Review

Psychosocial and health-status determinants of safe food handling among consumers: A systematic review and meta-analysis

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ABSTRACT

Consumers often engage in unsafe food handling practices at home, and various psychosocial and health-status constructs have been investigated to attempt to explain the underlying reasons affecting consumers' use of such practices. We conducted a systematic review of these studies to synthesize the associations between psychosocial and health-status constructs and consumer safe food handling behaviours to inform future research and interventions. The review followed standard systematic review procedures including: comprehensive search strategy; relevance screening of references; characterization of articles; data extraction; and risk-of-bias assessment. Meta-analysis was conducted on odds ratio (OR) and Pearson's *r* measures of association within unique data subgroups that were stratified by eight categories of behavioural determinants, five behavioural constructs, and two outcome types. A total of 66 relevant studies were identified. Knowledge was the most commonly investigated behavioural-determinant category (70%), but was only associated with one of the individual behavioural constructs: prevention of cross-contamination and practicing personal hygiene (adjusted OR = 1.56; 95% CI = 1.17, 2.06; I^2 = 40%; n = 4 studies). In contrast, attitudes and risk perceptions, the second most commonly investigated category (61%), was significantly associated with all constructs (adjusted ORs ranging from 1.84 to 3.63) except for avoiding the consumption of risky foods. Habits, subjective norm, and measures of self-confidence and control were consistently and strongly associated with various outcomes. Behavioural intentions had inconsistent associations with behaviours, while cues to action and the high-risk health status of consumers and their families were not associated with any outcomes. Most studies (77%) only reported measures of association that were unadjusted for confounding variables, resulting in high risk-of-bias ratings for most outcomes. Stratified analyses indicated that adjusted ORs differed from unadjusted measures. The review findings highlight key psychosocial constructs that could be targeted in future research and interventions to improve consumers' safe food handling behaviours.

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1. Introduction

Foodborne illness has a significant burden on society. For example, in the United States, an estimated 47.8 million cases occur each year, affecting roughly 1 in 6 Americans and resulting in >125,000 hospitalizations and >3000 deaths (Scallan, Griffin, Angulo, Tauxe, & Hoekstra, 2011a; Scallan et al., 2011b). In Canada, approximately 4 million cases of domestically-acquired foodborne illness occur each year, affecting roughly 1 in 8 Canadians and causing an estimated 11,600 hospitalizations and 238 deaths (M. K. Thomas et al., 2013, 2015). These illnesses have substantial economic impacts through direct healthcare costs and indirect costs such as productivity losses (McLinden, Sargeant, Thomas, Papadopoulos, & Fazil, 2014), and they can also lead to long-term suffering through various chronic sequelae.

Research suggests that most cases of foodborne illness are due to the consumption of food prepared at home compared to other settings (Keegan et al., 2009; Redmond & Griffith, 2003; Vrbova, Johnson, Whitfield, & Middleton, 2012). Previous surveys have found that consumers do not follow many recommended safe food handling practices at home (Fein, Lando, Levy, Teisl, & Noblet, 2011; Nesbitt et al., 2014; Redmond & Griffith, 2003), which likely contributes to the burden of foodborne disease in this population. Several different theories of behaviour change (e.g. Theory of Planned Behaviour [TPB], Health Belief Model [HBM]), specific psychosocial constructs (e.g. knowledge, attitudes), and health-status variables (e.g. at 'high risk' for foodborne illness) have been investigated to attempt to explain the underlying reasons affecting consumers' safe food handling behaviours at home (Byrd-Bredbenner, Berning, Martin-Biggers, & Quick, 2013; Mullan, 2010; Redmond & Griffith, 2003; Young & Waddell, 2016). While some theories and constructs have shown promising results, several studies have shown that a large proportion of the variance in consumers' safe food handling behaviours are still unexplained by the measured variables (Mullan, Allom, Sainsbury, & Monds, 2015a, 2016; Byrd-Bredbenner et al., 2008; Shapiro, Porticella, Jiang, & Gravani, 2011).

It is unlikely that a single "off-the-shelf" theory of behaviour change will optimally explain consumers' safe food handling behaviours without adaptation to the specific context (e.g. population characteristics, types of behaviours) and addition of other potentially important psychosocial and health-status constructs (Glanz, Rimer, & Viswanath, 2015). There is a need to use a structured and transparent approach to determine the psychosocial and health-status constructs reported in the literature that are the most consistently promising predictors of consumer safe food handling behaviours in different contexts. We conducted a systematic review of such studies to inform which constructs should be investigated in future primary research studies that measure consumers' safe food handling behaviours and to guide which constructs could be potentially targeted in future educational interventions for consumers.

2. Material and methods

2.1. Review question and eligibility criteria

This review was conducted according to a pre-specified protocol (available upon request) and followed standardized systematic review methodology (Higgins & Green, 2011; Young et al., 2014). Results are reported in accordance with the preferred reporting items for systematic review and meta-analysis (PRISMA) statement (Moher et al., 2009). The review question was: "What is the relationship between psychosocial and health-status constructs and safe food handling behaviours among consumers?" The behavioural determinants of interest included any psychosocial construct (e.g. knowledge, attitudes, habits, self-confidence) as well as consumers' high-risk health status. The outcome of interest included behavioural intentions and behaviours (self-reported or observed) related to safe food handling at home (Medeiros, Hillers, Kendall, & Mason, 2001). The population of interest was adult consumers (aged ≥18 years old) who prepare and consume food at home.

Eligible sources of evidence included journal articles, research reports, dissertations and theses, and conference proceeding articles published in English, French, Spanish, or Italian. Studies focused on food handlers and others working in the food industry, and those measuring outcomes not directly related to food safety (e.g. general handwashing), were excluded. Additionally, only behaviours related to prevention of foodborne illness from microbial hazards were of interest in this review; behaviours related to prevention of exposure to chemical and other hazards (e.g. allergens) were excluded.

2.2. Search strategy

A comprehensive search strategy was conducted using a combination of pre-tested search terms implemented in the following bibliographic databases on July 4, 2016: Scopus, PubMed, CAB Abstracts, Food Safety and Technology Abstracts, PsycINFO, Cumulative Index to Nursing and Allied Health Literature, Health and Safety Science Abstracts, Risk Abstracts, and ProQuest Dissertations and Theses. The search algorithm included combinations of terms in the following categories: topic (e.g. food safety); population (e.g. consumers, adults, home); behavioural determinants (e.g. attitudes, knowledge, beliefs); and outcome (e.g. behaviours, practices). The algorithm was developed in consultation with a librarian and was constructed by extracting keywords from the titles and abstracts of 10 known relevant articles. It was pre-tested in Scopus by iteratively adding and removing different terms while ensuring that the 10 known articles were captured. A complementary search for grey