Influencing Food Safety Behaviour in the Home
A Rapid Review

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Key Messages

Based on the highest quality evidence:

1. Among children and youth, educational training can improve food safety behaviour at home.

2. Among adults, educational training can improve food safety attitudes.

3. Among adults, interventions that include a social media component can improve food safety attitudes.

4. Interventions that provide messaging through more than one medium and/or exposure can improve food safety behaviour at home.

Executive Summary

Overview and Purpose

As part of the End-to-End Public Health Practice strategic priority, the Health Protection Division is exploring how to effectively prevent or reduce foodborne illness in Peel through a comprehensive evidence-informed approach. A 2017 report on enteric illness in Peel region identified the need to address foodborne illness acquired at home. Currently, there is no Peel population-level intervention proactively promoting food safety behaviour at home.

Research Question

The research question addressed in this review was: "What interventions influence food safety behaviour in the home setting?"

Methods and Results

A search for published and grey literature returned 59 results. Two strong quality reviews were included after assessing relevance, quality, and study overlap.

Synthesis

Among children and youth, educational training can improve food safety behaviour and attitudes. Among adults, there were mixed findings for the impact of educational training and media campaigns or other educational materials on food safety behaviour at home. However, these interventions can improve food safety attitudes. Among adults, interventions that included a social media component can improve food safety

behaviour at home and attitudes. Additionally, interventions that provided messaging through more than one medium and/or exposure can improve food safety behaviour at home. Interventions that engaged the target audience during the development, implementation, and/or evaluation can also improve food safety behaviour at home.

Recommendations

Recommendations were developed based on the highest quality of evidence and applicability and transferability discussions. We recommend that the Health Protection Division:

- Advocate for provincial co-ordination, partnership and development of an intervention to improve food safety behaviour at home.

- Collaborate with other Ontario public health units to develop a co-ordinated approach to address food safety behaviour at home.

- Leverage existing relationships with stakeholders to develop an intervention.

- Further investigate food safety behaviour at home, and factors consistently associated with behaviour such as food safety attitudes in Peel region.

- Engage the population in developing, implementing and evaluating an intervention.

- Strengthen our relationship with the community by building trust and familiarity with the Region of Peel-Public Health services in designing and implementing an intervention.

- Share findings of the rapid review with stakeholders including the Ontario Ministry of Health and Long-Term Care.

- Monitor research, particularly on the impact of social media interventions.

For detailed recommendations, see the Recommendations section (pg. 22).

1 Issue

Foodborne illness is common. Most people experience minor symptoms, often not enough to motivate them to seek medical care. In some cases, foodborne illness can lead to negative health outcomes, an economic burden on the health care system, lost productivity, hospitalizations and death. Foodborne illness cases are often not captured by traditional surveillance systems due to under-reporting and under-diagnosis. The modelled estimate for the true annual number of cases of domestically-acquired foodborne illness in Peel was 8,881 from 2007-2016 (excluding amebiasis and botulism which could not be estimated). (1) This represents about one in 154 people in Peel.

As part of the End-to-End Public Health Practice strategic priority, the Health Protection Division is exploring how to effectively prevent or reduce foodborne illness in Peel through a comprehensive evidence-informed approach. A report reviewing enteric illness in Peel during the period 2007-2016 identified the need to address foodborne illness acquired at home. (1)

Peel public health inspectors conduct case follow up over the phone with people who have a laboratory-confirmed foodborne illness, including those suspected to have acquired the illness at home. During the call, they provide education on food handling practices at home. However, the Region of Peel-Public Health does not provide population-level interventions proactively addressing food safety behaviour at home.

The purpose of this review is to determine what interventions influence food safety behaviour in the home to prevent or reduce foodborne illness.

2 Context

Between 2007 and 2016, campylobacteriosis and non-typhoidal salmonellosis, which are mostly foodborne, had the highest incidence rates among enteric illnesses in Peel. (1) Many of these cases were acquired outside commercial settings. In 2016, 64 per cent of people with non-travel-related campylobacteriosis or non-typhoidal salmonellosis did not report eating at a commercial food premise during the incubation period. This suggests that consuming food unsafely prepared or handled in the home setting is the main cause of foodborne illness.

Recommendations in the Enteric Illness report included developing strategies to improve food safety behaviour in the home. While the Health Protection Division provides information to the public, there is no intervention that proactively promotes food safety at home. Given a large proportion of foodborne illnesses is related to home food preparation, the Health Protection Division decided to explore interventions addressing food safety behaviour in the home.

In this rapid review, we examined which interventions can influence food safety behaviour at home, as well as factors consistently associated with behaviour.

3 Conceptual Framework

Based on our background literature review, we developed a conceptual framework to illustrate factors that influence food safety behaviour at home (See **Appendix A: Background Literature Review, Appendix B: Conceptual Framework**). Four factors **consistently** associated with food safety behaviour at home included:

- **Food safety habits**: the frequency of past safe food handling behaviours, or habits of safe food handling at home

- **Self-confidence and perceived control**: self-efficacy (confidence), perceived skills, and level of perceived control over safe food handling at home

- **Attitudes and risk perception:** attitudes and beliefs toward food safety/safe food handling; perceived food safety risks at home; perceived susceptibility to and severity of foodborne illness acquired at home

- **Subjective norms**: the extent to which an individual's friends and family perform food safety behaviours and would expect the individual to follow similar practices

Food safety habits and self-confidence and perceived control were the factors most consistently associated with food safety behaviour at home. These factors, as defined by Young and colleagues (2), should be considered when developing, implementing and evaluating a potential intervention to improve food safety behaviour in the home.

Other noted factors associated with food safety behaviour included:

- **Food preferences:** the food choices made based on quality characteristics, perceived health benefits and convenience rather than for food safety reasons.

- **Lifestyle constraints:** included lack of time, inconvenience, distractions or other aspects of lifestyle that are perceived as barriers to food safety behaviour.

- **Lack of resources and tools:** included no thermometers, separate cutting boards, enough refrigerator storage, and/or enough finances to purchase tools to facilitate food safety behaviour.

The association between food safety knowledge and food safety behaviour was inconsistent.

4 Literature Review Question

What interventions influence food safety behaviour in the home setting?

P (Population)	General population: individuals who prepare food in the home setting including adults, children and youth
I (Intervention)	Population-level food safety interventions
C (Comparison)	No intervention
O (Outcome)	Performing food safety behaviour at home

5 Literature Search

During April to May 2018, we conducted a search of published and grey literature for articles from 2007 onward to obtain the most recent and comprehensive literature. The search strategy was developed based on the PICO question and in consultation with a librarian (See **Appendix C**). The databases searched included Medline, HealthStar, PsycINFO, Environment Complete and Cochrane Database of Systematic Reviews. Grey literature sources included the National Collaborating Centre for Environmental Health, the U.S. Centers for Disease Control and Prevention Community Guide, World

Health Organization, and websites of Canadian and U.S. public health or food safety agencies.

The Environmental Health Review was hand-searched for relevant articles published since the journal's inception in 2012.

A key informant, Dr. Ian Young, a lead author of several relevant articles retrieved from the search, was also contacted for information on other relevant articles.

6 Relevance Assessment

Two reviewers independently assessed the relevance of the search results based on title and abstract, and then on the full-text article. Discrepancies were resolved through discussion. Relevancy was assessed using the following criteria:

Inclusion: synthesized literature (reviews and guidelines); populations similar to Peel region such as the U.S., U.K. and Australia; population-level interventions designed to improve food safety behaviour in settings including the home. Articles that assessed factors consistently associated with food safety behaviour at home as defined in the Conceptual Framework section (pg. 5) were also included in the review. These factors included food safety habits, self-confidence and perceived control of safe food handling, attitudes and risk perception, and subjective norms.

Exclusion: single studies; articles that did not describe interventions in sufficient detail; interventions not primarily intended to change food safety outcomes. Studies that examined the effect of interventions on factors not consistently associated with behaviour, such as knowledge, were excluded from analysis.

7 Results of the Search

The literature search identified 59 articles, which were reviewed for relevance by title and abstract. The full-text of five systematic reviews and one literature review were then reviewed based on the inclusion criteria. Of the six reviews, two were excluded and four were assessed for quality. See **Appendix D** for the search results flowchart.

8 Critical Appraisal

Two reviewers independently critically appraised four reviews using the Health Evidence Quality Assessment Tool. Discrepancies in appraised quality were resolved through discussion. Three systematic reviews were rated as strong quality and one literature review was rated as weak. The weak quality review was excluded, as well as one of the strong quality reviews, which contained the same studies found in a newer strong quality review.

Two strong quality systematic reviews were ultimately included in this review. These reviews included two of the same studies. However, the objectives of each review were different. One examined educational interventions to improve food safety behaviour at home, whereas the other review specifically examined the use of social media for communicating food safety and infectious disease risks. The difference in aims and limited overlap between the reviews led to both being included in the final summary.

9 Description of Included Studies

The highest quality evidence included two strong quality systematic reviews (See **Appendix E**). These reviews included studies on the effect of different interventions on food safety attitudes and/or behaviour.

Young et al. (2015). A systematic review and meta-analysis of the effectiveness of food safety education interventions for consumers in developed countries. (3)

The aim of this review was to determine the effectiveness of educational interventions to improve food safety behaviour at home for consumers in North America, Europe, Australia and New Zealand. Consumers were defined as those who prepare or handle food for consumption at home, including volunteer food handlers for special events.

The review included 79 studies: 17 randomized controlled trials, 12 non-randomized controlled trials, and 50 uncontrolled before-and-after studies.

Interventions to improve food safety behaviour at home were categorized into two groups: educational training/courses and media campaigns/other educational message materials. Settings included classrooms, the community, homes, seniors' centres and online. Various target populations were studied including students, parents, older adults, low-income individuals, and young adults. Different studies examined various food safety outcomes such as food safety knowledge, attitudes, behaviours, and/or behavioural intentions. There were no specific definitions of these outcomes.

Study findings were analyzed by:

- Study design (randomized controlled trials, non-randomized controlled trials, uncontrolled before-and-after studies)

- Intervention type (educational training/course, media campaign/other messaging)

- Target population (children/youth under 18 years old, adults 18 years of age and older, educators of consumers)

- Outcome type and outcome measure (categorical or continuous measure)

The overall quality of evidence was assessed for each subgroup using a modified version of the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) approach by the Cochrane Collaboration.

The authors also explored whether the effects of the interventions varied by factors such as frequency of intervention exposure and engagement of the target audience.

Specific food safety behaviours and attitudes were not examined due to limited availability and reporting of primary research. A variety of behaviours were measured in different ways across studies.

Overbey et al. (2017). A systematic review of the use of social media for food safety risk communication. (4)

The objectives of this review were to 1) assess the current state of literature on social media use for food safety and infectious disease communication to the public, and 2) make recommendations for using social media.

Communication techniques for information on non-sexually transmitted infectious diseases were included because they could be applied to foodborne illness. Infectious

disease control measures also rely heavily on managing risks at the individual level and on shaping perceptions. Including literature about infectious disease communication produced a greater sample size. The authors did not examine specific food safety or infectious disease messaging or behaviours.

Sixteen articles on food safety risk communication and eight articles on infectious disease communication were included. Three of the food safety articles examined communication interventions intended to change food safety behaviour at home. Two of these studies used an experimental study design with a control group. The interventions included a combination of traditional media campaigns, such as posters and public service announcements, social media, and/or a lecture-based course. The target audiences were either families with young children or university students.

The authors identified benefits and challenges of, and barriers to, using social media to communicate the risks associated with food safety and infectious disease. They presented factors that influence message engagement and reach.

Based on these findings, the authors made recommendations for using social media to communicate food safety and infectious disease risks to the public.

No reviews were found that included studies examining food safety habits, self-confidence and perceived control of safe food handling at home or subjective norms.

10 Synthesis of Findings

- **Among children and youth, educational training can improve food safety behaviour and attitudes.**

  o Among children and youth, educational training delivered in community and school settings had a small[1] significant effect on improving **food safety behaviour** in the home *(standardized mean difference (SMD)[2] range: 0.20 to 0.33; 7 studies); (median relative risk (RR)[3]=5.37; range: 1.04 to 9.69; 2 studies)*. (3) Training included workshops, courses, and/or curricula. Follow-up periods varied from immediately after to 3 months after. The overall quality of evidence ranged from very low to high.

  o Among children and youth, educational training had a small significant effect on improving **food safety attitudes** *(median SMD=0.31; range: 0.10 to 1.32; 3 studies).* (3) Follow-up periods ranged from immediately after to 6 weeks after. The overall quality of evidence was very low.

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[1] Magnitude of effect was categorized using Cohen's Criteria where effect size < 0.50 but $\geq$ 0.20 is considered small; effect size < 0.80 but $\geq$ 0.50 considered medium; effect size $\geq$ 0.80 considered high. Cohen, J. (1988). Statistical power for behavioural sciences. 2nd ed. Hillsdale, NJ: Erlbaum.

[2] Standardized mean difference (SMD) is the difference in the mean effect sizes of the intervention group and the control group expressed in standard deviation units. It is a ratio; its value does not depend on the measurement scale. SMD is used when studies have similar outcomes of interest but are measured using different scales, so the results cannot be combined directly.

[3] Two different effect estimates were presented in Young et al. (3). The relative risk (RR) metric was used when dichotomous categorical data were analyzed (a variable that takes on one of two possible values observed or measured), whereas SMD is used when continuous data were analyzed.

- **Among adults, there are mixed findings for the impact of educational training on food safety behaviour at home. However, educational training can improve food safety attitudes.**

  o Among adults, educational training either had a small significant effect on improving **food safety behaviour** at home or did not have a significant effect *(SMD range: 0.28 to 0.68; 22 studies); (median RR=1.26; range: 0.95 to 2.66; 10 studies).* (3) Training included workshops, courses, and/or curricula in school, academic and community settings. Follow-up periods varied from immediately after to 1 year after. The overall quality of evidence ranged from very low to low.

  o Educational training delivered to adults had a small significant effect on improving **food safety attitudes** *(SMD range: 0.26-0.43; 9 studies); (median RR=1.09; range: 1.04 to 1.33; 4 studies).* (3) Follow-up periods varied from immediately after to 6 months after. The overall quality of evidence ranged from very low to moderate.

- **Among adults, there are mixed findings for the impact of media campaigns/other educational materials on food safety behaviour at home. However, these interventions had a significant effect on improving food safety attitudes.**

  o Among adults, media campaigns/other educational materials either improved **food safety behaviour** at home or had no significant effect *(RR range: 1.35 to 2.31; 8 studies); (median SMD=0.24; range: -0.17 to 1.03; 4 studies).* Media campaigns/other educational materials included print media such as brochures, website information, and food product label information, and audio-video media

such as radio or TV ads. (3) Follow-up periods varied from immediately after to 9 months after. The overall quality of evidence ranged from very low to low.

- o Among adults, media campaigns/other educational materials had a small significant effect on improving **food safety attitudes** *(SMD range: 0.34 to 0.43; 11 studies); (RR range: 1.10 to 1.75; 8 studies).* (3) Follow-up periods varied from immediately after to 9 months after. The overall quality of evidence ranged from very low to low.

- **Among adults, interventions that include a social media component can improve food safety attitudes and behaviour at home.**
  - o Among adults, interventions that include messaging delivered through social media and other components, such as traditional media or lecture-based course, improved **food safety behaviour** at home based on two non-randomized control trials. (4) Follow-up periods varied from immediately after to 4 months after. The quality of these studies was not disclosed in the review.
  - o Interventions that include social media, distance education and/or traditional classroom lecture delivered in a university setting to students and staff had a small significant effect on improving **food safety attitudes** *(average SMD=0.26; 95% CI: 0.10 to 0.43; 2 studies).* (3) The follow-up period was immediately after the intervention. The overall quality of evidence was moderate.
  - o The benefits, drawbacks, barriers, and recommendations for social media use for food safety and infectious disease risk communication have been reported. (4) (See **Appendix F**)

- **Interventions that provide messaging through more than one medium and/or exposure can improve food safety behaviour at home.**
  - o Interventions that provided messaging through more than one medium and/or exposure had a moderately greater effect on improving food safety behaviour at home than interventions that provided messaging through only one medium and exposure *(average SMD=0.68; 95% CI: 0.03 to 1.33; 10 studies)* (3) Follow-up periods ranged from immediately after to 3 months after.

- **Interventions that engage the target audience during development, implementation, and/or evaluation can improve food safety behaviour at home.**
  - o Interventions that engaged the target population during development, implementation, and/or evaluation had a 47 per cent greater effect on improving food safety behaviour at home than interventions that did not engage the population *(average RR=1.47; 95% CI: 1.02 to 2.11; 17 studies)* (3) Follow-up periods ranged from immediately after to 9 months after.

Refer to **Table 1** for details.

Table 1: Effectiveness of interventions on food safety behaviour at home and attitudes

Intervention	Target audience	Food Safety outcome	Overall direction of effect	Number of studies	Effect estimate average (95% CI)[a] / median (range)[b]	Quality of evidence (GRADE rating)
Educational training	Children and youth	Behaviour	+	2 RCTs	SMD=0.20 (0.05 to 0.35)[b]	High
				2 NRTs	SMD=0.33 (0.17 to 0.90)[b]	Very low
				3 UBAs	SMD=0.31 (0.14 to 1.32)[b]	Very low
				2 UBAs	RR=5.37 (1.04 to 9.69)[b]	Very low
		Attitudes	+	3 UBAs	SMD=0.31 (0.10 to 1.32)[b]	Very low
	Adults	Behaviour	+/-	2 NRTs	SMD=0.37 (0.08 to 0.66)[a]	Low
				16 UBAs	SMD=0.28 (0.11 to 1.49)[b]	Very low
				4 RCTs	SMD=0.68 (-0.06 to 1.41)[b]	Low
				10 UBAs	RR=1.26 (0.95 to 2.66)[b]	Very low
		Attitudes	+	2 NRTs	SMD=0.26 (0.10 to 0.43)[a]	Moderate
				7 UBAs	SMD=0.43 (0.05 to 0.95)[b]	Very low
				4 UBAs	RR=1.09 (1.04 to 1.33)[b]	Very low
Media campaigns / other educational materials	Adults	Behaviour	+/-	2 NRTs	RR=2.31 (1.30 to 3.33)[b]	Low
				4 RCTs	SMD=0.24 (-0.17 to 1.03)[b]	Low
				6 UBAs	RR=1.35 (0.90 to 2.35)[b]	Very low
		Attitudes	+	8 RCTs	SMD=0.34 (0.05 to 0.76)[b]	Low
				3 NRTs	RR=1.75 (1.01 to 2.85)[b]	Very low
				3 UBAs	SMD=0.43 (0.13 to 0.81)[b]	Very low
				5 UBAs	RR=1.10 (1.02 to 1.23)[b]	Very low
Interventions including social media	Adults	Behaviour	+	2 NRTs	N/A[*]	Not described[*]
		Attitudes	+	2 NRTs	SMD=0.26 (0.10 to 0.43)[a]	Moderate

Positive effect (+); mixed effects (+/-).
[*]Note: In the Overbey et al. (2017) narrative review, the quality of the studies was assessed using the mixed methods appraisal tool (MMAT). (4) The specific quality ratings of each study were not described.
Randomized controlled trials (RCTs); non-randomized controlled trials (NRTs); uncontrolled before-after studies (UBAs)
Confidence interval (CI); standardized mean difference (SMD); relative risk (RR); Grades of Recommendation, Assessment, Development and Evaluation (GRADE)

11 Applicability and Transferability

The rapid review project team met with staff and management from the Health Protection Division to discuss applicability and transferability of the findings. Highlights from the discussions are provided below. For details, see **Appendix G**.

Political acceptability or leverage

- A home food safety intervention would be supported in the current political climate. It is in line with the Region of Peel's Community for Life vision.

- Innovative strategies tailored to Peel's cultural diversity are encouraged.

- An intervention can positively increase the public profile of the Region of Peel-Public Health (ROP-PH) by enabling the public to understand our role and services.

- With the new provincial government, there are potential budget cuts in 2019. We should build an economic case for decision makers to address home food safety.

Social acceptability

- A home food safety intervention would generally be perceived well by the population if we engage with them, and messages are presented in a non-judgemental way.

- We should keep home food safety messages focused, simple, visual and in multiple languages. Public perception of food safety terminology may vary due to potential language, cultural and literacy barriers. Time and place of messaging can be important (i.e. following an outbreak or messages in supermarkets).

- There is a misconception that foodborne illness is acquired from dining out rather than from food prepared at home.

- We should be careful about not giving the public the wrong impression that by learning how to prepare food at home safely, they can sell home prepared foods.

- ROP-PH may not be the best face to deliver home food safety messages due to our low profile in the community.

- The perception of government can be influenced by culture, which can affect public engagement and trust.

- We should target common risky food handling behaviours to be impactful.

Health equity

- Low socioeconomic status may impact accessibility to an intervention (e.g. financial, lack of time).

- Language, literacy, newcomer status and culture are potential barriers to uptake of an intervention, which can be overcome by culturally-sensitive visual resources.

- Partnering with Human Services, food banks and United Way may help us reach vulnerable populations and address potential barriers.

- We need to understand social media accessibility and usage in Peel. Access issues exist for the elderly and low-income groups.

Available essential resources (personnel and financial)

- Money, staff time, and resources are needed to develop, implement, and evaluate an intervention. Adequacy of staff training will depend on the intervention chosen.

- To lower costs, we can enlist university graduate students (e.g. marketing) and leverage the experience of internal and external stakeholders.

- Leveraging the resources of stakeholders would allow us to develop and implement an intervention in a cost-effective manner. Internal stakeholders could include Family Health, School Health, Chronic Disease and Injury Prevention, and Human Services. External stakeholders may include schools, child care centres, United Way, community groups, health care professionals, the public, grocery retailers, volunteer food handlers, and food banks.

Organizational expertise and capacity

- Home food safety is an issue bigger than Peel region. We should advocate to the province for a co-ordinated effort to address home food safety.

- A home food safety intervention would be in line with the ROP-PH's Strategic Plan and mandate under the Ontario Public Health Standards.

- There are existing programs that can be leveraged to develop an intervention such as the food handler certification program (internal) and Fight BAC (external).

- We could leverage the experience and reach of internal and external stakeholders to develop and implement an intervention.

- Organizational barriers include budget, resource allocation and reach. Staff are discouraged from reaching out to the community including disseminating educational pamphlets. We also don't have enough food safety resources for the public.

- ROP-PH's barriers to delivering home food safety messages include the public's lack of familiarity of the ROP-PH, reach, and lack of public trust in government. Collaboration with community leaders can better reach our population.

- ROP-PH has limited social media and website capabilities and presence.

- Buy-in from physicians to deliver a home food safety intervention can be difficult because they have many existing priorities.

- The sharing economy should be considered when developing home food safety messaging (e.g. risks of purchasing home-prepared foods for sale through Kijiji and Facebook).

- Our organization is motivated to address food safety since it is a public health problem and there are potential evidence-based interventions that can address it.

Magnitude of the "reach"

- Coordination with the Province can enable greater reach of target population.

- Priority populations should be identified through the data to determine outreach strategies. Different strategies are needed to reach different groups.

- Outreach to vulnerable populations can be leveraged through relationships with stakeholders such as school boards, child care centres, and Human Services.

Target population characteristics

- The research study populations are comparable to Peel, as the studies were conducted in developed countries relevant to the Canadian context. However, there may be some demographic differences such as age, immigrant status, cultural diversity, languages, and socioeconomic status. The impact of these differences on food safety behaviour is unknown.

- We need to understand our community's characteristics such as food safety behaviour, attitudes, and other factors associated with behaviour among different age groups and the top three representative cultures in Peel to tailor an intervention.

- We should determine our target population to start with (e.g. children and youth).

12 Recommendations

- Advocate for provincial co-ordination, partnership and development of an intervention to improve food safety behaviour at home, considering it is an issue that exists beyond Peel region. This may include advocating to the Ontario Ministry of Health and Long-Term Care (MOHLTC) and the Association of Supervisors of Public Health Inspectors of Ontario.
- Collaborate with other public health units in Ontario to develop a co-ordinated approach to address food safety behaviour at home.

- Leverage existing relationships with internal and external stakeholders to develop an intervention and efficiently reach the Peel population. Stakeholders could include other teams within the ROP-PH and schools. In partnership with stakeholders:
    - Develop educational training interventions for children and youth in community and school settings to improve food safety behaviour
    - Develop interventions for children and/or adults that are multi-component or frequent in exposure to improve food safety behaviour at home
    - Adapt or develop visual resources for children and/or adults to address language, cultural and literacy barriers
    - Create partnerships with reliable social media influencers to deliver key messages about food safety behaviour at home to adults
- Further investigate Peel population's food safety behaviour at home, and factors consistently associated with behaviour such as food safety attitudes.
- Engage the population in developing, implementing and/or evaluating an intervention to improve food safety behaviour at home. This may be through focus groups and surveys.
- Strengthen our relationship with the population by building trust and familiarity with the ROP-PH in designing and implementing an intervention.
- Share the findings of the rapid review with relevant stakeholders including the MOHLTC, the Ontario Chief Medical Officer of Health, Public Health Ontario, Canadian Institute of Public Health Inspectors, the National Collaborating Centre for Environmental Health, schools, and internal teams such as School Health and Family Health.

- Monitor research, particularly on the impact of interventions involving social media.

References

(1) Region of Peel-Public Health. (2017). Enteric illness in Peel region, 2007-2016. Mississauga: Region of Peel-Public Health.

(2) Young et al. (2017). Psychosocial and health-status determinants of safe food handling among consumers: a systematic review and meta-analysis. *Food Control,* 78: 401-411.

(3) Young et al. (2015). A systematic review and meta-analysis of the effectiveness of food safety education interventions for consumers in developed countries. *BMC Public Health,* 15: 822.

(4) Overbey et al. (2017). A systematic review of the use of social media for food safety risk communication. *J Food Prot,* 80(9): 1537-1549.

Appendices

Appendix A: Background Literature Review

Appendix B: Conceptual Framework

Appendix C: Search Strategy

Appendix D: Literature Search Flowchart

Appendix E: Data Extraction Tables

Appendix F: Additional findings

Appendix G: Applicability & Transferability Worksheet

Appendix A: Background Literature Review

Factors that influence food safety behaviour at home

Issue:

This report summarizes the important factors that influence food safety behaviour in the home setting. The findings of this research will inform the Health Protection Division's rapid review on interventions that influence food safety behaviour at home.

Recommendation:

- The rapid review should investigate interventions that change **food safety habits** (frequency of past safe food handling behaviour or habit of safe food handling at home) and **self-confidence and perceived control of safe food handling** at home, in addition to food safety behaviour. Interventions that change **food safety attitudes and risk perception** and **social pressure/subjective norm** should also be considered.

Context:

The Region of Peel-Public Health has a mandate to prevent or reduce the burden of foodborne illnesses in our community as articulated in the 2018 Ontario Public Health Standards. Foodborne illnesses can have serious, long-term health consequences, particularly for vulnerable groups such as young children, the elderly, pregnant women and immunocompromised individuals. As part of the End-to-End Public Health Practice strategic priority, the Health Protection Division has been exploring how we can prevent or reduce the incidence of foodborne illness in Peel through a comprehensive evidence-informed approach.

The first step was to collect information on the state of enteric illness in Peel region. The Enteric Illness in Peel region, 2007-2016 report[1] identified key areas of concern including the need to address foodborne illness acquired at home. Between 2007 and 2016, campylobacteriosis and non-typhoidal salmonellosis, enteric illnesses that are predominantly foodborne, had the highest incidence rates among all enteric illnesses in Peel. In 2016, 64 per cent of people with domestically-acquired campylobacteriosis or non-typhoidal salmonellosis did not report eating at a food premise during the incubation period.

The Enteric Illness report further identified knowledge gaps in safe food handling among Canadians.[1] Based on the Public Health Agency of Canada's FoodBook, a Canadian population-based telephone survey, in 2014-2015, only 67 per cent reported using separate cutting boards for raw meat and other foods, and 19.7 per cent reported cleaning the cutting board after preparing raw meat before preparing other foods. Just under one third of respondents who cooked

meat reported using a food or meat thermometer to know when meat was cooked.

At the Region of Peel-Public Health, when public health inspectors follow up with people with laboratory-confirmed foodborne illnesses suspected to be acquired at home, they provide education on safe food handling practices over the phone. At the Health Protection Contact Centre, inspectors may respond to inquiries from the public related to food safety practices at home. However, currently, there are no proactive programs/services specifically aimed at preventing foodborne illness in the home setting. To address this issue, we need a better understanding of all the factors (i.e. demographics, behavioural determinants) that may influence food safety behaviour in the home. Thus, a background literature review was conducted to obtain the best available evidence to answer the research question: what factors influence food safety behaviour in the home setting?

Findings:

Description of included research

- Based on a systematic search of synthesized peer-reviewed and grey literature published in the last 10 years, three relevant strong quality systematic reviews were included in this review (**Appendix A: Search Strategy and Appendix B: Relevancy Criteria**). These articles were critically appraised by at least three independent reviewers using the Health Evidence Quality Assessment Tool.
- The following articles were included in this review:

  - Young and Waddell conducted a 2016 systematic review and thematic synthesis of qualitative primary research studies investigating the barriers and facilitators to safe food handling among consumers.[2]

  - Young and colleagues conducted a 2017 systematic review of behavior-change theories and psychosocial constructs within each theory that are most consistently associated with consumers' safe food handling behaviors.[3]

  - Young and colleagues conducted another 2017 systematic review and meta-analysis of associations between psychosocial and health-status constructs and consumer safe food handling behaviours.[4]

Summary of the research

- **Food safety habits** and **self-confidence and perceived control over safe food handling at home** were most consistently associated with food safety behaviour at home.

  - Safe food handling habits (frequency of past safe food handling behaviours or habit of safe food handling at home) and self-confidence and perceived control over safe food handling at home were frequently associated with food safety behaviour in various

behaviour change models.[3]

- o Self-confidence and perceived control over food handling at home were consistently associated with avoiding consumption of risky foods[§] (Pearson's correlation coefficient (r) = 0.22; 95% CI: 0.03 to 0.42), preventing cross-contamination or practicing personal hygiene[**] (r=0.30; 95% CI: 0.08 to 0.50), and measures of overall food safety behavior (r=0.30; 95% CI: 0.26 to 0.35).[4]

- o Food safety habits were also consistently associated with preventing cross-contamination or practicing personal hygiene (r=0.32; 95% CI: 0.20 to 0.38) and measures of overall food safety behaviour (r=0.60; 95% confidence interval (CI): 0.54 to 0.65).[4]

- o Safe food handling behaviour in the home was perceived as unconscious, repetitive and routine, and influenced by past actions and experiences rather than as deliberate action and rational logic.[2] Consumers tended to actively think about food safety under special or unfamiliar circumstances (e.g. preparing large meal for family gathering, preparing food for first time).

- Attitude and risk perception was also consistently associated with food safety behaviour at home.

- o Positive attitudes and beliefs toward food safety or perceived food safety risks at home were significantly associated with adequate cooking of foods[††] (adjusted odds ratio (OR)=3.63; 95% CI: 2.53 to 5.20), preventing cross-contamination or practicing personal hygiene (OR=1.94; 95% CI: 1.37 to 2.74), time-temperature control[‡‡] (OR=1.84; 95% CI: 1.17 to 2.90), and measures of overall food safety behaviour (r=0.34; 95% CI: 0.16 to 0.50).[4]

[§] Avoiding consumption of risky foods was defined by Young and colleagues[4] as avoiding consumption of unpasteurized milk, cheese made from unpasteurized milk, unpasteurized juices and cider, and raw sprouts; avoiding consumption of high-risk foods among vulnerable groups of consumers (e.g. dishes containing raw meats, fish, seafood, and eggs; non-dried deli meats without appropriate reheating).

[**] Preventing cross-contamination or practicing personal hygiene was defined by Young and colleagues[4] as appropriate handwashing; not handling food while ill; washing fruits and vegetables; not washing meat and poultry; cleaning of kitchen surfaces, cutting boards, and utensils; separating raw from cooked foods.

[††] Adequate cooking of foods was defined by Young and colleagues[4] as use of a thermometer to check cooking doneness; achieving adequate cooking temperatures; appropriate reheating of leftovers.

[‡‡] Time-temperature control of foods was defined by Young and colleagues[4] as appropriate refrigeration, freezing, defrosting, and hot holding practices; adherence to recommended storage times; disposal of expired foods.

- Attitudes, beliefs and perceived food safety risks were not significantly associated with avoiding consumption of risky foods (adjusted OR=1.53; 95% CI: 0.99 to 2.37).[4]

- Due to consumers' confidence in their own food handling practices at home, they generally did not perceive that they were at risk of foodborne illness.[2]

- Consumers' concern for children and dependants such as the elderly, whom they prepare food for, was more likely to change consumers' food safety practice.[2]

- Subjective norm/social pressure was also consistently associated with food safety behaviour at home.

  - Subjective norm is the extent that consumers' family and friends prepare food safely and would expect them to follow similar practices. Subjective norm was associated with measures of overall food safety behaviour (r=0.15; 95% CI: 0.06 to 0.24).[4]

  - Moderate confidence[§§] was found in the finding that some consumers were also influenced by cultural traditions and family and friends, and to a lesser extent, social acceptability of the practice.[2]

- Knowledge was not consistently associated with food safety behaviour at home.

  - Food safety knowledge was associated with preventing cross-contamination and practicing personal hygiene (adjusted OR=1.56; 95% CI: 1.17 to 2.06), and measures of overall food safety behaviour (r=0.35; 95% CI: 0.27 to 0.43).[4]

  - However, knowledge was not significantly associated with other food safety behaviours such as adequate cooking of foods (adjusted OR=0.88, 95% CI: 0.68 to 1.14), avoiding consumption of risky foods (adjusted OR=1.30; 95% CI: 0.81 to 2.08), and time-temperature control (adjusted OR=1.15; 95% CI: 0.73 to 1.81).[4]

  - Moderate confidence[‡‡] was found in the finding that knowledge did not always correspond to actual or self-reported safe food handling practices. Consumers often acknowledged engaging in unsafe behaviours despite being aware of recommended practices.[2]

- Being in a high-risk group for foodborne illness (e.g. older adults, immunocompromised individuals, pregnant or caring for young children) or having at least one high-risk family member at home may not necessarily be associated with better food safety behaviour.

  - Moderate confidence[§§] was found in the finding that a change in health status (e.g. first-

---

[§§]Young and colleagues (2016)[2] defined confidence or likelihood that the review finding is a reasonable representation of the phenomenon of interest based on adaptation of the *Confidence in the Evidence from Reviews of Qualitative research (CERQual)* approach. Categorized into high, moderate and low.

time pregnant women, immunocompromised) may be associated with a stronger willingness to modify some food safety behaviours.[2]

- o However, no association was found between being in a high-risk group for foodborne illness or having at least one high-risk family member at home and food safety behaviour including avoiding consumption of risky foods (adjusted OR=0.88; 95% CI: 0.65 to 1.17) and time-temperature control (adjusted OR=1.37; 95% CI: 0.53 to 3.54).[4]

- Behavioural intentions or motivation to engage in safe food handling behaviour in the future were not consistently associated with food safety behaviour.

  - o Behavioural intentions were associated with avoiding consumption of risky foods (r=0.17; 95% CI: 0.14 to 0.20), preventing cross-contamination and practicing personal hygiene (r=0.34; 95% CI: 0.04 to 0.59), and measures of overall food safety behaviour (r=0.47; 95% CI: 0.35 to 0.58).[4]

  - o However, behavioural intentions were not significantly associated with adequate cooking (r=0.23; 95% CI: -0.02 to 0.45) and time-temperature control (r=0.34; 95% CI: -0.16 to 0.69).[4]

- Cues to action (hearing or reading about food safety from various sources such as the media or internet) were associated with food safety awareness, but not significantly associated with preventing cross-contamination and practicing personal hygiene.

  - o Moderate confidence[***] was found in the finding that media stories and coverage have some, at least short-term, influence on consumers' awareness of food safety issues.[2]

  - o High confidence[§§] was found in the finding that consumers considered health care professionals and extension services as credible sources of food safety information.[2]

  - o However, cues to action were not associated with preventing cross-contamination and practicing personal hygiene (r=0.19; 95% CI: -0.01 to 0.38), the only food safety behaviour that was examined.[4]

- There were other factors that influenced food safety behaviour that were described in only one review[2] such as practical and lifestyle constraints and food preferences.

  - o There was high confidence[§§] in the finding that several food safety practices were often seen as inconvenient or impractical in some situations.[2] Consumers often noted a lack of time, laziness, hassle and negligence as barriers.

[***] Young and colleagues (2016)[2] defined confidence or likelihood that the review finding is a reasonable representation of the phenomenon of interest based on adaptation of the *Confidence in the Evidence from Reviews of Qualitative research (CERQual)* approach. Categorized into high, moderate and low.

- o There was also high confidence[†††] in the finding that consumers tended to make food choices based on quality characteristics, perceived health benefits and convenience rather than for food safety reasons.[2]

Conclusion:

Based on the findings of this review, **safe food handling habits** and **self-confidence and perceived control of safe food handling at home** were most frequently associated with better food safety behaviour at home. **Positive attitudes and risk perceptions towards food safety at home** and **subjective norm/social pressure** were also associated with safe food handling behaviour at home.

Food safety knowledge, behavioural intentions, and being in a high-risk group for foodborne illness or having at least one high-risk family member in the household were not consistently associated with food safety behaviour at home. Cues to action were associated with food safety awareness, but not preventing cross-contamination or practicing personal hygiene. Other factors such as practical and lifestyle constraints and food preferences were associated with food safety behaviour, but these were only explored in one review. More research is needed on the impact of cues to action, practical and lifestyle constraints and food preferences on food safety behaviour.

Therefore, the rapid review should investigate interventions that change **food safety habits** and **self-confidence and perceived control of safe food handling at home**, in addition to food safety behaviour. Interventions that change **food safety attitudes and risk perception** and **subjective norm/social pressure** should also be considered.

Submitted by: *Michelle Ng, Analyst, Research & Policy, Health Protection Division*

Submitted to: *Danny Martin, Manager, Health Protection Division*
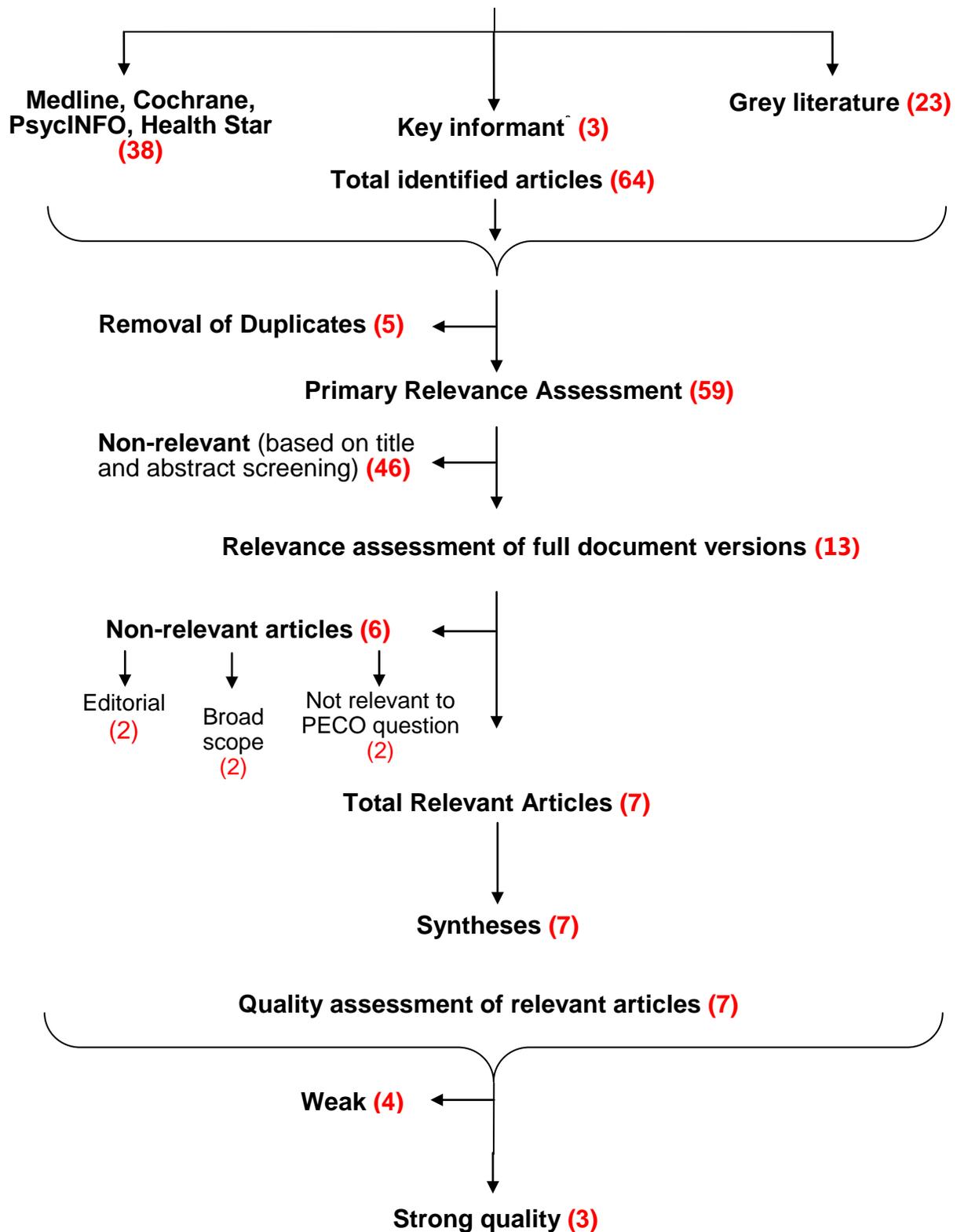
Date: August 23, 2018

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1. Region of Peel-Public Health. (2017). Enteric illness in Peel region, 2007-2016.

2. Young and Waddell. (2016). Barriers and facilitators to safe food handling among consumers: a systematic review and thematic synthesis of qualitative research studies. *PLoS One,* 11(12): e0167695.

3. Young et al. (2017a). Explaining consumer safe food handling through behavior-change theories: a systematic review. *Foodborne Pathog. Dis.,* 14(11): 609-622.

4. Young et al. (2017b). Psychosocial and health-status determinants of safe food handling among consumers: a systematic review and meta-analysis. Food Control, 78: 401-411.

[†††] Young and colleagues (2016)[2] defined confidence or likelihood that the review finding is a reasonable representation of the phenomenon of interest based on adaptation of the *Confidence in the Evidence from Reviews of Qualitative research (CERQual)* approach. Categorized into high, moderate and low.

Background Literature Review Appendix A: Literature search flowchart

What factors influence food safety behaviour in the home setting? **(May 2018)**

Medline, Cochrane, PsycINFO, Health Star (38)

Key informant (3)

Grey literature (23)

Total identified articles (64)

Removal of Duplicates (5)

Primary Relevance Assessment (59)

Non-relevant (based on title and abstract screening) **(46)**

Relevance assessment of full document versions (13)

Non-relevant articles (6)

Editorial (2)

Broad scope (2)

Not relevant to PECO question (2)

Total Relevant Articles (7)

Syntheses (7)

Quality assessment of relevant articles (7)

Weak (4)

Strong quality (3)

Background Literature Review Appendix B: Relevancy criteria

Inclusion criteria:
- Literature reviews and guidelines
- Content specific to addressing food safety behaviour in the home setting
- Population in North America or similar (i.e. UK, Australia, etc.)
- Besides the general population, include articles that examine specific subpopulations (e.g. children, pregnant women, immunocompromised, young adults, teens, elderly, etc.)
- Articles published in past 10 years

Exclusion criteria:
- Populations not similar to Peel such as under-developed or developing countries
- Scope of article is too broad

Appendix B: Conceptual Framework

Factors associated with Food Safety Behaviour at Home
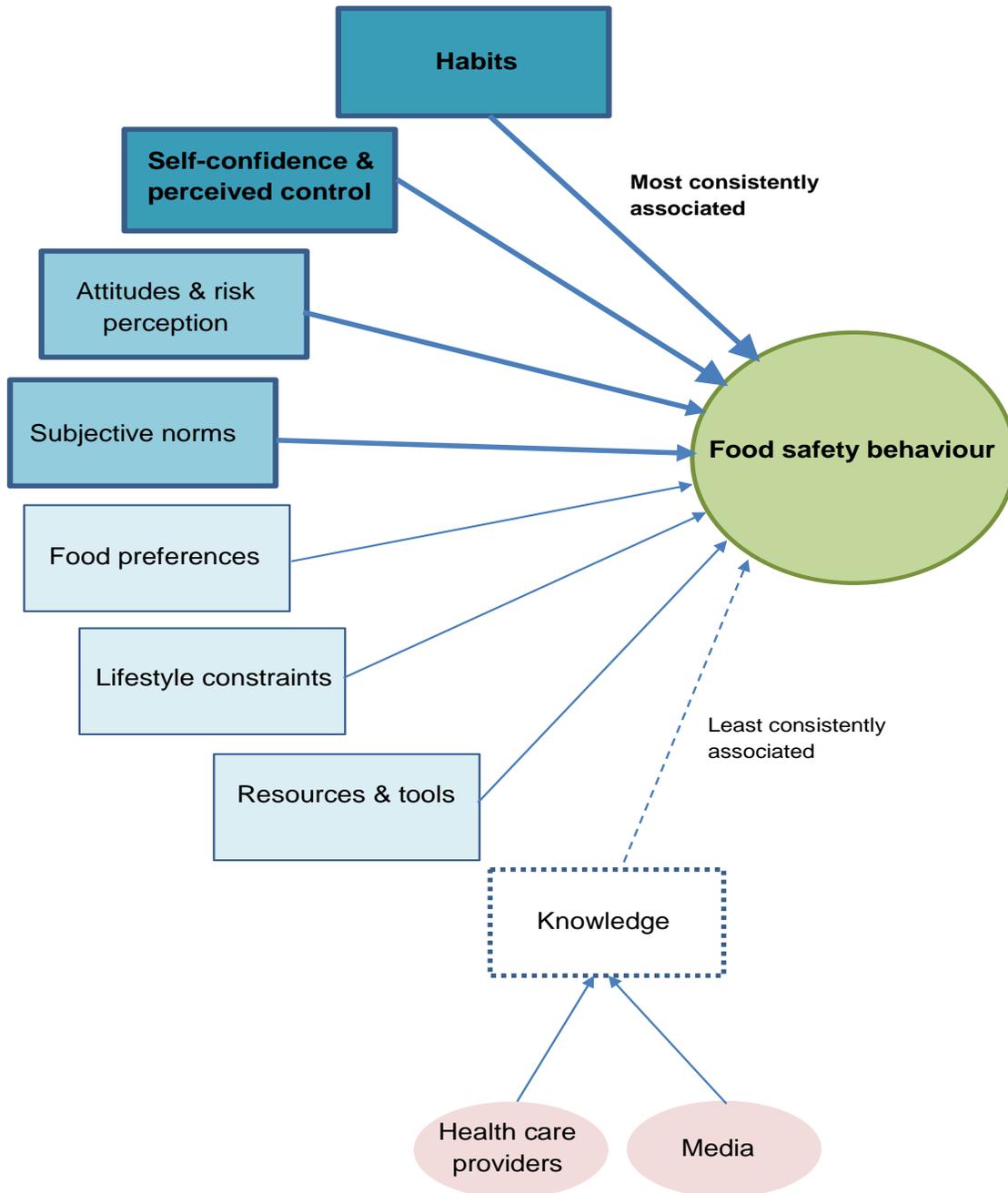
Note: The thickness of the lines represents the degree of consistency of the association

Appendix C: Search Strategy

Ovid Search

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to May 2, 2018>, Ovid Healthstar <1966 to March 2018>, Ovid MEDLINE(R) <1946 to April Week 4 2018>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <May 07, 2018>, PsycINFO <2002 to April Week 5 2018>
Search Strategy:
----
1   exp food safety/ (83844)
2   food safety.ti. (2782)
3   safe food handl*.ti,ab. (174)
4   hygien*.ti. (48100)
5   food.ti. (127211)
6   4 and 5 (1211)
7   exp food handling/ (55742)
8   prepar*.ti,ab. (1039106)
9   cook*.ti,ab. (38004)
10   safe*.ti,ab. (1108608)
11   7 or 8 or 9 (1115476)
12   10 and 11 (45344)
13   1 or 2 or 3 or 6 or 12 (127125)
14   intervention*.ti,ab. (1420689)
15   program*.ti,ab. (1327093)
16   course*.ti,ab. (871238)
17   campaign*.ti,ab. (66670)
18   train*.ti,ab. (797371)
19   initiative*.ti,ab. (133277)
20   workshop*.ti,ab. (58043)
21   education.ti,ab. (787137)
22   exp health education/ (280212)
23   social media.ti,ab. (14711)
24   14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 (4532637)
25   13 and 24 (16672)
26   review.ti,pt. (4096860)
27   meta analys*.ti,pt. (173399)
28   synthes*.ti,pt. (322089)
29   guideline*.ti,pt. (124232)
30   26 or 27 or 28 or 29 (4586177)
31   25 and 30 (3325)
32   remove duplicates from 31 (2191)
33   food.ti. (127211)
34   32 and 33 (290)
35   limit 34 to yr="2007 -Current" (149)
36   consumer*.ti,ab. (123440)
37   home*.ti,ab. (669054)
38   domestic.ti,ab. (93852)
39   36 or 37 or 38 (873505)
40   35 and 39 (52)

****

Environment Complete Search

S30	🔊 S29 AND S28	**Search modes** - Boolean/Phrase
S29	🔊 TI review OR TI "meta analys" OR TI synthes* OR TI guideline*	**Search modes** - Boolean/Phrase
S28	🔊 S27 AND S26	**Search modes** - Boolean/Phrase
S27	🔊 AB intervention* OR AB program* OR AB course* OR AB campaign* OR AB train* OR AB initiative* OR AB workshop* OR AB education	**Search modes** - Boolean/Phrase
S26	🔊 S21 OR S22 OR S25	**Search modes** - Boolean/Phrase
S25	🔊 S24 AND S23	**Search modes** - Boolean/Phrase
S24	🔊 AB safe	**Search modes** - Boolean/Phrase
S23	🔊 DE "FOOD handling" OR AB prepar* OR AB cook*	**Search modes** - Boolean/Phrase
S22	🔊 TI hygiene* AND TI food	**Search modes** - Boolean/Phrase
S21	🔊 DE "FOOD safety" OR TI "food safety" OR AB "safe food handl*"	**Search modes** - Boolean/Phrase
S20	🔊 S19 AND S18	**Search modes** - Boolean/Phrase
S19	🔊 TI review OR TI "meta analys" OR TI synthes* OR TI guideline*	**Search modes** - Boolean/Phrase
S18	🔊 S17 AND S16	**Search modes** - Boolean/Phrase

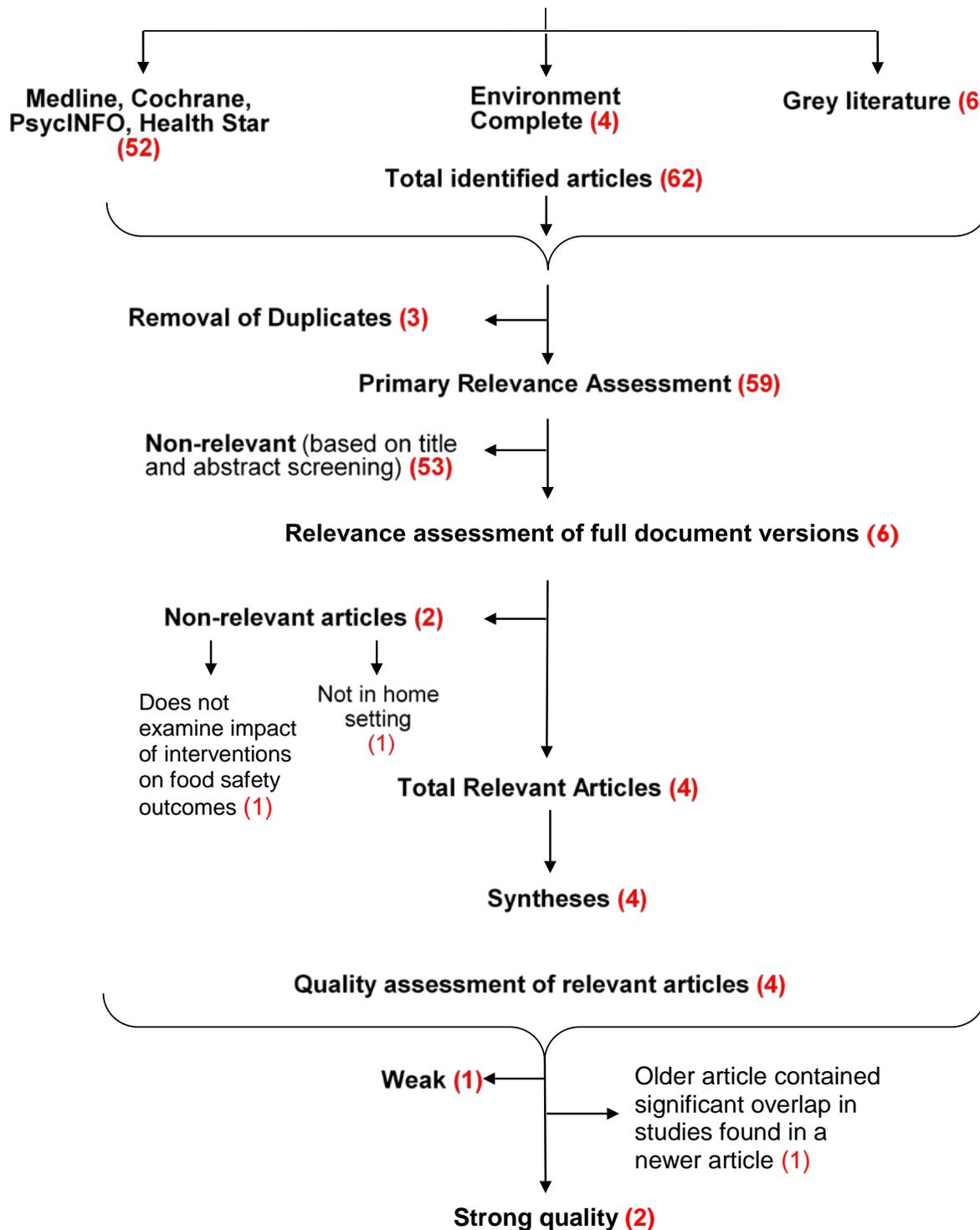| S17	AB intervention* OR AB program* OR AB course* OR AB campaign* OR AB train* OR AB initiative* OR AB workshop* OR AB education	Search modes - Boolean/Phrase
S16	S11 OR S12 OR S15	Search modes - Boolean/Phrase
S15	S14 AND S13	Search modes - Boolean/Phrase
S14	AB safe	Search modes - Boolean/Phrase
S13	DE "FOOD handling" OR AB prepar* OR AB cook*	Search modes - Boolean/Phrase
S12	TI hygiene* AND TI food	Search modes - Boolean/Phrase
S11	DE "FOOD safety" OR TI "food safety" OR AB "safe food handl*"	Search modes - Boolean/Phrase
S10	S9 AND S8	Search modes - Boolean/Phrase
S9	TI review OR TI "meta analys" OR TI synthes* OR TI guideline*	Search modes - Boolean/Phrase
S8	S7 AND S6	Search modes - Boolean/Phrase
S7	AB intervention* OR AB program* OR AB course* OR AB campaign* OR AB train* OR AB initiative* OR AB workshop* OR AB education	Search modes - Boolean/Phrase
S6	S1 OR S2 OR S5	Search modes - Boolean/Phrase
S5	S4 AND S3	Search modes - Boolean/Phrase
S4	AB safe	Search modes - Boolean/Phrase
S3	DE "FOOD handling" OR AB prepar* OR AB cook*	Search modes - Boolean/Phrase
S2	TI hygiene* AND TI food	Search modes - Boolean/Phrase
S1	DE "FOOD safety" OR TI "food safety" OR AB "safe food handl*"	Search modes - Boolean/Phrase

Grey Literature Search

Website	Search Strategy/Terms	Hits	Relevant results
National Collaborating Centre for Environmental Health (NCCEH)	Searched all evidence reviews, guidelines, workshops/presentations under "Food" categories. Search terms: "food safety" AND "home" "food handling" AND "home"	22 11	0
Health Canada	Searched food safety sections and reports/publications for relevant documents.	N/A	0
U.S. Centers for Disease Control (CDC)	"food safety" AND "home" (searched 1st 5 pages)	4679	0
Public Health Ontario (PHO)	Searched food safety sections and reports/publications for relevant documents.	N/A	0
Ministry of Health & Long-Term Care (MOHLTC)	Searched food safety sections and reports/publications for relevant documents.	N/A	0
Canadian Institute for Public Health Inspectors (National and Ontario branch websites)	Searched food safety sections and reports/publications for relevant documents.	N/A	0
CDC Community Guide	"food safety" OR "food handling"	1	0
Environmental Health Review journal	Hand searched journal published from 2012-2018	N/A	0
Foodsafety.gov	"home" (searched 1st 5 pages)	742	0
U.S. Department of Agriculture (USDA) Food and Nutrition Service	"food safety" AND "home" (searched 1st 5 pages) "food safety" And "intervention*" (searched 1st 5 pages)	168,000 240	0
Public Health Agency of Canada (PHAC)	"food safety" AND "home" (searched 1st 5 pages)	5,483,797	0
World Health Organization (WHO)	"food safety" AND "home" (searched 1st 5 pages) ("Food safety" OR "food handling") AND	2000+ 1270	0

	"consumer" (searched 1st 5 pages)		
Fraser Health Authority	"food safety" AND "home"	14	0
British Columbia Center for Disease Control (BCCDC)	"food safety" AND "home"	0	0
Google Scholar	("food safety" OR "food handling") AND "intervention*" AND ("home" OR "consumer") From 2007-2018 (searched 1st 5 pages)	17,200	2
	("food safety" OR "food handling") AND "intervention*" AND ("home" OR "consumer" OR "domestic") AND ("systematic review" OR "scoping review" OR "literature review" OR "meta-analys*" OR "synthes*" OR "guideline") (searched 1st 5 pages)	19,200	1
Trip database	(("food safety" OR "food handling") AND "intervention*" AND ("home" OR "consumer" OR "domestic")) from:2007 to:2018	140	2

Search conducted from May 1 to 3, 2018. The librarian found no relevant results from the following websites: Effective Public Health Practice Project (EPHPP), National Association of County & City Health Officials (NACCHO), Public Health England and the National Institute for Health and Care Excellence (NICE).

Appendix D: Literature Search Flowchart

What interventions influence food safety behaviour in the home setting? **(April-May 2018)**

Medline, Cochrane, PsycINFO, Health Star (52)

Environment Complete (4)

Grey literature (6)

Total identified articles (62)

Removal of Duplicates (3)

Primary Relevance Assessment (59)

Non-relevant (based on title and abstract screening) **(53)**

Relevance assessment of full document versions (6)

Non-relevant articles (2)

Does not examine impact of interventions on food safety outcomes (1)

Not in home setting (1)

Total Relevant Articles (4)

Syntheses (4)

Quality assessment of relevant articles (4)

Weak (1)

Older article contained significant overlap in studies found in a newer article (1)

Strong quality (2)

40

Appendix E: Data Extraction Tables

Items reviewed	Systematic review #1: A systematic review and meta-analysis of the effectiveness of food safety education interventions for consumers in developed countries
General information & Quality rating	
1. Author(s), Year	Young et al., 2015
2. Quality rating	Strong (10/10)
3. Objectives	To synthesize the effectiveness of all types of food safety educational interventions for consumers
Details of review	
4. Number and types of studies included	79 studies (17 randomized controlled trials (RCTs), 12 non-randomized controlled trials (NRTs), 50 uncontrolled before-and-after studies) 65 studies conducted in the U.S.A., 11 studies in Europe, 2 studies in Australia, 1 study in Canada
5. Search period	From inception to May 20, 2014
6. Search sources	<u>Databases</u> Scopus, PubMed, Agricola, CAB Abstracts, Food Safety and Technology Abstracts, PsycINFO, Educational Resources Information Center (ERIC), Cumulative Index to Nursing and Allied Health Literature (CINAHL), ProQuest Public Health <u>Grey literature</u> ProQuest Dissertations and Theses, websites of 24 relevant organizations <u>Other</u> Hand searching of the Environmental Health Review and the Journal of Nutrition Education and Behavior "Great Educational Materials" Collection, reference lists of 15 review articles and 15 relevant primary research studies
7. Inclusion & Exclusion criteria	<u>Inclusion</u> • Primary research published in English, French or Spanish • Peer-reviewed journal articles, research reports, dissertations, conference abstracts or papers

	• Studies of experimental design (randomized and non-randomized controlled trials and uncontrolled before-and-after)
	• Consumers defined as those who prepare or handle food for consumption at home, including volunteer food handlers for special events (e.g. potlucks)
	• Studies targeted at educators of consumers (e.g. train-the-trainer studies)
	• Studies conducted in North America, Europe, Australia and New Zealand (most similar to Canadian context)
	Exclusion
	• Interventions that did not have an explicit food safety component (e.g. generic hand-washing not in a food handling context)
	• Studies targeted at food handlers employed in food service industry
8. Review methods	Risk-of-bias assessment
	• Studies were assessed for risk of bias for each main outcome using criteria adapted from existing tools for randomized and non-randomized experimental studies.[1-3]
	Meta-analysis
	• For meta-analysis, studies were stratified into subgroups by: **study design** (randomized controlled trial (RCT), non-randomized controlled trial (NRT), uncontrolled before-and-after studies), **intervention type** (educational training/courses and media campaigns/other messaging), **target population** (children and youth < 18 years old, adults 18 years and older, and educators of consumers), **outcome type** (knowledge, attitudes, behaviours, behavioural intentions, stages of change), **outcome measure type** (dichotomous or continuous measures)
	• Meta-analysis of dichotomous outcome measures was conducted using the relative risk (RR) metric and of continuous outcomes using standardized mean difference (SMD)
	• When heterogeneity was high ($I^2 > 60\%$), median and range of effect estimates from individual studies in the meta-analysis subgroup was calculated instead.
	• Meta-analysis was conducted using a random-effects model.
	Meta-regression
	• When $I^2 > 25\%$ and there were at least 10 studies, meta-regression conducted on meta-

	analysis data to explore sources of heterogeneity in effect estimates
	• To increase power of these analyses, data were not stratified by intervention type or target population
	• Variables evaluated as potential predictors of heterogeneity included: publication year, document type (journal vs. other), study region (North America vs. other), food safety-specific intervention vs. inclusion of other content (e.g. nutrition), intervention development informed by theory of behaviour change or formative research, target population engaged in intervention development, implementation, and/or evaluation, intervention included digital/web-based or audio-visual component, intervention targeted high-risk population (i.e. infants, elderly, immunocompromised, caregivers, pregnant women) or low socio-economic status populations, insufficient reporting of outcome data, length of participant follow-up (within 2 weeks post intervention/not reported vs. longer), intervention dose (> 1 exposure type/medium vs. 1 exposure/not reported)
	
	Quality-of-evidence assessment using GRADE
	• Each meta-analysis data subgroup assessed for overall quality of evidence using modified version of the Cochrane Collaboration's Grades of Recommendation, Assessment, Development and Evaluation approach (GRADE).[1,4] Findings were classified in the following categories:
	    o Very low: True effect is likely substantially different from measured estimate
	    o Low: True effect may be substantially different from measured estimate
	    o Moderate: True effect likely to be close to measured estimate, but there is possibility that it is substantially different
	    o High: Strong confidence that true effect lies close to that of the measured estimate

Details of interventions	
9. Types of interventions	• Educational training/courses such as workshops, courses and curricula in school, academic and community settings • Media campaigns/other educational materials such as print media (e.g. brochures, websites, food product labels) and audio-video media (e.g. radio or TV ads)
10. Intervention settings	Specific settings not always specified. Settings include school classroom (elementary

	school, high school, university/college), home, seniors centres, online
11. Target groups	University, college, high school and middle school students, low-income parents/caregivers of children, child care providers, refugees and immigrants, older adults, general public, low-income food program clients, low-income children, pregnant/female caregivers, educators of low-income families, urban home cooks, women, mothers/caregivers of children, African-American youth, high school teachers, Hispanic community, Hispanic preschool children, persons living with AIDS, community staff, elderly caregivers of grandchildren, volunteer cooks, young adults, household food preparers
12. Outcome measures	Consumer food safety knowledge, attitudes, behaviours, behavioural intentions
Results of review	

13. Main results	Notes:
	• Only outcomes (i.e. food safety behaviour and attitudes) relevant to our research question are presented here
	• Each meta-analysis data subgroup assessed for overall quality of evidence using GRADE. Refer to "Review Methods" section of table for definition of rating categories.
	• When heterogeneity was high ($I^2 > 60\%$), median and range of effect estimates from individual studies in the meta-analysis subgroup was calculated instead.
	
	Meta-analysis results:
	
	<u>Effect of educational training/course interventions</u>
	
	In children/youth:
	• Among RCTs:
	    ○ Community- and school-based food safety educational training interventions had a small[5] significant effect on improving **food safety behaviour** (median standard mean difference (SMD)=0.20; range: 0.05 to 0.35; I^2=96%; 2 studies; GRADE rating=high). The follow-up period for one of the studies was immediately after the intervention and for the other study, 2 weeks after the intervention.
	
	• Among NRTs:
	    ○ Educational training interventions had a small significant effect on improving **food safety behaviour** (median SMD=0.33; range: 0.17 to 0.90; I^2=64%; 2

studies; GRADE rating=very low). The follow-up period for one of the studies was 1 week following the intervention. The other study did not report the follow-up period.

- Among uncontrolled before-and-after studies:
    - Among studies with continuous measures of food safety behaviour, educational training interventions had a small significant effect on **food safety behaviour** (median SMD=0.31; range: 0.14 to 1.32; I^2=99%; 3 studies; GRADE rating=very low). The follow-up period for one of these studies was immediately after the intervention. The follow-up periods for the other study were immediately after and 6 weeks after the intervention. The third study did not report the follow-up period.

    - Among studies with dichotomous measures of **food safety behaviour**, consumers exposed to educational training interventions were 5.37 times more likely to have better food safety behaviour than those who were not exposed (median relative risk (RR)=5.37; range: 1.04 to 9.69; I^2=94%; 2 studies; GRADE rating=very low). The follow-up period for one of these studies was immediately after the intervention. The follow-up periods for the other study were immediately after and 3 months after the intervention.

    - Educational training had a small significant effect on **food safety attitudes** (median SMD=0.31; range: 0.10 to 1.32; I^2=99%; 3 studies; GRADE rating=very low). The follow-up period for one of these studies was immediately after the intervention. The follow-up periods for the other study were immediately after and 6 weeks after the intervention.

In adults:
- Among RCTs:
    - Food safety educational training interventions did not have a significant effect on improving **food safety behaviours** (median SMD=0.68; range: -0.06 to 1.41; I^2=94%; 4 studies; GRADE rating=low). The follow-up period for these studies ranged from 2 weeks to 2 months after the intervention.

- Among NRTs:
  - University-based educational food safety interventions involving social media training, distance education and traditional classroom lecture had a small significant effect on **food safety attitudes** in university students and staff (average SMD=0.26; 95% CI: 0.10 to 0.43; I^2=0%; 2 studies; GRADE rating=moderate). The follow-up period for these studies were immediately after the intervention.

  - Educational training interventions had a small significant effect on improving **food safety behaviour** (average SMD=0.37; 95% CI: 0.08 to 0.66; I^2=58%; 2 studies; GRADE rating=low). The follow-up period for these studies were immediately after the intervention.

- Among uncontrolled before-and-after studies:
  - Educational training either had a small significant effect on **food safety behaviour** (median SMD=0.28; range: 0.11 to 1.49; I^2=100%; 16 studies) or no significant effect on **food safety behaviour** (median RR=1.26; range=0.95 to 2.66; I^2=97%; 10 studies) (GRADE rating=very low). The follow-up period for the 16 studies that found a significant effect on behaviour ranged from immediately after to 1 year after the intervention. The follow-up period for the 10 studies that found no significant effect on behaviour ranged from immediately after to 6 months after the intervention.

  - Educational training had a small significant effect on **food safety attitudes** (median SMD=0.43; range: 0.05 to 0.95; I^2=99%; 7 studies; and median RR=1.09; range: 1.04 to 1.33; I^2=86%; 4 studies) (GRADE rating=very low). The follow-up period for these studies ranged from immediately after to 6 months after the intervention.

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Effect of media campaign/other educational material interventions

In adults:
- Among RCTs:
  - Media campaigns/other messaging had no significant effect on **food safety behaviour** (median SMD=0.24; range: -0.17 to 1.03; I^2=85%; 4 studies; GRADE rating=low). The follow-up period for these studies ranged from 4 weeks to 3 months after the intervention.

  - Media campaigns/other messaging had a small significant effect on **food safety attitudes** (median SMD=0.34; range: 0.05 to 0.76; I^2=94%; 8 studies; GRADE rating=low). The follow-up period for these studies ranged from immediately after to 4 weeks after the intervention.

- Among NRTs:
  - Media campaigns/other messaging was significantly associated with improved **food safety behaviour** (median RR=2.31; range: 1.30 to 3.33; I^2=90%; 2 studies; GRADE rating=low). The follow-up period for these studies ranged from 5 weeks to 4 months after the intervention.

  - Media campaigns/other messaging was significantly associated with improved **food safety attitudes** (median RR=1.75; range: 1.01 to 2.85; I^2=95%; 3 studies; GRADE rating=very low). The follow-up period for these studies ranged from immediately after to 4 months after the intervention.

- Among uncontrolled before-and-after studies:
  - Media campaigns/other messaging did not have a significant effect on **food safety behaviour** (median RR=1.35; range: 0.90 to 2.35; I^2=93%; 6 studies; GRADE rating=very low). The follow-up period for these studies ranged from 1 to 274 days.

  - Media campaigns/other messaging had a small significant effect on **food safety attitudes** (median SMD=0.43; range: 0.13 to 0.81; I^2=99%; 3 studies; and

median RR=1.10; range: 1.02 to 1.23; I^2=85%; 5 studies) (GRADE rating=very low). The follow-up period for these studies ranged from immediately after to 274 days.

Meta-regression results:

<u>Predictors of variability between studies</u>

- Interventions involving more than one training session or provided messaging materials through more than one medium or exposure type (i.e. multi-faceted interventions) had a moderately higher average effect on **food safety behaviour** compared to interventions that included only one training session or provided messaging materials through only one medium or exposure among RCTs (average SMD=0.68; 95% CI: 0.03 to 1.33; adjusted R^2=44.6%; 10 studies). The follow-up period for these studies ranged from immediately after to 3 months after the intervention.

- Interventions that that were developed, implemented, and/or evaluated with the engagement of the target population were on average 1.47 times more effective on **food safety behaviour** than interventions that did not involve the engagement of the target population among uncontrolled before-and-after studies (RR=1.47; 95% CI: 1.02 to 2.11; adjusted R^2=27.4%; 17 studies). The follow-up period for these studies ranged from immediately after to 9 months after the intervention.

- Many studies were weak quality and the results were heterogeneous. More robust experimental studies are needed to build on interventions shown to be effective in uncontrolled before-and-after studies.

14. Comments/limitations	- Meta-analyses of a small number of studies within each subgroup - Most meta-analysis data subgroups contained significant heterogeneity that was unexplainable by variables examined in meta-regression models. Limited availability of studies within each subgroup limited the power to identify potential predictors of between-trial heterogeneity in meta-regression.

	- Correlation values for most studies were not reported, so the authors imputed plausible values from other comparable studies to allow for meta-analysis. Sensitivity analyses indicated this was a potential concern for some outcomes of studies that used an imputed value of the pre-post correlation. - 50 of the 79 studies included in the review were uncontrolled before-and-after studies (i.e. pre-post testing in same population without separate control group). Although these studies found consistent positive effects overall for all intervention-population-outcome combinations, results were heterogeneous. Many of these studies were low quality rating based on GRADE. - The authors' ability to investigate specific food safety behaviour constructs (i.e. personal hygiene, adequate cooking of foods, etc.) were limited by the availability and reporting of primary research in various data subsets, as many studies only reported overall scores or scales. - Similarly, the authors' ability to subdivide food safety attitudes into key constructs from relevant behaviour change theories (i.e. Theory of Planned Behaviour, The Stages of Change Theory, Health Belief Model) was limited due to the lack of research on the relationship between various behavioural change constructs and specific food safety behaviours.

[1] Higgins and Green, editors. (2011). Cochrane handbook for systematic reviews of interventions. Version 5.1.0. The Cochrane Collaboration.
[2] Cochrane Effective Practice and Organisation of Care Group: Suggested risk of bias criteria for EPOC reviews.
http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/14%20Suggested%20risk%20of%20bias%20criteria%20for%20EPOC%20reviews%202013%2008%2012_0.pdf
[3] Effective Public Health Practice Project: Quality assessment tool for quantitative studies. http://www.ephpp.ca/tools.html
[4] Guyatt et al. (2011). GRADE guidelines. 1. Introduction – GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol,* 64: 383-94.
[5] Magnitude of effect was categorized using Cohen's Criteria where effect size < 0.50 but > 0.20 is considered small; effect size < 0.80 but > 0.50 considered medium; effect size > 0.80 considered high. Cohen, J. (1988). Statistical power for behavioural sciences. 2nd ed. Hillsdale, NJ: Erlbaum.

Items reviewed	Systematic review #2: A systematic review of the use of social media for food safety risk communication
General information & Quality rating	
1. Author(s), Year	Overbey et al., 2017
2. Quality rating	Strong (8/10)
3. Objectives	• To assess the current state of literature on social media use for food safety and infectious disease communication, including study types, focus and main conclusions • To determine the conclusions provided by these studies concerning how social media are used in food safety and infectious disease risk communication, and the recommendations for using social media based on these studies
Details of review	
4. Number and types of studies included	Total of 24 articles included: • 16 on food safety communication (3 focused on the content of social media, 9 on motivations/opinions of certain groups that use social media, and 3 on interventions intended to change behaviour[1-3]) • 8 on infectious disease communication Of the 24 articles: • 7 examined all or general social media • 6 focused on microblog content (including Twitter) • 4 focused on Facebook • 2 focused on blog content • 1 focused on forums • 1 focused on a phone app • 1 focused on use of bookmarking sites • 1 examined both Facebook and Twitter • 1 examined Facebook, Twitter and blogs Of the 24 articles: • 3 used qualitative methods • 5 used quantitative methods

	• 16 used a mixed methods approach
	
	Of the 24 articles,
	  • 8 conducted in Europe
	  • 7 conducted in the U.S.A.
	  • 4 conducted in Asia
	  • 1 conducted both in the U.S.A. and Asia
	  • 4 focused on all English language social media content

5. Search period	2010-2015
6. Search sources	Databases PubMed, Web of Science, Google Scholar, Academic Search Complete Other Reference lists
7. Inclusion & Exclusion criteria	Inclusion • Primary focus on communication through social media about food safety and/or infectious diseases (included because communication techniques used for non-sexually transmitted infectious diseases could be applicable to foodborne illness, and allowed for more robust number of studies) • Original peer-reviewed research studies • All study designs Exclusion • Studies not in English • Literature reviews, review papers, dissertations, theses, reports, conference papers or abstracts, letters to the editor, feature articles • Studies on data mining or disease tracking or surveillance • Studies with a primary marketing or advertising focus
8. Review methods	• Articles were coded through an iterative approach using thematic analysis using a list of themes established prior to final coding. A semantic, theoretical approach was used to conduct thematic analysis.

	- The general purpose of the social media activity in each study was grouped into one of the following categories: 1) content (study focused content of a body of social media), 2) intervention (study focused on intervention delivered through social media with intent to obtain behaviour change), 3) opinions and motivation (studies focused on why certain groups used social media or on a group's opinions of social media) - The quality of each study was assessed using a modified form of the mixed methods appraisal tool (MMAT)
Details of relevant interventions	
9. Description of interventions	- Mobile smartphone app providing immediate access to food safety information (Albrecht et al., 2012)[1] - Campaign using both traditional (posters, magnets, PSAs, mascot) and social media (Facebook, Twitter, YouTube) aimed at impacting food leftover practices of families with young children (James et al., 2013)[2] - Facebook-based intervention alone or Facebook-based intervention in conjunction with lecture-based course aimed at impacting college students' food safety knowledge, attitudes and self-reported practices (Mayer and Harrison, 2012)[3]
10. Intervention settings	Studies conducted in U.S. communities in Nebraska and Iowa, online, and university settings
11. Intervention target groups	Families with young children; university students and staff
12. Outcome measures	Knowledge, behavioural intentions and self-reported practices of handling food leftovers properly, food safety knowledge, attitudes and self-reported practices
Relevant results of review	
13. Main results	Effect of social media interventions on food safety behaviour - Three studies[1-3] found that social media or social media-based interventions used for food safety risk communication had an impact on increased self-reported food safety behaviours and/or attitudes. - Based on two studies[2,3] that had an experimental study design with a control group,

| | food safety interventions delivered through social media in conjunction with other modes such as traditional media or a lecture-based course had an impact on self-reported food safety practices among targeted groups (families with young children and university students and staff)

Considerations for using social media for food safety and infectious disease risk communication
- Benefits:
  - The ability to reach a diversity of people (11 studies)
  - Gather information and target specific populations (9 studies)
  - The ability to react immediately to situations and provide timely information (8 studies)
  - Opportunities to engage with the target population (1 study)
  - Allow users to access unbiased public opinions that can help improve communication efforts (2 studies)
  - Low cost and resource input (1 study)

- Factors impacting message engagement and reach:
  - Trust in producer of social media content (10 studies)
  - Consumer interest in food safety (7 studies)
  - Controversial issues and high-profile stories such as a celebrity becoming ill (7 studies)

- Drawbacks:
  - Difficult to manage numerous platforms and ease of information access allows more complex questions to be asked (3 studies)
  - Difficult to measure the impact of social media on behaviour (2 studies)
  - Takes time to manage a social media account. Investment needed to ensure an effective presence (2 studies)
  - Difficult to control messages on social media (1 study)

- Barriers:
  - Different age groups use social media- some more comfortable than others (i.e.

	younger age groups)
	o Anonymity and stigma- some users may be concerned about privacy or discussing health concerns that carry stigma (i.e. diarrhea associated with foodborne illness) (3 studies)
	o Information overload- users may be overwhelmed with information on social media and either reject the whole experience or do not know how to identify credible information (2 studies)
	• Recommendations:
	o Complement traditional media sources with social media (11 studies)
	o Proactively monitor social media to understand public sentiment and emerging issues and build a relationship with the target audience by establishing dialogue and demonstrating responsiveness before crises arise (4 studies)
	o Tailor social media use according to target audience. Social media may be more appropriate for certain demographics (5 studies)
	o Consider the impact of using links in social media content as the inclusion of links may prevent the widespread dissemination of content (1 study)
	o Ensure consistent messages are delivered between different groups (1 study)
	o Communicate about the conclusions of outbreaks or crises situations. People like to know the cause of an outbreak or crisis situation and need closure when it ends (1 study)
14. Comments/limitations	• Few research studies provided experimental evidence for the impact of social media interventions on food safety behaviour. Only two studies provided a control group in their analysis of social media impacts. The absence of controlled studies makes eliminating confounding variables and providing a strong conclusion about social media's efficacy difficult.
	• Methodological quality scores of the studies indicate areas for improvement in future investigations such as acknowledging and controlling biases introduced when using social media-based populations as surrogates for the general population regarding beliefs and behaviours.
	• A main limitation of this review is the small sample size. Many studies focused on

	different topics, utilized different methods and provided a range of conclusions. More standardization of studies may be necessary to build a credible body of evidence concerning the role of social media in food safety communication.
	• The studies highlighted the importance of preconceived ideas for shaping users' responses to social media, but the literature is still lacking information on how these ideas are formed and how to structure social media messages based on this information.

[1] Albrecht et al. (2012). Leftovers and other food safety information for iPhone/iPad application ("smartphone" technology). *J Nutr. Educ. Behav.,* 44:469-471.

[2] James et al. (2013). A summative evaluation of a food safety social marketing campaign "4-Day Throw Away" using traditional and social media. *J. Food Sci. Educ.,* 12:48-55

[3] Mayer and Harrison. (2012). Safe Eats: an evaluation of the use of social media for food safety education. *J. Food Prot.,* 75:1453-1463

Appendix F: Additional Findings

The following are considerations for using social media for food safety and infectious disease risk communication reported by Overbey and colleagues (2017) (3):

Benefits:

- The ability to reach a diversity of people (11 studies)

- Gather information and target specific populations (9 studies)

- The ability to react immediately to situations and provide timely information (8 studies)

- Opportunities to engage with the target population (1 study)

- Allow users to access unbiased public opinions that can help improve communication efforts (2 studies)

- Low cost and resource input (1 study)

Factors impacting message engagement and reach:

- Trust in producer of social media content (10 studies)

- Consumer interest in food safety (7 studies)

- Controversial issues and high-profile stories such as a celebrity becoming ill (7 studies)

Drawbacks:

- Difficult to manage numerous platforms and ease of information access allows more complex questions to be asked (3 studies)

- Difficult to measure the impact of social media on behaviour (2 studies)

- Takes time to manage a social media account. Investment needed to ensure an effective presence (2 studies)

- Difficult to control messages on social media (1 study)

Barriers:

- Different age groups use social media- some more comfortable than others (i.e. younger age groups)

- Anonymity and stigma- some users may be concerned about privacy or discussing health concerns that carry stigma (i.e. diarrhea associated with foodborne illness) (3 studies)

- Information overload- users may be overwhelmed with information on social media and either reject the whole experience or do not know how to identify credible information (2 studies)

Recommendations:

- Complement traditional media sources with social media (11 studies)

- Proactively monitor social media to understand public sentiment and emerging issues and build a relationship with the target audience by establishing dialogue and demonstrating responsiveness before crises arise (4 studies)

- Tailor social media use according to target audience. Social media may be more appropriate for certain demographics (5 studies)

- Consider the impact of using links in social media content as the inclusion of links may prevent the widespread dissemination of content (1 study)

- Ensure consistent messages are delivered between different groups (1 study)

- Communicate about the conclusions of outbreaks or crises situations. People like to know the cause of an outbreak or crisis situation and need closure when it ends (1 study)

Appendix G: Applicability and Transferability Worksheet

Factors	Questions	Notes
Applicability (feasibility)		
Political acceptability or leverage	• Will a home food safety intervention be allowed or supported in current political climate?	• A home food safety intervention would be positively received and supported in the current political climate. It would be in line with the Region of Peel's Community for Life vision.
	• What will the public relations impact be for local government?	• The goal of the Region of Peel-Public Health is to reduce the burden of foodborne illness in our community. The scope of the Food Safety program would be broadened to food safety practice within the community and not just within food premises.
		• Concern was expressed that we may need to justify the importance of addressing home food safety due to potential budget cuts in 2019. New Council will need to be informed about the importance of home food safety (e.g. update through Council report). New provincial government cutting costs. We need to build an economic case for decision makers such as explaining the impact of foodborne illness on health care system usage. Perhaps more data can be collected on reasons for admissions to hospitals.
		• Need to work on obtaining buy-in from the medical community (i.e. hospitals/physicians buy-in) to improve surveillance of foodborne illness (i.e. stool testing).
	• Will a home food safety intervention enhance the stature of the organization? o *For example, are there reasons to do the program that relate to increasing the profile and/or creative a positive image of public health?*	• An intervention can increase the public profile of the Region of Peel-Public Health. It could enable the public to understand role of public health and show that we are working with the community to improve health outcomes. • It's possible that an intervention will likely enhance the stature more at the level of stakeholders rather than directly with the public depending on who delivers messages.

		• There could be political appetite to develop innovative strategies tailored to the cultural diversity in Peel. For example, there could be opportunity to partner with cultural groups to establish a place to discover and understand cultural food preparation practices, and to provide a forum to engage with different cultural communities. Cultural food recipes could be shared along with food safety tips.
Social acceptability	• Will the Peel population find a home food safety intervention socially acceptable? Is it ethical? o *Consider how a home food safety intervention would be perceived by the population.*	• A home food safety intervention would be perceived well by the population if we engage with them and messages are presented in a non-judgemental way. We should avoid creating the perception of Public Health or the government as a "nanny state". o There is interest in the community for learning about food safety (i.e. seniors groups)- recent food safety presentation to seniors' group was well-received. o Some groups may have more interest (e.g. pregnant women, moms, caregivers, cancer patients, diabetics) than others. o Not all sectors may find it socially acceptable. Perhaps if the burden of illness is clear, a home food safety program would be embraced by the community. We will need to consult with various community stakeholders. • We are a role model for the community and they may look to Public Health for guidance. • Specific interventions (e.g. cold holding or thermometer use) may be considered overzealous or require careful consideration to invoke behaviour change. • There is a misconception that foodborne illness is acquired from dining out. • We need to be careful about not giving the public the wrong impression that by learning how to prepare food at home safely, they

		can sell home prepared foods. The promotion of home food safety and the sale of home-prepared foods need to go hand and hand. • One of the barriers is that the public doesn't associate Public Health with educating about home food safety. We need to communicate to the public that food safety practice goes beyond food premises. • We may not be the best face to deliver home food safety messages. The Region of Peel-Public Health has a low profile in the community. Appropriate community leaders or social influencers will need to be identified. • We need a strategy to overcome "fake news". Dispelling myths will be needed. Partnering with community leaders and credible social media influencers may be helpful (e.g. Instagram food bloggers, Dr. Oz-like TV doctors). Need to obtain buy-in from these potential partners. • Some cultural barriers may need to be overcome. For example, in some cultures/communities, age discrimination may affect receptivity of an intervention among community leaders like matriarchs/religious leaders. • The perception of government can be influenced by culture, which could affect the receptiveness to an intervention. It can affect public engagement and trust. Relationship can be improved through communication. Perhaps raising our public health profile might change perspective. • Need to be mindful of public perception of terms like "raw" vs. "uncooked". They may not be understood in the same way that we do. • To help increase social acceptability, we may want to highlight our "End-to-End Public Health" initiative to explain why we are addressing home food safety. We can engage with the public by sharing our rapid review findings and obtaining feedback.

	o *How might we need to tailor the language and tone of potential key messages for a home food safety intervention?*	• Consider keeping the home food safety messages focused, simple, visual, culturally sensitive, and in multiple languages. • Food safety messaging can sometimes be too simple- refrain from oversimplifying. • We may want to identify and target common risky food preparation behaviours to be impactful.
	o *Consider any assumptions you might have made about the population. Are they supported by the literature?*	• People prefer visual messages over text-heavy messages • People/families are busy- educational pamphlets would not be sufficient. • In-time messaging could be considered. For example, visual food safety messages displayed at grocery store or home food safety messages delivered following an illness/outbreak. • Strategies to teach school-aged kids about recycling could be applied to teach home food safety. The information can be brought back to the household. • YouTube videos, radio and TV messages may have greater reach of target population and some people may be more receptive to messages delivered from media. • Fight BAC is a prime example of home food safety resources that are often used. • The UK public health authority has educational videos for food handlers.
Health Equity	• What are the health equity considerations for a home food safety intervention?	• Reaching the low-income population where accessibility is a barrier: lack of transportation, time, no internet access. Income affects food choices and time spent preparing food at home. • Other barriers include: language, literacy and cultural. New immigrants may face some of these barriers. Visual resources can help overcome

		that and are more accessible to the population. This is supported by the urgent response rapid review. Culturally-sensitive resources need to be developed.
		• Resources can also be made available at cultural markets.
		• To address difficulty in reaching out to vulnerable groups (i.e. low socioeconomic status), we can partner with Human Services, Food Bank, and United Way organizations.
		• If there are costs of participating in an intervention, the costs and timing (availability of intervention) could present as barriers - funding and accommodation for low-income individuals should be considered.
		• If considering social media in intervention, need to understand the proportion of target population that uses social media and accessibility to it.
Available essential resources (personnel and financial)	• Who/what is available/essential for the local implementation?	• Money, staff time, room usage and resources (e.g. print or media resources) to develop/implement/evaluate an intervention were identified as potential barriers to implementation. Outreach to community may be limited by staff time. Not clear until intervention planned.
		• Role of different staff members (i.e. PHIs, HPOs, etc.) needs to be discussed.
		• Project planning required to assess training and costs associated with developing an intervention
		• Stakeholder engagement important in developing intervention. i.e. Human Services, School Health, Family Health (e.g. supper club), Chronic Disease & Injury Prevention (CDIP), Workplace health teams, frontline staff (public health inspectors, public health nurses), health promoters.
		• Joint effort with educators, moms' groups, seniors, teens, young kids, workplaces, health care professionals, food retailers, psychologists/sociologists, marketing professionals, cooking classes,

		various community groups, schools, school boards, food banks, volunteer food handlers.
		• With focused engagement of specific stakeholder groups who could then bring messaging to the public; Peel Health could deliver the interventions with their existing staffing.
		• The sharing economy requires consideration and inclusion in any home food safety interventions. For example, the sale of home-prepared foods through interfaces such as Kijiji and Facebook. A decision guide to navigate the sharing economy is available from the Large Urban Mayors' Caucus of Ontario.
		• Consider the use of kitchen space such as the one available at the Peel Memorial Hospital kitchen, which is used to teach diabetics healthy eating.
	• Are staff adequately trained? If not, is training available and affordable?	• Adequacy of staff training will depend on the intervention.
	• What are the costs?	
	o *Consider: in-kind staffing, supplies, systems, space requirements for staff, training, and technology/administrative supports.*	• Cross-departmental and divisional collaboration could add to costs of implementation.
	o *Consider any available cost-benefit analyses that could help gauge the health benefits of the intervention.*	• PHIs expressed that they see value in public outreach activities to deliver home food safety messaging such as participating in community events/groups to increase visibility and familiarity with Public Health. Some have volunteered at these events. There should be compensation for PHIs who participate in these community outreach initiatives.
	o *Consider the cost of the intervention relative to the number of people that benefit/receive the intervention.*	• If Public Health can't go out to provide education, there should be other ways to provide educational materials to community. Visual resources could be disseminated.
		• Communicating home food safety messages through our website was dismissed- our website is not accessed enough.
		• Barriers with social media presence and capabilities in our

		organization.
		• To lower costs of planning and implementing of intervention, we can:
		o Hire/take on university graduate students, particularly in Marketing
		o Partner with and leverage the experience of relevant internal and external stakeholders
		• Need to understand our community (e.g. food safety behaviour, attitudes, habits, etc.) to tailor the intervention. May need to do focus testing/surveys.
		• An intervention may have an impact on the reporting frequency of foodborne illness- may increase reports of illness from food prepared at home and decrease reports of illness from food premises.
Organizational expertise and capacity	• Would an intervention be in line with Peel Public Health's 10-Year Strategic Plan (i.e., 2009-2019, 'Staying Ahead of the Curve')? • Are there existing legislation or regulations (either local or provincial) that support the development of an intervention? • Might there be overlap with existing programs or is it symbiotic (i.e., both internally and externally)?	• To promote home food safety would be in line with our Strategic Plan. • Our goal is to enhance the health status of the population and reduce disparities through an appropriate intervention- focus is on prevention. • According to the Ontario Public Health Standards (OPHS), we are mandated to educate the public on food safety at home under the Food Safety Standard and Protocol. However, the OPHS is short on details. • Our content from Food Premises Regulation can support the intervention. • Existing programs currently- food handler certification (internally) and Fight BAC http://www.fightbac.org/ (externally). • There may be some overlap with the Contact Centre- staff can use social media when the Contact Centre is slow.

	• Would designing an intervention lend itself to cross-departmental/divisional collaboration?
	    o If so, who should be involved?
		• Ideally stakeholders should deliver the interventions rather than Health Protection (HP) staff. HP staff can be utilized to engage stakeholders.
		
		• Potential partners we could work with to develop an intervention include: child care centres including small daycares (uninspected), seniors groups (e.g. Caledon seniors groups, rotary clubs, older adult centre in Square One), School Health (incorporate in curriculum/programming), university/colleges.
		
		• We can partner with nutritionists/dietitians (CDIP) and Family Health program organizers (i.e. Teen Supper Club) to deliver home food safety messages. Can work with Communications.
		
		• We can leverage existing relationships to develop an intervention (i.e. the United Way and its associated organizations and Human Services can help extend our reach to the vulnerable population. We could also work with the food banks to reach vulnerable populations.
		
		• The Ministry of Education made changes to programming in child care centres. Home food safety incorporated.
		
		• There is potential in partnering with grocery retailers to deliver home food safety messages. However, we need to be aware of their resources and willingness to partner. For example:
		
		    o Partnering with nutritionists of major grocery retailers.
		
		    o Visual prompts could be located in the Produce department for example to educate the public about washing produce/fruit. There is a perception that packaged food don't need washing.
		
		    o Visual prompts to educate people about adequate cooking of frozen chicken nuggets. People don't follow the instructions on the package.
		
		    o Adding home food safety messages to retailer's email newsletters (i.e. Costco).

		• Potential opportunity to work with organizers of cooking classes to incorporate home food safety messaging.
		• PHIs expressed that the sale of home-prepared foods has been an ongoing issue. There are people starting up home food businesses. The Food Safety Quality Assurance working group is in the early stages of working on a standard response.
		• There was agreement that home food safety is an issue bigger than Peel, and there is inconsistency across the province in dealing with the sale of home-prepared foods, response to this issue should be led by the province. Need to think bigger to make impact. Disseminating a media campaign, for example, would be easier at provincial level, since Peel doesn't have strong media outlets.
		• Advocacy to the Province, and co-ordinated effort with other teams/organizations is recommended to address home food safety. Potential to leverage resources from ASPHIO, who deals with provincial-level issues like raw milk. There could be challenges in working with the province.
		• Need organizational leadership to support an intervention
	• What organizational barriers/structural issues or approval processes need to be addressed?	• Organizational barriers include budget, resource allocation (competing with other programs for limited $$) and reach (leverage relationships with stakeholders).
		• An organizational barrier identified is that staff are discouraged from reaching out to the community including the dissemination of pamphlets. We don't have enough home food safety educational resources for the public.
		• In the past, Public Health used to teach food safety in schools. This could be a missed opportunity.
		• We may not be the best face to deliver home food safety messages. There are several barriers: public's lack of familiarity of the Region of Peel-Public Health and its role/services, Public Health has no public

<table>
<tr><td></td><td></td><td>presence/low visibility in the community, lack of reach, and issues with public trust in government. Appropriate community leaders or social influencers will need to be identified.</td></tr>
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		• presence/low visibility in the community, lack of reach, and issues with public trust in government. Appropriate community leaders or social influencers will need to be identified.
		• Buy-in from physicians to deliver home food safety intervention can be difficult. York region has a diarrhea pamphlet for physicians. Physicians are busy with many competing priorities. Timing of messaging can be important. For example, more may pay attention to food safety messages following an outbreak. May want to connect with Physician Outreach Coordinator to determine approach. Other media to deliver home food safety messages: Health Professional Updates, physician rounds.
		• Barriers with social media presence and capabilities in our organization.
		• Piloting a Q&A chat line and mobile app like the "Ask Karen" (https://www.foodsafety.gov/experts/askkaren/index.html) could be done in Peel. However, people don't visit our website. It is something we could advocate for.
	• Is the organization motivated (learning organization)? o *Consider organizational capacity/readiness and internal supports for staff learning.*	• Organization is motivated from perspective it is identified as a public health problem and there are potential preventative interventions that are evidenced-based, we have a mandate to do it, and may require a secondment to get things progressing. • Unsure if there is organizational capacity/readiness.

Transferability (generalizability)

| Magnitude of the "reach" and cost effectiveness of a home food safety intervention | • How should the proposed intervention reach the priority population(s)?

    o What will be the coverage of the priority population(s)? | • Advocacy to the Province to lead a harmonized response to home food safety can enable greater reach of target population.

• Priority populations should be identified through the data (e.g. communicable disease reports, evidence).

• Intervention can reach children by leveraging current relationships with |

		school boards, School Health nurses, child care centres.
		• Schools focus on cooking in the classes and not food safety. We could work with school boards and School Health nurses to incorporate food safety into the curriculum.
		• Outreach can be through physicians, pregnant women (especially first-time moms), child care providers to reach parents (e.g. through newsletters), relevant social media, community centres (parents hanging out during hockey practice, skating lessons etc.), point of sale in food stores (i.e. safe preparation of chicken nuggets), schools (curriculum, newsletters), home care providers (to reach homebound seniors who tend to be isolated).
		• Outreach to vulnerable populations can be accomplished by working with Human services and United Way.
		• YouTube videos, radio and TV messages may have greater coverage of target population and some people may be more receptive to messages delivered from media.
		• Outreach to population can occur through Peel multi-services clinics, social media, cooking classes, volunteer food handler groups.
		• Reach of population- start small and progress to larger reach.
		• Different strategies may be needed to reach different groups.
		• Need buy-in of community leaders/influencers to reach cultural/community groups.
Target population characteristics	Note: the populations studied in the literature were: In the Young et al. (2015) review: Mostly in the U.S., some in Europe, a couple in Australia and one in Canada. Target groups were diverse (e.g. kids, young	• Generally comparable. • However, need to keep in mind with Peel population is number of newcomers to Canada, families have multiple priorities, extended families in same household (high cost of housing), adults working long hours, taking kids to various activities, traditional meal times less common, business impacts eating where people eat, what they are eating (outside of home), kids may have "alone time" between school

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	adults, elderly, mothers, parents, ethnic groups, teachers, low-income individuals, general public, etc.)
	
	For the Overbey et al. (2017) review:
	
	Families with young children in U.S. communities in Nebraska and Iowa and a U.S. university setting.
	
	• Are studied populations from the literature comparable to the Peel population?
	
	• Will any difference in characteristics (e.g., ethnicity, socio-demographic variables, number of persons affected) impact intervention effectiveness locally?
	
	    o Consider if there are any important differences between the studies and the population in Peel (i.e., consider demographic, behavioural and other contextual factors).
		and parents arrival after work, a risky time for snack preparation. Families have a lot to think about on a given day- food safety likely not one of them.
		
		• There may be differences in the distribution of age groups, immigrant status, cultural diversity, language spoken, and socioeconomic status characteristics in Peel. The impact of these characteristics on food safety. behaviour is unknown. These characteristics will need to be further explored to tailor an intervention to the Peel population.
		
		• Cultural perceptions of foodborne illness/food handling practice can be a barrier.
		
		    o Diarrhea may be perceived by some as a common occurrence depending on country of origin - it may not be acknowledged as an illness in some cultures.
		
		• Start with targeting intervention to children/youth/young adults- focus test to determine target group.
		
		• Need to further investigate food safety behaviour, attitudes, habits, etc. from Peel population to customize interventions- need representative sample of top 10 cultures in Peel (how they identify themselves), different age groups, main food preparers, socioeconomic status, volunteer food handlers.
		
		• The social phenomenon of perception of government, which could be influenced by culture, could affect receptiveness to an intervention. It can affect public engagement and trust. Relationship can be improved through communication. Perhaps raising our public health profile might change perspective.
		
		• Some studies in rapid review included university students. An intervention targeting just university students wouldn't be reflective of diversity in Peel.
		
		• Women pregnant for first time are generally more concerned about what they are eating and post partum more concerned about what children are consuming.

		• Social media may not be accessible and/or used by all segments of the population. Access issues for elderly, low-income, people who choose not to participate in social media.

Form Completed by: Danny Martin, Liz Haydu, Gagan Babra, Michelle Ng, Tania MacDonald, Susan Zivkovic, Wilson Wong, Sherridon McKoy, Roxana Gruescu, Beata Hilliard, Alex Clemens, Paul Callanan, Dr. Lawrence Loh

Worksheet adapted from: Buffet C., Ciliska D., and Thomas H. National Collaborating Centre for Methods and Tools. November 2007. *Can I Use this Evidence in my Program Decision? - Assessing Applicability and Transferability of Evidence*.