



Church/Community Suppers: What is the Evidence for Risk of Food-borne Illness?

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evidence review

Summary

- We estimate that 3% to 16% of food-borne outbreaks investigated by public health agencies are associated with community events including church suppers, fairs, potlucks, picnics, etc.
- However, there is likely under-reporting of individual cases of enteric illness and of small outbreaks related to these events.
- Poor food handling practices at home and at the site where the food is prepared or served are implicated in most of the reported outbreaks.

Introduction

This document has been prepared for public health professionals: to inform them of the burden of enteric illness associated with community events; to identify practices associated with event-related food-borne illness and ways to control them; and to recommend criteria for deciding which events warrant public health investigation.

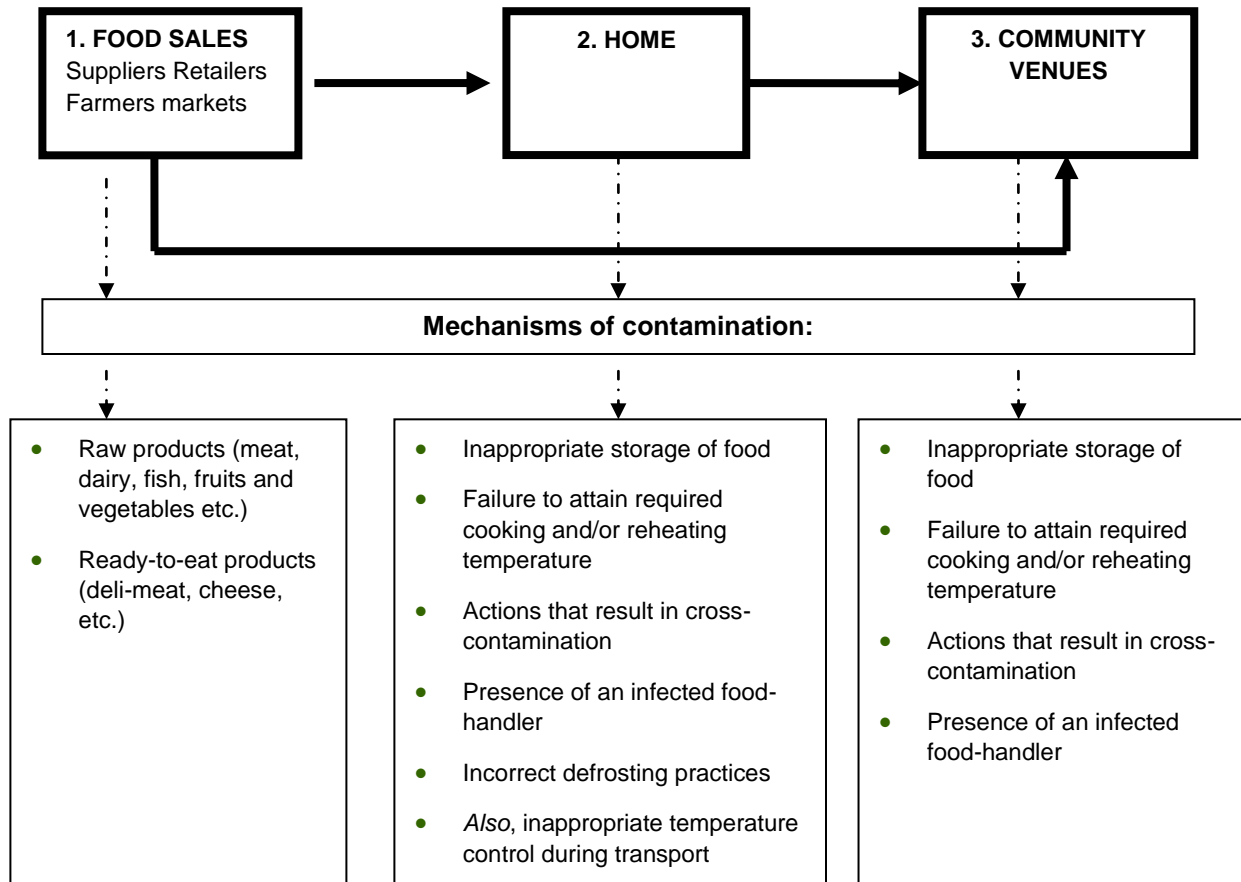
For the purposes of this paper, a community event is defined as a gathering where non-professionally catered food is consumed; such as, church suppers, potlucks, picnics, barbeques, festivals,

weddings, funerals, etc. Food may come from suppliers and be prepared or cooked on-site, or the food may be prepared or cooked in homes and transported to the site. Food-preparation at community events is usually unregulated, often occurs in kitchens with inadequate facilities and equipment, and involves preparers who may not have food safety training.¹

The variety of these types of events necessitated a broad search of the literature. In order to gather as much evidence as possible, the search did not have date restrictions. Complete coverage of all databases was included; for example, Medline (including In-process and non-indexed citations) was searched from 1950 – present (July 2009) while Academic Search Complete was searched from 1975 – July 2009. Searches of biomedical databases used keywords and subject headings that included combinations of locations (church, mosque, community, neighbourhood, etc.) and event types (picnic, buffet, supper, etc). Searches in general databases also included keywords and subject headings related to outcome (outbreak, illness, disease, etc.). Searches restricted to material in English were conducted in the scholarly literature, newspaper reports, online search engines and hand-searching of important publications (e.g., Morbidity and Mortality Weekly Report).



Figure 1. Origin of contaminated food at community events



Food-borne Illness Outbreaks

Food at community events may become contaminated at various stages: the supplier level; the food-store level; and during the cooking or preparation stage at home or on-site. The main sources of contamination are listed in Figure 1.

1. Food-borne illness linked to raw products or fresh produce

It is well-established that food-borne illnesses may be linked to consumption of raw or undercooked products such as ground beef, chicken, eggs, as well as certain ready to eat products, in particular deli-meat and cheese.^{2,3} During the past decade, an increasing number of food-borne outbreaks have been associated with fresh produce, including contaminated cantaloupes, green onions, unpasteurized cider, fresh squeezed orange juice, lettuce, raspberries, alfalfa sprouts, sliced tomatoes, and frozen berries.²⁻⁸

2. Food-borne illness linked to the home

In general, the true incidence of food-borne disease is difficult to ascertain because cases of illness are under-reported and individual cases or small outbreaks that originate in the home are less likely to be identified by public health authorities.^{2,5,8} The majority of cases of food-borne illness are believed to be sporadic and/or isolated.² Still, outbreaks that involve households, extended family gatherings and outdoor events may contribute substantially to the total number of cases of food-borne illness each year.^{9,10}

In Europe and North America, many cases of food-borne illness occur as a result of improper food handling and preparation by consumers in their own kitchens.^{1,9,11-13}

Various contributing factors have been identified:^{1,11,13}

- contaminated raw food supply;

- a lack of awareness among the general public of basic food safety principles ;
- mistakes in food-handling and food preparation at home;
- deliberate consumption of raw, unpasteurized or undercooked foods of animal origin.

The five most common mistakes in handling and preparing food at home are listed in Figure 1.^{13,14}

3. Food-borne illnesses linked to community settings

Few published articles describe the proportion of outbreaks linked to community events. One article identified 816 outbreaks during the period 1927 to 2006 in the United States, Canada, Europe, and Australia where food workers were implicated in the spread of food-borne illness.¹⁴ The term food worker is used in this context to describe individuals who harvest, process, prepare, and serve food.¹⁵ An extensive literature search was conducted to locate published and unpublished documents. Attendance at international food safety-related conferences and personal communication with experts in the field resulted in the acquisition of additional studies. Among the 816 outbreaks identified, less than 3% were linked to a community event.¹⁴ In this case, the actual percentage of outbreaks linked to a community event may be underestimated because the outbreaks mentioned in this article were selected on the basis that food-handlers were implicated in causing the outbreaks.

A study in England and Wales found that between January, 1992 to December, 1994, the Public Health Laboratory Service Communicable Disease Surveillance Centre identified 1,590 outbreaks of infectious intestinal disease, of which a minimum data set was captured for 1,282 (80%). Six hundred and forty-two (50%) were food-borne and 101 (16%) of these food-borne outbreaks were associated with food prepared for large numbers on domestic premises.⁹ Another study of 279 outbreaks of gastrointestinal disease in the northeast region of England found that about 10% may have been linked to social events.¹⁰

As illnesses or outbreaks in these settings are less likely to be reported, there is a lack of knowledge on the potential sources of food contamination at community events.¹⁶ Large, interstate, and restaurant-associated outbreaks are more likely to be reported

than outbreaks occurring in a single family or at community events attended by few people.^{16,17}

Published articles on individual food-borne outbreaks linked to community settings

Fourteen articles were found on food-borne outbreaks related to community settings. The settings included: picnics, mass gatherings, parties, a music festival, community meals, church camps, and weddings (Table 1).

From these studies, it appears that outbreaks in community settings were reported to public health authorities when a relatively high number of cases were involved (>20) or when the disease was severe (e.g., botulism). In all of these outbreaks, the cases were confirmed by stool specimens. Outbreaks that are not confirmed with a stool or blood specimen are probably much less likely to be reported.

The same food-handling mistakes occurring at home were also implicated in these community event outbreaks. Among the 14 articles, eight reported problems with cooking temperature and four mentioned that contamination was linked to foodhandlers. Two articles did not describe the source of contamination.

Although published reports of illnesses associated with the consumption of fresh produce at community events were expected, none were identified. While this may be the result of a limited search strategy, data from The Centre for Science in the Public Interest's Outbreak Database (1990-2007) indicates that only a small proportion of outbreaks associated with produce occur at community events; the majority occur in restaurants, schools, or private homes.¹⁸

Leading causes of food-borne pathogens in general and linked to homes

In the USA, the Centers for Disease Control and Prevention (CDC) collect data on food-borne disease outbreaks (FBDO) from states and territories through the Food-borne Disease Outbreak Surveillance System (FBDSS). 2006 is the most recent year for

which data has been analyzed with 1,270 FBDO. Among them, 70% of FBDO had a confirmed (621) or suspected (263) etiology. Among those with a confirmed etiology, 55% were associated with a virus (most frequently calciviridae including Norovirus)¹⁹⁻²² and 32% with bacteria. *Salmonella* is the most reported bacteria among FBDO.²³

A different trend has been observed in the home setting. Historically, the largest proportion of reported food-borne disease outbreaks associated with private homes has been caused by *Salmonella*.¹¹ Another study in England between 1992 and 1994, identified 101 food-borne outbreaks associated with domestic catering. *Salmonella* was associated with 77 (76%).⁹ In most cases, the outbreaks occurred during summer and the most common vehicles implicated were poultry and eggs. Inappropriate storage and storing at ambient temperatures for long periods before serving were the most common risk factors implicated in the disease outbreaks.

In the 14 articles listed in Table 1, the same trends were observed; thirteen articles mentioned that the outbreak occurred following bacterial contamination and one article mentioned viral contamination of oysters.

Knowledge and practice among consumers

Numerous articles have highlighted gaps in food safety knowledge and practice among consumers.^{12, 24-33} The most important issues are:

- incorrect defrosting practices;
- improper cooling of cooked food;
- inadequate reheating of cooked food;
- lack of knowledge concerning cross-contamination;
- lack of knowledge concerning hand hygiene.

Research strongly suggests that a significant percentage of food-borne outbreaks could be prevented through an integrated approach in which knowledge of food safety is promoted and food safety training is provided to the general population.^{11,12,15,24,25,31,34} It has been suggested that

food safety education and evaluation in the future be organized around five behavioural constructs:³⁵

- practice personal hygiene;
- cook food adequately;
- avoid cross-contamination;
- keep foods at safe temperature;
- avoid food from unsafe sources.

Some authors have observed gaps between knowledge and application of safe food handling practices among consumers, which may result in food-borne disease.^{11,12,26} The disparity between food safety knowledge and food handling practices of consumers can be attributed to an optimistic bias effect; people overestimate the correctness of their practices.²⁶

Although the literature contains a growing body of studies that describe innovative, community-based education strategies, the effectiveness of most of these strategies has not been formally evaluated.^{1, 36-39}

Conclusion

Food preparation for community events such as church suppers, picnics or barbeques may be an important setting for food-borne illness adversely affecting a large number of people.³⁷ It is difficult to understand the real risk of illness because these events involve diverse audiences, varied settings, diverse strategies, and different ethno-cultural groups. Based on the available literature, we estimate that between 3% to 16% of documented food-borne outbreaks are associated with community events.

Evidence gaps

1. Notification

This review was based on results of a literature review, which found a limited number of reported food-borne illnesses and outbreaks linked to community events. It is likely that there are many more community event outbreaks that have not been published; contacting individual public health

authorities would have certainly increased the number of events to draw data from.

Outbreaks related to community events should be reported to public health authorities because they may involve many people and may indicate a serious problem of contamination. While not all reported outbreaks are investigated, investigation of community event outbreaks may serve to identify hazards originating with food suppliers. Often these outbreaks are relatively easy to investigate because they are related to a unique event, participants become sick almost at the same time, and the potential contaminant sources (i.e., food items) are limited in number. One factor limiting investigation can be the lack of left-over foods against which stool culture isolates can be compared.

Overall, there appears to be under-reporting in the published literature of food-borne disease outbreaks related to community events. A system to capture community event-related outbreaks is not currently available in Canada. Such a system would help greatly in better understanding food-borne illnesses in the community.

A better reporting system would also allow public health departments to use a cost-effectiveness approach to assist in determining when a food-borne outbreak investigation should be opened; the collection of more and better evidence would help in setting investigative criteria such as the number of affected people and the disease severity among index cases.

2. Training

Many issues have been raised about food safety knowledge in the general population. Research is needed on more effective ways to educate the population about food safety and to provide more efficient food safety education/certification for food handlers involved in certain types of community catering events.

Gaps exist between knowledge and application of proper food handling procedures and additional studies are needed on how best to close these gaps.

Table 1. Selected articles where a food-borne outbreak was linked to a community event

No	Settings	Where food has been prepared?	# of ill	# Attendees (# respondents)	Pathogens implicated	Contamination occurred from
1	Picnic, 1960 ⁴⁰	Food prepared by an unlicensed local caterer with one helper in his house.	72	96	<i>Staphylococcus aureus</i>	Probably food handler.
2	Picnic, 2002 ⁴¹	Food cooked on site.	134	277 (237interviewed)	<i>Salmonella panama</i>	Temperature abuse, hand-washing violation, improperly calibrated oven thermometer.
3	Huge mass gathering in the forest, 1990 ⁴²	Brought food from home and cooked on site.	185	12,700 (1719 questionnaires mailed out and 317 total respondents)	Antibiotic resistant <i>Shigella</i>	Poor hygiene, multiple food handlers, 47 different communal kitchens.
4	Mass gathering in Alaska, 1994 ³⁶	Multi-site, potluck on 3 days.	19 Case-control study.	?	<i>Shigella</i>	Probably food handler improperly prepared or stored foods.
5	Music festival, 1991 ⁴³	Five days outdoor festival. Food cooked on site.	3175	?	<i>Shigella</i>	2000 volunteer food-handlers, poor hygiene, limited access to soap and running water.

No	Settings	Where food has been prepared?	# of ill	# Attendees (# respondents)	Pathogens implicated	Contamination occurred from
6	Community meal, 1997 ⁴⁴	Preparer baked food at home and transported it to her work place.	18	125 (98 completed questionnaire)	<i>Salmonella sp.</i>	Temperature abuse.
7	Church camp, 1995 ⁴⁵	Food cooked on site.	23	99 (73 contacted)	<i>Staphylococcus aureus</i>	Temperature abuse.
8	Church supper, ⁴⁶	Food prepared on site.	122	169	<i>Streptococcus pyogenes</i>	Eggs were contaminated and not well cooked.
9	2 church suppers in Louisiana, 1996 ⁴⁷	Food prepared on site.	29/48 (of those interviewed).	? (48 interviewed)	Norwalk	Steaming oysters.
10	Church fundraiser, 2003 ³⁴	Foodhandlers were members of the congregation.	104	400 (189 interviewed)	<i>Salmonella sp.</i>	Crab-cakes contaminated with raw eggs. Temperature abuse.
11	BBQ, Austria, 2006 ⁴⁸	Food prepared by a local farmer.	5	20	<i>Clostridium botulinum</i>	Source was not found.
12	Buffet, 2008 ⁴⁹	Food supplied at the event included a variety of "tasters" from different ethnic groups and was prepared by various individuals in their homes.	54	92 (72 completed questionnaire)	<i>Clostridium perfringens</i>	Temperature abuse; inadequate reheating.
13	Wedding ⁵⁰	Meal was prepared by several guests at their homes and was brought to a communal building where the wedding took place.	26	285 (unknown how many contacted)	<i>Salmonella sp.</i>	The source was not found. The guests did not collaborate well with the investigators.
14	Wedding ⁵¹	The caterer was not a professional but occasionally prepared food from her domestic kitchen for functions involving friends and relatives.	78	121 completed questionnaire	<i>Salmonella sp.</i>	The turkey was not sufficiently cooked.

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Additional resources

Some health authorities have provided information about promising practices in preventing outbreaks caused by food served during community events:

US Department of Agriculture: http://www.fsis.usda.gov/PDF/Cooking_for_Groups.pdf

Saskatoon Health Region:

http://www.saskatoonhealthregion.ca/your_health/documents/101321bookletMay2008greyscale.pdf

Yukon Health and Social Services: http://www.hss.gov.yk.ca/pdf/foodpremises_app_temp_gl.pdf

For more information, contact your local, regional, or provincial food safety authorities.

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