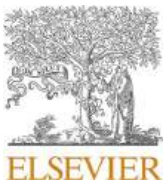
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Review



Informality in food environments: a systematic scoping review of nutrition, livelihood, and sociopolitical outcomes and implications for food policy

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ABSTRACT

Over one billion people in low- and middle-income countries (LMICs) work in food systems, including informal actors such as traditional, street, and mobile vendors, who contribute to food environments critical for food and nutrition security. Despite their role in LMIC food environments, research on how informality is defined and its influence remains limited, creating significant policy gaps. This systematic scoping review addresses these gaps by examining how informality in food environments is defined and empirically studied, and how it intersects with nutrition within livelihood and sociopolitical contexts. A search was conducted across fourteen databases on studies published in English after 2000. From 23,250 records, 327 studies across 64 countries were included. Most research (84%) was conducted in urban settings and employed a diverse range of methodologies. Fewer than 25% of articles explicitly defined informality, as compared to the three components of informality defined by the International Labor Organization: 83% of studies defined informality as goods produced for markets, 23% referred to private enterprises, and only 10% mentioned social protection for vendors. Common food products studied included prepared foods, beverages, and vegetables. Key sociopolitical factors influencing informality were regulation, governance, gender dynamics, and access to water, sanitation, and public spaces. Main livelihood challenges included business operations, vendor interactions, and working hours. Results demonstrate that informal food environments are a linchpin for food security and livelihoods in LMICs. Without understanding informal food environment actors from an interdisciplinary and multidimensional perspective, policies will continue to miss these important food system actors.

1. Introduction

Food systems employ 1.23 billion people globally, with most of those jobs being "informal" (Bonnet et al., 2019; Davis et al., 2023; Chen, 2001). Especially in low- and middle-income countries (LMICs), the "informal" sector is a significant source of livelihoods, particularly for the poor, women, and migrants. "Informality" is also of considerable policy relevance, central to debates around reducing worker vulnerability through social protection, ensuring compliance with relevant food regulations, appropriate urban planning and infrastructure

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development, protecting workers' rights, reining in corruption in public services, and balancing inclusive economic growth with viable taxation (Bonnet et al., 2019; Williams and Lansky, 2013; Godfrey, 2011; Joshi et al., 2014).

Yet while informal actors are widely agreed to be ubiquitous in food systems and economies of LMICs, experts disagree on what constitutes "informality", reflected by over 100 existing definitions (Knox et al., 2019; Ashaley-Nikoi and Abbey, 2023; Luque, 2022; Linares, 2018). The definition itself is widely debated among policymakers and practitioners due to varying contexts and diverse sociopolitical environments in which informality occurs (Ashaley-Nikoi and Abbey, 2023; Luque, 2022; Oliver, 2016). Informality can be traced back to the seminal work done by Hart in the 1970 s, which distinguished work systems as either "informal", low-productivity, unregulated systems or "formal", efficient, regulated, productive, capitalistic systems (Williams and Lansky, 2013; Hart, 1973; Chen et al., 2006). This binary sectoral definition led to an International Labor Organization (ILO) definition in which informal employment refers to private enterprises that are unlicensed or unregistered, produce goods and services for the market, and lack social welfare protection (Bonnet et al., 2019; ILO. Indicator description: Informality. ILOSTAT [Internet]., 2020; ILO, 2022). The binary classification into "formal" and "informal" affects approaches to studying informality, including methods and narratives that have emerged about informal food systems, as well as food policies aimed at supporting informal vendors, such as formalization (Linares, 2018). Formalization of informal food sectors has largely remained unsuccessful due to the high infrastructure costs associated with registration, licensing, permitting, enforcement, and food safety regulation—costs that are often not locally contextualized (Ashaley-Nikoi and Abbey, 2023; Keck and Etzold, 2013; Lince, 2011; Sepadi and Nkosi, 2023; Mhando and Mramba, 2021; Blackmore et al., 2021). Variations in approaches to studying informality have led to diverse perceptions of it; for example, neo-liberal economists view informality as entrepreneurial, while neo-Marxist disciplines view it as precarious (Knox et al., 2019; Ashaley-Nikoi and Abbey, 2023; Termeer et al., 2024). There is a growing consensus that informality manifests differently by context and is not a binary state but rather multi-dimensional; for example, a vendor might have authorization to use a space while remaining unregistered for taxation (Oliver, 2016; Guha-Khasnobis et al., 2006; Altrock, 2016). While we recognize this complexity, we use the term 'informality' throughout this paper for lack of a better term that captures the full spectrum of this concept in various contexts.

Within LMIC food systems, informality exists in many food environments—the spaces where consumers procure, acquire, and consume their food (Ameye et al., 2025; Constantinides et al., 2021; Downs et al., 2020; Osei-Kwasi et al., 2020; Turner et al., 2020). For example, the informal food environment includes street vendors, kiosk operators, mobile vendors, market stall vendors (including vendors outside traditional markets), or home-based vendors. While informality in on-farm jobs is relatively well understood (Davis et al., 2023), the characterization of informality within the food environment is less clear. Indeed, research and policy routinely exclude these informal actors or fail to consider their specific needs.

Further study of informality in LMIC food environments is warranted for three main reasons.

First, there is a growing interest in decent work, urbanization, and demographic shifts in LMICs. As decent work (e.g., fair wages and working conditions) gains considerable attention as part of just food system transitions, demographic shifts marked by a growing youth labor force are occurring in many LMICs (Barrientos et al., 2011; ILO, 2023). In Africa, in particular, an estimated 50% of the population is below 19 years of age, and this demographic faces insufficient livelihood opportunities (Yi et al., 2025; Schneider, 2024). These dynamics create a push into the informal food environment sector, which tends to increase in scale relative to the primary production sector as part of structural transformation (Yi et al., 2025; Schneider, 2024; Rud and Trapeznikova, 2021). Second, the food environment has been gaining attention for its contributions to diets, food security, and livelihoods. Within this literature, there is growing recognition of the importance of informal vendors; for example, street food is increasingly seen as making a key contribution to dietary intake and nutrition (Steyn et al., 2013; Landais et al., 2022). Previous studies have shown that informal vendors in the food environment play a key role in mitigating food insecurity and enhancing convenience and access to food for low-income consumers (Croft, 2016; Battersby et al., 2016; Ahmed et al., 2015). Finally, there is increasing awareness that informal actors, including those in food environments, are affected by sociopolitical factors, such as bribery and personal safety concerns, as well as access to capital, inputs, and networks that facilitate entrepreneurship (Mahopo et al., 2022; Riley, 2020). These factors are also gendered and cultural, indicating the varied and multidimensional nature of informality (Ashaley-Nikoi and Abbey, 2023; Chen et al., 2006).

Despite the importance of studying informality in food environments, there is no systematic synthesis of the literature on how informality is understood within the food environment, how informality in food environments contributes to nutrition and livelihood outcomes, or the sociopolitical factors that affect informality in this context. To address these evidence gaps, we undertook a systematic scoping review addressing three key questions:

1. How is informality defined and studied in empirical research on the food environment?
2. What factors of the informal food environment have been studied regarding food security, food choice, and nutrition outcomes?
3. What socio-political factors have been identified to affect informal food vendors' livelihoods and operations?

2. Methods

The questions above guided our search strategy, screening process, data extraction, charting, and analyses. We conducted the systematic scoping review in accordance with the Joanna Briggs Institute guidelines, and reported the review in alignment with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) (Tricco et al., 2015; Tricco et al., 2018). The protocol was registered via Open Science Framework in May 2023 (https://doi.org/10.17605/OSF.IO/YMK3T). We included English-language studies published from 2000 to May 2023 on informal food environments in LMICs. We aimed to capture studies on "informal employment in the food environment" using synonyms and variations of the following keywords: street foods, (in)formal, casual, (il)legal, (un) licensed, (un)regulated, traditional, and mobile vendors. We used the World Bank's definition of LMICs. We focused on outcomes related to nutrition, livelihoods, and sociopolitical contexts.

Nutrition was broadly defined to include food security, food choice, food safety, and dietary intake. We used the UN Committee on World Food Security's definition of food security, i.e., the status by which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (FAO. The State of Food Security and Nutrition in the World, 2024). Food choice refers to how and why people choose to eat (Constantinides et al., 2021). Dietary intake was reflected in individual intake of a variety of food types (processed, prepared, raw, fruits, vegetables, meat, dairy, snacks, beverages, and other foods) and in adequate nutrient intake. We used the Turner et al. (2018) definition for the food environment as "the interface that mediates people's food acquisition and consumption within the wider food system" (Turner et al., 2018). It encompasses "external" dimensions such as availability, prices, vendor properties, product properties, and promotional information. The definition also covers "internal" dimensions relevant to individual choices, such as the accessibility, affordability, convenience, and desirability of food sources and products.

Socio-political outcomes and influences included personal safety, access to services and resources (including public spaces and water/sanitation), bribes, lending and credit schemes, gender dynamics (social positions shaping interactions in the food environment), child labor, regulation, and social protection. For the search strategy, *livelihoods and labor* were defined as elements reported about informal livelihoods, such as income, wages, hours worked, job security, access to capital, labor force (workers under businesses), and networks. During pilot testing of the data charting framework, these outcomes were expanded, based on deductive coding of the papers, to include the source of stock, transportation, interaction with other vendors, food environment, rental space, and other labor involved in the informal food environment. Similarly, socio-political contexts were expanded to include legitimacy (i.e., the capacity to be seen as legal) (Blackmore et al, 2015), migrant identity, and the role of childcare as a factor pushing women towards the informal food environment (Sneyd, 2016; Duque and Moreno, 2022).

A systematic search was designed and run by a research librarian specializing in evidence synthesis methodologies. Information sources were selected to accommodate the interdisciplinary nature of the research questions, including both large, interdisciplinary databases and smaller, subject-specific repositories. We searched eight academic databases (CAB Abstracts, Web of Science Core Collection, Food Science and Technology Abstracts, BIOSIS Previews, Scopus, Agricola, GenderWatch, Sociology Source Ultimate). We also searched five grey literature repositories (Proquest Dissertations and Theses Global, the FAO Library, CIRAD, Global Agricultural Research Data Innovation & Acceleration Network, and IRDC). Searches were only limited by publication date, and no other database-specific filters were used. Full search strategies for each information source are available on the Open Science Framework protocol. A sample search strategy is provided in Supplementary Table 1.

Screening

The search results from all information sources were exported to the citation-management program EndNote (X9.3.3). For each information source, a single file was exported from EndNote and imported into the screening platform Covidence (Covidence.org), which removed duplicate records. To advance through the screening stages, studies were required to meet all of the following six inclusion criteria: (i) the study was written in English; (ii) the study was published in or after the year 2000; (iii) the study captured informal employment in the food environment; (iv) the study focused on populations in LMICs; (v) the study's outcomes focused on nutrition, livelihoods/labor, or socio-political factors; and (vi) the study was a peer-reviewed journal article, technical report, government document, thesis, or dissertation. Exclusion criteria were defined as the inverse of the inclusion criteria. Reasons for exclusion were documented during the full-text screening stage. Studies that included both food and non-food vendors were excluded because it was not possible to disaggregate findings specific to informal food environments without risking misattribution.

The systematic screening process involved multiple stages to identify relevant studies for inclusion. Two reviewers simultaneously conducted blinded screening of article titles and abstracts according to our predefined inclusion criteria, with conflicts resolved by a third reviewer. Studies for which one or more exclusion criteria applied were removed from consideration; those that could not be confidently excluded moved on to the second round of screening. The 1,889 articles that passed title and abstract screening were then subjected to full-text screening. Although we intended to conduct the second screening with two reviewers, as documented in our protocol, we decided to use a single reviewer due to the very large number of records. In doing so, we followed MECCIR guidelines by re-screening 10% of the studies to ensure the reliability of the screening decision (MECCIR MG of the C. Methodological expectations of Campbell Collaboration intervention reviews: Conduct standards. Campbell Policies Guidel Ser [Internet]. 2016). A reliability of 88% was achieved in this process, and discordance was discussed within the team. All reviewers met weekly to discuss the types of articles being screened and the challenges posed by those that did not neatly fit the screening criteria; these discussions were recorded and reviewed to ensure consistency in decision-making, capture emerging themes in the literature, document methodological changes, and maintain transparency. These documented discussions also served as an audit trail for the screening decisions, informing subsequent refinements to the data extraction framework.

We made one deviation from the protocol during the title and abstract screening process. Initial screening identified a large number of articles explicitly focused on food safety outcomes (food-borne illness, diarrhea, or other gastrointestinal issues from consuming food from informal vendors) related to the informal food environment, especially laboratory studies and knowledge, attitude, and practice surveys (Insfran-Rivarola et al., 2020; Grace, 2015; Desye et al., 2023; Grace et al., 2019; Wallace et al., 2022). Recognizing that the literature on food safety had been extensively synthesized and not wanting to either duplicate this or have food safety overwhelm the other focuses of the review, we excluded food safety-specific outcomes.

Data extraction, coding, quality appraisal, and analysis

We conducted iterative pilot testing of the data characterization framework across 10 papers with a six-person extraction team until 100% inter-rater reliability was achieved. The research questions and protocol guided data charting, which captured key study characteristics, including study title, author(s), geographic location, urbanicity (urban, *peri*-urban, rural), study design and methodology, use of theoretical framework, sample size and population characteristics, definitions of informality employed by authors, research methodology, study design (Sparling et al., 2021), the three outcome types of interest (nutrition, livelihoods/labor, and socio-political factors), climate change or pandemic impact, use of digital services, policy recommendation and associated relevant text excerpts for qualitative synthesis. The pilot testing also facilitated inductive coding, which complemented a priori deductive coding.

We systematically assessed all papers to determine their alignment with the ILO definition of informal employment, which entails four specific criteria (ILO. Indicator description: Informality. ILOSTAT [Internet]., 2020): (i) private enterprises or self-employment arrangements, (ii) enterprises that are unlicensed, unregistered, unregulated, or untaxed, (iii) entities that sell food or beverages directly to markets or consumers, specific to the food environment context, and (iv) employment arrangements that lack social welfare protection such as health insurance, paid leave, or formal contracts. Only criteria i, iii, and iv were explicitly assessed during this stage, since criterion ii was part of the review's inclusion criteria. Articles were not excluded for failing to meet ILO criteria; rather, alignment with each criterion was documented descriptively to characterize the literature.

Study quality was assessed using the Mixed Methods Appraisal Tool (MMAT), which provides a systematic approach to evaluating studies across different methodological designs (Hong et al., 2018). The MMAT employs a three-option response format (yes, no, can't tell) for all assessment questions. We applied a two-stage quality assessment process. First, all records underwent initial quality screening using two preliminary questions: (i) Are there clear research questions? and (ii) Do the collected data allow the research questions to be addressed? Studies receiving non-affirmative responses to either screening question were excluded from the final synthesis due to “very poor” quality. Studies that passed the initial quality screening proceeded to a methodology-specific quality appraisal, using five additional questions that assessed the appropriateness of the study design, sampling strategy, data collection methods, analytical approach, and validity of inference according to the specific study type (qualitative, quantitative, or mixed methods). For scoring purposes, questions that received “no” or “can’t tell” responses were assigned one point, while “yes” responses received zero points. Based on the total score out of five possible points, studies were categorized as low quality (4–5points), moderate quality (2–3 points), or high quality (0–1 point).

We conducted exploratory analyses to summarize key findings and patterns across the included studies, and we used a comprehensive narrative synthesis to address the main objectives of the systematic review. We performed qualitative text analyses and thematic coding in Microsoft Excel, and quantitative exploratory data analyses and visualization in R statistical software and Flourish Studio.

3. Results

The PRISMA diagram in Fig. 1 illustrates the screening processes. The search across 14 databases yielded 23,250 records. After removing duplicates (n = 10,954), we screened 12,294 records by title and abstract. We retained 1,889 records for full-text screening. At the full-text screening stage, most records were excluded because they did not focus on informality in the food environment (n = 504; i.e., studies on informal garment sector workers, street waste pickers, or informal vendors selling cigarettes); lacked outcomes related to the review aims (n = 272); or included both food and non-food informal vendors (n = 312). After full-text screening, we retained 327 records for data extraction and analysis. Of these, seven studies were deemed very poor quality based on the two-item preliminary questions from the MMAT tool and were excluded from the synthesis, resulting in 320 included

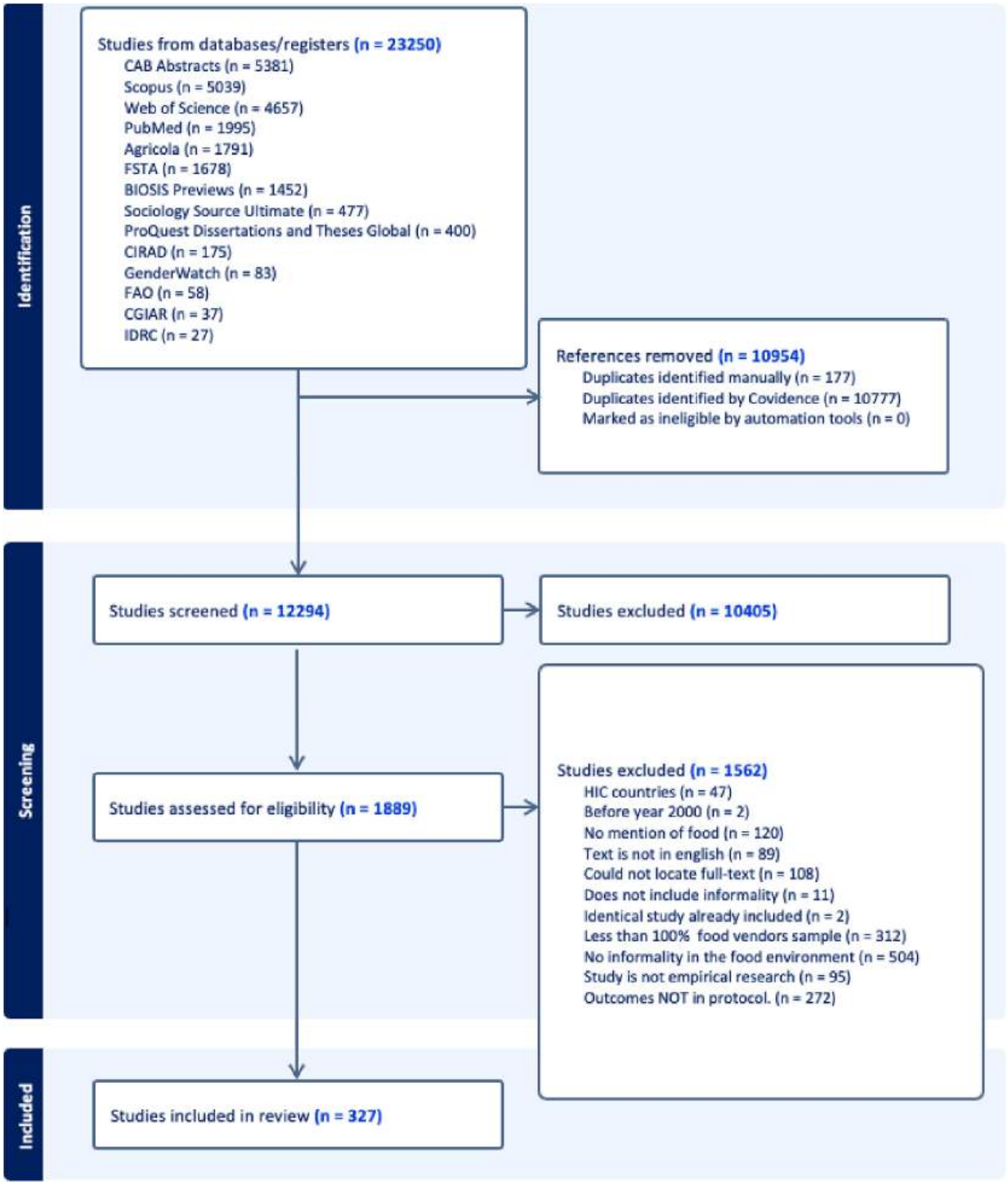


Fig. 1. PRISMA diagram.

studies. The methodological quality of the included studies was generally adequate: 7 were low quality, 36 moderate quality, and 277 good quality.

We synthesize evidence on the informal food environment and actors from the 320 studies in the following sections. Supplementary Table 2 lists all included studies.

4. Study settings, time trends, methods, and outcomes

Overall, 64 LMICs were represented in the included publications. Fig. 2 (Panel A) illustrates the geographic distribution and density of study settings at the country level. African countries comprised 69% of study settings, with South Africa (n = 53), Kenya (n = 34), Ghana (n = 28), Nigeria (n = 19), and Mozambique and Tanzania (n = 10 each) representing the most frequently studied countries in Africa. Asia accounted for 31% of the total records, with India (n = 22), Vietnam (n

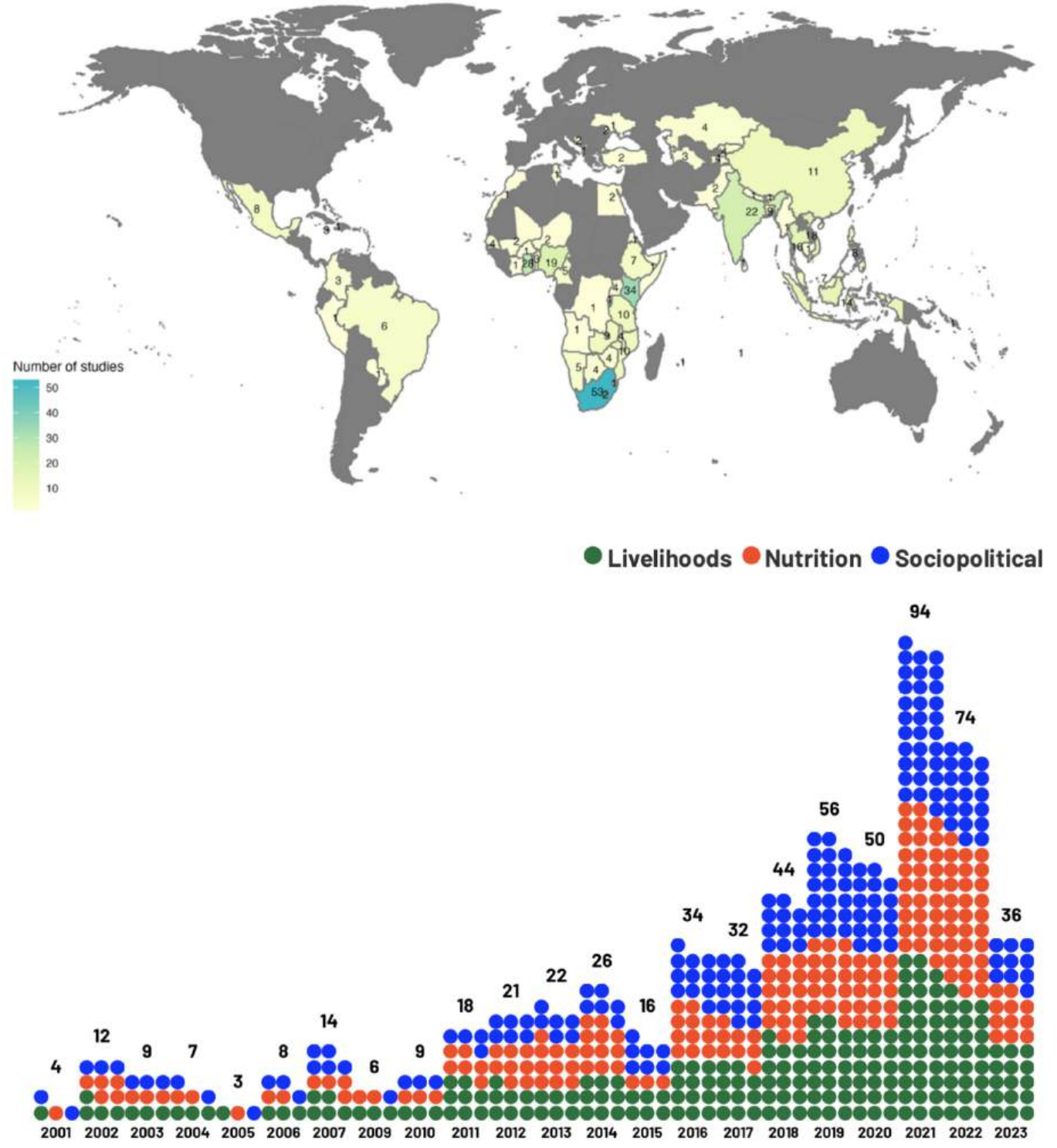


Fig. 2. Study settings, time trends, and outcomes. Panel A: Map of included studies and Panel B: time trends by outcomes.

= 18), Thailand (n = 16), Indonesia (n = 14), and China (n = 11) as the top country contexts studied. Latin American and Caribbean (LAC) countries were least represented, likely because the inclusion criteria restricted studies to those published in English. Mexico (n = 8), Brazil (n = 6), and Colombia and Jamaica (n = 3 each) were the most studied countries in the LAC region. Fewer than seven records had a study setting in island nations, including Fiji, the Solomon Islands, Haiti, Mauritius, and Jamaica.

Over 86% of the records were peer-reviewed journal articles. The top five journals with the most included articles were *Food Security* (n = 12), *Urban Forum* (n = 10), *Public Health Nutrition* (n = 8), *Sustainability* (n = 7), and *Cities* (n = 6). Publication frequency increased beginning in 2018, as shown in Fig. 2, Panel B. Among the 320 records included, 214 records reported livelihood outcomes, 200 reported nutrition outcomes, and 188 reported other factors (Note: a single study could have multiple outcomes and multiple settings).

Fig. 3 shows an UpSet plot illustrating the intersection of outcomes in a single study (see section below on co-occurrence across and between outcomes and implications for framing) (Conway et al., 2017). The bar graph shows the total number of papers, while the colored line in the dot plot shows the intersection of the outcome sets represented by that bar. Ninety-one (of 320) records covered all three outcomes of interest; 62 focused solely on nutrition; and 60 focused on livelihood and sociopolitical outcomes. By contrast, a focus on nutrition plus sociopolitical outcomes was much less common, covered in only 14 papers.

Urban areas accounted for 84% of study settings, followed by *peri*-urban areas at 11%, and rural areas at 5%. Nine records (3%) explicitly mentioned informal settlements, including informal housing and slum settlements. Regarding municipality type, studies were predominantly conducted in city settings. Over 86% (278/320) of the studies were conducted in cities, with more than a third being capital cities alone (108/278) and very few mentioning small cities (15/278). Approximately 13% of the studies were from smaller urban municipalities such as towns (34/320) or village or rural settings (7/320). Approximately 11% mentioned only the region or state (or province or department) where the study was conducted, in addition to other administration unit.

Diverse methodologies and study designs were employed to study the informal food environment. Fig. 4 presents a summary overview of 1) the general approach (i.e., qualitative, mixed, quantitative, and other including evidence synthesis/ reviews) (Sparling et al., 2021), 2) specific methods (i.e., ethnography, case study, action research, quantitative surveys, and other), 3) data collection tools (i.e., interviews, mapping, observations, and other), and 4) sampling frames (i.e., census, convenience, snowball, random, purposive, and other) used in the included studies. A single study could use multiple designs, tools, and sampling approaches. Most studies were empirical (88%), typically using primary data. Qualitative methods accounted for 44%, followed by mixed-methods (39%), and quantitative methods (15%). The most common data collection tools were interviews (31%), surveys (22%), and observations (16%). The most common sampling methods employed were random (19%), convenience (12%), and purposive (15%), with a few records using census-type (7%), snowball (6%), and cluster sampling approaches (<1%). Nearly 27% of the articles specified no information about sampling; these primarily included studies using key informant interviews with policymakers or stakeholder interviews, studies that used secondary data analyses, or reviews.

About 83% (267/320) of the studies were cross-sectional, with fewer than 9% using multiple time points (e.g., panel, cohort, ethnography). The remaining studies (8%, 26/320) were not applicable because they used evidence types such as policy or government document syntheses. The types of vendors studied in the included papers were street vendors (61%), traditional/wet market vendors (12%), small shop/kiosk vendors (5%), household vendors (<1%), and cross-border vendors (<1%).

5. How is informality defined and studied in the empirical literature?

Among the 320 records, over 83% of the included papers on informal food environment vendors mentioned goods or services produced for markets, 23% referred to private enterprises, and only 10% addressed access (or lack thereof) to social protection.

Fewer than 80 (of 320) articles explicitly specified how they defined informality. From the analysis of these texts, five thematic definition categories emerged, as illustrated in Table 1 with examples from the

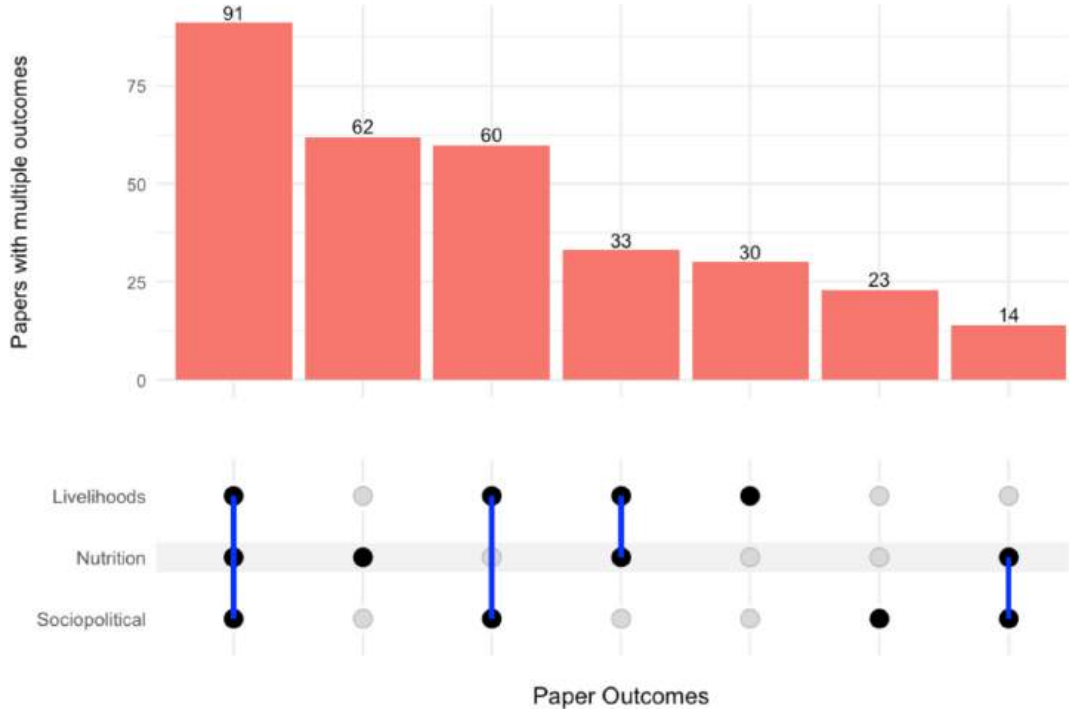


Fig. 3. Papers with multiple outcomes.

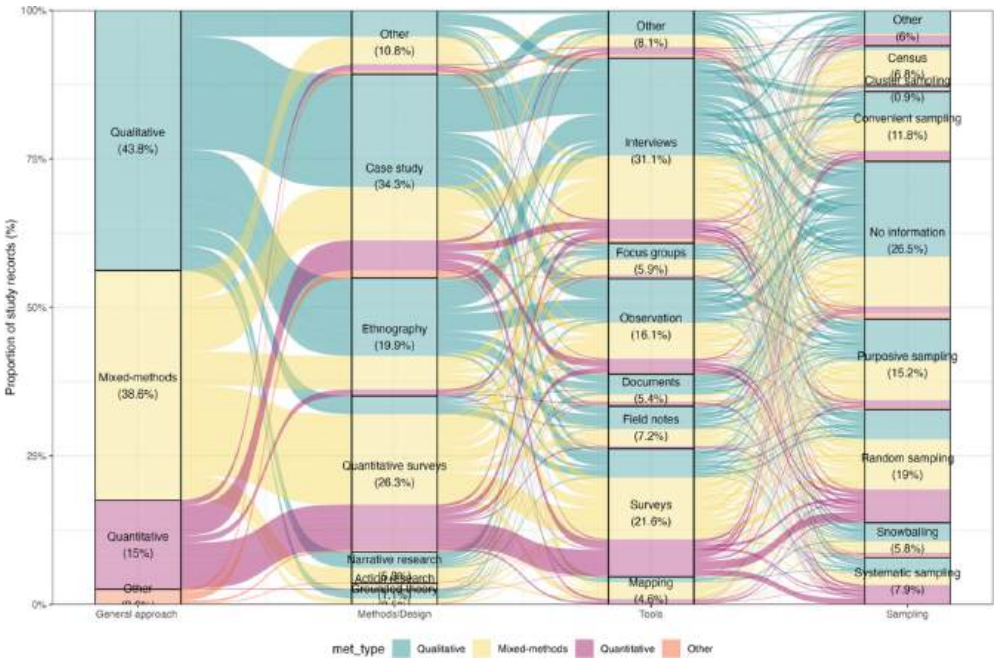


Fig. 4. Overview of the methods, study design, tools, and sampling approaches in the 320 papers included. One study can use multiple tools and sampling approaches.

included studies. The first three categories were rooted in existing literature. The first category drew on the ILO definition, itself based on Hart (Hart, 1973). The second category focused on permanent or semi-permanent infrastructure, aligning with Tinker's 1987 conception of street foods and enterprises (Tinker, 2003; Tinker, 1995; Tinker, 1987). The third category defines informal food vendors based on the types of products sold, such as prepared foods, water packets or bottles, bread, or animal-source foods, and/or on the use of a legally recognized space for vending. The fourth category is location-based, emphasizing vendors' visibility on streets or sidewalks, and broadly includes a definition from an FAO report on street foods (FAO. Street foods. Report of an FAO Expert Consultation, Jogjakarta, Indonesia, 5-9 December 1988). Finally, some papers adopted data-driven approaches to define vendors within the informal food environment.

In many cases, these definitions overlap and expand on one another depending on context. The key differences are that the first category does not specify mobility; the second refers to the vendor's infrastructure; the third group is mobile and lacks a fixed, legally recognized selling space; and the fourth category focuses on specific roads or informal settlements, products, and/or services where the food is sold.

6. What factors of the informal food environment have been studied regarding nutrition?

Of the 200 studies that reported on the nutrition dimension, papers touched on nutrition in four general ways: describing types of food and beverages sold and/or consumed, sometimes including nutrient content (n = 140 records); discussing consumers' food choices (n = 93); discussing food security, primarily food access for the poor, migrants, low-wage workers (often men), or other vulnerable populations (n = 83); and traditional or localized food culture (n = 40).

The studies used different perspectives to consider the foods sold and consumed. They examined them from a vendor perspective, considering operational characteristics, market constraints, and regulatory challenges (Mahopo et al., 2022; Resnick et al., 2019). They also analyzed them through a consumer lens, either with a focus on food-handling practices and food away from home or on access to healthy and unhealthy diets, often estimating the nutrient content of the prepared foods (Micah et al., 2012; Bormann et al., 2016; Lues et al., 2006; Nutritional, 2002; Hill et al., 2014; Namugumya and Muyanja, 2011; Raneri and Wertheim-Heck, 2019). Informal food vendors sell both traditional and more industrialized processed foods, contributing substantially to energy, protein, high-sodium, and micronutrient intakes, such as millet porridges in South India or toasted grasshoppers in Oaxaca, Mexico (Steyn et al., 2013; Hill et al., 2014; Namugumya and Muyanja, 2011; Micah et al., 2012; Patel et al., 2014; Haron et al., 2022; Munoz de Chavez et al., 2000). The imbalance between the availability and portion sizes of these traditional foods and those of more energy-dense processed foods is one factor contributing to what Kroll and colleagues call "obesogenic food environments," where food choice is constrained to outlets that stock more unhealthy foods (Kroll et al., 2019). This work examines the interactions between obesogenic food environments and individual or household food choice and consumption patterns (Kroll et al., 2019).

Food choice studies discussed convenience, desirability (including among affluent or middle-class consumers who seek food in informal spaces), consumer demand, and the customization of prepared food. Food security studies emphasized foods that met both availability from a vendor perspective and affordability from a consumer perspective, especially for those with limited access to formal food retail and other vulnerable groups, such as migrants and the urban poor Etzold, 2014; Berger and van Helvoirt, 2018; Companion, 2010. The informal food environment is also seen as a space of culturally acceptable foods, including local traditional foods (Munoz de Chavez et al., 2000), foods not found in commercial establishments (Duong et al., 2023), wild foods (e.g., termites, mushrooms, traditional leafy greens), and bush meat (e.g., elephant, hippopotamus, antelope, monkey, porcupine, rat) (Ngeh et al., 2014; De Merode and Cowlishaw, 2006; Randolph et al., 2022). The informal food environment may also relate to perceptions of fresh food availability. For example, in Kenya, there is a preference for raw milk or milk with higher butterfat content sold by informal vendors because the texture of milk sold in more formal sectors is altered during industrial processing (Blackmore et al., 2020). Overall, the informal food environment, shaped by informal food vendors, presents a paradox. On the one hand, it was a place of rich food culture and greater availability of traditional foods, thereby creating demand for those products

Table 1
Emerging definitions of informal food environment vendors and illustrative quotes.

Informal food environment definition categories	Definitions	Illustrative quotes
ILO/Hart definition (Hart, 1973) ***(42% of the studies)***	Vendors who sell goods and services to market, not registered or licensed, do not have social protection. Typically, considered to have low productivity	Uses informality as defined by the ILO, "a dynamic array of small-scale economic endeavors, that share one important characteristic: they are not recognized or protected under legal and regulatory framework" (King, 2016) (Ghana) "Informal economy seems to both deceivingly simple and extraordinarily complex and defines the economic actions that is out of boundaries of formal economy that bypass the costs of, and are excluded from the protection of, laws and rules" (Toker, 2021) (Turkey)
Permanent semi-permanent structure (Tinker) (Tinker, 2003) ***(20% of the studies)***	Informal food vendors that don't have physical structured space to sell food.	"Street trading is a growing urban phenomenon in Dhaka city, visible at different places in stationary or moving form. Hence, they are defined as traders who sell goods to the public without a permanent premise to conduct business. Those self-employed workers in the informal sector recognized as street traders who do not have a fixed, permanent concrete arrangement to sell their goods and services" (Husain et al., 2015) (Bangladesh).
By product and/or or legality ***(7% of the studies)***	Informal food vendors that sell specific foods, for example, ready-to-eat foods, and do not have a legally-recognized space.	"In this paper, the term "street vendors" refers to food sellers who do not have a fixed legal space in the local wet markets, and who can either be mobile within certain neighborhoods (using a bicycle or a motorbike) or sell from pavements along the streets. Street food vendors sell a variety of agricultural produce including vegetables, fruits, pork, live fish and seafood, live poultry, fresh rice noodles, tofu, boiled or roasted maize, ground nuts and dried fish." (Kawarazuka et al., 2018) (Vietnam)
By specific location and visibility / FAO 2009 Report (FAO. Street foods. Report of an FAO Expert Consultation, Jogjakarta, Indonesia, 5-9 December 1988) ***(29% of the studies)***	Informal food vendors selling foods at roadsides, streets, or informal settlements	"At the other extreme were smaller informally regulated markets where vendors either operated out of small shacks or at the roadside, usually in informal settlements" (Riley, 2020) (Botswana and Malawi) "Street foods, according to the Food and Agriculture Organization, represent any ready-to-eat foods or beverages prepared and/or sold by vendors and hawkers, especially in streets and other similar public places (Food and Agriculture Organization, 2009). The preparation and/or sale of these foods may be generally classified into three; those prepared in small scale factories at the local level and brought to the street for sale, those that are prepared by the vendor at home and brought to the street for sale, and foods that are prepared and sold at the vending site on the street." (Mensah et al., 2018) (Ghana)
Data-context driven approach ***(3% of the studies)***	These definitions are data and context driven, sometimes adds to the ILO definition.	"In order to determine the different levels of informalization of the female food vendors, four variables were used to generate a dichotomous variable of informality by relying on (i) legal (registration) status, (2) tax (registration) status, (3) account ownership and (4) the type of physical structure of the enterprise. It is important to note that most studies rely only on the first three variables (see Adom and Williams, 2014) but given the uniqueness of the food service industry, the fourth variable is included. As explained earlier, almost all actors in the food sector may be considered formal if the definition is restricted to the first three variables and this is mainly because most of them are registered to meet local authority regulations about food safety and not necessarily because they meet the characteristics of formal firms. For this paper, a firm is considered formal if it is registered with local authorities (district assembly and Registrar General Department), tax authorities, keeps a formal account and has a physical structure in the form of cafes, 'takeaways', 'chop bars' and restaurants. (Ashaley-Nikoi and Abbey, 2023) (Ghana)

and increasing biodiversity in the food system. On the other hand, the informal food environment simultaneously provided easy access to nutrient-poor, energy-dense ultra-processed foods and illegal (yet locally accepted) foods such as bush meat.

To unpack this dynamic, we summarize the food environment factors most frequently studied as compared to the types of food sold. The most examined informal food environment factors were vendor and product properties (n = 181), food availability (n = 117), consumer convenience (n = 108), food affordability (n = 96), and food prices (n = 93); see Supplementary Fig. 1 for details. The most studied food products were prepared foods (n = 109), raw vegetables (n = 81), meat/flesh products (n = 71), raw fruits (n = 67), snacks/chips (n = 49), and beverages (n = 48). Fig. 5 (and Supplementary Fig. 2) illustrates a Sankey diagram connecting food environment dimensions to types of foods, as covered in the reviewed studies. The plot reveals that research on informal food vending heavily focuses on prepared/cooked foods, with vendor characteristics and food availability being the most examined dimensions. Vendor and product properties were often studied in the context of prepared food (n = 81), including through studies linking women's livelihoods to food preparation (Otoo et al., 2012; Mahopo et al., 2022; Eijdenberg and Borner, 2017). The next-most-common food environment factors studied were convenience for the customer through prepared food (n = 57), followed by vendor properties with the sale of raw vegetables (n = 53), meat/fish (n = 46), and fruits (n = 42). Prices often came up in studies conducted on prepared food (n = 43). Fig. 5 also identifies some of the less-studied informal food environment factors and foods.

In the deductive coding framework, two types of convenience

emerged. First, convenience for the consumer (n = 108), as referred to in the original food environment framework, involves food products that reduce opportunity costs, such as time, fuel, and water, thus increasing demand for those products (Turner et al., 2018; Turner et al., 2020). Second, vendor convenience (n = 75; see Supplementary Fig. 4) includes factors that shape vendors' selling choices, such as social capital that makes products more accessible or more reliable transportation, thereby reducing opportunity costs for vendors. An ethnographic study from Indonesia illustrates this concept, where a vendor selling *soto ayam* (Indonesian chicken soup) was able to access chicken through his social network, even during market shortages (Malasan, 2017). The secondary effects of vendor convenience factors (e.g., on consumers) remain understudied.

Overall, there are several key findings from the papers examining the nutrition dimension. Diverse food products are available in the informal food environment, from traditional fruits and vegetables to conventional and customizable prepared foods to increasingly industrialized processed foods (Kroll et al., 2019; Sousa et al., 2021; Albuquerque et al., 2022). For example, Akoa Etoa and colleagues document "197 culinary dishes have been inventoried, with the main dishes being boiled rice, wheat donuts, *Ebobolo (fermented cassava)*, groundnut sauce, boiled plantains, fried beans, and fufu corn" within seven markets in the Yaounde, Cameroon (Akoa Etoa et al., 2018). Regarding accessibility, it is studied through both economic and physical lenses. For example, studies note more informal vendors in poor communities, such as informal settlements and workplaces for low-wage workers (Blackmore et al., 2020; Riley, 2020). Studies also often describe informal vendors as being located near bus stations, workplaces, and schools (Hiamey et al., 2013; Thi et al., 2021; The, 2023). These existing built environments and demographics shape and interact with the types of food available in the food environment. Certain food products were exclusively bought from informal settings, such as traditional vegetables, specific cuts of meat, or prepared foods, irrespective of consumers' socioeconomic status (ShuRu et al., 2020; Wertheim-Heck, 2015). Lastly, while consumer diets are widely studied, very few studies discussed the health, diets, and nutrition of food vendors themselves. When health was mentioned, studies focused on respiratory health from exposure to air pollution, with women more exposed to both cooking fumes and outdoor air pollution (Sepadi and Nkosi, 2023; Mhando and Mramba, 2021).

7. What socio-political factors affect informal food vendors' livelihood and operations?

The most frequently studied socio-political dimensions were gender dynamics (n = 74), governance and regulation (n = 43), access to public space (n = 29), legitimacy (n = 28), and access to water and sanitation (n = 24; Supplementary Fig. 3). Bribes, personal safety, migration challenges, and childcare appeared in fewer than 20 studies each. Meanwhile, the most common livelihood challenges were general business challenges (n = 74), labor force (n = 36), business tenure and rental space (n = 34), working hours (n = 34), vendors' age (n = 32), and interaction with supermarkets and other actors in the food environment (n = 31). Fig. 6 illustrates these interconnections between sociopolitical factors and livelihood dimensions (Supplementary Fig. 4), with thicker flows indicating stronger associations between categories. Business challenges emerged as the dominant livelihood dimension, receiving convergent flows from multiple sociopolitical factors. A second cluster encompasses interrelated operational themes, including labor force, working hours, vendor age, and business tenure status. The third cluster captures market relationships, encompassing interactions with other food environment actors (such as supermarkets and other vendors), the source of food stock, and capital/transportation factors.

Regarding gender, the reviewed studies clearly identify the gendered nature of the informal food environment. Across diverse contexts studied, most informal food vendors were women. The types of food sold were also gendered; most notably, women vendors were primarily involved in the sale of prepared foods and raw vegetables (Ashaley-Nikoi and Abbey, 2023; Grace et al., 2019; Guha et al., 2022; Tinker, 1987; Battersby et al., 2016; FAO. Street foods. Report of an FAO Expert Consultation, Jogjakarta, Indonesia, 5-9 December, 1988; King, 2016;

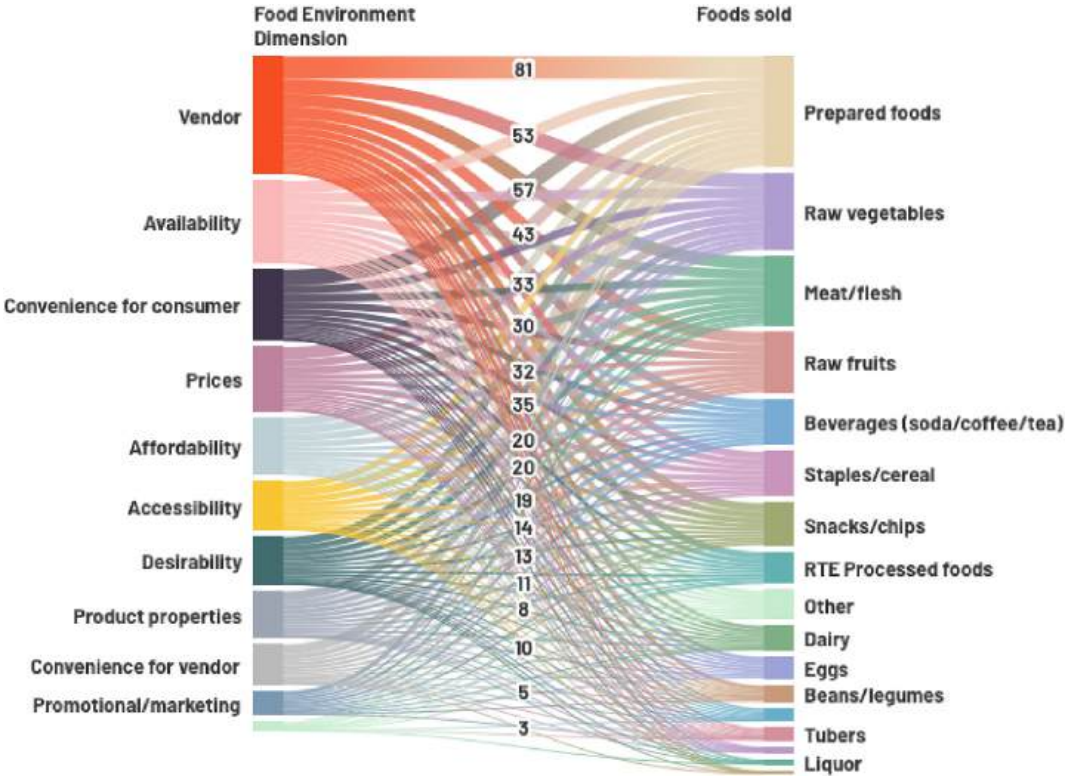


Fig. 5. Food environment dimensions related to foods that were studied.

Toker, 2021; Murphy et al., 2020). An example that nicely illustrates gendered aspects is the fish trade in Tanzania, where a study describes "younger men dominating the more lucrative but riskier fresh trade, older men prioritizing steady income from smoked fish, and women culturally constrained to selling a cooked product (i.e., fried fish)" (Moreau et al., 2021).

The informal food environment was perceived as an inclusive space for a diverse range of women's experiences, with studies noting both push factors (i.e., aspects that force women into these roles from other sectors) and pull factors (i.e., aspects that attract women to the sector or role) (Sisay et al., 2021; Mhando and Mramba, 2021; Tinker, 2003; Argenti et al., 2003). Reviewed studies also show the multiple gender productive and reproductive roles that women vendors juggle, such as how women vendors adjust their working schedules—by strategically timing their operations around peak trading periods and commuting hours—to accommodate unpaid household or care work (Sneyd, 2016; Petersen et al., 2018; Vargas and Urinboyev, 2015). Lack of access to capital was a recurring theme across many studies, particularly among women. However, women vendors did not always act alone: joint decision-making, shaped by local social norms, was also observed when marital partners owned businesses.

Access to public space was a significant theme and represented a fundamental point of tension for informal food vendors, involving both formal and informal regulatory practices (Sepadi and Nkosi, 2023; Resnick et al., 2019; Moustier et al., 2008; Lalu Naik et al., 2023; Lata, 2022; Yasmeen, 2001; Utah, 2015; Lintelo, 2009). Access to public space was cited as a key factor in keeping the cost of street food down (The, 2023); however, vendors still must pay to access water and other public services, often through nearby physical stores; such stores also sometimes offer protection from harassment (Utah, 2015; Lintelo, 2009; Milgram, 2020; Sowatey et al., 2018; Swai, 2019; Bhoola and Chetty, 2022). Many reviewed studies revealed tensions about public space. For example, some studies documented formal attempts to regulate vendor access to public space through zoning systems (Malasan, 2017; Yasmeen, 2001). Others noted how informal payments through bribes were commonly accepted for space and protection, undermining such attempts (Yasmeen, 2001; Randolph et al., 2022). Vendors found creative, locally specific ways to navigate these tensions. In Dhaka, Bangladesh, for example, vendors used "quiet encroachment" tactics, with some male vendors hiding under tea tables when police

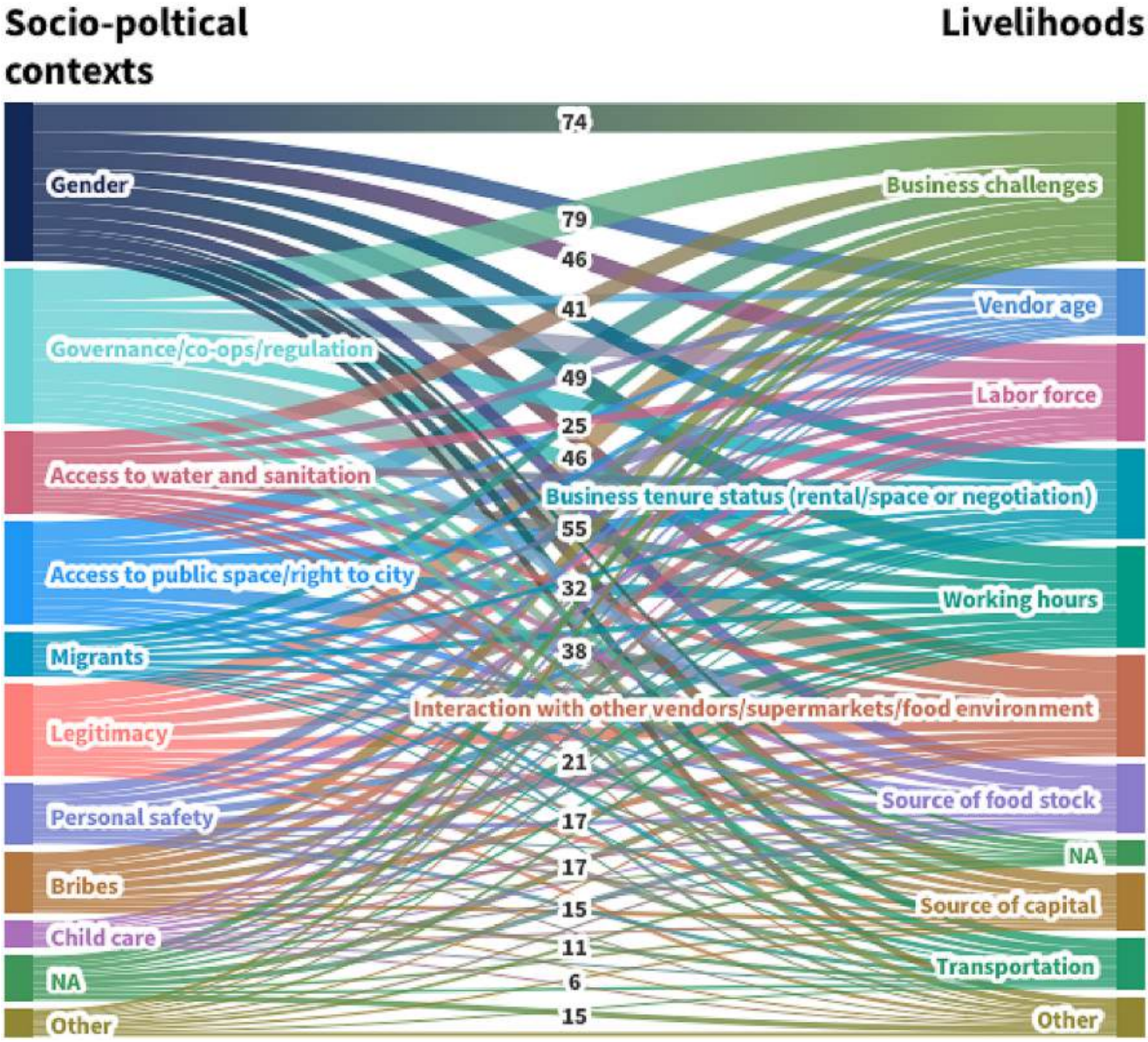


Fig. 6. Sociopolitical and livelihood outcomes intersection.

approached. At the same time, their wives took over operations, as "local police are not comfortable arresting women vendors" (Lata, 2022). Research from Nigeria's secondary cities revealed a different pattern, where vendors operated in an environment of "benign neglect by the government" rather than harsh repression (Resnick et al., 2019). These varied approaches to spatial governance ultimately shaped both vendor livelihoods and urban food access.

Multiple studies highlighted the intersection of these two issues—spatial access with gender. In Bangladesh, for example, a study reported that "few women operate businesses in public due to traditions of patriarchy" (Lata, 2022). In Tanzania's fish markets, spatial arrangements reflected gender hierarchies, with "traders of smoked and dried fish and prawn (nearly exclusively male)" occupying (more preferred) covered areas, and in contrast, "deep-fried fish, sold almost always by women, were traded from small, moveable cabinets in a separate area" (Moreau et al., 2021). Gender-specific business challenges include harassment, gender-based violence, and seizure of goods, which shaped the spatial and temporal patterns of what women and men sold (Mhando and Mramba, 2021; Resnick et al., 2019; Lalu Naik et al., 2023).

Several studies also made it clear that livelihoods and business operations were shaped by complex social networks that underpinned the informal food environment, creating competitive advantages through relationships (Kawarazuka et al., 2018; Migration and Labour, 2016; Petersen et al., 2018; Milgram, 2020). The Indonesian vendor case study mentioned above exemplified this broader pattern of social interconnectivity with economic effects (Malasan, 2017). This single Indonesian vendor mobilized an extensive network comprising his wife and six neighbors for food preparation labor, while sourcing ingredients from multiple specialized suppliers: a shallot vendor, ginger and turmeric shops, various green grocers, a rice vendor, dried fish and shrimp vendors, and spice retailers. These relationships extended beyond simple transactions to constitute what Malasan et al. (2017) term "social infrastructure", purposefully cultivated social ties that reduce both operational costs and competitive pressures. Through these embedded relationships, vendors created mutual dependencies that stabilized supply chains, shared risks, and established informal governance mechanisms, all of which helped legitimize the work. Supplementary Fig. 5 illustrates the social infrastructure framework developed by Malasan et al. (2017) based on their ethnographic case study.

8. Co-occurrence of outcomes across and between three outcome groups

Lastly, we highlight two distinct types of co-occurrences between the three outcome groups (Fig. 7, top and bottom panels): (1) within-dimension overlap, where categories within the same dimension are simultaneously addressed in a single paper, and (2) cross-dimension overlap, where factors spanning the Livelihoods, Sociopolitical, and Nutrition (food environment factors shaping diets) dimensions co-occur.

Across both panels, the strongest co-occurrences cluster of papers around a core set of categories: *vendor properties* in the Nutrition dimension (n = 181 papers overall), *business challenges* in the Livelihoods dimension (n = 142), and *governance/regulation* and *gender* in the Sociopolitical dimension (n = 117 and n = 113, respectively). This concentration is unsurprising given the vendor-centric aims of this review. In the cross-dimension panel (Panel A), *vendor* and *business challenges* were the single most frequent pairing (n = 110 papers), followed by *business challenges* and *governance/regulation* (n = 79) and *business challenges* and *gender* (n = 74), indicating that papers examining vendor food environment dimensions are consistently also engaging with regulatory, labor, and gender contexts. Within dimensions (Panel B), co-occurrence was similarly concentrated: *vendor* co-occurred most frequently with *availability* (n = 76) and *prices* (n = 75) within the Nutrition; *business challenges* co-occurred with *labor force* (n = 63) and *vendor interactions* (n = 62) within Livelihoods; and *governance/regulation* appeared alongside both *gender* (n = 52) and *public space access* (n = 52) within the Sociopolitical dimension.

The high co-occurrence counts of papers across the matrices, with many cells exceeding 30–50 papers, indicate that these three dimensions are deeply intertwined in the literature, supporting the argument that they should be studied and analyzed together rather than in isolation. Co-occurrence also relates to how informality is studied in different disciplines and geographies. For example, we noted papers from economics, public health nutrition, sociology, urban geography, and development studies, each of which tends to bring its own framework into a study of the informal food environment. A glimpse of the frameworks in the papers spanned a wide range of disciplinary traditions, including feminist geography (Kawarazuka et al., 2018; Blas-Yañez et al., 2018; Sinyolo et al., 2022), ambiguous and flexible governance frameworks (Dai et al., 2019), translocality and everyday encroachment (Migration and Labour, 2016; Lata, 2022), sustainable livelihood theory (Swai, 2019), social relations and social practice approaches (Murphy et al., 2020; Adeosun et al., 2022; Wertheim-Heck and Raneri, 2020), and economic embeddedness theories (Jyotishi et al., 2021). This disciplinary diversity reflects why 'informality' itself has been theorized differently across contexts and research traditions, variously framed as opportunistic, precarious, entrepreneurial, or innovative.

9. Summary of policy recommendations from the papers

Over 66% (n = 214) of the studies provided policy recommendations, covering more than 40 countries. The policy recommendation texts were summarized and organized around four thematic policy areas, shown in Table 2. In the first cluster, *infrastructure and operational support,* emerged as the most extensively documented policy area, with over 65 studies out of 214, demonstrating the importance of basic utilities (such as water, electricity, and shade), designated vending zones, and technological solutions such as the use of m-commerce or energy-saving stoves (Mwangi, 2002; Pipitwanichakarn and Wongtada, 2019). Some authors noted that, under the impact of climate change and other shocks, the importance of basic infrastructure was even more critical and tended to be disproportionately affected by gender; for example, women might have less access to market water taps (Gartin, 2012; Roa, 2023). Mobile traders, who are often young men, may be constrained by a lack of access to basic infrastructure. For the second cluster, *definitions, perceptions, and regulatory frameworks*, the reviewed papers (21% of 214 studies) largely suggest that effective informal food environment governance necessitates moving beyond traditional formal-informal binaries. Authorities should move toward more nuanced policy approaches that acknowledge the legitimate economic role of street vendors and informal food retailers, potentially including legal recognition or collaborative governance.

A third cluster, *gender-responsive policies and financial inclusion,* constitutes a specialized but critical intervention area, with over 35 studies (16%) offering recommendations to lower barriers and increase opportunities for women vendors in informal food economies. Lastly, the *social protection and resilience measures* (21%) cluster represents an emerging policy frontier. One prominent subtopic within this category was policies to mitigate the shocks caused by pandemic-related disruptions to livelihoods in the informal food environment. Studies examined how shocks shaped access to food consumption and provision, especially in urban and *peri*-urban contexts.

10. Discussion

This paper has reviewed the literature on informal vendors in food environments, from whom many people in LMIC contexts procure food, with a focus on nutrition, socio-political, and livelihood dimensions. The topic is of extensive and growing interest, with 320 records meeting inclusion criteria and a steady increase in publications over the 22 years

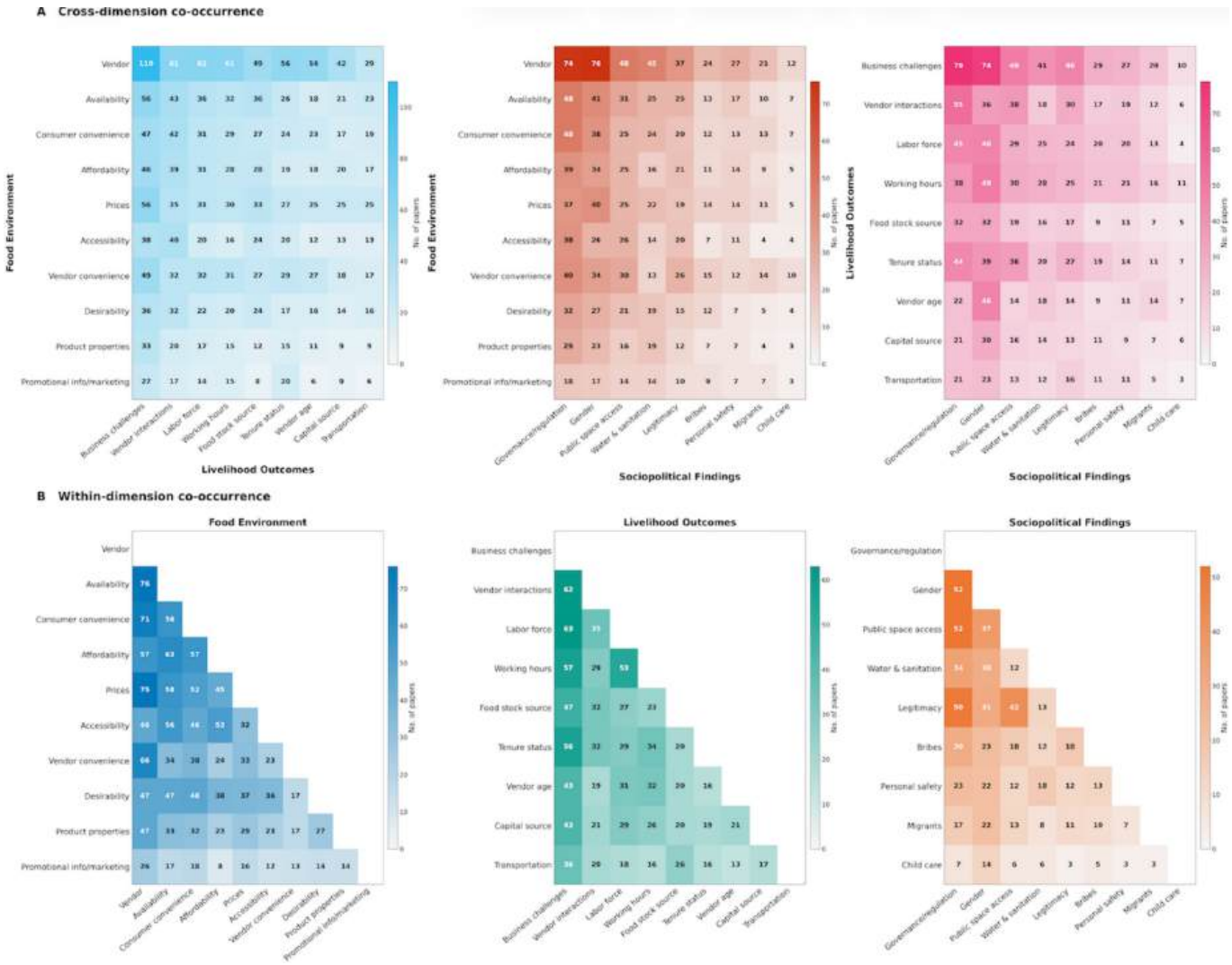


Fig. 7. Co-occurrence of topics across and within dimensions *The top panel shows the distribution of dimension occurrences among three outcome groups (nutrition, livelihoods, and socio-political dimensions), while the bottom panel shows the overlap of outcomes within each outcome group.*

covered by the search strategy. While many LMIC contexts are represented, countries in Latin America, the Middle East and North Africa, and Central Asia tended to be underrepresented compared to those in Sub-Saharan Africa and South Asia. Urban areas (particularly in capital cities) were overrepresented compared to rural and *peri*-urban areas or small cities. While most studies met basic quality criteria, a significant share of the literature lacked methodological clarity (e.g., 27% of studies included no information on sampling). Informal food environment researchers could facilitate more rigorous comparisons and policy recommendations through including: more precise definitions of vendors; more systematic information on their work conditions (e.g., access to social security, wages, hours, diets, nutrition, health and air pollution exposure of vendors); stronger analysis connecting foods sold with nutrition implications (e.g., consumer diet quality or meal frequency); and deeper analysis of how vendor preferences and convenience factors manifest and affect their choices (and by extension, consumers' food choices). Finally, given the strong evidence that gender-related factors play an important role in structuring informal food environments, the topic of personal safety, including gender-based violence and safe childcare, seems understudied in the literature.

A key finding from this review is that, despite a large volume of research covering informal livelihoods in food environments, there remains considerable ambiguity about what constitutes 'informal'. Fewer than one quarter of the reviewed studies clearly specified their definition of informality; among those that did, a wide range of definitions was used, including space-based, product-based, and location-based definitions in addition to those citing the well-established ILO definition. The choice of definition has implications for what is studied and what is not, and ambiguity in classification limits the ability to compare across contexts or to generalize from the available studies to form or test larger theories about informality and how it affects key nutrition, social, and livelihood outcomes. Moreover, the unclear classification of informality muddies policy debates. Definitions that focus on location (e.g., at roadsides or in informal settlements) are likely to lead to place-based policies or interventions; those focused on infrastructure (e.g., having physical stalls) to infrastructure-based policies; and those focused on licensing or legality to legalization or formalization. While all of these can be valid, a more systematic and holistic approach would help ensure that research-recommended policies are tailored to research results, rather than predetermined by research definitions. While a monolithic definition of informality across contexts is unnecessary—one of the clearest and most consistent recommendations across the reviewed literature was the need for a nuanced and multidimensional one—it would be helpful to have, and apply, a more consistent set of modular criteria to classify informality across its continuum.

The review results underline the importance of informal food environments for food security and nutrition, with 200 records covering nutrition-related aspects and reflecting a wide diversity of different

Table 2
Policy recommendations from reviewed papers.

Policy thematic group	Key policy recommendations	Illustrative quotes
Infrastructure & operational support (30% of 214 studies)	• Basic utilities (water, electricity, sanitation) • Designated markets and vending zones • Cold storage and waste management • Transport connectivity, technological innovations • Inclusive urban planning (designated spaces)	*"Provide qualitative measures of different unrestricted amenities such as electricity, waste disposal area, washing facility, drinking water facility, and cold storage by civic authorities"* (India) (Ghatak and Chatterjee, 2018) *"Building cold storage infrastructure, improving the physical infrastructure of markets, and tax reform to support micro and small businesses"* (Ethiopia) (Bliznashka et al., 2021)
Definitions, perception, and regulatory framework (21%)	• Move beyond formal/informal binary • Recognize legitimate economic role • Legal recognition • Collaborative governance	*"Therefore, food policies must embrace a new conceptualization of the food retail in which both the formal and informal retail coexist and contribute to the food security" (Kenya)* (Berger and van Helvoirt, 2018) *"The first policy implication is recognizing street vending as an activity that generates income and jobs that brings goods and services to consumers" (Colombia)* (Martinez et al., 2017)
Gender-responsive policies and financial inclusion (16%)	• Business skills development • Accessible microfinance • Vendor associations • Gender-sensitive programming	*"The fact that female street food vendors do not belong to the poorest segment of society needs to be acknowledged when considering the facilitation of credit. Credit programmes run by NGOs usually target poverty reduction, but many street food vendors are not among the poorest."* (Vietnam) (Hiemstra, 2016) *Assisting women in their food vending activity will require greater access to credit, a better regulation of informal sector activities, better skills training and the sharing of household responsibilities"* (Cameroon) (Fonchingong, 2005) *"1) Interventions of gender-responsive value chain interventions retail should consider the findings of such current studies to propose policy strategies that specifically address enabling factors such as sharing of household labour in paid and unpaid labour, and the strengthening of bargaining power of women retailers…2) for effective implementation of gender-responsive market intervention, we recommend that initiatives should consult with and deliberate the voices of both women and men"* (Egypt) (Murphy et al., 2020)
Social protection & resilience measures (12%)	• Social safety nets for informal workers	*"First, governments should devise mechanisms to extend social protection to informal economy workers"* (Turkey) (Toker, 2021) *"Social protection systems can play an important role in cushioning the informal traders from pandemic-related shocks, such as losses of livelihoods and income*" (Zimbabwe) (Tinarwo et al., 2023)

types of foods sold, as well as the ways informal vendors share food access. An important aspect of informal food vendors' role is facilitating access to both nutrient-dense foods (e.g., fruits, vegetables, and animal-source foods) and ultra-processed foods in rural and urban areas alike, thereby making them a double-edged sword when it comes to enabling healthy diets. While this highlights an opportunity for policy intervention to steer vendors towards selling more nutritious foods, policies to limit sale of ultra-processed food could be difficult, given the complexity of implementing regulations affecting informal vendors, especially regarding food safety. We have observed that informal vendors are increasingly recruited by formal food industry actors, including manufacturers and distributors, as low-cost channels for product placement and market penetration targeting lower socioeconomic status consumers (Ambikapathi et al., 2021; Nordhagen and Demmler, 2023; Development and for External Food Environment Surveillance Systems (EFESS) around Two Secondary Cities in Kenya | ANH Academy [Internet], 2023).

The most examined food environment factors were vendor/product properties (n = 181), availability (n = 117), consumer convenience (n = 168), affordability (n = 96), and prices (n = 93). This differs slightly from the scoping review of food environments in LMICs conducted in 2020 by Turner et al., which found that external food environment domain factors featured strongly, especially availability, vendor properties, and product properties, as well as prices. Given that this review focuses explicitly on informal vendors, it is not surprising that vendor properties are a prominent feature. However, we also found that consumer convenience and affordability, from the internal dimension of the Turner et al. (2019) framework featured strongly in the studies included in this review; this is consistent with the literature's understanding that vendor properties play a significant role in operationalizing convenience for consumers as well as in shaping demand and driving food choice (Constantinides et al., 2021; Nordhagen and Demmler, 2023).

The results also make clear that informal vendors' roles and actions in food environments are shaped by sociopolitical contexts. In particular, informal employment in food environments is highly gendered, echoing a broader trend of informal livelihoods in LMICs, where a larger share of women are employed in informal sectors than in formal ones (Bonnet et al., 2019; Chen, 2001; Ambikapathi et al., 2021). The informal food environment presents both challenges and opportunities for women vendors: while they may lack access to public space, credit, and other resources, and face harassment or violence, they can also leverage their food-related knowledge and skills to earn an income and work flexibly, adapting to their care responsibilities. Some informal food environments are also characterized by joint decision-making among wives and husbands, other relatives of both genders, and broader social networks. A context-specific understanding of gender issues is thus crucial.

The topics found by the review to be covered in the literature likely reflect not only the topics that are the most salient for study but also the topics that are the most study-able and researchers' individual interests. While this is speculative, on the second point, we notice relatively limited research on certain potentially sensitive topics, such as bribes and corruption or personal safety (e.g., sexual exploitation or harassment) as well as on some that could be logistically difficult to study (e.g., migration and mobility among food vendors). On the third point, there are clearly clusters of researchers in certain disciplines working on this topic; for example, among the 53 studies from South Africa (the most-studied country), many have overlapping authorship or author affiliations, particularly reflecting specific disciplines. The existence of particularly active researchers and research clusters with specific interests likely results in those interests being particularly well represented in the literature. Research funders' interests may also play a role – for example, interest among major development donors in gender equity and women's empowerment over the past 10–15 years may be

partly why gender dynamics is so well represented in the literature. Considering these various factors shaping research focus, we note several topics that are less well covered in the literature. Geographically, Central Africa, the MENA region, Central America, and Central Asia are under-represented; while a focus on urban areas generally makes sense, additional work in rural areas and small cities and towns is warranted, as even rural areas are increasingly integrated into non-subsistence food systems. Methodologically, there is considerable scope for studies that follow subjects or settings over time, to track dynamics in rapidly changing food environments or amid policy change. Research that connects informal food environments to diet quality or nutrition outcomes among consumers, rather than just their food choices, would be welcome, as would studies examining the diets and nutrition of food vendors themselves. In the socio-political domain, bribery and corruption, personal safety, migration challenges, and childcare are all topics ripe for further study. On livelihoods, research that examined the evolution of informal food environment work over time (i.e., a worker's career) would help to shed light on the extent to which food vending is a temporary stopgap or long-term role and the extent to which individuals find economic mobility through it. Additional work on how informal actors interact with formal value chains would also be useful from a policy perspective, as the two are often treated in isolation.

Prior work on informality in LMIC food environments has provided a rich set of policy recommendations. The most apparent consensus on this topic was the need to provide basic utilities (e.g., electricity, water, and sanitation) as well as cold storage and waste management services, equitably and inclusively for informal workers. Extending this point, it was broadly recommended to designate markets or vending zones and to plan urban areas in ways that are inclusive of these vendors, rather than trying to erase them or chase them out. Gender-responsive approaches, such as support for women's vendor associations, skill development, and accessible microfinance, were also widely recommended to strengthen social safety nets and bolster vendor resilience to shocks. Underlying all these points was a strong and consistent recommendation to rethink 'informality' within the policy context, moving beyond binaries to recognize overlapping categories along a continuum, with a legitimate economic role for actors all along that continuum. This approach would be supported by adopting a consistent yet flexible, multi-criteria-based definition of informality, as discussed above. Such an inclusive, respectful approach can form the basis for more collaborative approaches to governance and regulation, which may be more likely to meet vendor and social needs simultaneously.

This review has several methodological limitations. First, the lack of an updated search is a constraint. Most guidelines recommend that searches be re-run if they are older than a year. Due to the large number of records identified, however, it was not feasible to update the search for this review. Second, the decision to examine only English-language publications introduces potential bias by excluding relevant work published in other languages; in particular, Francophone West Africa and Latin America may have been under-represented due to the language criterion. Third, we used only a single screener for the initial unfiltered screening phase. Using only one screener increases the risk of mistakes and oversights that could influence the final included studies. We attempted to mitigate this limitation by having another screener review 10% of first screener decisions and by holding frequent team meetings and discussions throughout the screening process. Lastly, we made a protocol deviation to omit studies on food safety, given the plethora of systematic reviews found on this topic. This could present a biased view of the socio-political context and policy recommendations, as public health concerns often shape the state's engagement with the informal food sector. We note that we reviewed several food safety reviews and found that their recommendations are broadly aligned with those generated by this synthesis (Wallace et al., 2022; Grace, 2015).

Informality in LMIC food environments is a significant and persistent force, shaping consumer food choices, food security, and nutrition, while supporting the livelihoods of millions. The significant role of women vendors in informal food environments provides opportunities and cautions about the need to be more attentive to gender dynamics and structural factors that shape women's options, to ensure positive livelihood, nutritional, and policy outcomes. Informal economies can become inclusive economies through targeted, differentiated investment that acknowledges the diversity of these economies' participants (Soto et al., 2025; Elias et al., 2023; Soto et al., 2024). The informal food environment is a place where both precarious survival activities and thriving entrepreneurial ones can co-exist, depending on context; it can provide traditional biodiverse foods as well as industrially processed, or even illegal, ones. Simultaneously, demographic pressures, including youth unemployment and urbanization, are driving demand for affordable access to food in urban areas, contributing to a contentious informal food environment. To better inform policy, future research should embrace this dynamic and multidimensional nature, considering in depth the contributions informal vendors make to the diverse goals that comprise food system transformation.

CRediT authorship contribution statement

Ramya Ambikapathi: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Elizabeth Fox:** Writing – review & editing, Formal analysis. **Swetha Manohar:** Writing – original draft, Formal analysis. **Erick Muriungi:** Formal analysis, Data curation. **Jacob Blizard:** Writing – review & editing, Formal analysis, Data curation. **Daniel Mason-D'Croz:** Writing – review & editing. **Matthew Kibbee:** Writing – review & editing, Methodology, Data curation. **Avery Sirwatka:** Writing – review & editing, Formal analysis, Data curation. **Rachel Bezner Kerr:** Writing – review & editing, Conceptualization. **Simon Kimenju:** Writing – review & editing. **Nilupa S. Gunaratna:** Writing – review & editing. **Mark Lundy:** Writing – review & editing, Funding acquisition. **Jane Battersby:** Writing – review & editing, Validation, Formal analysis. **Mario Herrero:** Writing – review & editing, Funding acquisition. **Jenny Wiegel:** Writing – review & editing, Validation, Funding acquisition. **Stella Nordhagen:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodpol.2026.103197.

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