions in the future.

5

The journey does not end here: From discussion and mapping to transformative action

“Never before in my wildest thoughts have I ever considered that food is directly impacted by the status of sanitation infrastructure, but now I know.” Consumer, focus group discussion in Kosovo

Throughout the FGDs+ and mapping exercises, residents carefully explored food safety challenges and identified strategies to promote food security in Mathare, Kibera and Mukuru. The research also provided several opportunities for mutual learning between vendors, livestock keepers and consumers. Key findings include the following:

- Balloon mapping, FGDs+ and cognitive mapping helped illuminate street vendors' essential roles within the community food system, as well as uncovering the magnitude and scale of environmental hazards affecting such foods. For the first time, residents were able to visualise where 'danger and dining meet'. The findings also revealed how deeply rooted, structural forces persistently draw food vendors and low-income consumers towards hazardous sites.
- Residents gained various spatial insights from the mapping exercises, such as the diverse locations and temporal patterns of community food vendors. Mapping has revealed how vendors as well as other residents use public spaces innovatively and manage them via informal governance. Furthermore, the study explored ongoing spatial conflicts between food vendors, livestock keepers, children's playgrounds and other activities in contested public spaces. These areas are primarily main streets and walkways, which may be affected by various environmental hazards.
- Traders themselves enjoyed a newfound opportunity for horizontal and vertical exchanges in the FGDs+, as they interacted for the first time with peers operating throughout their settlements. Vendors shared a range of experiences, including daily opening and closing times; bustling and less popular sites; nearby retailers; and both the pros and cons of selling in their settlements. Additionally, participants benefited from

the comparative knowledge that the FGD+ facilitators had gained in other settlements.

The project's participatory methods also offered a range of new insights and helped to empower residents. These innovative methods and detailed findings can support future advocacy with Kenyan government officials or other stakeholders, as follows:

- Building local capacities in mapping and visualisation tools strongly promoted the participants' confidence, self-awareness and empowerment. By sharing extensive spatial and qualitative data with residents, the project also helped them to prioritise future interventions using the project's co-produced knowledge.
- Community-led mapping can become a tool for engaging public authorities, while residents' local initiatives on infrastructure can complement formal planning policies. For instance, the FVA has already embraced balloon mapping and other mapping methods as tools both for knowledge creation and community mobilisation. Such iterative and participatory tools can amplify residents' voice in advocating for improved water, sanitation or other interventions. They can also showcase community-led infrastructure improvements and further develop social, health and environmental practices that support food safety in informal settlements.
- In Nairobi and other Kenyan cities, there are opportunities for food vendors to collaborate with official initiatives such as the Kenya Slum Upgrading Programme (KENSUP) and the Kenya Informal Settlement Improvement Project (KISIP). Participatory mapping will be fundamental to establishing these partnerships with government and aid agencies.

Participants themselves recognised the significant potential of using mapping tools to transform vendors' status and increase their public profile. As one FVA member reflected, the research had empowered and highlighted the contributions of her fellow traders:

“Urban poor women vendors produce much of the settlement's food, and care for the conservation of public spaces and the environment. Yet we continue to face exclusion that prevents us from realising our potential. Empowering women through such studies and government social and economic policies is crucial for ending food insecurity and poverty in informal settlements.”

Furthermore, she rightly underscored the need for state policies to bolster urban food security, and these initiatives will need to combine multiple sectors and geographic scales. Without sound housing and land tenure policies, as well as improved incomes, services and infrastructure, the urban poor will remain at elevated risk of food insecurity. Kenyan legislation on food safety and livestock keeping is also highly inappropriate to the challenges in informal settlements (see Section 4.3). Urban-level initiatives, such as improved services, infrastructure and mobilisation of vendors, can be complemented by broader social and economic policy measures. For instance, urban food security can be supported by promoting market efficiency, improving the transport of foods and providing social protection to bolster food security during crises (Cohen and Garrett 2010). These authors also proposed several useful recommendations regarding street vendors:

“Given the importance of street foods, municipal authorities should train vendors in hygiene, adequately and consistently enforce regulations, and improve basic infrastructure. Collaborating with vendor associations [can] facilitate training and regulatory compliance.” (Cohen and Garrett 2010: 479)

Our research similarly identified the need to train vendors in hygiene, collaborate with vendor associations and improve infrastructure access. In particular, FGD+ participants have emphasised the importance of adequate water, sanitation, drainage and regular rubbish collection in their settlements. Sheds and adequate storage are another priority, in order to promote food safety as well as allowing vendors to continue operating along the streets. Vendors, livestock keepers and other residents can also help to develop appropriate designs for markets, waste disposal points and other community-led solutions to transform public spaces. We conclude by sketching a research and advocacy agenda, which we will continue to develop in partnership with food vendors in Nairobi's informal settlements.

6

Conclusions: Key findings and priorities for action–research and advocacy

Although street foods are essential both to consumers and vendors in informal settlements, inadequate infrastructure and services pose several threats to food safety and livelihoods. Selling food near uncollected rubbish, without adequate water and sanitation and with only improper storage or non-existent refrigeration can all promote food contamination. Increased insecurity and inadequate public lighting can also prevent vendors from selling after dark. Some vendors sell close to water taps, but they may still lack the money or time to wash their foods, utensils or hands thoroughly. In turn, this can produce severe health risks, especially given the lack of safe toilets in informal settlements. Nevertheless, street foods do provide several benefits to customers in terms of affordability, accessibility and social ties in their communities. Vendors are deeply embedded in informal settlements, but we suggest that the very advantages of convenience and proximity to their fellow residents can also generate health risks that require future interventions.

Future interventions to promote food security will need to be tailored to a variety of food vendors and should reflect the contextual specificities of their informal settlements. For instance, as noted above, large animals are more commonly kept in Mukuru than in Mathare or Kibera. Vendors' needs may differ significantly based on food type, such as cooked meals, fresh produce,

packaged goods and dried beans or cereals. Other variations may include sellers' levels of mobility and methods of display; some are mobile hawkers while others sell items on the ground or from fixed sites (kiosks, restaurants or 'hotels', etc.). We highlighted the role of locational factors, including vendors' access to infrastructure, levels of insecurity and proximity to various hazards. Traders' interactions with livestock keepers and other residents of informal settlements are again highly complex, requiring careful consideration when proposing future initiatives.

The close interrelations between vendors, environmental hazards and service deficits in informal settlements, as well as food's multiple links to community well-being, together make it critical to support this previously hidden trade. Although vendors in informal settlements have been overlooked both by policy makers and researchers, we argue that they can provide a central entry point for equitable food policy, practice and action–research in African cities. A study of food hawkers can help to reveal deeper challenges in informal settlements, while future interventions can generate significant benefits for vendors and consumers alike. During subsequent stages of our action–research project in Nairobi's informal settlements, we will continue to explore the following themes:

a) Uncovering the links between vending, urban health and food security

Accessible, affordable vended foods can enhance health and help to reduce poverty among consumers as well as sellers in informal settlements. As one of the largest recurrent expenditures in low-income households, food has a pivotal role in shaping poverty dynamics and can strongly contribute to well-being (particularly among children, people with HIV/AIDS and other vulnerable groups). While some food vendors may be quite prosperous, many traders are very low income and may not differ significantly from their customers in informal settlements. Via interviews and additional FGDs+, we will explore the dynamics of successful food vendors and the obstacles facing other traders, as well as tracing the linkages between vending, urban health and food security more generally.

b) Creating opportunities to reduce poverty and support gender equity

Food vending frequently provides vital support to women traders and their children, while gender and lifecycle dynamics help in understanding the complex food trade in informal settlements. Although food vendors encompass women or men, old or young residents, many are female traders who are more likely to sell fresh produce or certain cooked foods such as *githeri* (beans and maize stew). Mothers with small children are often less able to travel and, more generally, women may have few livelihood alternatives due to their limited skills or access to capital. As a result of these constraints in resources, training, transport and access to childcare, as well as gender norms that already link women with cooking, selling food in their communities can be an especially crucial income-generating activity. Demonstrating the importance of food vendors can foster women's empowerment via greater recognition of their contributions, in addition to forging ways of addressing their unmet needs. By continuing to investigate women's and men's particular challenges through FGDs+, their key priorities for interventions can be identified. Analysing the gendered or other axes of differences among vendors can thus inform strategies to reduce poverty and promote gender-equitable initiatives.

c) Revealing the policy neglect and environmental hazards in informal settlements

Unlike the highly visible traders working in the CBD or in well-established markets, the contributions and unique needs of hawkers in Nairobi's informal settlements are usually overlooked. Operating in a policy vacuum, as in informal settlements more generally, traders working there may be less likely to receive supportive services

or other interventions. Informal settlements' spatial conflicts, greater environmental hazards and increased levels of insecurity may create unusually severe challenges for food hawkers. Furthermore, traders in informal settlements are caught in a broader web of meagre solid and liquid waste management. Even as they strive to maintain their vending sites, many cannot adequately dispose of food wastes and struggle to cope with poor drainage. These characteristics suggest some of the particular challenges of food vendors in informal settlements, which we will seek to unravel in later stages of the research.

d) Using food vending as an entry point for new alliances and advocacy

We suggest that food vending offers an unusually valuable entry point for holistic initiatives that simultaneously enhance food security and create wider gains in informal settlements. To ensure food safety, vendors will need various initiatives that can also create benefits for residents and other workers by improving their settlements' infrastructure, services and environmental quality. For instance, improved water and sanitation is essential for vendors preparing meals or cleaning fresh produce; better water and sanitation will also support livelihoods and health more generally in their settlements. Key services also include regular rubbish collection, well-maintained drainage and enhanced flood control, which will also help residents to cope with extreme weather and will improve environmental quality. Upgraded paths can prevent dust or other food contaminants and facilitate access by mobile vendors; in addition, better paths will help other workers and the many residents who travel on foot. Food vendors are therefore a strategic entry point for initiatives to enhance food safety and access to food, which can also generate extensive gains in their communities.

By continuing to mobilise workers in the FVA and forge other alliances, it may be possible to strengthen their voice and leverage with Kenyan decision makers. The participatory tools developed in this project can underpin such advocacy campaigns, both by offering detailed data and empowering residents to seek greater recognition. Muungano and other SDI affiliates have already developed their capacities for mapping and enumeration (Karanja 2010, Patel *et al.* 2012), which can also inform mapping of food vendors and nearby infrastructure. In sum, the multi-faceted strategies needed to support food vendors can offer a highly compelling motivation for government advocacy and integrated initiatives, which can create a set of far-reaching benefits in informal settlements.

References

- Aanensen, D.M., Huntley, D.M., Feil, E.J. and Spratt, B.G. (2009), 'EpiCollect: linking smartphones to web applications for epidemiology, ecology and community data collection', *PLoS One*, Vol. 4, No. 9, pp. e6968.
- Akiba Mashinani Trust (AMT), University of Nairobi, Strathmore University, Muungano wa Wanavijiji, and Katiba Institute (2014), 'Mukuru Situation Analysis Report', Nairobi, 145 pages.
- Amendah, D.D., Buigut, S. and Mohamed, S. (2014), 'Coping strategies among urban poor: evidence from Nairobi, Kenya', *PLoS One*, Vol. 9, No. 1, pp. e83428.
- Appadurai, A. (2001), 'Deep democracy: urban governmentality and the horizon of politics', *Environment and Urbanization*, Vol. 13, No. 2, pp. 23-43.
- Barry, L. (2014), 'How Public Lab collaborates to make environmental science something anyone can do', presented at the Open Source Developers' Conference, Academia Sinica Taipei, Taiwan, 11 April 2014.
- Brown, A. (ed.) (2006), *Contested Space: Street Trading, Public Space, and Livelihoods in Developing Cities*. IDTG Publishing, Rugby.
- Charmes, J. (2012), 'The informal economy worldwide: trends and characteristics', *Margin: The Journal of Applied Economic Research*, Vol 6, No 2, pp. 103-132.
- Clark, G. (2013), 'Twentieth-century government attacks on food vendors in Kumasi, Ghana.' In: Hansen, K et al. (eds.), *Street Economies in the Urban Global South*, pp. 29-48. School for Advanced Research Advanced Seminar Series, Santa Fe.
- Cohen, M.J. and Garrett, J.L. (2010), 'The food price crisis and urban food (in)security', *Environment and Urbanization*, Vol. 22, No. 2, pp. 467-482.
- FAO (2010) The state of food insecurity in the world 2010. Food and Agriculture Organization of the United Nations, Rome. Available at <http://www.fao.org/docrep/013/i1683e/i1683e.pdf> [Accessed 5 May 2015]
- Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M. and Toulmin, C. (2010), 'Food security: the challenge of feeding 9 billion people', *Science*, Vol. 327, No. 5967, pp. 812-818.
- Hansen, K. et al. (eds.), *Street Economies in the Urban Global South*. School for Advanced Research Advanced Seminar Series, Santa Fe.
- Johnson, D. (2007), 'Public Participation Geographic Information Systems as surveillance tools in urban health.' In: Jensen, R et al. (eds.) *Geo-Spatial Technologies in Urban Environment*, pp. 109-120. Springer, Berlin Heidelberg.
- Karanja, I. (2010), 'An enumeration and mapping of informal settlements in Kisumu, Kenya, implemented by their inhabitants', *Environment and Urbanization*, Vol. 22, No. 1, pp. 217-239.
- Keller, S. (2014), 'Transect walk', Sustainable Sanitation and Water Management, Basel, Switzerland. Available at <http://www.sswm.info/category/planning-process-tools/exploring/exploring-tools/preliminary-assessment-current-status/tran> [Accessed 5 May 2015]
- Kimani-Murage, E., Schofield, L., Wekesah, F., Mohamed, S., Mberu, B., Ettarh, R., Egondi, T., Kyobutungi, C. and Ezech, A. (2014), 'Vulnerability to food insecurity in urban slums: experiences from Nairobi, Kenya', *Journal of Urban Health*, Vol. 91, No. 6, pp. 1098-1113.
- Makau, J., Dobson, S. and Samia, E. (2012), 'The five-city enumeration: the role of participatory enumerations in developing community capacity and partnerships with government in Uganda', *Environment and Urbanization*, Vol. 24, No. 1, pp. 31-46.
- Maxwell, D. (1999), 'The political economy of urban food security in Sub-Saharan Africa', *World Development*, Vol. 27, No. 11, pp. 1939-1953.
- Misselhorn, A., Aggarwal, P., Ericksen, P., Gregory, P., Horn-Phathanothai, L., Ingram, J. and Wiebe, K. (2012), 'A vision for attaining food security', *Current Opinion in Environmental Sustainability*, Vol. 4, No. 1, pp. 7-17.
- Morgan, K. (2009), 'Feeding the city: The challenge of urban food planning', *International Planning Studies*, Vol. 14, No 4, pp. 341-348.
- Moser, C.O. (1998), 'The asset vulnerability framework: reassessing urban poverty reduction strategies', *World Development*, Vol. 26, No. 1, pp. 1-19.
- Muoki, M., Tumuti, D. and Rombo, D. (2008), 'Nutrition and public hygiene among children under five years of age in Mukuru slums of Makadara Division, Nairobi', *East African Medical Journal*, Vol. 85, No. 8, pp. 386-397.

- Muraya, P.W. (2006), 'Urban planning and small-scale enterprises in Nairobi, Kenya', *Habitat International*, Vol. 30, No. 1, pp. 127-143.
- Muungano Support Trust (MuST) (2014), 'Kenyan settlement profiling report – Nairobi'. Slum Dwellers International (SDI), Cape Town.
- Mwangi, A.M., den Hartog, A.P., Foeken, D.W., van't Riet, H., Mwadime, R.K. and Van Staveren, W.A. (2001), 'The ecology of street foods in Nairobi', *Ecology of Food and Nutrition*, Vol. 40, No. 5, pp. 497-523.
- Patel, S., Baptist, C. and d'Cruz, C. (2012), 'Knowledge is power—informal communities assert their right to the city through SDI and community-led enumerations', *Environment and Urbanization*, Vol. 24, No. 1, pp. 13-26.
- Porter, G., Lyon, F. and Potts, D. (2007), 'Market institutions and urban food supply in West and Southern Africa a review', *Progress in Development Studies*, Vol. 7, No. 2, pp. 115-134.
- Proietti, I., Frazzoli, C. and Mantovani, A. (2014), 'Identification and management of toxicological hazards of street foods in developing countries', *Food and chemical toxicology*, Vol. 63, pp. 143-152.
- Rambaldi, G., Corbett, J., Olson, R., McCall, M., Muchemi, J., Kyem, P.K., Weiner, D. and Chambers, R. (2006), 'Mapping for change: practice, technologies and communication', *Participatory Learning and Action*, No. 54. IIED and CTA, London.
- Robertson, M. (2014), *Sustainability Principles and Practice*. Routledge, Abingdon.
- Ruel, M.T., Garrett, J.L., Hawkes, C. and Cohen, M.J. (2010), 'The food, fuel, and financial crises affect the urban and rural poor disproportionately: a review of the evidence', *The Journal of Nutrition*, Vol. 140, No. 1, pp. 170S-6S.
- Shapouri, S., S. Rosen, B. Meade, and F Gale (2009) Food security assessment, 2008–2009. Outlook No. (GFA-20), Washington DC. Available at http://www.ers.usda.gov/media/155651/gfa20_1_.pdf [Accessed 5 May 2015]
- Shubert, W. (2014), 'Balloon mapping: How to make your low-flying satellite.' *Geojournalism Handbook*. Available at: <http://geojournalism.org/2013/08/balloon-mapping-how-to-make-your-own-low-flying-satellite/> [Accessed 5 May 2015]
- Sieber, R. (2006), 'Public participation geographic information systems: A literature review and framework', *Annals of the Association of American Geographers*, Vol. 96, No. 3, pp. 491-507.
- Simiyu, E. (2014), 'Mapping the physical constraints to food safety in Nairobi's informal settlements: Case study of Mathare.' MSc dissertation, Department of Geospatial Engineering and Space Technology, University of Nairobi.
- Sonnino, R. (2009), 'Feeding the city: Towards a new research and planning agenda', *International Planning Studies*, Vol. 14, No. 4, pp. 425-435.
- Steyn, N.P., Mchiza, Z., Hill, J., Davids, Y.D., Venter, I., Hinrichsen, E., Opperman, M., Rumbelow, J. and Jacobs, P. (2014), 'Nutritional contribution of street foods to the diet of people in developing countries: a systematic review', *Public Health Nutrition*, Vol. 17, No. 6, pp. 1363-1374.
- Tacoli, C., Bukhari, B. and Fisher, S. (2013), 'Urban poverty, food security and climate change', Human Settlements Working Paper No. 37, Rural-Urban Interactions and Livelihood Strategies. IIED, London.
- University of Nairobi, MuST and Muungano wa Wanavijiji (2012), 'Mukuru Kwa Njenga Slum Upgrading Plan', Nairobi. Available at www.centreforurbaninnovations.com/download/file/fid/422 [Accessed 5 May 2015]
- van 't Riet, H., den Hartog, A.P., Mwangi, A.M., Mwadime, R.K., Foeken, D.W. and van Staveren, W.A. (2001), 'The role of street foods in the dietary pattern of two low-income groups in Nairobi', *European Journal of Clinical Nutrition*, Vol. 55, No. 7, pp. 562-570.
- WaterAid (2005), 'Community mapping: A tool for community organizing,' London. Available at <http://www.wateraid.org/~media/Publications/community-mapping-programme-partner-guidelines.pdf> [Accessed 5 May 2015]

Related reading

Reframing the debate on urbanisation, rural transformation and food security briefing by Cecilia Tacoli and Bill Vorley

<http://pubs.iied.org/17281IIED.html>

Dining with less danger: mapping food and environmental hazards in Mathare, Nairobi briefing by Soheli Ahmed, Edwin Simiyu, Grace Githiri, Adrienne Acioly, Shadrack Mbaka, Irene Karanja, and Leonard Kigen

<http://pubs.iied.org/17218IIED.html>

The role of local government in urban food security by Cecilia Tacoli, Hoang Xuan Thanh, Mensah Owusu, Leonard Kigen, and Jon Padgham

<http://pubs.iied.org/17171IIED.html>

Urban poverty, food security and climate change working paper by Cecilia Tacoli, Budoor Bukhari, and Susannah Fisher

<http://pubs.iied.org/10623IIED.html>

Mapping, enumerating and surveying informal settlements and cities Environment & Urbanization 24:1

<http://eau.sagepub.com/content/24/1.toc>

UNFPA Technical Briefing: Urbanization and food prices by Gordon McGranahan

<http://pubs.iied.org/G03114.html>

Is urbanization contributing to higher food prices? working paper by Jesper Stage, Jorn Stage, and Gordon McGranahan

<http://pubs.iied.org/10573IIED.html>

The food price crisis and urban food (in)security working paper by Marc Cohen and James L. Garrett

<http://pubs.iied.org/10574IIED.html>

Food security is rarely prioritised in African cities, and food vendors are similarly ignored or stigmatised, despite providing a range of affordable, accessible meals. Furthermore, past research and urban policies usually overlook food hawkers selling *inside* informal settlements. Based on participatory research in Nairobi, this paper aims to address the invisibility of vendors in informal settlements and to inform more appropriate, inclusive urban food security strategies. Balloon-mapping and other novel mapping techniques were combined with focus group discussions to explore vendors' practices, challenges, and opportunities for promoting food safety. Our detailed maps, vivid narratives, and community-led strategies may cook up a storm that can create safer foods and more secure livelihoods, with benefits extending across African informal settlements.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them — from village councils to international conventions.



International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org

Funded by:



This research was funded by UK aid from the UK Government, however the views expressed do not necessarily reflect the views of the UK Government.



Knowledge
Products