FOOD SAFETY BEHAVIOUR IN TRADITIONAL MARKETS: A NARRATIVE REVIEW OF FRAMEWORKS AND DETERMINANTS

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(Received 14th August 2026; revised 13th October 2026; accepted 21st October 2026)

Abstract. Food safety behaviour among food handlers in traditional markets remains a persistent public health concern, particularly in low- and middle-income countries where vendors operate within informal, resource-constrained environments. This narrative review synthesises current evidence on food safety behaviour in traditional markets, with attention to its multilevel determinants and the theoretical foundations provided by the Health Belief Model and Social Cognitive Theory. Literature was identified through targeted searches of PubMed, Scopus, Web of Science, and Google Scholar for publications between 2014 and 2026. Findings indicate that food safety behaviour in traditional markets is shaped by sociodemographic, structural, regulatory, economic, and psychosocial factors operating simultaneously. The Health Belief Model captures individual cognitive appraisal effectively but inadequately addresses structural realities, whereas Social Cognitive Theory complements this gap by emphasising reciprocal determinism. The integration of both frameworks offers a more comprehensive analytical lens for understanding food safety behaviour as a practice shaped by daily market conditions. The review proposes an integrated framework to guide future research, measurement, and intervention development for traditional market vendors working within informal livelihood systems.
Keywords: *informal food sector, food handlers, behavioural determinants, health belief model, social cognitive theory*

Introduction

Foodborne disease continues to represent a substantial global public health burden, with the World Health Organization (WHO) estimating that one in ten people worldwide is affected each year (WHO, 2015). Within this broader challenge, traditional markets occupy a complex position. They serve as essential nodes of local food distribution and cultural exchange, particularly in low- and middle-income countries, yet they are also consistently identified as elevated-risk environments for food contamination (Food and Agriculture Organization of the United Nations and World Health Organization, 2024; GAIN, 2023). This dual role makes traditional markets a critical setting for food safety research and intervention. Food handlers in traditional markets differ substantially from their counterparts in formal food service establishments. They typically operate as small-scale, family-assisted, or self-employed enterprises with variable access to formal training, supervision, and infrastructure (Tirmizi et al., 2018; Toh and Birchenough, 2000). Their daily practices are shaped by economic survival, livelihood precarity, peer culture, and the physical realities of open-air or semi-formal vending environments. Consequently, evidence and intervention models derived from formal food service settings cannot be uncritically transferred to traditional market contexts (Leahy et al., 2022).

In Sabah, periodic tamu markets remain important community spaces where food exchange, social interaction, and small-scale livelihood activities intersect. Their mixed

formal-informal character makes them especially relevant for examining how food safety behaviour is shaped by cultural routines, economic necessity, and local governance arrangements (Mohd Yakin et al., 2022). The dynamics observed in these markets exemplify the broader regional pattern of informal food sector operations across South East Asia, where food safety behaviour cannot be separated from the social and economic structures within which vendors operate. Despite considerable global investment in food handler training programmes and regulatory frameworks, the persistence of foodborne risks suggests that current approaches may not adequately address the multiple influences shaping food safety behaviour in informal food environments. A recurring finding in the literature is the knowledge-practice gap, in which food handlers demonstrate adequate knowledge but inconsistent behavioural compliance (Begum et al., 2025; Rifat et al., 2022; Young et al., 2018). Understanding this gap requires examination of the broader cognitive, social, and structural mechanisms shaping behaviour beyond knowledge transmission alone.

Behavioural theories such as the Health Belief Model (HBM) and Social Cognitive Theory (SCT) have been widely applied to explain health-related behaviours. The HBM captures individual cognitive appraisal of health threats, while SCT emphasises the reciprocal interaction between personal, environmental, and behavioural factors (Bandura, 1986; Janz and Becker, 1984). Although both frameworks have been used in food safety research, they have rarely been integrated into studies of informal traditional markets, where structural barriers, livelihood pressures, and peer-based learning systems play a defining role in shaping practice. By framing food safety behaviour as a social and behavioural phenomenon embedded within informal livelihood systems, this review positions traditional market food safety as an issue of public health behaviour, occupational practice, and community governance rather than a purely technical hygiene problem.

Contribution of this review

This review makes three contributions. First, it consolidates evidence on food safety behaviour in traditional markets as a distinct informal occupational setting rather than treating it as an extension of formal food service. Second, it examines the strengths and limitations of the HBM and SCT for explaining food safety behaviour under resource constraints. Third, it proposes an integrated theoretical perspective that can guide future measurement development and context-sensitive intervention design for traditional market food handlers operating in informal economies.

Review questions

This review addresses three guiding questions: (1) What determinants influence food safety behaviour in traditional market settings? (2) How do the HBM and SCT explain food safety behaviour, and what are their respective limitations in informal market contexts? (3) What is the conceptual rationale for integrating the HBM and SCT to study food safety behaviour in traditional markets?

Materials and Methods

This article presents a narrative review of literature on food safety behaviour in traditional market settings, with particular focus on its determinants and applicable

behavioural theories. A narrative review approach was adopted to integrate conceptual, empirical, and contextual literature relevant to informal market food handling, in line with the review's aim to inform theoretical synthesis rather than to quantify effect sizes (Sukhera, 2022; Greenhalgh et al., 2018). Literature was identified through searches of PubMed, Scopus, Web of Science, and Google Scholar between January and April 2026 and included publications from 2014 to 2026, together with seminal theoretical works published earlier where conceptually relevant. Search terms combined keywords related to food safety behaviour, food handlers, traditional markets, street vendors, informal food sector, HBM, SCT, knowledge-practice gap, and food safety interventions. Inclusion criteria covered peer-reviewed articles published in English between 2014 and 2026 that addressed food safety behaviour, its determinants, or its theoretical foundations in traditional market or informal food settings. Foundational theoretical works published earlier (Bandura, 1986; Janz and Becker, 1984; Rosenstock, 1974) were retained for conceptual completeness. Grey literature from international agencies, including the Food and Agriculture Organization, the WHO, and the Codex Alimentarius Commission, was included where relevant. Search results were screened first by title and abstract, followed by full-text review where relevance was uncertain. Priority was given to studies that addressed food handlers, informal food environments, behavioural determinants, food safety training, or theory-based behaviour change. Studies focused exclusively on formal food premises, consumer-side food safety, or behavioural framings unrelated to the review's thematic focus were excluded. The included literature was then grouped into thematic categories reflecting individual, social, environmental, regulatory, economic, and theoretical determinants. The final body of literature was organised thematically rather than chronologically to support conceptual integration across studies. Because the review was narrative rather than systematic, the search strategy was intended to identify conceptually and empirically relevant literature rather than to exhaustively capture all studies on food safety behaviour.

Food safety behaviour in traditional markets

Defining food safety behaviour

Food safety behaviour refers to the routine practical actions undertaken by individuals involved in food preparation, handling, and distribution to prevent contamination and reduce the risk of foodborne illness (Young et al., 2018). For food handlers, this encompasses personal hygiene, handwashing, utensil cleaning, food covering, separation of raw and cooked foods, safe storage practices, temperature control, and prevention of cross-contamination (Begum et al., 2025; Soon, 2019). The WHO consolidates these core actions through the Five Keys to Safer Food framework (WHO, 2006). In empirical research, food safety behaviour is commonly conceptualised as a composite construct that integrates multiple specific practices rather than isolated actions (Haddad and Ngah, 2024a; Boutros and Roberts, 2020). This conceptualisation aligns with behavioural frameworks that understand practice as the product of multiple cognitive, social, and contextual influences acting together. Measurement is typically achieved through self-reported questionnaires, direct observation, or a combination of both, with each approach carrying distinct methodological strengths and limitations (Bulochova et al., 2024; Zanin et al., 2017).

Traditional markets as a distinct food safety setting

Traditional markets, including wet markets, public markets, open-air bazaars, and the periodic tamu of Sabah and other parts of Southeast Asia, serve as essential food access points and as social and cultural institutions for local communities (Mohd Yakin et al., 2022). Their operational characteristics distinguish them from formal food premises in several important ways. Vendors frequently work in open or semi-open spaces with temporary or semi-permanent stalls, often selling diverse food types in close spatial proximity. The absence of temperature-controlled storage, intermittent water access, inadequate drainage, and exposure to weather, dust, pests, and animals collectively define a distinct food safety environment (DeWaal et al., 2022; Leahy et al., 2022). Recognition of these distinctive operational realities has led the Codex Alimentarius Commission to adopt the Guidelines for Food Hygiene Control Measures in Traditional Markets for Food, which explicitly acknowledges that traditional markets require setting-specific hygiene guidance distinct from that applied to formal indoor food premises (Food and Agriculture Organization of the United Nations and World Health Organization, 2024). This formal recognition supports the broader argument that food safety behaviour in traditional markets must be examined in relation to the conditions under which vendors work rather than evaluated against standards designed for fundamentally different operational environments.

Food handlers as a distinct occupational population

Food handlers in traditional markets constitute a distinct occupational population shaped by informal operational structures, livelihood-driven decision-making, and limited engagement with formal regulatory pathways. Unlike workers in commercial establishments who typically operate under clear managerial supervision, traditional market vendors predominantly function as small-scale, self-employed, or family-assisted operators (Abdul Aziz et al., 2024). Their daily routines are tightly intertwined with economic survival, with food handling decisions frequently mediated by income continuity, market footfall, and the pressures of subsistence trading (Nordhagen et al., 2025; Madjdian et al., 2024a, 2024b). Their food safety knowledge is also acquired through pathways that differ from those of formal sector workers. Rather than relying predominantly on structured classroom certification, vendors often develop hygiene practices through experiential learning, family transmission, peer observation, and community norms (Begum et al., 2025). These features highlight the inadequacy of food safety frameworks designed around formal-sector assumptions, including the availability of written standard operating procedures, consistent regulatory oversight, and universal access to formal training. In the absence of such institutional structures, traditional market vendors play a critical role in safeguarding the safety of locally consumed food, yet remain largely outside the reach of conventional food safety governance.

Determinants of food safety behaviour in traditional markets

Reviews of food safety behaviour consistently demonstrate that no single category of determinants is sufficient to explain observed variation in compliance, and that meaningful behavioural change requires intervention across multiple levels of influence (Begum et al., 2025; Garsow et al., 2025). The following subsections examine the major categories of determinants relevant to traditional market settings.

Sociodemographic determinants

Sociodemographic factors such as age, gender, education, occupational experience, and certification status are commonly examined as predictors of food safety knowledge and practice. These variables operate as proxies for differential access to information, resources, and training. Educational attainment is particularly well documented, with higher education generally associated with greater hygiene awareness and behavioural compliance (Elexson et al., 2023; Wan Nawawi et al., 2022). However, this association is not universal. In settings with limited facilities, structural barriers may substantially limit the extent to which educational advantage translates into safe daily practice (Begum et al., 2025; Rifat et al., 2022). The effects of gender and occupational experience are more mixed. While some studies suggest female vendors display more consistent hygiene behaviours, partly attributable to cultural patterns of food preparation responsibility, other reviews find no significant gender effect once environmental constraints are considered (Begum et al., 2025). Similarly, while extensive experience can build practical competence, it can also entrench habitual practices that diverge from formal recommendations (Thaivalappil et al., 2018). These inconsistencies indicate that sociodemographic factors function less as direct causes of behaviour than as background conditions influencing how food handlers engage with their operational environment (Wang et al., 2023; Young et al., 2018).

Knowledge, training, and the knowledge-practice gap

Knowledge of microbiological hazards and safe handling principles remains a foundational determinant of food safety behaviour, and structured training programmes have been shown to improve knowledge acquisition and attitudinal disposition toward safer practice (Insfran-Rivarola et al., 2020). Nevertheless, an enduring finding across the global food safety literature is the persistent gap between knowledge and behavioural compliance. Umbrella reviews consistently demonstrate that food handlers may exhibit adequate knowledge and positive attitudes while displaying inconsistent practice (Begum et al., 2025; Young et al., 2018). This disconnects challenges the linear assumption underlying the conventional Knowledge-Attitude-Practice model, which presumes that acquired information automatically translates into rational behaviour. In informal market environments, the knowledge-practice gap is often less a matter of cognitive failure than of structural infeasibility. Vendors may understand recommended hygiene principles yet remain unable to apply them consistently due to limitations in water access, sanitary infrastructure, time, supervision, and economic resources (Begum et al., 2025; Madjdian et al., 2024a, 2024b). Therefore, knowledge-only interventions are likely to demonstrate limited effectiveness when implementation conditions remain unchanged.

Environmental and infrastructural determinants

Environmental and infrastructural conditions constitute the foundational context within which all food safety behaviour occurs. Unlike individual cognitive factors, infrastructural determinants are largely outside the food handler's direct control, yet they exert a powerful influence on the feasibility of safe practice. The physical configuration of a market, including potable water availability, drainage, waste disposal, sanitary facilities, and stall infrastructure, directly conditions whether vendors can implement

fundamental hygiene actions (Food and Agriculture Organization of the United Nations and World Health Organization, 2024; Madjdian et al., 2024a, 2024b). In informal and traditional markets, infrastructural limitations consistently emerge as primary barriers to food safety compliance. Open-air or semi-open vending spaces complicate the separation of raw and ready-to-eat foods, while the absence of temperature-controlled storage compels vendors to rely on rapid daily sales (DeWaal et al., 2022). Intermittent or shared water supplies hinder consistent handwashing and utensil sanitation, and exposure to weather, dust, and pests further constrains the practical implementation of safe-handling routines (Leahy et al., 2022). Under such conditions, even motivated and skilled food handlers may struggle to maintain safe practices without basic infrastructure support.

Regulatory and enforcement factors

Regulatory enforcement and certification frameworks function as additional determinants of food safety behaviour, though their operation differs substantially between formal and informal sectors. In formal settings, structured inspection regimes and clearly defined penalties typically reinforce compliance. In informal markets, by contrast, regulatory presence is often episodic, fragmented across multiple authorities, and accompanied by ambiguous certification expectations (Nordhagen et al., 2025; Kuboka et al., 2024). When enforcement visibility is low or perceived as inconsistent, the deterrent effect of formal regulation diminishes, and food safety motivation shifts toward self-regulation, peer norms, and informal accountability structures. Importantly, command-and-control enforcement approaches have been shown to be less effective in informal settings where vendors lack the resources to meet formal standards (Leahy et al., 2022). Supportive and educational enforcement strategies, by contrast, may yield more sustainable improvements by strengthening vendor trust and signaling realistic expectations (Begum et al., 2025).

Economic and livelihood determinants

Economic and livelihood pressures emerge as among the most consequential determinants of food safety behaviour in informal markets, particularly among vendors operating on subsistence-level margins. The direct and indirect costs of compliance, including purchases of hygiene materials, investment in storage equipment, and absorption of spoilage losses, are weighed continuously against immediate income needs (Abdul Aziz et al., 2024; Madjdian et al., 2024a, 2024b). Under conditions of income insecurity, food safety decisions tend to follow a feasibility logic in which economic preservation takes precedence over idealised hygiene standards. Vendors with higher monthly revenue are typically better positioned to invest in hygiene equipment, whereas those under time pressure and high workload intensity during peak trading hours may resort to procedural shortcuts (Thaivalappil et al., 2018). Consumer demand patterns further shape vendor behaviour: where customers prioritise low prices over visible hygiene markers, vendors have limited economic incentive to absorb the costs of improved practices (Nordhagen et al., 2025; Kuboka et al., 2024). Within this analytical lens, non-compliance in informal markets often reflects adaptation to livelihood constraints rather than wilful negligence.

Theoretical foundations: Health belief model and social cognitive theory

The complexity of food safety behaviour, particularly within informal traditional market environments, necessitates theoretical frameworks capable of addressing both cognitive motivation and contextual realities. Two complementary frameworks dominate the food safety behaviour literature: the HBM and SCT. This section reviews each framework, examines its strengths and limitations, and prepares the conceptual ground for their integration in studies of traditional market food handlers.

The health belief model

Developed in the 1950s within the United States Public Health Service to understand non-adherence to preventive health behaviours, the HBM has become one of the most extensively applied behavioural frameworks in health research (Jones et al., 2015; Orji et al., 2012). The model proposes that health-promoting behaviour follows a rational cognitive appraisal in which individuals weigh perceived susceptibility to and severity of a health threat against perceived benefits and barriers of preventive action (Carpenter, 2010). The framework was later expanded to include cues to action and self-efficacy, broadening its capacity to capture both motivational triggers and confidence in behavioural execution. When applied to food safety, the HBM frames a food handler's likelihood of adopting safe practices as a product of risk appraisal and behavioural assessment (Haddad and Ngah, 2024a). Perceived susceptibility represents the vendor's belief that unsafe handling could result in foodborne illness, while perceived severity captures the anticipated seriousness of the consequences for customers, the business's reputation, and legal standing. Perceived benefits and barriers reflect the cost-benefit calculations underlying behavioural decisions, while cues to action and self-efficacy account for triggers and confidence respectively. Meta-analyses of HBM applications, however, indicate that perceived susceptibility and severity are typically weaker predictors of behavioural change than perceived barriers, particularly when health threats are not personally experienced or immediately tangible (Orji et al., 2012; Carpenter, 2010). Notwithstanding its widespread use, the HBM has notable limitations as a standalone explanatory framework. Quantitative reviews indicate that the core constructs explain only 20% to 40% of variance in health-related behaviours (Orji et al., 2012). The model has also been criticised for failing to specify the ordering or combination rules among its constructs (Jones et al., 2015). Most importantly for the present review, the HBM is fundamentally an individual-level cognitive framework and provides limited theoretical leverage for explaining the influence of structural, social, and environmental conditions on behaviour (Young et al., 2018).

Social cognitive theory

SCT, formally articulated by Bandura (1986), offers a broader explanatory framework by moving beyond purely cognitive models. The central tenet of SCT is reciprocal determinism: the continuous, dynamic interaction among personal cognitive factors, the behaviour itself, and the external environment (Boutros and Roberts, 2020; Manjarres-Posada et al., 2020). This conceptualisation explicitly incorporates the social and physical contexts that surround behaviour, addressing a key gap in purely individualistic cognitive frameworks. Within SCT behavioural capability refers to the knowledge and skills required to perform behaviour, while observational learning describes the acquisition of behaviour through watching others. Reinforcements encompass internal and external responses that shape the likelihood of behavioural

continuation, and expectations capture the anticipated consequences of behaviour. Self-efficacy, conceptualised as the individual's confidence in their capacity to perform a behaviour despite obstacles, occupies a central role and is developed through mastery experience, social modelling, verbal persuasion, and physiological state management (Manjarres-Posada et al., 2020). Self-regulation, encompassing goal-setting and self-monitoring, accounts for the internal psychological processes that sustain behaviour in the absence of external supervision (Haddad and Ngah, 2024b; Boutros and Roberts, 2020). Empirical applications of SCT in food safety research have demonstrated associations between key constructs, particularly environmental determinants, self-efficacy, self-regulation, and outcome expectations, and food safety behaviour among restaurant workers and food handlers (Haddad and Ngah, 2024b; Boutros and Roberts, 2020). These findings indicate that safe food handling cannot be reduced to individual choice alone but emerges from the interplay between worker confidence, peer influence, supervisory reinforcement, and physical infrastructure.

Results and Discussion

Comparative analysis

Table 1 presents a comparative analysis of the two frameworks across key conceptual dimensions, highlighting their complementary strengths and limitations.

Table 1. *Comparative analysis of the health belief model and social cognitive theory in food safety behaviour research.*

Dimensions	Health belief model	Social cognitive theory
Primary focus	Individual cognitive appraisal of health threats and behavioural costs/benefits	Reciprocal interaction between person, behaviour, and environment
Core constructs	Perceived susceptibility, severity, benefits, barriers, cues to action, self-efficacy	Reciprocal determinism, behavioural capability, observational learning, reinforcements, expectations, self-efficacy, self-regulation
Conceptual strength	Captures internal motivational and risk-appraisal processes underlying behavioural readiness	Captures the multilevel social, environmental, and self-regulatory mechanisms sustaining behaviour
Key limitation	Limited engagement with social and structural context; assumes rational decision-making	Greater conceptual complexity may complicate operationalisation in applied settings
Application to food safety	Useful for explaining individual risk perception and motivation	Useful for explaining behaviour sustainability within social and environmental constraints
Empirical relevance	Frequently used to explain risk perception and perceived barriers	Useful for explaining behaviour shaped by social, environmental, and self-regulatory factors

Rationale for integrating the health belief model and social cognitive theory

Reliance on the HBM alone proves analytically insufficient when examining food safety behaviour among informal market vendors, primarily because the model isolates individual cognitive decision-making while giving limited attention to the social conditions and practical constraints of the workplace (Young et al., 2018). The limitation is particularly evident in studies of the knowledge-practice gap. A vendor may possess adequate knowledge, perceive elevated foodborne illness risk, and recognise the benefits of safe handling, yet remain unable to implement those practices due to absent water access, peer pressure to maintain high service speed, or income loss from rejecting customer demand for cheaper but riskier products. Integration of SCT with the HBM offers a more comprehensive, multilevel analytical lens. The HBM effectively maps the internal risk appraisals and motivational calculations that initiate

behaviour, while SCT contributes the multidimensional mechanisms, self-regulation, observational learning, environmental facilitation, and peer reinforcement, needed to sustain behaviour in complex settings. Recent literature on food service workers has demonstrated that integrated applications capture a more complete picture of how handlers navigate competing safety requirements and operational pressures (Haddad and Ngah, 2024a, 2024b). For traditional market settings specifically, integration is particularly justified because food safety behaviour cannot be understood as a single-level phenomenon. Individual beliefs may shape whether vendors recognise food safety as important, but SCT-derived constructs are needed to explain whether they have the social, environmental, and structural support to translate those beliefs into routine practice. Examined together, the two frameworks position food safety behaviour as both cognitively motivated and shaped by the working environment: a negotiated practice requiring both the motivation to act and the capability to navigate the operational realities of the traditional market environment. An integrated framework also supports more contextually grounded measurement. In informal market settings, constructs such as perceived barriers, environmental influences, self-efficacy, and self-regulation are unlikely to operate in the same way as in formal food service contexts. Items measuring these constructs must therefore undergo contextual adaptation that accounts for limited infrastructure, irregular enforcement, livelihood pressure, variable literacy, and routine-based hygiene practices (Begum et al., 2025; Madjdian et al., 2024a, 2024b). This combined theoretical approach provides the basis for adapting measurement tools to informal market realities, ensuring that measurement and intervention reflect the actual behavioural pathways operating in informal settings rather than those assumed by formal sector frameworks.

Proposed integrated framework

Drawing on the comparative analysis in Section 5 and the rationale for integration in Section 6, this review proposes a combined HBM-SCT model for understanding food safety behaviour among food handlers in traditional markets. The proposed framework is presented in *Figure 1*. The framework positions food safety behaviour as the outcome of three interacting layers of influence. The first layer comprises the cognitive-motivational constructs of the HBM: perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy, which collectively shape vendors' internal appraisal of food safety risks and the perceived value of adopting safer practices. The second layer comprises SCT constructs; behavioural capability, observational learning, reinforcement, self-regulation, environmental support, and self-efficacy; which account for the social and self-regulatory mechanisms through which behaviour is sustained over time. The third and integrative layer represents the contextual determinants distinctive to traditional market settings: infrastructure, regulatory enforcement, livelihood pressure, customer demand, peer norms, and local governance. These contextual determinants do not merely constrain or facilitate the operation of the psychosocial constructs; they actively shape what counts as feasible, acceptable, and rewarded practice within the market environment. By positioning contextual determinants as an interpretive layer rather than a peripheral moderator, the framework acknowledges that food safety behaviour in informal markets is the product of negotiation between individual cognition, social influence, and structural conditions. The proposed framework offers three advantages. First, it positions food safety behaviour as both cognitively motivated and shaped by market conditions, rather than

the product of individual choice alone. Second, it provides a structured basis for measurement adaptation, identifying which constructs require contextual rewording for traditional market populations. Third, it provides a translational architecture for intervention development, indicating that interventions must address cognitive motivation, behavioural skill, and structural feasibility simultaneously if they are to achieve sustainable behavioural change.

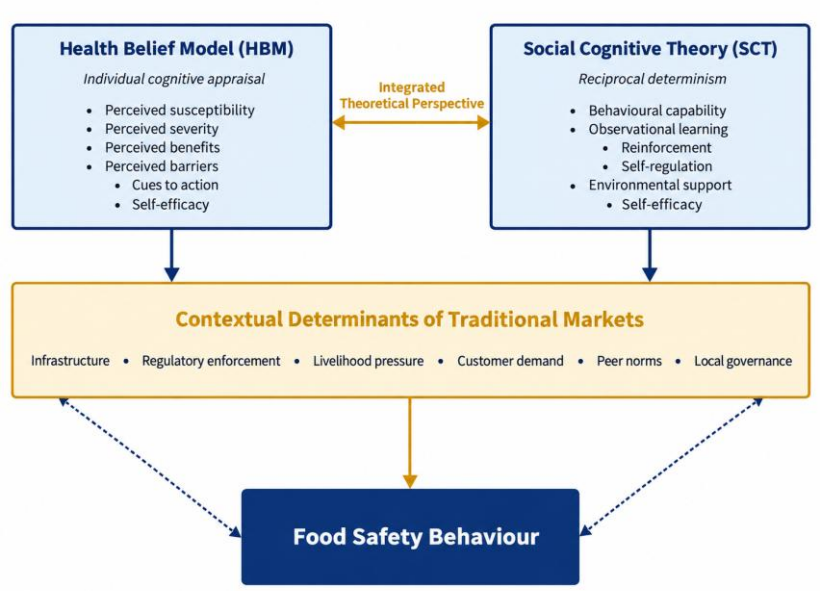

Figure 1. *Integrated health belief model-social cognitive theory framework for food safety behaviour among traditional market food handlers.*

Implications for intervention development

Translating an integrated understanding of food safety behaviour into intervention design requires moving beyond knowledge-based training alone. Evidence suggests that information-only approaches produce inconsistent behavioural change, particularly in resource-constrained settings, whereas interventions addressing cognitive, social, and structural influences are more likely to achieve sustainable improvements (Yeargin et al., 2021; Insfran-Rivarola et al., 2020). The Medical Research Council framework provides a structured pathway for translating behavioural theory into practice through iterative intervention development, contextual adaptation, and feasibility testing before definitive evaluation (Skivington et al., 2021). For traditional market interventions, this means early engagement with end-user feedback, formative evaluation of acceptability and feasibility, and explicit attention to the operational constraints documented in the empirical literature. Implementation outcomes such as acceptability, appropriateness, and feasibility should be assessed during early intervention development using validated measures such as the Acceptability of Intervention Measure, the Intervention Appropriateness Measure, and the Feasibility of Intervention Measure (AIM, IAM, and FIM) (Weiner et al., 2017). The availability of validated Malay versions further supports their application in Malaysian community-based research (Salleh et al., 2023).

In practical terms, interventions targeting traditional market food handlers should prioritise visual and demonstration-based training rather than text-heavy formats, given the variable literacy levels of the target population. Content should emphasise feasible

adaptations within existing infrastructural constraints rather than idealised standards, recognising that many vendor practices represent adaptation to operational constraints. Peer-based reinforcement, drawn from SCT principles of observational learning and reciprocal determinism, offers a potentially scalable mechanism for sustaining behavioural change in social environments characterised by high vendor-to-vendor interaction (Madjdian et al., 2024a, 2024b; Young et al., 2018). From a policy perspective, the findings suggest that improving food safety in traditional markets should not rely solely on individual training or punitive inspections. Local authorities should combine infrastructure support, vendor-centred education, participatory monitoring, and gradual compliance strategies rather than relying solely on punitive enforcement. Within the Malaysian regulatory context, this suggests the need to adapt existing food handler training structures to better reach informal market vendors, particularly through community-level delivery and locally relevant training formats.

Research gaps, future directions and limitations of the review

Despite the substantial literature on food safety behaviour, several critical gaps remain particularly salient for traditional market research in South East Asian contexts. First, empirical evidence on the psychosocial and contextual determinants of food safety behaviour among traditional market food handlers in Malaysia, particularly in East Malaysian states such as Sabah and Sarawak, remains limited. Most Malaysian food safety research has focused on formal premises, institutional kitchens, or urban food service settings, leaving informal market environments underrepresented in the national evidence base. Second, there is a clear shortage of contextually validated instruments for measuring food safety behaviour and its determinants among informal market vendors. Many existing instruments were developed in formal food service settings and assume operational conditions, such as written standard operating procedures, supervisory hierarchies, and designated handwashing facilities, that do not consistently exist in traditional market environments. Direct transfer of such instruments risks misalignment in measurement and compromised validity (Bulochova et al., 2024; Zanin et al., 2017).

Third, while the HBM and SCT have been applied individually in food safety research, their integration within informal, resource-constrained traditional market settings remains underexplored. Empirical investigations of how HBM constructs interact with SCT constructs in jointly shaping food safety behaviour are needed to advance theoretical understanding and to inform integrated intervention design. Fourth, feasibility-tested intervention modules tailored to the realities of traditional market vendors remain scarce in the Malaysian and broader South East Asian contexts. While the Malaysian regulatory framework mandates food handler training under existing food hygiene regulations, the prevailing Food Handler Training Programme is primarily structured around licensed and formal food premises (Elexson et al., 2023; Tirmizi et al., 2018). Informal market vendors operating outside standard certification pathways, therefore, remain underserved by current training outreach. Future research should prioritise: development and validation of context-specific measurement tools; empirical testing of the integrated HBM-SCT framework; and feasibility and subsequent effectiveness evaluation of context-sensitive interventions.

Several limitations of this narrative review should be acknowledged. First, the review followed a narrative rather than systematic methodology, which permits broader conceptual integration but does not involve formal protocol registration, quality

appraisal, or risk-of-bias assessment of included sources. Second, the literature search was limited to English-language publications, potentially excluding relevant evidence published in regional languages such as Bahasa Malaysia, Bahasa Indonesia, and other South East Asian languages. Third, the thematic synthesis reflects the interpretive choices of the review team, and alternative conceptual organisations of the same literature are possible. Finally, findings may not be directly transferable to other informal food settings such as mobile vendors or roadside traders.

Conclusion

Food safety behaviour in traditional markets emerges as a multilevel phenomenon shaped by individual cognition, social influence, environmental conditions, and broader structural realities. While the HBM offers a valuable framework for understanding internal risk appraisal and motivational determinants, its limited engagement with structural and environmental context renders it insufficient as a standalone framework in informal market settings. SCT complements this gap by explicitly incorporating reciprocal interactions among person, behaviour, and environment, while emphasising self-efficacy, self-regulation, and observational learning as central behavioural mechanisms. The proposed framework provides a theoretically grounded and context-sensitive perspective for understanding food safety behaviour among traditional market vendors. By integrating cognitive and environmental influences, it offers a foundation for developing culturally appropriate measurement tools and practical interventions that better reflect the realities of informal food systems. Future research should empirically evaluate the framework and assess the effectiveness of interventions developed from it. Strengthening food safety in traditional markets requires moving beyond knowledge transfer to interventions that acknowledge the realities of informal livelihoods, enabling more sustainable improvements in food safety practices and public health across South East Asia.

Acknowledgement

NA conceptualised the review, conducted the literature search and synthesis, and drafted the manuscript. AO provided supervisory guidance, critical review of the manuscript, and contributed to interpretation of the manuscript. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors declare no conflict of interest.

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