

# Promoting Food Safety in the Informal Markets of Low- and Middle-Income Countries: The Need for a Rethink

Steven Jaffee<sup>1</sup> and Spencer Henson<sup>2\*</sup>

<sup>1</sup>Dept. of Agricultural and Resource Economics, University of Maryland, College Park, MD 20742, USA

<sup>2</sup>Dept. of Food, Agricultural & Resource Economics, University of Guelph, Guelph, Ontario, Canada N1G 2W1

## SUMMARY

This article is an overview of the food safety challenges in the informal sector of low- and middle-income countries (LMICs), especially those in sub-Saharan Africa and large parts of Asia. New strategic approaches are clearly needed to address these challenges. The informal sector, comprising large numbers of small vendors, processors, and foodservice operators, remains a vital component of the food systems in most LMICs. The informal sector is critically important for providing affordable access to fresh, nutritious foods, especially to the poor, even though this sector may also be a source of less nutritious foods. However, food safety problems are ubiquitous in many informal food markets and distribution channels because of the lack of food safety awareness, weak incentives to take necessary actions, and lack of appropriate infrastructure and management capacity. This situation has significant public health implications for many LMICs. In these countries, informal markets typically account for a large proportion of foodborne diseases associated with marketed foods. Current strategies and investments to improve national food control systems, which predominantly focus on the formal sector, are having little impact on the safety of food in the informal sector. To complement national controls, an alternative strategy is needed that is focused on municipal institutions and involves multisectoral interventions and approaches to regulatory delivery that are more appropriate to informal businesses.

## OVERVIEW

Despite on-going structural changes, the food systems of most low- and middle-income countries (LMICs; defined by the World Bank according to the level of gross national income per capita (49)) still feature a preponderance of micro and small-scale food processors, grocers, market vendors, and foodservice operators, especially in sub-Saharan Africa and large parts of Asia. These players, many of whom operate within the informal sector, are especially important in domestic markets for fish, meat, fruit, and vegetables, which are all nutrient-rich foods that are also leading vectors of foodborne disease (FBD) (15). Food market fragmentation and informality is predicted to remain a prominent fixture

of the food systems of LMICs for the foreseeable future (26, 44), meaning that attention is urgently needed to address the food safety challenges that the informal sector present.

Unsafe food is a widespread issue in informal food distribution channels in LMICs, with significant public health implications. In many locations, especially sub-Saharan Africa and large parts of Asia (13, 15), unsafe food results from a combination of inadequate food safety awareness, poor hygienic and/or food storage and preparation practices, and deficient infrastructure and environmental conditions (15). In many instances, both the incentives and the capacities for informal food businesses to provide safer food are limited.

Few LMICs have coherent strategies for tackling food safety risks in the informal sector (15). The operative approach often is based on an exclusion model that involves perpetuating adverse conditions for informal economic activities combined with periodic attempts to disrupt informal businesses in the hope of hastening their demise and ushering in enterprises that are more consistent with the official vision of a “modern” food system (52, 53). This approach does not make food safer but impedes the ability of many (especially poor) consumers to access affordable and nutritional foods. Although the global food safety strategies of the World Health Organization (WHO) (50) and the Food and Agriculture Organization of the United Nations (FAO) (11) acknowledge the importance of the informal sector and the challenges faced for enhancing food safety in this context, they lack new thinking on what to do about this situation. This gap in thinking and practice with respect to food safety in the informal sector must be addressed if the incidence of FBD is to be reduced in LMICs.

## FOOD SAFETY AS A DEVELOPMENT ISSUE

For many LMICs, especially in sub-Saharan Africa and large parts of Asia, the topic of food safety first emerged on their development agendas as a trade issue. In response, considerable resources were deployed to align national regulations with international food safety standards and to build systems of food safety control to comply with trade partner requirements, especially those of high-

\*Author for correspondence: Phone: +1 613.614.522; Email: shenson@uoguelph.ca

income countries. The track record of such trade-related interventions is generally good, and many LMICs have achieved notable successes in exporting higher value, food safety-sensitive products, including fish, meat, spices, nuts, fruits, and vegetables (18).

In recent decades, incrementally more attention has been given to concerns about unsafe food in the domestic markets of LMICs, including the potential repercussions for public health, consumer trust, and the achievement of sustainable development goals (18). This increased attention to food safety has been spurred by improved estimates of the global public health burden of FBD (14), better understanding of the economic costs of unsafe food in rapidly changing food systems (18), and the devastating public health and/or commercial consequences of major instances of food fraud (12, 33).

Much of the emphasis of recent food safety interventions has focused on central government regulatory and surveillance capacity (18), that is, development of a functional national food control system to enforce national or international standards through surveillance, inspection, and laboratory testing. In the domestic setting, the primary target of such efforts is the formal sector and the medium and large food manufacturers, supermarkets, and commercial farms therein (15). Two factors explain this targeting. First, emerging food safety regulatory systems are most appropriate for larger and formal sector players, whereas it is hard to regulate commercial entities that are small, not formally registered, and have high rates of business turnover. Second, central regulatory agencies with constrained budgets and personnel tend to focus on those players and locations most easily identified, reached, and influenced and those for which the legal consequences of noncompliance can be enforced. The result is that the informal sector remains largely untouched in most LMICs, especially in sub-Saharan Africa and large parts of Asia.

### THE STATUS OF FOOD SAFETY CONTROL IN LMICs

Building of effective food control systems is a work in progress for most LMICs (15). Many countries have modernized their food laws, often with the support of international organizations and donors (perhaps most notably the FAO), yet have made limited progress in implementing these laws. For example, assessments of food safety capacity in LMICs have revealed (i) the lack of a comprehensive national policy, translating into the lack of clear priorities for intervention; (ii) the presence of many standards yet a lack of clarity on whether they are voluntary or mandatory; (iii) fragmentation of institutional responsibilities among central government institutions; (iv) limited coordination or delegation of functions between central institutions and those at the subnational level; and (v) major gaps in and/or uncoordinated arrangements for

surveillance and assessment of FBD (18). In contrast, many upper middle-income countries have advanced much further in developing and utilizing official food control regulations.

Both the WHO (50) and FAO (11) have released global strategies for food safety covering the period up to 2030. These strategies emerged from consultative processes and presumably represent state-of-the-art thinking among food safety professionals on how best to apply sound science, emerging technologies, and proven management systems to assess, manage, and communicate food safety risks. Each of these strategies outline core principles and key priorities for promoting capacity, information sharing, etc. However, these strategies are most relevant for high- and upper middle-income countries whose food systems are mostly formalized and where administrative structures and physical infrastructure are relatively strong. The aspirations in these plans are also relevant for low- and lower middle-income countries seeking to provide support and oversight for their larger and/or export-oriented food enterprises. Yet these strategies mostly failed to address how LMICs might better engage with micro and small food enterprises and better address unsafe food in the informal sector. Ironically, the informal sector presents the major challenge for LMICs when it comes to the burden of FBD and thus should be the priority when it comes to efforts to enhance food safety.

### THE INFORMAL SECTOR IN LMICs

The food systems of most LMICs have a hybrid structure, combining larger players, modern forms of food retail, and closely coordinated supply chains with a multitude of micro and small players within informal distribution channels. The informal sector, predominantly consisting of businesses that are not formally registered as an economic entity, comprises a diversity of players including community market vendors, traditional kiosks, micro food processors and animal slaughterhouses, street food or food truck vendors, and operators of small or alleyway restaurants (15). Across the informal sector, food businesses may vary in the degree to which they operate in fixed locations or are transient, with high startup and failure rates.

In many LMICs, the informal sector continues to predominate in the handling, processing, and distribution of many foods, although there is wide variation both within and across countries especially in sub-Saharan Africa and large parts of Asia. For example, in sub-Saharan Africa, 85 to 95% of the market demand for food is serviced by informal markets (45), with this proportion expected to decline to 50 to 70% by 2040. Surveys across southern Africa have revealed that 70% of lower income households normally obtain foods from informal outlets (4). In many African cities, street foods also account for a significant proportion of daily food intake for both adults and children (43).

In Vietnam, although the role of supermarkets in food expenditures has been growing in the largest cities, this

role is limited and primarily restricted to processed foods (37). Nationwide, traditional outlets still accounted for 92% of grocery retail sales in 2019; only in the richest city do modern retail outlets account for >15% of grocery sales. The predominance of traditional outlets is even greater for fresh perishable foods. For example, in Hanoi >90% of consumer spending on fruits, vegetables, meats, and eggs still occurs in traditional outlets, and community markets are by far the most important locale of such food purchases. In Mexico, only an estimated 15% of food purchases occur at formal sector enterprises; the remainder occur in the informal sector or in situations where there is a mix of formal and informal enterprises (9).

Even in countries where their penetration is greater, supermarkets predominantly complement rather than displace community markets and other traditional vendors. Although supermarket penetration is relatively high in the major urban centers of China, community markets continue to be the most significant source of fresh foods (40). The same situation occurs in African countries where supermarket penetration has been relatively more significant (42). Here, consumers continue to prefer traditional markets when purchasing fresh produce due to wider product choice, greater freshness, flexible pricing, proximity to home or work, and the social interactions that take place during shopping. At the same time, consumption of street foods remains conspicuous. An estimated 2.5 billion people worldwide eat street food daily (10).

Among today's LMICs, although processes of food system formalization and consolidation are evident, these tend to take decades to fully play out. In most LMICs, the continued informality of economic activity, including that related to food, has been one of the defining features of urbanization (47). At least for another decade and probably much longer, small-scale operators and informal distribution channels are expected to predominate in food markets, thus serving most of the world's urban population and especially the urban poor.

This situation poses major challenges for the effective management of food safety in the domestic market settings of LMICs. The circumstances of many enterprises in the informal sector are not conducive to effective regulatory oversight and/or the upgrading of food safety controls. Informal food markets tend to be characterized by high rates of business entry and exit, often in the context of wider macroeconomic and/or political challenges for businesses as a whole, with an excess of micro and small enterprises competing for consumers predominantly based on price (21, 25, 48). Lacking formal registration and with little engagement with the financial sector, informal enterprises struggle to access the investment and/or working capital needed to enhance their food safety controls. Because many of these enterprises lack formal title to the land or facilities where they operate, they frequently change locations (7).

When government officials do engage with informal business, the interactions often focus on limiting or disrupting their activity. In the traditional food markets that service much of the population of LMICs, especially the poor, any notions of food safety control are based more on visual cues, personal trust, and/or experience than on official systems of regulation (6, 31, 36). The notion of food control is something of a misnomer in these contexts.

## FOOD SAFETY IN THE INFORMAL SECTOR

### Status of food safety controls

A plentiful literature has documented widespread deficiencies in food safety knowledge and awareness among informal food handlers, processors, and vendors (24, 27, 28, 32, 35, 41). In part, this knowledge gap reflects a widespread lack of training on food handling and minimal engagement with food control officials but also the significant rate of turnover in informal enterprises (and the handlers therein). Lack of hygienic food preparation and poor food handling practices (1, 3, 16, 27), even where there is evidence of at least some food safety awareness, can reflect deficiencies in the environmental conditions and/or physical infrastructure in which informal food businesses operate (5, 17, 23).

In sharp contrast to export-oriented enterprises and/or larger businesses in formal domestic food distribution channels, the micro and small enterprises in informal markets face both weak incentives and lack of capacity to manage food safety effectively. Regulatory, market, and/or social pressures around food safety are typically not effective for inducing behavioral changes or upgrades among informal food actors (15). The predominant *modus operandi* of informal food businesses is cost minimization, with minimal capacity to manage business risks or innovate, resulting in high rates of business turnover (25, 48). The failure to address these incentive and capacity deficits has meant that most interventions have failed to induce significant and sustained food safety improvements in the informal sector.

### Safety of food in informal markets

Evidence from many localized studies, especially those in sub-Saharan Africa and large parts of Asia, indicate that the above factors commonly result in high levels of microbial pathogens in fresh foods sourced from small slaughterhouses or distributed at community markets and in prepared foods sold by street vendors and other foodservice operators (6, 7, 19, 20, 29, 32, 38). Consumers may take actions to reduce their exposure to foodborne microbial hazards, although they often have limited food safety awareness (2, 8), are not focused on hazards that pose the most significant health risks (34), find it difficult to reliably differentiate safe from unsafe food (31), and when making food choices typically give most weight to affordability and convenience (36). The subset of consumers able to pay a premium for certified "safe" food are commonly held back by their lack of understanding of

specific labels and/or their lack of confidence in the integrity of the systems that oversee the sourcing, labelling, and distribution of such foods (46, 51).

Although the micro and small enterprises in informal food markets are faced with numerous food safety challenges, a key question is whether this situation adds up to something significant when it comes to FBD in LMICs. Unfortunately, the lack of hard data makes it difficult to answer this question. However, estimates taking into account the relative size of the informal sector, its prominence in the distribution of fresh foods and in out-of-home eating, and the comparatively higher incidence of FBD in foods from this sector are alarming (15). These estimates suggest that in LMICs as a whole, the proportion of FBD from marketed food attributable to the informal sector is around 80% for low-income and 65% for lower middle-income countries. Wide variation can be found across LMICs according to income and geographical location, but even in upper middle-income countries informal markets most likely account for half of FBD attributable to marketed foods.

## **A FOOD SAFETY STRATEGY FOR THE INFORMAL SECTOR**

### **The need for a strategy**

The informal sector remains a vital component of the food system of most LMICs, especially in sub-Saharan Africa and large parts of Asia. Because of a host of demographic, economic, spatial, social, and other factors, this situation will continue for many years. Yet, informal food enterprises have serious food safety issues that cannot go unchallenged if public health is to be enhanced as part of efforts to achieve sustainable development goals.

Unfortunately, many of the current food safety interventions used in LMICs are unlikely to have much impact on the informal sector. First, central regulatory agencies have little contact with let alone leverage over informal food enterprises, especially away from the capital city. Emerging food safety controls, including systems of surveillance and networks of laboratories, have little relation to the structural and operational realities of the informal sector (15). The one exception is when periodic investigations of prevailing food safety hazards in the informal sector are undertaken, usually in the context of one-off research studies. Second, many national governments and/or development agencies have tried pilot-scale programs to raise the food safety awareness of informal sector food operators and/or to enable these operators to adopt low-cost technologies for more hygienic food storage or preparation (22). Although short-term impacts have often been positive, they have rarely been sustained or scaled up without reinforcing policies or investments. Third, numerous pilot interventions have upgraded select markets, often following periodically published guidelines for “healthy traditional markets.” However, few countries have applied a more

strategic approach to the modernization and management of traditional food markets (15).

Looking to the future, more of the same approach is not going to deliver safer food in the informal sector at the scale needed. At the same time, it is unrealistic to expect incipient centralized food controls focused on the formal sector to trickle down to local informal food markets. Clearly, a very different approach is needed that involves adjustments to institutional mandates, to the locus and thematic clustering of food safety interventions, and to regulatory delivery. Four guiding principles are presented below.

### **Centrally guided local action**

The bulk of interventions aimed at improving food safety in the informal sector should occur at the municipal level, which is a marked departure from the top-down approach to food safety of many governments in LMICs. This change of focus requires that subnational government agencies be legally empowered to enact their own laws and/or to enforce national and/or subnational requirements. National government and food safety agencies still play an important role. Having delegated power to regulate food safety in the informal sector to local authorities, the central government then must mobilize resources and provide guidelines and technical backstopping for local actions. In many instances, effective action by municipal governments will require a change in mind set to recognize the important role played by the informal sector, both in terms of livelihoods and in urban food security. Thus, a new approach to municipal food safety law enforcement is needed.

### **Rebalancing regulatory enforcement**

Strict enforcement of regulations is unlikely to be effective vis-à-vis the food safety practices of informal sector food enterprises (15, 22). Strict enforcement more likely leads to a greater turnover of enterprises, which makes enhancement of food safety controls more difficult. Thus, the regulatory aim should be the gradual and continuous enhancement of food safety practices. Municipalities must see financial penalties as a last resort rather than a source of much-needed revenue. Although shutting down informal businesses and harassing street vendors might be seen to communicate that authorities are taking food safety seriously, these actions do little to improve the safety of food in the informal sector.

Broadly, a wholesale change in the policies and attitudes of municipal governments and local officials with respect to informal food businesses is needed, as is a change in the blend of actions they take. Greater effort should go into engaging and enabling informal food enterprises to strengthen their capacities to carry out their businesses in ways that result in safer food. To this end, officers should see themselves as food safety advisors as much as regulatory inspectors, and they should be trained and rewarded accordingly. Municipal governments also have a role to play

in engendering market incentives for improved food safety in the informal sector, for example through local consumer food safety awareness campaigns.

### **Multisectoral action**

Stand-alone food safety interventions alone are unlikely to be effective and/or cost-efficient for achieving sustainable impacts on the safety of food in the informal sector. For example, efforts to train informal food handlers are unlikely to have appreciable impacts on food safety when these handlers operate in unsanitary market conditions. Improvements in the safety of food in the informal sector are better achieved when bundled with broad-based interventions designed to enhance access to potable water, improve sanitation and environmental management, and upgrade market infrastructure, among other things. Thus, food safety must be taken into account in urban planning and in approaches to the delivery of improved municipal services. Food safety in the informal sector must be seen as an issue to be addressed by both food safety and public health officials and officers and by urban planners and those responsible for urban development more generally.

### **Differentiating municipal strategies and priorities**

Food safety in the informal sector is not an issue where “one size fits all,” in which a common approach to promoting and/or enforcing food safety rules is applied across the plethora of informal enterprises. The structural and operating norms of informal food enterprises differ widely, for example between street food vendors and traditional market traders. Thus, differences exist in the food safety risk profiles of operators within the informal food sector and in the scope for interventions targeting these operators. The nature of the informal sector also differs across food commodities, among urban, periurban, and rural settings, and across countries. Thus, although some common operating principles for municipalities exist, including those detailed above, there is also a need for customization and adaptation to prevailing local realities and norms. The challenge, therefore, is to pragmatically tailor a decentralized and multisectoral approach to enhancing food safety in the informal sector to prevailing circumstances. This tailoring might include shifts in priorities, changes in the sequencing and integration of interventions, and/or adaptation of approaches to facilitation and enforcement. This process of adaptation and “learning while doing” is likely to be on-going.

## **CONCLUSIONS**

Although FBD imposes a significant economic and social cost on LMICs (18), food safety is rarely recognized by national governments and donors as a significant development issue. Food safety investments that have been made have tended to accompany efforts to boost trade in high-value agrifood products and/or to augment official and centralized food control functions that predominantly focus on the formal sector. The scale and specific nature of the food safety issues associated with the informal sector have been largely ignored, even though most of the burden of FBD can be reasonably attributed to food that is marketed by and through the informal sector.

A pressing need exists to refocus the food safety agendas of LMICs on the informal sector. Simply waiting for the informal sector to go away through the ongoing restructuring of agrifood systems as part of the processes of economic development will not suffice; the informal sector will remain a key facet of food markets in LMICs for years to come. However, centralized food safety controls based on a traditional regulatory compliance model are unlikely to be either efficient or effective. Approaches toward enhancing the food safety in the informal sector must recognize the prevailing structure and *modus operandi* of this sector. Decentralized actions are needed, based especially around municipalities, that are more facilitation than enforcement focused and are aligned with broader efforts to enhance access to potable water and sanitation, improved environmental management, and upgraded markets and other elements of public infrastructure. The diverse nature of the informal sector must be recognized and actions aligned with prevailing capacities and incentives to implement enhanced food safety practices.

## **ACKNOWLEDGEMENTS**

This research was conducted as part of the CGIAR Initiative on One Health “Protecting human health through a One Health approach” and the CGIAR Research Program on Agriculture for Nutrition and Health A4NH. We thank all funders who supported this research through their contributions to the CGIAR Trust Fund (<https://www.cgiar.org/funders/>). Various academic researchers and food safety practitioners provided valuable input and feedback for this work, especially Hung Nguyen-Viet and Delia Grace. The views expressed here are solely those of the authors.

## REFERENCES

- Adane, M., B. Teka, Y. Gisunpublmu, G. Halefom, and M. Ademe. 2018. Food hygiene and safety measures among food handlers in street food shops and food establishments of Dessie Town, Ethiopia: a community-based cross-sectional study. *PLoS One* 13(5):e0196919. <https://doi.org/10.1371/journal.pone.0196919>.
- Alimi, B. A., A. T. Oyeyinka, and L. O. Olohungebe. 2016. Socio-economic characteristics and willingness of consumers to pay for the safety of *flura de numu* in Lorin, Nigeria. *Qual. Assur. Saf. Crop. Foods* 8:81–86.
- Arora, A., and R. Mogra. 2019. Assessment of food safety practices followed by street food vendors. *Asian J. Home Sci.* 14:320–324.
- Battersby, J., and V. Watson. 2018. Improving urban food security in African cities: critically assessing the role of informal retailers, p. 186–208. In Y. Cabannes and C. Marocchino (ed.), *Integrating food into urban planning*. UCL Press, London.
- Bormann, F., O. Adzinyo, and L. Letsa. 2016. Safety and hygiene status of street vended foods in Ho, Ghana. *J. Hosp. Manag. Tour.* 7:25–32.
- Cardoso, R. V. C., G. Ribeiro de Santana, and T. F. D. Guimaraes. 2014. Street food consumers in Salvador, Bahia, p. 223–256. In R. V. Cardoso, M. Companion, and S. R. Marras (ed.), *Street food: culture, economy, health and governance*. Routledge, London.
- Contreras, C. P. A., R. V. Cardoso, L. N. Nunes de Silva, and R. E. G. Cuello. 2020. Street food, food safety and regulation: what is the panorama in Columbia? *J. Food Prot.* 83:1345–1358.
- Ezekiel, C. N., M. Sulyok, D. A. Babalola, B. Warth, V. C. Ezekiel, and R. Krska. 2013. Incidence and consumer awareness of toxigenic *Aspergillus* section *Flavi* and aflatoxin B<sub>1</sub> in peanut cake from Nigeria. *Food Control* 30:596–601.
- Farah, I., D. Stern, Y. Ramírez, N. López-Olmedo, C. Pérez-Ferrer, B. A. Langellier, M. A. Colchero, and T. Barrientos-Gutierrez. 2023. Food and beverage purchases at formal and informal outlets in Mexico. *Public Health Nutr.* 26:1034–1043.
- Fellows, P., and M. Hilmi. 2011. *Selling street and snack foods*. FAO Diversification Booklet 18. Food and Agriculture Organization of the United Nations, Rome.
- Food and Agriculture Organization of the United Nations. 2022. *FAO strategic priorities for food safety within the FAO strategic framework 2022–2031*. Committee on Agriculture, 28th Session, 18–22 July 2022. Food and Agriculture Organization of the United Nations, Rome.
- Freitas, T., S. Singh, and J. Gilbert. 2017. Brazil's tainted-meat probe leaves world hungry for chicken. Available at: <https://www.bloomberg.com/news/articles/2017-03-22/brazil-tainted-meat-scandal-leaves-the-world-hungry-for-chicken>.
- Grace, D. 2015. Food safety in low and middle income countries. *Int. J. Environ. Res. Public Health* 12:10490–10507.
- Havelaar, A. H., M. D. Kirk, P. R. Torgerson, H. J. Gibb, T. Hald, R. J. Lake, N. Praet, D. C. Bellinger, N. R. de Silva, N. Gargouri, N. Speybroek, A. Cawthorne, C. Mathers, and World Health Organization Foodborne Disease Burden Epidemiology Reference Group. 2015. World Health Organization global estimates and regional comparisons of the burden of foodborne disease in 2010. *PLoS Med.* 12:e1001923.
- Henson, S. J., S. Jaffee, and S. Wang. 2023. New directions for tackling food safety risks in the informal sector of developing countries. International Livestock Research Institute, Nairobi, Kenya.
- Huynh-Van, B., V. Vuong-Thao, T. Huynh-Thi Thanh, S. Dang-Xuan, T. Huynh-Van, L. Tran-To, N. Nguyen-Thi-Thao, C. Huynh-Bach, and H. Nguyen-Viet. 2022. Factors associated with food safety compliance among street food vendors in Can Tho City, Vietnam: implications for intervention activity design and implementation. *BMC Public Health* 22:94.
- Ibrahim, S., B. Y. Kaltungo, H. B. Uwale, A. Y. Baba, S. N. Saidu, F. U. Mohammed, and H. Dahiru. 2021. Role of slaughter facilities management in zoonoses and safety of meat produced for human consumption in Nigeria: a review. *Bull. Natl. Res. Cent.* 45:137–141.
- Jaffee, S., S. J. Henson, L. Unnevehr, D. Grace, and E. Cassou. 2019. The safe food imperative: accelerating progress in low- and middle-income countries. World Bank, Washington, D.C.
- Jahan, M., M. Rahman, M. Rahman, T. Sikder, R. A. Uson-Lopez, A. S. M. Selim, T. Saito, and M. Kurasaki. 2018. Microbiological safety of street-vended foods in Bangladesh. *J. Consum. Prot. Food Saf.* 13:257–269.
- Johnson, N., J. R. Mayne, D. Grace, and A. J. Wyatt. 2015. How will training traders contribute to improved food safety in informal markets for meat and milk? A theory of change analysis. Discussion paper 1451. International Food Policy Research Institute, Washington, D.C.
- Kok, R., and R. Balkaran. 2014. Street food vending and hygiene practices and implications for consumers. *J. Econ. Behav. Stud.* 6:188–193.
- Kwoba, E., D. O. Oduori, E. R. Lambertini, L. F. Thomas, D. Grace, and F. Mutua. 2023. Food safety interventions in low- and middle-income countries in Asia: a systematic review. *Zoonoses Public Health* 70:187–200. <https://doi.org/10.1111/zph.13028>.
- Loukieh, M., E. Mouannes, C. A. Jaoudeh, L. H. Wakim, F. Fancello, and M. B. Zeidan. 2018. Street foods in Beirut City: an assessment of the food safety practices and of the microbiological quality. *J. Food Saf.* 38:e12455.
- Mallhi, I. Y., M. Sohaib, A. U. Khan, and M. Nawaz. 2019. Evaluating food safety knowledge, practices, and microbial profile of meat in abattoirs and butchery shops in Lahore, Pakistan. *J. Food Saf.* 39:e12612.
- Maloney, W. F. 2004. Informality revisited. *World Dev.* 32:1159–1178.
- Minot, N., R. Stringer, W. J. Umberger, and W. Maghraby. 2015. Urban shopping patterns in Indonesia and their implications for small farmers. *Bull. Indones. Econ. Stud.* 51:375–388.
- Mwove, J., S. Imathiu, I. Orina, and P. Karanja. 2020. Food safety knowledge and practices of street food vendors in selected locations within Kiambu County, Kenya. *Afr. J. Food Sci.* 14:174–185.
- Nkosi, N. V., and F. T. Tabit. 2021. The food safety knowledge of street food vendors and the sanitary conditions of their street food vending environment in the Zululand District, South Africa. *Heliyon* 7:e07640.
- Odwar, J. A., G. Kikuvu, J. N. Kariuki, and S. Kariuki. 2014. A cross-sectional study on the microbiological quality and safety of raw chicken meats sold in Nairobi, Kenya. *BMC Res. Notes* 7:627.
- Owuor, S. 2020. Inclusive growth and informal food vending in Nairobi, Kenya. *Hungry Cities report 21*. Hungry Cities Partnership, Cape Town, South Africa.
- Owusu-Sekyere, E., V. Owusu, and H. Jordaan. 2014. Consumer preferences and willingness to pay for beef food safety assurance labels in the Kumasi Metropolis and Sunyani Municipality of Ghana. *Food Control* 46:152–159.
- Pariza, T., and M. J. Cho. 2024. Food safety in Latin American informal food establishments. *Front. Sustain.* 4. <https://doi.org/10.3389/frsus.2023.1325060>.
- Pei, X., A. Tandon, A. Alldrick, L. Giorgi, W. Huang, and R. Yang. 2011. The China melamine milk scandal and its implications for food safety regulation. *Food Policy* 36:412–420.
- Petrescu, D. C., I. Vermeir, and R. M. Petrescu-Mag. 2020. Consumer understanding of food quality, healthiness and environmental impact: a cross-national perspective. *Int. J. Environ. Res. Public Health* 17:169.

35. Prakashbabu, B. C., J. M. Cardwell, L. Craighead, A. P. N. Ndour, D. Yempabou, E. Ba, R. Bada-Alamedji, A. J. Akakpo, and J. Guitian. 2021. "We never boil our milk, it will cause sore udders and mastitis in our cows"—consumption practices, knowledge and milk safety awareness in Senegal. *BMC Public Health* 20:742.
36. Rheinländer, T., M. Olsen, J. A. Bakang, H. Takyi, F. Konradson, and H. Samuelsen. 2008. Keeping up appearances: perceptions of street food safety in urban Kumasi, Ghana. *J. Urban Health* 85:952–964.
37. Rikolto, World Bank, and Centro Internacional de Agricultura Tropical. 2020. Rapid diagnostic assessment of the food systems and food safety hazards associated with vegetables, pork and fish marketed and consumed in Hanoi and Ho Chi Minh City. Rikolto, Hanoi, Vietnam.
38. Salamandane, A., A. C. Silva, L. Brito, and M. Malfeito-Ferreira. 2021. Microbiological assessment of street foods at the point of sale in Maputo (Mozambique). *Food Qual. Saf. S:fya030*.
39. Sharma, C., and S. Biswas. 2020. Determinants of bribe in informal sector: some empirical evidence from India. *Global Bus. Rev.* 21:436–457.
40. Si, Z., S. Scott, and C. McCordic. 2019. Wet markets, supermarkets and alternative food sources: consumers' food access in Nanjing, China. *Can. J. Dev. Stud.* 40:78–96.
41. Sibanyoni, J. J., P. A. Tshabalala, and F. T. Tabit. 2017. Food safety knowledge and awareness of food handlers in school feeding programs in Mpumalanga, South Africa. *Food Control* 73:1397–1406.
42. Skinner, C. 2019. Contributing and yet excluded? Informal food retail in African cities, p. 104–115. In J. Battersby and V. Watson (ed.), *Urban food systems governance and poverty in African cities*. Routledge, London.
43. Steyn, N. P., Z. Mchiza, J. Hill, Y. D. Davids, I. Venter, E. Hinrichsen, M. Opperman, J. Rumbelow, and P. Jacobs. 2014. Nutritional contribution of street foods to the diet of people in developing countries: a systematic review. *Public Health Nutr.* 17:1363–1374.
44. Tefft, J., R. Adjao, and A. Morgan. 2017. Food systems for an urbanizing world. World Bank, Washington, D.C.
45. Tschirley, D., M. W. Ayieko, M. Hichaambwa, J. Goeb, and W. Loescher. 2010. Modernizing Africa's fresh produce supply chains without rapid supermarket takeover: towards a definition of research and investment priorities. Food Security International Development working paper 93030. Department of Agricultural, Food and Resource Economics, Michigan State University, East Lansing.
46. Vagneron, I., E. Bienabe, P. Ferrand, T. Myint, P. Tho, and D. Jourdain. 2018. Urban consumer preferences regarding organic and safe and environmentally friendly agro-based products in Vietnam and Myanmar. Asian Development Bank, Manila, Philippines.
47. Vorley, B. 2023. Working with informality: constructive ways to transform food systems. International Institute for Environment and Development, London.
48. Webb, J. W., G. D. Bruton, L. Tihanyi, and R. D. Ireland. 2013. Research on entrepreneurship in the informal economy: framing a research agenda. *J. Bus. Ventur.* 28:598–614.
49. World Bank. n.d. World Bank country and lending groups. Available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>.
50. World Health Organization. 2023. WHO global strategy for food safety 2022–2030. World Health Organization, Geneva.
51. Yin, S., L. Wu, L. Du, and M. Chen. 2010. Consumers' purchase intention of organic food in China. *J. Sci. Food Agric.* 90:1361–1367.
52. Young, G., and J. Crush. 2019. Governing the informal sector in cities of the Global South. Discussion paper 30. Hungry Cities Partnership, Cape Town, South Africa.
53. Young, G., and J. Crush. 2020. The urban informal food sector in the Global South, p. 198–217. In J. Crush, B. Frayne, and G. Haysom (ed.), *Handbook on urban food security in the Global South*. Edward Edgar, London.

## *In Memory*

IAFP was notified of the passing of member **James L. Smith**. The Association extends our deepest sympathy to his family and colleagues. IAFP has sincere gratitude for his contribution to food safety.