

*Review Article*

## **Home-based Foods in Malaysia: A Food Safety Perspective**

**Subashini Pallianysamy<sup>1,4</sup>, Noor Azira Abdul-Mutalib<sup>2,3</sup>,  
Ungku Fatimah Ungku Zainal Abidin<sup>2</sup>, Nor Khaizura Mahmud @ Ab Rashid<sup>1,3</sup>  
and Nurul Hawa Ahmad<sup>1,3\*</sup>**

<sup>1</sup>*Department of Food Science, Faculty of Food Science and Technology, Universiti Putra Malaysia, 43300 Serdang, Selangor, Malaysia*

<sup>2</sup>*Department of Food Service and Management, Faculty of Food Science and Technology, Universiti Putra Malaysia, 43300 Serdang, Selangor, Malaysia*

<sup>3</sup>*Laboratory of Food Safety and Food Integrity, Institute of Tropical Agriculture and Food Security, Universiti Putra Malaysia, 43300 Serdang, Selangor, Malaysia*

<sup>4</sup>*Food Safety and Quality Division, Ministry of Health, 62675 Putrajaya, Malaysia*

### **ABSTRACT**

Home-based food businesses are trending among the new generation of food entrepreneurs, particularly during and after the COVID-19 pandemic. This review aims to provide a general scenario of home-based food businesses in Malaysia, possible contamination sources associated with home-based food and foodborne pathogens that can be linked to common food in Malaysia. Home-based food business is an integral part of food supply chain sells through local markets, online platforms, delivery services or direct pick up whereby food safety is a critical component to be taken care of. This review paper explores initiatives by Ministry of Health in order to create

awareness and safety measures in different level of food business. This review also highlights current home-based food guidelines in Malaysia and the knowledge, practice, and attitude (KAP) linked to food operators in Malaysia. This paper also synthesizing current research associated with KAP food handlers and provides insights of future direction of improving food safety systems particularly for home-based food business.

**Keywords:** Food safety, home-based food business, home-based food, KAP study

### **ARTICLE INFO**

*Article history:*

Received: 12 July 2024

Accepted: 02 September 2024

Published: 16 May 2025

DOI: <https://doi.org/10.47836/pjtas.48.3.01>

*E-mail addresses:*

gs64207@student.upm.edu.my (Subashini Pallianysammy)

n\_azira@upm.edu.my (Noor Azira Abdul-Mutalib)

ungkufatimah@upm.edu.my (Ungku Fatimah Ungku Zainal Abidin)

norkhaizura@upm.edu.my (Nor Khaizura Mahmud Ab Rashid)

nurulhawa@upm.edu.my (Nurul Hawa Ahmad)

\*Corresponding author

## INTRODUCTION

A home-based food (HBF) business is any business that sells products from their home (Mason et al., 2011). HBF can be operated by the business owner, individually or with workers (Dahari et al., 2019). Home-based Food Guidelines by the Ministry of Health, Malaysia, defines home-based food as “food prepared at home for selling purposes.”

The booming of HBF businesses is evident, especially during the COVID-19 pandemic (Tarmazi et al., 2021). Following the Malaysian government's Movement Control Order (MCO), most people are confined at home and face many outdoor restrictions. MCO has caused many economic activities to slow down, consequently forcing many people to lose their occupations. Nevertheless, some unemployed have started HBF to meet their financial need in line with the great demand of consumers looking for food delivery services during MCO. In 2024, Malaysia's online food delivery revenue will reach USD 2.77 billion, with an expected increase of up to USD 4.63 billion in market volume by 2029 (Statista, 2024).

The Malaysian government has introduced numerous initiatives, such as PRIHATIN and PENJANA Economic Stimulus Package, to facilitate HBF business. Pemulihan NewBiz Financing Fund allocated RM50 million in 2022 via Agro Bank to support new HBF businesses (Gimino, 2022). However, the dine-in operation has resumed in Malaysia during the transition period from pandemic to endemic state. Nevertheless, the emergence of e-commerce and social media has caused HBF's business to grow sustainably, particularly for individuals needing household income (Lee, 2021).

Malaysia's economy is recovering momentum post-MCO, but the global inflation crisis has tremendously altered consumer purchasing behavior. The National inflation rate increased to 3.2% in December 2022, as reported by the Department of Statistics Malaysia (2021). More retail owners shifted their businesses to home-based settings to minimize operation costs (Zhang et al., 2022). One of the possible reasons for HBF operators to sustain their business operations at home could be because they may feel that it is still more practical and accommodating to generate income (Zhang et al., 2022). Considering numerous initiatives by the Malaysian government to support solo entrepreneurs, including HBF operators, it can be anticipated that these initiatives may accelerate the growth of HBF in the future (Topimin & Hashim, 2021).

Unfortunately, many foodborne outbreaks are linked to home-based food (Azanza et al., 2018; Byrd-Bredbenner et al., 2013). In May 2020, 48 illnesses and one death were reported in the northeast state of Malaysia due to the consumption of a local dessert called *pudding buih* (bubbled pudding). The egg-based pudding was most likely contaminated with *Salmonella* as raw egg white was used. Furthermore, there is no cooking step prior to consumption (“*Puding Buih* food poisoning,” 2020). Affected individuals bought the delicacy via an online platform operated by HBF traders. A recurrent episode of *pudding buih* food poisoning occurred in 2022, where in this case, the home-prepared dessert was

sold at a local stall. This incident affected two children ("Food poisoning: samples of *pudding buih* sent to a lab for analysis," 2022).

On top of that, major food poisoning cases have been reported in Malaysia between May and July 2024. In May 2024, 65 primary school students in Kedah were sick after consuming flat noodle soup ("Sixty-five Sungai Petani primary school pupils suffer food poisoning," 2024). About a month later, two deaths (a two-year-old girl and a 17-year-old male) and 22 illnesses were reported due to spoiled fried noodles and eggs in Selangor. Eighty-two suffer food poisoning symptoms from consuming fried noodles and eggs. Meanwhile, in Johor, breaded fried chickens sold in a school canteen have been implicated in causing food poisoning symptoms to 90 students and nine staff members ("Batu Pahat school canteen ordered shut over food poisoning – Johor exco," 2024). Lastly, a typhoid outbreak in Kelantan has affected ten high school students with abdominal pain, vomiting, and diarrhea (Abdullah, 2024). A mass screening of 1000 individuals led to three food handlers being identified as the source of the outbreak ("Three food handlers identified as the source of the typhoid outbreak at Kelantan school," 2024).

Although the etiologic agents of these foodborne illnesses were not fully reported, the implicated foods might have been contaminated with foodborne pathogens that otherwise can be inactivated by proper cooking procedures or controlled via hygienic handling and appropriate storage conditions. Given that the home environment may not optimally support food preparation, handling, or storage safety protocols (Farias et al., 2020), and food safety practices heavily rely on HBF operators, a more sustainable approach is needed by immersing food safety culture in HBF business. Food safety culture fosters human behavioral changes toward food safety practices (Global Food Safety Initiative, 2018). This concept covers many aspects of food safety, including the first-in-first-out principle of raw materials, cleaning and sanitation, record keeping, and allergen control. Food safety culture adopts the mentality of 'this is the right thing to do,' which is greatly aligned with Sustainable Development Goals (SDGs) of responsible consumption and production (SDG 12). By quality education (SDG 4), partnerships for goals (SDG 17), and good health and well-being (SDG 3), food safety culture can be fostered via strategic efforts from government, private, and community segments in reducing food poisoning cases in Malaysia.

## **POSSIBLE CONTAMINATION SOURCES OF HOME-BASED FOOD**

### **Raw Materials**

Perishable goods such as fruits, vegetables, meat, poultry, and dairy products have a short shelf-life. Maintaining perishable goods in a cold environment can minimize the risk of foodborne illnesses, delay the growth of spoilage microorganisms and maintain product quality. Limited cold storage spaces at home may yield an excessive load of refrigerators and

freezers, which consequently prevent the cold storage environment from being maintained below 4°C and -18°C, respectively (United States Department of Agriculture [USDA], 2023). Bulk storage of perishable goods may increase the risk of microbial proliferation. Malaysia is a tropical country where the indoor temperature can range between 21°C to 37°C, with high humidity and high solar irradiation (Gou et al., 2018). Thawing meat, poultry and seafood by submerging frozen products in a kitchen sink or basin at ambient conditions can cause proliferation of foodborne pathogens and spoilage microorganisms (USDA, 2023). With the upward trajectory of global warming, Malaysia likely will continue to face heat wave threats that could increase the risk of foodborne pathogen growth.

Dry ingredients such as anchovy, flour, rice, spices, and dried fruits may have a longer shelf life than perishable goods. However, bacterial spores and mycotoxins are commonly found in dry ingredients (Tanushree et al., 2019). Spores and mycotoxins can survive cooking temperatures. Bacterial spores may germinate after cooking and proliferate in finished products if not stored properly (Navaneethan & Effarizah, 2023). Mycotoxins are potent etiologic agents, and a small number of mycotoxins (ppm or ppb level) can cause severe health symptoms. Obtaining raw materials from reputable suppliers may mitigate the risk, but suppliers only consider bulk purchases, which can be a limiting factor for HBF's business. Extreme weather conditions and uncontrolled relative humidity are major determinants of mold contamination in dry goods (Tanushree et al., 2019).

## Cross-contamination

Cross-contamination occurs when a contaminated entity encounters an uncontaminated entity. Three possible routes for cross-contamination could happen at home kitchens: contamination from food-to-food, person-to-food, and surface-to-food. For instance, food-to-food cross-contamination may occur when raw meat and poultry are stored with ready-to-eat foods. Raw juices may spread on cooked or ready-to-eat food if placed or stored near one another without proper control. Food handlers who have poor hygiene can cause person-to-food cross-contamination. Food handlers who handle raw ingredients and ready-to-eat food without hand washing can transfer foodborne pathogens to ready-to-eat foods. Surface-to-food contamination is likely to happen when the same utensils, such as a chopping board and knife, are simultaneously used for raw meat and poultry and ready-to-eat fresh salad vegetables (Kirchner et al., 2021). A study by Borrusso and Quinlan (2017) found that contamination of foodborne pathogens was significantly associated with unsafe or unsanitary conditions of home kitchens in Philadelphia, with 45% of home kitchens detected with multiple foodborne pathogens such as *Escherichia coli*, *Staphylococcus aureus*, *Salmonella*, *Campylobacter*, and *Listeria monocytogenes*.

Consumers commonly use food delivery services to shuttle food items from merchants to end customers due to several accommodating factors (Keeble et al., 2020). A generalized

framework of food delivery service in Malaysia has been extensively described by Ahmad and Zainal (2021), demonstrating a triad connection between customers, food delivery services, and merchants. There are multiple activities involved between each connection point, such as how customers order food via online platforms and how e-hailing riders deliver food to customers' doorsteps. Most importantly, many instances within those activities can introduce cross-contamination, which may put HBF businesses at risk. First, improper HBF food packaging may cause spills, allowing cross-contact with unsanitary delivery bags or vehicle surfaces. Furthermore, most riders use self-owned vehicles, and the sanitary conditions of the vehicles and reusable delivery bags heavily rely on the rider's self-inspection and food safety self-awareness. Secondly, cross-contamination may occur when non-food items, food items, raw foods, and cooked foods are not well segregated in a delivery bag. For instance, tempering frozen raw foods may cause leakage of raw juice and cross-contact with cooked foods. Lastly, cross-contamination could be attributed merely to the deliverers' lack of food safety knowledge, practices, and attitude, most likely due to noncompulsory food safety training for riders (Hishamudin et al., 2024). On top of cross-contamination incidences, food safety risk for HBF may be escalated when foods are exposed to time-temperature abuse conditions.

### **Kitchen Space and Layout**

Urban housing development in Malaysia is largely focused on low-medium income earners. The size of affordable housing is between 614 to 1195 square feet for apartments and  $\leq 1900$  square feet for landed houses (Construction Industry Development Board Malaysia, 2020). It strongly suggests that the home kitchen has limited space and may not be sufficient to establish specific food preparation, handling, packaging, and storage zones. The home kitchen also serves as a communal space for school, work, laundry and social activities. The home kitchen is accessible to family and nonfamily members and pets so they can roam around freely. Owing to heterogeneous resident profiles and the many ways that kitchen areas are used, foods prepared by HBF operators can pose food safety risks due to a variety of sources of cross-contamination (Wills et al., 2015). In addition to space, the home kitchen design and layout vary depending on the user. Coordination of kitchen cabinets, appliances, and waste containers (hazardous or nonhazardous) is based on the homeowner's preference, which may not be ideal for hygienic design.

In terms of premise setting, Food Standards Australia and New Zealand require that kitchen layout and space are enough for people to work without contaminating food and to separate cooked food away from raw food (Food Standards Australia and New Zealand, 2021). In EU countries, Mihalache et al. (2022) proposed a 'food safety triangle's kitchen design that may support food hygiene practices, contrasting with an ergonomic kitchen design. The food safety triangle design consists of a handwashing sink, countertop and

stove, with the distance between each apex less than 1 m. Although more studies are needed to correlate kitchen design with food safety practices, it can be inferred that ideal kitchen design should minimize cross-contamination during food preparation and handling.

POSSIBLE FOODBORNE PATHOGENS ASSOCIATED WITH HOME-BASED FOOD

Malaysia has various local cuisines, predominantly consisting of rice and wheat-based food as carbohydrate sources and fish, egg, and chicken as protein sources (Goh et al., 2020). Guidelines for food poisoning investigation in Malaysia (Food Safety and Quality Division, 2024) have outlined potential foodborne pathogens that could be tested according to the type of common foods in Malaysia (Table 1). *Salmonella* remains a major concern in Malaysia because many food poisoning episodes have been associated with it.

Table 1  
Foodborne pathogens that can be associated with foods commonly consumed in Malaysia

Food group	Specific food	Pathogen*								
		<i>Salmonella</i>	<i>Escherichia coli</i> O157:H7	<i>Bacillus cereus</i>	<i>Diarrheal Bacillus</i> spp.	<i>Listeria monocytogenes</i>	<i>Clostridium perfringens</i>	<i>Vibrio cholerae</i>	<i>Vibrio parahaemolyticus</i>	<i>Staphylococcus aureus</i>
Cereal and grains	White rice			/	/					
	Fried rice			/	/					
	Roti canai †			/	/					
	Noodle			/	/					
	Pasta			/	/					
Poultry	Fried chicken	/								/
	Chicken nugget	/								/
	Chicken ball	/								/
	Chicken frankfurter	/								/
	Steamed chicken	/								/
	Chicken in broth	/					/	/		/
	Chicken gulai †	/					/			/

Table 1 (continue)

Food group	Specific food	Pathogen*								
		<i>Salmonella</i>	<i>Escherichia coli</i> O157:H7	<i>Bacillus cereus</i>	<i>Diarrheal Bacillus</i> spp.	<i>Listeria monocytogenes</i>	<i>Clostridium perfringens</i>	<i>Vibrio cholerae</i>	<i>Vibrio</i> <i>parahaemolyticus</i>	<i>Staphylococcus aureus</i>
Egg	Hard/Half boiled egg	/								
	Fried egg	/								
	Salted egg	/								
	Egg <i>gulai</i> †	/								
Meat	Meatball	/	/							
	Sausage	/	/							
	Meat in broth	/	/				/	/		
	Meat <i>gulai</i> †	/	/				/			
Seafood	Fishball	/							/	
	Dried/Salted fish	/							/	
	Fried fish	/							/	
	Fish <i>gulai</i> †	/							/	
Vegetables	Cockles	/							/	
	<i>Ulam</i> †	/								
	<i>Kerabu</i> †	/								
	Stir-fry vegetables	/								
Milk	UHT/pasteurized milk	/				/				
	Pudding	/				/				

Note. †*Roti canai*: Malaysian flatbread; *Gulai*: spicy/mild stew that may use spices, condiments, or coconut milk; *ulam*: traditional/common vegetables that can be eaten raw or boiled; *kerabu*: pickled salad that may incorporate shredded coconut, seafood (cockles/squid), or beef tripe. \*The limit of detection (LOD) of *Salmonella*, *Vibrio cholerae*, and *Vibrio parahaemolyticus* is 0.04 CFU/g and limit of quantification (LOQ) of *Bacillus cereus*, *Escherichia coli*, *Staphylococcus aureus* is 100 CFU/g according to Food Safety and Quality (2019); LOD and LOQ of *Listeria monocytogenes* are according to ISO 11290-2:2017; no specified LOQ for *Clostridium perfringens* stated in FSQ (2019), but a maximum of 1-log increase is permitted during Ready-to-Eat meat and poultry production based on United States Department of Agriculture Food Safety Inspection Service (2021)



## HOME-BASED FOOD OPERATORS AND HANDLERS

Food handlers from various food services play an important role in food safety because they may introduce pathogens into foods during production, processing, distribution, and preparation (Azanza et al., 2019). Food handlers are individuals directly involved in food preparation, come into contact with food or food contact surfaces, and handle packaged or unpackaged food or appliances in any food premises (Act 281, Food Act 1983). According to Malaysian Food Hygiene Regulations 2009, every personnel defined as a food handler shall undergo food handler training provided by a recognized school of food handler training and must be vaccinated for the Typhoid vaccine. These requirements also apply to home-based food handlers, but awareness of these requirements among home-based food operators and handlers is still questionable. Therefore, studies conducted where food handlers became the main target of most researchers because they were the key players determining and controlling the best practices of food hygiene in food establishments.

Given the dynamic nature of their HBF businesses, Razak et al. (2022) suggested introducing a specific category for home-based food handlers under the Food Hygiene Regulations 2009. Such regulation may mitigate home-based operators' reluctance to register and follow food safety recommendations to save costs. Another issue that can be mitigated includes hiring foreign part-time workers who do not possess legal working permits, as they are willing to accept low wages (Abd Rahim et al., 2017). Illegal foreign workers may not be eligible for Typhoid vaccination, which can increase the risk of spreading diseases. Helpers among acquaintances who are not committed to full-time home-based operators should also be considered as food handlers. Sick food handlers may be in contact with food preparation, cooking, or packaging due to ignorance of good hygienic practices. In this sense, measuring their knowledge and awareness is highly important, especially for home-based food handlers. Food poisoning is a public health problem in Malaysia and among the top five communicable diseases in Malaysia, which spread through contaminated food, water and food handlers. Thus, there is a need to ensure that the HBF operators understand standard food safety protocols and adhere to requirements by the Malaysia Ministry of Health to protect public health.

### Food Safety Awareness

In Malaysia, the data on food poisoning cases related to home-based food are lacking. Furthermore, not all food poisoning cases are being reported. So, the exact number of food poisoning incidents associated with home-based food is unknown. Most home-based food businesses do not have a business license, and consumers do not know the level of hygiene being practiced by home-based food handlers. Therefore, further studies on the safety of the food produced from home-kitchen have been conducted from various perspectives to improve the service and safety of the food produced from home kitchens.



Customers sometimes rely on testimonies to drive their purchasing decisions because there is no accessible tool or guideline to assess the safety and cleanliness of home-based food (Iblasi et al., 2016).

Unlike HBF, the food industry in Malaysia must execute food safety assurance programs such as Good Manufacturing Practice (GMP), Hazard Critical Control Points (HACCP), ISO 22000, or *Makanan Selamat Tanggungjawab Industri* (MeSTI). In particular, MeSTI is designed for small and medium enterprises (SMEs) to meet food safety requirements minimally in compliance with the Food Hygiene Regulations 2009. Under the MeSTI scheme, food manufacturing premises must be physically audited, given free consultation by Ministry of Health (MOH) officers, approved for operation and monitored after a year of certificate issuance (Food Safety and Quality Division, 2023). In addition, MOH has also introduced *Bersih, Selamat dan Sihat* (BeSS) recognition to encourage food premises such as food kiosks, cafeterias, school canteen, and restaurants, practice food safety standards and promote healthier food options (Food Safety and Quality Division, 2024). Apart from this, MOH initiated the Trust MyCatering Certification, which recognizes that the catering industries comply with food safety elements under the Food Hygiene Regulations 2009 (Food Act 1983). This certification is also applicable to HBF operators who are doing catering business using home kitchens as their business facilities.

Halal certification is a major concern in Malaysia's food and beverage industry and worldwide. It ensures religious compliance, safety, and hygiene compliance. Halal Certification boosts sales and influences customers' purchasing decisions (Yusuf et al., 2017). No halal certification is provided for home-based food products, yet claims of halal home-based food are mushrooming on social media. This statement can create misunderstandings and confusion among customers, thus causing food safety awareness to be prejudged.

In 2020, MOH conducted a pilot project on home-based food operators in Malaysia. A total of 114 out of 410 (27.8%) home-based food operators were approved after going through the approval process from MOH (Figure 1). All participants were briefed on the food safety requirements, and the MOH officers verified their kitchens before approval was granted (Ministry of Health, 2021). There are several reasons why participants who enrolled in the pilot project were unable to be listed under MOH. Some of the reasons include i) HBF operators could not fulfill all requirements from MOH, ii) low commitments from the HBF operators who did not respond to do corrective actions to get approved, iii) HBF just a hobby or temporary business to get extra income for some operators, as they may acquire a permanent job after the pandemic was over. Therefore, MOH has taken necessary steps to educate and regulate home-based food operators in Malaysia by encouraging them to register themselves under a database system called Fosim Domestic to monitor them effectively.

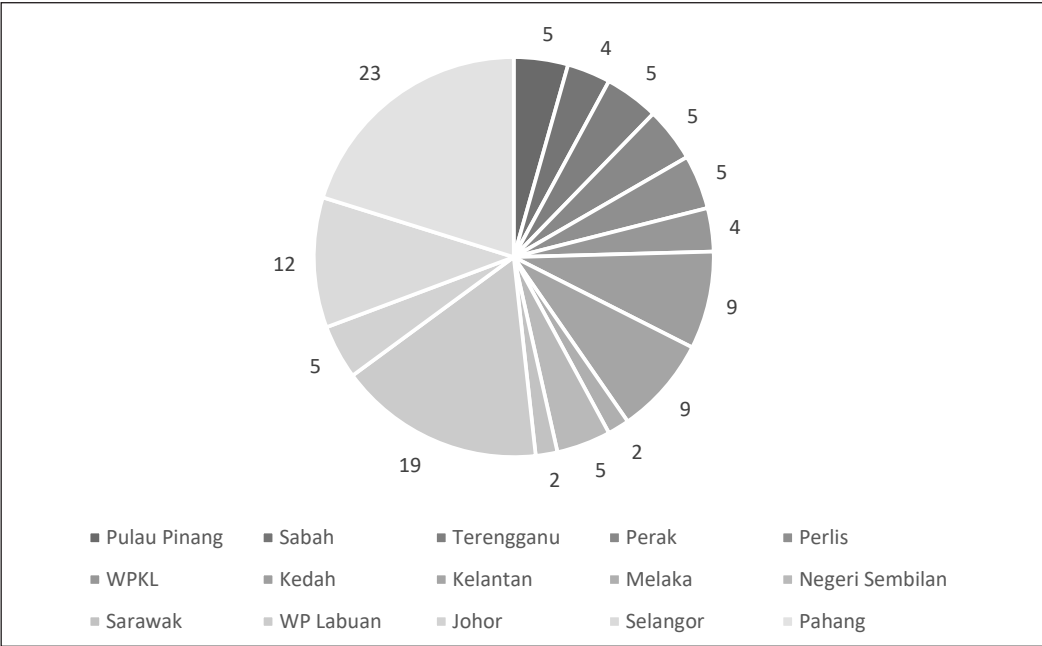


Figure 1. Recognition for home-based listing in the pilot project in Malaysia (Food Safety Quality Division, 2021)

Ministry of Health Malaysia (MOH) has taken the initiative to educate home-based food operators by providing them with specific guidelines for home-based food operators. The Ministry of Health launched a new home-based food listing scheme to encourage home-based food operators to comply with the Food Act 1983 and Food Regulations 1985; Food Hygiene Regulations 2009. Under this guideline, all the home-based food operators are required to undergo Food Handlers training, get vaccinated for typhoid, implement all the food safety measures as in the guidelines, and perform self-monitoring according to the home-based food operator checklist. In 2021, home-based food safety guidelines were also published in the same year as the main reference document for the listing scheme (Ministry of Health, 2021). HBF operators listing specifically initiated to formalize activities as well as food safety control measures. While food safety assurance program implementation may be challenging to HBF operators, relevant food safety standards need to be implemented by HBF operators because any violations by HBF will be treated as any other food handlers and compounded according to the Food Act 1983.

Food safety surveillance is crucial in ensuring that food prepared, sold, or imported into the market meets the standards set by the Food Act 1983. Routine food safety monitoring is conducted by MOH, in which ready-to-eat foods collected from food premises are commonly tested for the presence of foodborne pathogens, including *Bacillus cereus*, *Staphylococcus aureus*, *Salmonella*, and *Escherichia coli*. Microbiological analyses

are conducted in accredited laboratories and are performed according to respective ISO methods (Standards Malaysia, 2024). On top of routine monitoring, a large-scale seasonal inspection such as food stalls and bazaars during Ramadan (Muslim’s fasting month) is also conducted. In 2022, for instance, the Food Safety and Quality Division (FSQD) undertook national-level enforcement, given the increased volume and variety of food sold. Out of 12,934 premises inspected, 38 were ordered to shut their operations due to incompliance with the regulations (Food Safety and Quality Division, 2022).

**Knowledge, Attitude, and Practice (KAP)**

Knowledge, attitude, and practice (KAP) is survey-based research and the most common method used to evaluate the relationship between knowledge, attitude, and practice of food handlers in various fields of the food business. Food safety knowledge and attitudes are the most important cognitive factors that can influence food safety practices, and multiple studies use KAP models to study correlations between food safety knowledge and attitude (Baser et al., 2017; Lim et al., 2016). In Malaysia, KAP studies have been conducted on food handlers in all kinds of food service industries, as illustrated in Table 2.

Although food safety knowledge is important to prevent foodborne illness in home kitchens, approximately 50% of the reported studies on food handlers were not necessarily translated into practice (da Cunha et al., 2019). As mentioned in Food Hygiene Regulations 2009, food handlers in Malaysia must undergo training. However, further studies need to be conducted on the effectiveness of the training provided and evaluate the attitude of home-based food handlers towards food safety. Several studies also show that the level of knowledge did not solely contribute to or influence the level of attitude (Ahmed et al., 2021). These findings revealed that there could be other factors, including environment, job satisfaction, and the relationship between employees and supervisors in a proper food establishment. Therefore, sociodemographic profiles that influence the variables should also be extended to other factors.

Researchers could utilize cross-sectional studies to compare the knowledge, attitude, and self-reported practices (KAP) of food safety assessments focusing on food handlers

Table 2  
*Example of knowledge, attitude and practice (KAP) score of food handlers in different food service facilities in Malaysia*

Sectors	Knowledge (mean)	Attitude (mean)	Practice (mean)
Cafeterias at residential colleges	~57.8%	~76.9%	~66.5%
Hospitals	<90%	<70%	<35%
Restaurants or kiosk	<84%	<82%	<77%
Hawker centers	<84.1%	<67.9%	<74%

*Note.* Scores between 0 to 40: poor, 41 to 70: fair, 71 to 80: Good

in food service industries (Nee & Sani, 2011; Lee et al., 2017). Cross-sectional studies are conducted involving a certain group of people at one point in time. Cross-sectional studies involve face-to-face interviews, online surveys through Facebook, WhatsApp, and Instagram, or self-reported survey questionnaires distributed by survey companies (Amodio et al., 2022). The sample size varies based on population, location, and time frame needed to complete the survey. Relevant studies (Amodio et al., 2022) are mostly self-reported, based on what is being answered by the respondents, which may be reported differently from actual practice. It may be fit for other food businesses. However, for home-based food businesses, it is suggested to conduct a qualitative study in the explanatory method to study in detail the nature of the business and other contributing factors since home-based food businesses are considered a new emerging business that needs to be explored to provide new insight into the business for necessary actions. Because KAP studies are self-reported data, the findings of KAP studies can be further validated using microbiological assessment of home-based food produced. Observation via online or physical demonstration can be used to evaluate hygienic practices more effectively. The findings of the KAP study are valuable input towards improving existing training modules.

## **CONCLUSION**

### **Summary**

The home-based food business (HBF) is considered part of the food supply chain. Past incidents have revealed that food handlers in Malaysia still lack food safety knowledge, have an inadequate understanding of handling raw materials and have poor hygiene practices. Various factors, including home-kitchen size, layout, location, and usage, can also be considered contributing factors. Yet, there are still limited studies that can strongly correlate the factors mentioned and the contamination sources of home-based food. Home-based food guidelines by the Ministry of Health, Malaysia, are designed to equip HBF operators with a basic knowledge of hygienic food preparation. Given that the HBF operators have various sociodemographic backgrounds, it is critical to measure their level of understanding to comply with the current requirements.

### **Future Perspective and Recommendations**

Nowadays, greater internet literacy and accessibility allow customers to purchase food from HBF businesses from the comfort of their smartphones. HBF operators no longer wait for walk-in customers because e-hailing companies can deliver the food to their customers' doors. With this ongoing demand, HBF operators can reach a larger market size and generate more income. HBF also plays a critical role as one of Malaysia's food supply chain niches. Nevertheless, there is no scheduled monitoring or inspection of HBF operations via the voluntary HBF listing scheme of the Ministry of Health Malaysia. One

approach that may mitigate the risk of foodborne illness for HBF business is establishing a set of maximum limits covering kitchen occupancy, food preparation and storage capacity, and revenue range. Once the maximum limits have been reached and sustained over a reasonable period, regulatory bodies can urge HBF businesses to convert their businesses to a commercial scale because commercial food businesses abide by existing food laws and regulations in Malaysia. To do this, HBF operators must be listed in the scheme. An appropriate enforcement approach must also be designed so that it is feasible for the authorities to carry out the policy and straightforward enough for HBF operators to understand it.

## ACKNOWLEDGEMENTS

The authors thank the Food Safety and Quality Division, Ministry of Health Malaysia and the Hadiah Latihan Persekutuan scholarship for financially supporting Subashini Pallianysamy.

## REFERENCES

- Abd Rahim, S. A., Nawawi, A., & Puteh Salin, A. S. A. (2017). Internal control weaknesses in a cooperative body: Malaysian experience. *International Journal of Management Practice*, 10(2), 131-151. <https://doi.org/10.1504/IJMP.2017.083082>
- Abdullah, S. M. (2024, July 16). Ten secondary students in Kelantan test positive for typhoid, outbreak under control. *New Straits Times*. <https://www.nst.com.my/news/nation/2024/07/1077584/10-secondary-students-kelantan-test-positive-typhoid-outbreak-under>
- Ahmad, N. N. N., & Zainal, A. S. A. S. (2021) Online food delivery services: Make or break the halal supply chain? *Journal of Food and Pharmaceutical Sciences*, 9(1), 384-394. <https://doi.org/10.22146/jfps.1149>
- Ahmed, M. H., Akbar, A., & Sadiq, M. B. (2021). Cross sectional study on food safety knowledge, attitudes, and practices of food handlers in Lahore district, Pakistan. *Heliyon*, 7, e08420. <https://doi.org/10.1016/j.heliyon.2021.e08420>
- Amodio, E., Calamusa, G., Tiralongo, S., Lombardo, F., & Genovese, D. (2022). A survey to evaluate knowledge, attitudes, and practices associated with the risk of foodborne infection in a sample of Sicilian general population. *AIMS Public Health*, 9(3), 458-470. <https://doi.org/10.3934/publichealth.2022031>
- Azanza, M. P. V., Membrebe, B. N. Q., Sanchez, R. G. R., Estilo, E. E. C., Dollete, U. G. M., Feliciano, R. J., & Garcia, N. K. A. (2019). Foodborne disease outbreaks in the Philippines (2005 – 2018). *Philippines Journal of Science*, 148(2), 317–336.
- Baser, F., Ture, H., Abubakirova, A., Sanlier, N., & Cil, B. (2017). Structural modeling of the relationship among food safety knowledge, attitude and behavior of hotel staff in Turkey. *Food Control*, 73, 438-444. <https://doi.org/10.1016/j.foodcont.2016.08.032>
- Batu Pahat school canteen ordered shut over food poisoning – Johor exco. (2024, July 1). *Bernama*. <https://www.bernama.com/en/news.php/news.php?id=2312957>

- Borrusso, P. A., & Quinlan, J. J. (2017). Prevalence of pathogens and indicator organisms in home kitchens and correlation with unsafe food handling practices and conditions. *Journal of Food Protection*, 80(4), 590-597. <https://doi.org/10.4315/0362-028X.JFP-16-354>
- Byrd-Bredbenner C., Berning J., Martin-Biggers J., & Quick, V. (2013). Food safety in home kitchens: A synthesis of the literature. *International Journal Environmental Research Public Health*, 10(9), 4060-4085. <https://doi.org/10.3390/ijerph10094060>
- Construction Industry Development Board Malaysia. (2020). *CIBD affordable housing design standard for Malaysia*. <https://www.cidb.gov.my/wp-content/uploads/2022/07/205-CIDB-Affordable-housing-design-standard-for-malaysia-min.pdf>
- da Cunha, D. T., de Rosso, V. V., Pereira, M. B., & Stedefeldt, E. (2019). The differences between observed and self-reported food safety practices: A study with food handlers using structural equation modeling. *Food Research International*, 125, 108637. <https://doi.org/10.1016/J.FOODRES.2019.108637>
- Dahari, Z. (2019). Key success factors of home-based business among female entrepreneur in Saudi Arabia. *Asia-Pacific Joournal of Business Review*, 3(2), 43-66. <https://doi.org/10.20522/APJBR.2019.3.2.43>
- Department of Statistic Malaysia. (2022). *Press release consumer price index Malaysia December 2021*. [https://Www.Dosm.Gov.My/V1/Index.Php?R=Column/Cthemebycat&Cat=106&Bul\\_Id=N1rkrdjlawtlu315y0m3ostzt21dzz09&Menu\\_Id=Bthzthqxn1zqmvf6a2i4rkzondfkqt09](https://Www.Dosm.Gov.My/V1/Index.Php?R=Column/Cthemebycat&Cat=106&Bul_Id=N1rkrdjlawtlu315y0m3ostzt21dzz09&Menu_Id=Bthzthqxn1zqmvf6a2i4rkzondfkqt09)
- da Silva Farias, A., da S., de Almeida Akutsu, R. D. C. C., Botelho, A. B. A., & Zandonadi, R. P. (2019). Good practices in home kitchens: Construction and validation of an instrument for household food-borne disease assessment and prevention. *International Journal of Environmental Research and Public Health*, 16(6), 1005. <https://doi.org/10.3390/IJERPH16061005>
- Eighty-two suffer food poisoning symptoms from consuming fried noodles and eggs. (2024, Jun 12). *The Sun*. <https://thesun.my/local-news/82-suffer-food-poisoning-symptoms-from-consuming-fried-noodles-and-eggs-HA12561017>
- Food poisoning: Samples of pudding buih sent to lab for analysis. (2022, April 10). *The Star*. <https://www.thestar.com.my/news/nation/2022/04/10/food-poisoning-samples-of-039puding-buih039-sent-to-lab-for-analysis>
- Food Safety and Quality. (2024). *BeSS guidelines and applications*. <https://hq.moh.gov.my/fsq/permohonan-garis-panduan-bess?>
- Food Safety and Quality (2023). *MeSTI*. <https://hq.moh.gov.my/fsq/mesti>
- Food Safety and Quality Division. (2021). *Annual report FSQP*. <https://hq.moh.gov.my/fsq/laporan-tahunan-pkkm>
- Food Safety and Quality Division. (2022). *Annual report FSQP*. <https://hq.moh.gov.my/fsq/laporan-tahunan-pkk1>
- Food Safety and Quality. (2019). *Guidelines for investigation of food poisoning incidents based on Hazard Analysis Critical Control Point (HACCP) concept (Edition 2019)*. <https://hq.moh.gov.my/fsq/garis-panduan-berdasarkan-haccp>
- Gimino, G. (2022, August 6). PM: RM50mil allocated for aspiring home food business owners. *The Star*. <https://www.thestar.com.my/news/nation/2022/08/06/pm-rm50mil-allocated-for-aspiring-home-food-business-owners>

- Global Food Safety Initiative. (2018). *A culture of food safety - A position paper from the Global Food Safety Initiative (GFSI)*. <https://mygfsi.com/wp-content/uploads/2019/09/GFSI-Food-Safety-Culture-Full.pdf>
- Goh, E. V., Azam-Ali, S. McCulloch, F., & Mitra, S. R. (2020). The nutrition transition in Malaysia; key drivers and recommendations for improved health outcomes. *BMC Nutrition*, 6, 32. <https://doi.org/10.1186/s40795-020-00348-5>
- Gou, Z., Gamage, W., Lau, S. S. Y., & Lau, S. S. Y. (2018). An investigation of thermal comfort and adaptive behaviors in naturally ventilated residential buildings in tropical climates: A pilot study. *Buildings*, 8(1), 1-17. <https://doi.org/10.3390/buildings8010005>
- Hishamuddin, N. S., Mustafa, E., & Sadiman, M. Q. (2024). Examining food safety practices of food delivery riders using the KAP Theory. *Journal of Tourism, Hospitality & Culinary Arts*, 16(1), 968-980.
- Iblasi, W. N., Dojanah M. K., & Bader, S. A. A.-Q. (2016). The impact of social media as a marketing tool on purchasing decisions (Case Study on SAMSUNG for Electrical Home Appliances). *International Journal of Managerial Studies and Research*, 4(1), 14-28.
- Keeble, M., Adams, J., Sacks, G., Vanderlee, L., White, C. M., Hammond, D. & Burgoine, T. (2020). Use of online food delivery services to order food prepared away-from-home and associated sociodemographic characteristics: A cross-sectional, multi-country analysis. *International Journal of Environmental Research and Public Health*, 17(14), 5190. <https://doi.org/10.3390/ijerph17145190>
- Kirchner, M., Goulter, R. M., Chapman, B. J., Clayton, J., & Jaykus, L.-A. (2021). Cross-contamination on atypical surfaces and venues in food service environments. *Journal of Food Protection*, 84(7), 1239-1251. <https://doi.org/10.4315/JFP-20-314>
- Lee, H. K., Abdul Halim, H., Thong, K. L., & Chai, L. C. (2017). Assessment of food safety knowledge, attitude, self-reported practices, and microbiological hand hygiene of food handlers. *International Journal of Environmental Research and Public Health*, 14(1), 55. <https://doi.org/10.3390/ijerph14010055>
- Lee, J. (2021, May 29). E-commerce growth requires delivery service providers to move fast to meet surge in demand. *The Star*. <https://www.thestar.com.my/business/smebiz/2021/05/29/e-commerce-growth-requires-delivery-service-providers-to-move-fast-to-meet-surge-in-demand>
- Lim, T.-P, Chye, F. Y., Sulaiman, M. R., Mohd Suki, N., & Lee, J.-S (2016). A structural modeling on food safety knowledge, attitude, and behaviour among Bum Bum Island community of Semporna, Sabah. *Food Control*, 60, 241-246. <https://doi.org/10.1016/j.foodcont.2015.07.042>
- Ministry of Health Malaysia. (2021). *Home-based food safety guidelines*. <http://fsq.moh.gov.my/v6/xs/page.php?id=441000695>
- Ministry of Health Malaysia (2020). *Annual report 2020, food safety and quality division*. <http://fsq.moh.gov.my/v6/xs/page.php?id=21>.
- Mason, C. M. Carter, S., & Tagg, S. (2011). Invisible businesses: The characteristics of home-based businesses in the United Kingdom. *Regional Studies*, 45(5), 625–639. <https://doi.org/10.1080/00343401003614241>
- Mihalache, O. A., Dumitraşcu, L., Nicolau, A. I., & Borda, D. (2021). Food safety knowledge, food shopping attitude and safety kitchen practices among Romanian consumers: A structural modelling approach. *Food Control*, 120, 107545. <https://doi.org/10.1016/J.FOODCONT.2020.107545>



- Mihalache, O. A., Møretør, T., Borda, D., Dumitraşcu, L., Neagu, C., Nguyen-The, C., Maître, I., Didier, P., Teixeira, P., Lopes Junqueira, L. O., Truninger, M., Izsó, T., Kasza, G., Skuland, S. E., Langsrud, S., & Nicolau, A. I. (2022). Kitchen layouts and consumers' food hygiene practices: Ergonomics versus safety. *Food Control*, 131, 108433. <https://doi.org/10.1016/J.FOODCONT.2021.108433>
- Mucinhato, R. M. D., da Cunha, D. T., Barros, S. C. F., Zanin, L. M., Auad, L. I., Weis, G. C. C., Saccol, A. L. de F., & Stedefeldt, E. (2022). Behavioral predictors of household food-safety practices during the COVID-19 pandemic: Extending the theory of planned behavior. *Food Control*, 134, 108719. <https://doi.org/10.1016/j.foodcont.2021.108719>
- Navaneethan Y., & Effarizah, M. E. (2023). Post-cooking growth and survival of *Bacillus cereus* spores in rice and their enzymatic activities leading to food spoilage potential. *Foods*, 12(3), 626. <https://doi.org/10.3390/foods12030626>.
- Nee, S. O., & Sani, N. A. (2011). Assessment of Knowledge, Attitudes and Practices (KAP) among food handlers at residential colleges and canteen regarding food safety. *Sains Malaysiana*, 40(4), 403-410.
- 'Puding Buih' food poisoning case due to use of expired eggs. (2020, May 31). *Malay Mail*. <https://www.malaymail.com/news/malaysia/020/05/31/puding-buih-food-poisoning-case-due-to-use-of-expired-eggs-says-terengganu/1871122>
- Razak, S. S. A., Tuan, L. Y., & Lau, T. C. (2022). Food safety legal issues in home-based food business. *International Journal of Academic Research in Business and Social Sciences*, 12(1), 2600–2610. <https://doi.org/10.6007/IJARBS/v12-i1/12133>
- Reuschke, D., & Mason, C. (2022). The engagement of home-based businesses in the digital economy. *Futures*, 135, 102542. <https://doi.org/10.1016/J.FUTURES.2020.102542>
- Sixty-five Sungai Petani primary school pupils suffer food poisoning. (2024, May 21). *The Star*. <https://www.thestar.com.my/news/nation/2024/05/21/65-sungai-petani-primary-school-pupils-suffer-food-poisoning>
- Standards Malaysia. (2024). *Microbiology, nucleic acid, chemical & genetically modified (G.M.O) SAMM No. 267*. [https://www.jsm.gov.my/images/3-accreditation/resources/samm/document/SC\\_1.7\\_-\\_Specific\\_Criteria\\_Molecular\\_Testing\\_Final.pdf](https://www.jsm.gov.my/images/3-accreditation/resources/samm/document/SC_1.7_-_Specific_Criteria_Molecular_Testing_Final.pdf)
- Statista. (2024). *Online food delivery-Malaysia*. <https://www.statista.com/outlook/emo/online-food-delivery/malaysia>
- Tanushree, M. P., Sailendri, D., Yoha, K. S., Moses, J. A. & Anandharamakrishnan, C. (2019). Mycotoxin contamination in food: An exposition on spices. *Trends in Food Science and Technology*, 93, 69-80. <https://doi.org/10.1016/j.tifs.2019.08.010>
- Tarmazi, S. A. A., & Ali, N. M. (2021). The purchase intention of online home-based food products among Kelantanese. *Journal of Tourism, Hospitality & Culinary Arts*, 13(3), 128-138.
- Three food handlers identified as source of typhoid outbreak at Kelantan school. (2024, July 4). *The Star*. <https://www.thestar.com.my/news/nation/2024/07/04/three-food-handlers-identified-as-source-of-typhoid-outbreak-at-kelantan-school>
- Topimin, S., Hashim, M., & Rahayu, S. (2021). An overview of government business support programmes for micro and small businesses in Malaysia during the COVID-19 crisis. *Malaysian Journal of Business and Economics*, 8(2), 7-14. <https://doi.org/10.51200/mjbe.vi.3659>

- United States Department of Agriculture Food Safety and Inspection Service. (2021). *FSIS stabilization guideline for meat and poultry products (Revised Appendix B)*, Guideline ID FSIS-GD-2021-0013. [https://www.fsis.usda.gov/sites/default/files/media\\_file/2021-12/Appendix-B.pdf](https://www.fsis.usda.gov/sites/default/files/media_file/2021-12/Appendix-B.pdf)
- Wills, W. J., Meah, A., Dickinson, A. M., & Short, F. (2015). I don't think I ever had food poisoning'. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. <https://doi.org/10.1016/j.appet.2014.11.022>
- Yusuf, A. H., Oyelakin, I. O., Abdul Shukor, S., & Ahmad Bustamam, U. S. (2017). The role of halal certification in business performance in Selangor: A study on kopitiam. *Malaysian Management Journal*, 21, 1-22. <https://doi.org/10.32890/mmj.21.2017.9052>
- Zhang, T., Gerlowski, D., & Acs, Z. (2022). Working from home: Small business performance and the COVID-19 pandemic. *Small Business Economics*, 58, 611636. <https://doi.org/https://doi.org/10.1007/s11187-021-00493-6>