

Evaluation of Research Methods and Measures in Food Safety Studies Focused on Food-Service Sector.

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Introduction

With the high prevalence of foodborne illness worldwide (12) there is a concern regarding foodborne outbreaks associated with food-service establishments. It is estimated that 2.4 million cases of foodborne illness occur yearly in the UK (4) and that about a half of foodborne outbreaks may be attributed to food-service and catering establishments (9). Food handling and preparation practices were also found to be common contributing factors to the incidence of foodborne illness in the US restaurants (1).

Being at the final stage of food production and service, food-service employees play a vital role in ensuring food safety. Appropriate implementation of food safety practices such as: preventing cross-contamination, handwashing, cleaning and disinfecting, temperature control, separation of raw and cooked foods, using of safe water and raw materials are of utmost importance (3,11). The complexity of food-service operations requires an ongoing cultivation of positive food safety culture to ensure effective management of food safety (5,7,10).

In the last 20 years a number of studies have been conducted exploring food safety behaviours of food-service employees with the purpose to ascertain food handler food safety performance. To gain an in-depth understanding cognitive and behavioural factors that influence food handler compliance, and to avoid bias, it is important to rely on findings that are triangulated (8,2).

Purpose

This study aimed to identify and analyse primary research studies, focused on food-handler food safety behaviour and cognition in food-service establishments, and to determine the gap in the current body of research related to factors influencing food safety culture.

Methods

This review was conducted as follows:

- A systematic keyword search was conducted to obtain primary peer-reviewed studies published in English language in the last 20 years (2001-2021).
- Data was collated and recorded using a Qualtrics Database created for the purposes of this review.
- All captured data were quantitatively analysed using Qualtrics and MS Excel utilising tools for descriptive statistics.

References

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Results

Characteristics of the reviewed studies (n=118)

Years of Publication

The earliest study obtained for this review was undertaken in 2003 and the most recent in 2021 (Figure 1). A third (34%) of all studies was conducted in the years 2019-2021, indicating an increased attention to the topic of food safety in food-service establishments in recent years.

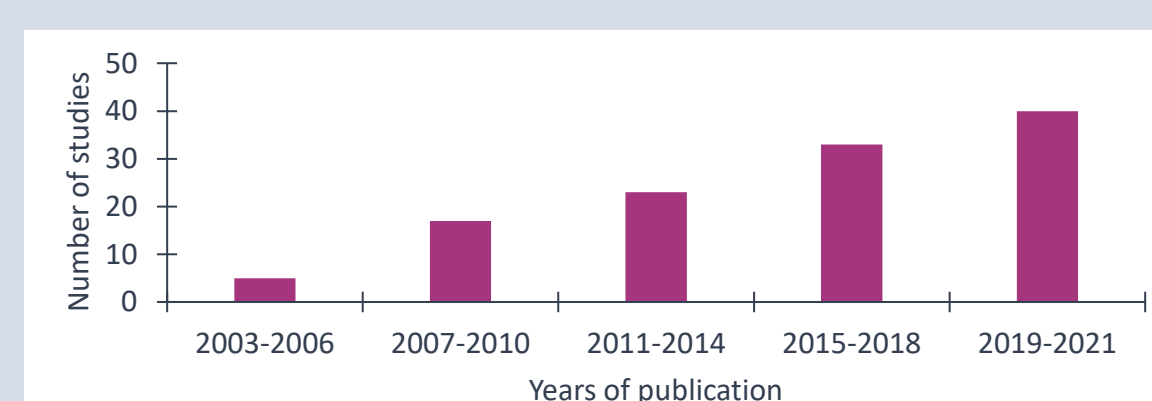


Figure 1. Distribution of collated research studies (n=118) by the years of publication.

Countries of origin

Majority of studies originated from the United States (29%), Brazil (17%) and the United Kingdom (7%) (Figure 2). Studies from other countries were also represented in this review.

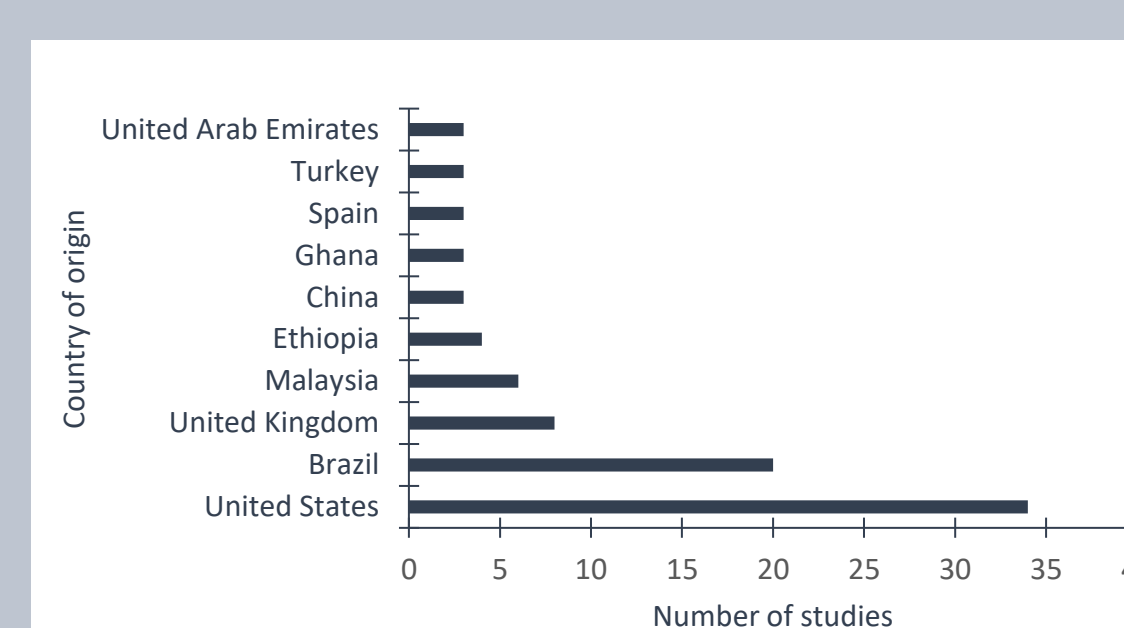


Figure 2. Countries with the highest numbers of studies in the reviewed sample (n=118).

Food-service settings

The reviewed studies investigated various food-service settings (Figure 3). Majority of studies included restaurant establishments (70%) and school or university food-service facilities 31%.

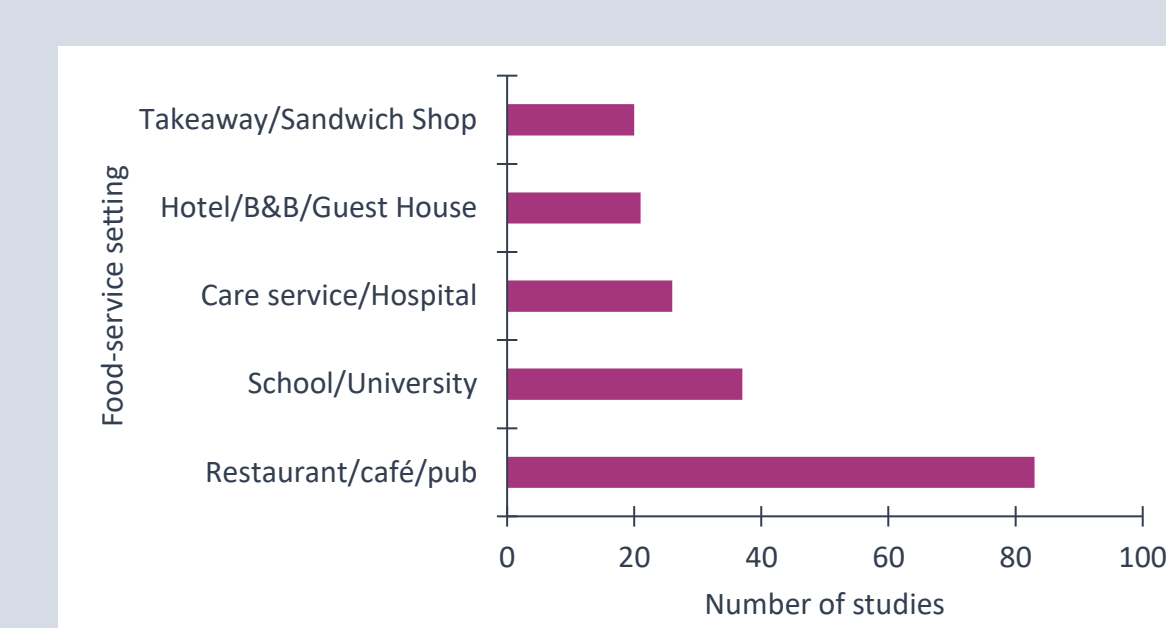


Figure 3. Food-service settings investigated in the reviewed studies (n=118).

Methods utilised for data collection in the reviewed research

Various methods of data collection were used in the reviewed food-service food safety studies (Figure 4), as follows:

- Questionnaire has been identified as the most utilised data collection method, used in 80% of different studies. And 55% of studies relied on questionnaires as a sole method.
- Observation was used in 29% of studies. In the majority of the observational studies (n=29/34) a structured checklist was utilised by a non-disguised observer.
- Interviews were utilised in 11% of studies and Focus groups in only 3% of studies.
- Microbiological assessment was used in 10% of studies, out of which two (n=2/12) used it as a sole method of data collection.
- Only 19% of studies relied on the application of social cognitive theory or model. TPB (Theory of Planned Behaviour) and KAP (Knowledge, Attitude and Practice) were most utilised (Figure 5).
- Only 28% of studies utilised mixed data collection methods, for example combining a questionnaire with observation (Table 1).

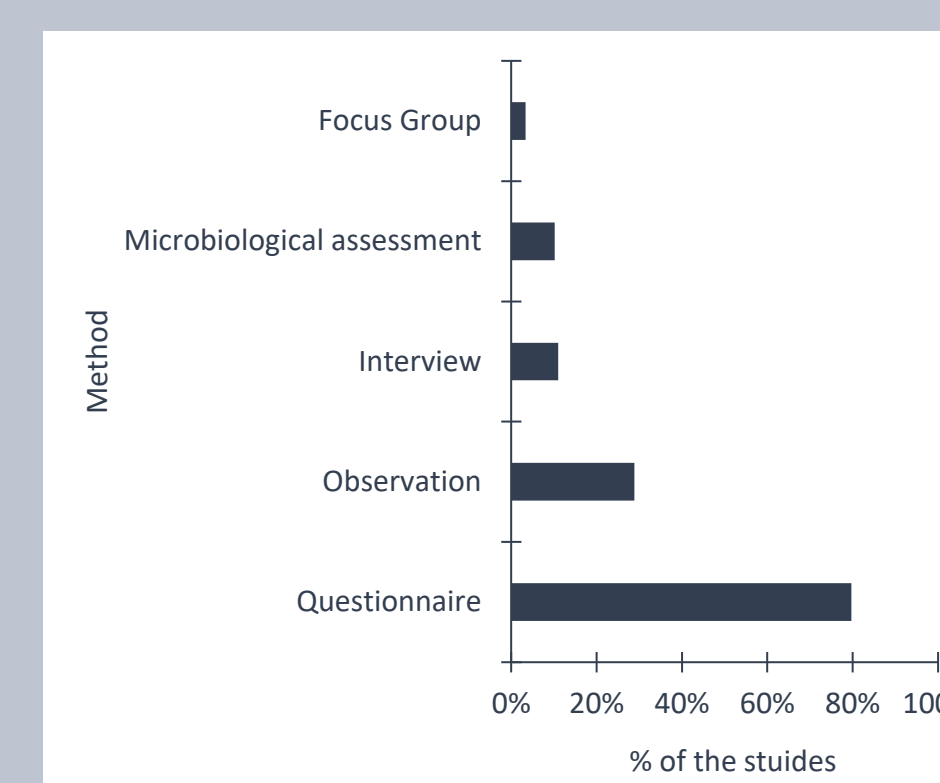


Figure 4. Methods used for data collection in the reviewed research studies (n=118).

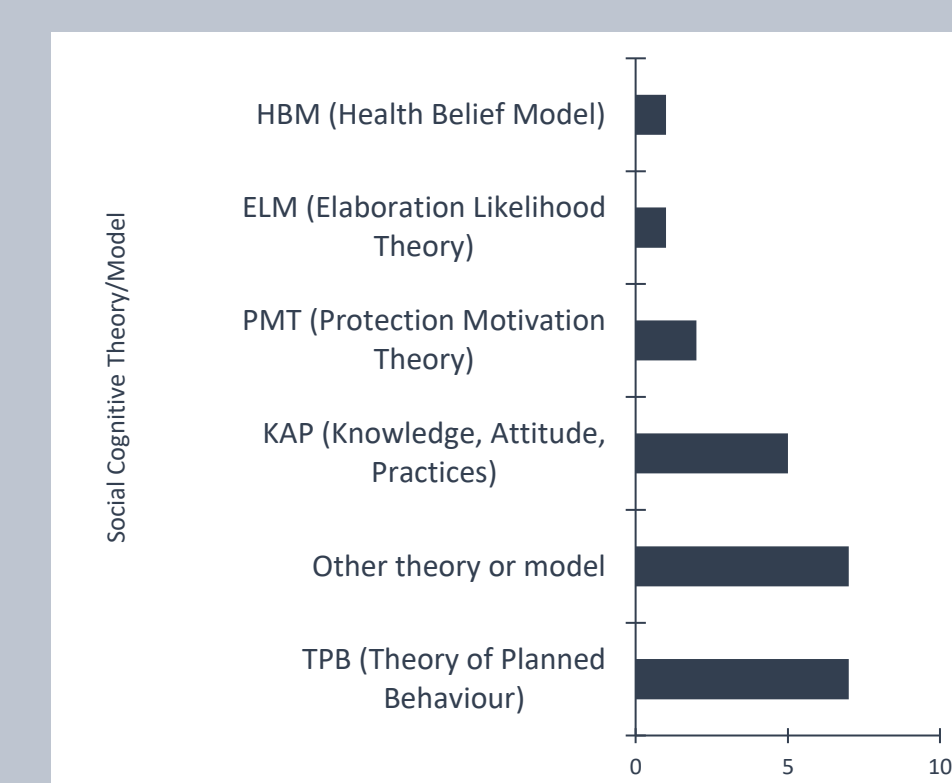


Figure 5. Social cognitive theories or models applied in the reviewed research studies (n=22).

Table 1. Mixed methods utilised in the reviewed studies (n=33).

Questionnaire	Observation	Microbiological assessment	Interview	Focus group	Studies using method combinations (n=33)
✓	✓				48%
✓			✓		15%
✓	✓	✓			12%
✓		✓			9%
✓		✓			6%
✓	✓		✓		3%
✓	✓		✓		3%
✓				✓	3%

Measures investigated in the reviewed research

Different measures were investigated in the food-service food safety studies (Figure 5), as follows:

- Cognitive measures, such as knowledge (58%) and attitude (41%) were most investigated in the reviewed research.
- Behavioural measures were investigated through the self-reports (41%) and observed food safety performance (24%).
- Only 11% of reviewed studies investigated a combination of cognitive and behavioural measures (Figure 6).



Figure 5. Measures investigated in the reviewed research studies (n=118).

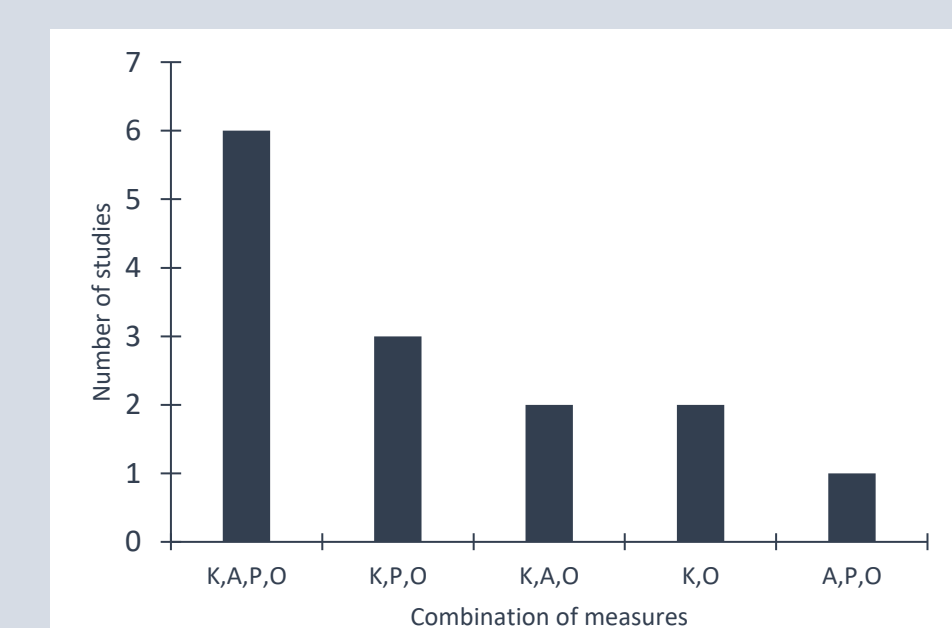


Figure 6. Mixed measures investigated in the reviewed studies (n=14). Here: K-Knowledge, P-Self-reported practices, A-Attitude, O-Observed behaviour.

Data related to food safety culture, as described by Griffith *et al.* (6), have been captured from 17% of reviewed studies:

- Food safety culture indicators, such as 'Communication' and 'Leadership' were explored most frequently (n=14/20).
- However, data about the other food safety indicators, such as Risk and Food Safety Management System were lacking (Figure 7).



Figure 7. Food safety culture constructs explored in the reviewed research studies (n=118).

Cognitive and behavioural data was captured from food-service food safety studies related to food safety performance:

- Food handler food safety were most often investigated through the assessment of food handler knowledge and self-reports.
- There is a particular lack of the observational data detailing the duration of handwashing, occasions when handwashing is performed, freezing/ defrosting and cleaning (Figure 8).

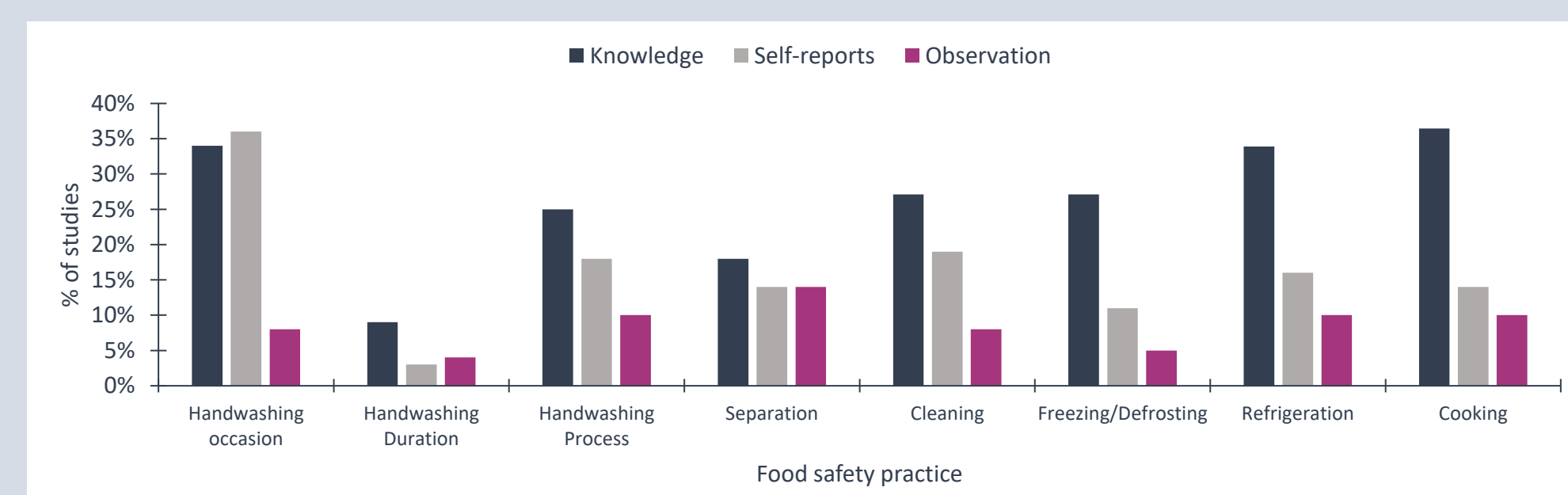


Figure 8. Food safety practices explored in the reviewed studies through knowledge, self-reports and observation (n=118).

Significance of study

This review identified specific gaps in the food-service food safety research:

- Data related to cognitive measures, such as risk perception and motivation and data related to food safety culture were lacking.
- A lack of studies relying on the application of social-cognitive measures was determined.
- There is a need for data triangulation, via utilization of mixed method approaches and investigation of mixed cognitive and behavioural measures.

It is suggested that addressing these gaps will ensure the reliability of research findings and help in obtaining an in-depth understanding of food handler behaviour and compliance in food-service establishments.