

Critical Infrastructure Protection Initiative @ Dalhousie University

Analysis of Print Media Coverage of Two Cases of Food Contamination: The New York Times Coverage of the 2006 E. Coli Contamination of Spinach and The Globe and Mail Coverage of the 2008 Maple Leaf/ Listeriosis Event

Kevin Quigley, John Quigley, Emily Pond and Colin Macdonald

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Analysis of Print Media Coverage of Two Cases of Food Contamination: The New York Times Coverage of the 2006 E. Coli Contamination of Spinach and The Globe and Mail Coverage of the 2008 Maple Leaf/ Listeriosis Event

Kevin Quigley, PhD, Dalhousie University
Corresponding Author
E-mail: kevin.quigley@dal.ca

John Quigley, PhD, University of Strathclyde

Emily Pond, Dalhousie University

Colin Macdonald, Dalhousie University
5/27/2012



School of Public Administration
6100 University Avenue
Halifax, Nova Scotia
B3H 3J5
902-494-3782

Draft Research Report on Media Coverage of Two Cases of Food Contamination

The goal of the report is to provide information about themes and controversies that have occurred during two past food contaminations and were included in media coverage of these events. The observations are drawn primarily from four sources: (1) a media database that we developed and maintain at the School of Public Administration at Dalhousie University that includes various aspects of media coverage of 25 critical infrastructure and emergency management events; (2) detailed analysis of three months of coverage in *The New York Times* of the 2006 E-coli contamination of spinach; (3) detailed analysis of three months of coverage in *The Globe and Mail* of the 2008 Maple Leaf Foods / Listeriosis event; and (4) risk and media literature.

There are aspects of any emergency management event that are unique, and therefore it is extremely difficult to make general claims; this is especially so when we have small sample sizes, as we have here. With this in mind, we have reviewed the two food contamination cases (as depicted in the media coverage) and have tried to identify key controversies that may provide insights into the public management challenges associated with these types of events. While the research generated interesting insights, recall that the food contamination observations are based on two very different cases. Note also that there may be fundamental cultural and institutional issues at play: the coverage of the e-coli contamination concerns the US and the US governments whereas the coverage of Maple Leaf concerns Canada and the Canadian governments.

I was assisted in this research by two graduate research assistants, Colin Macdonald and Emily Pond, and Professor John Quigley, industrial statistician at the University of Strathclyde in Glasgow, Scotland.

As this report is in draft form and was written on a very tight timeline, I would ask that you not cite it without the permission of the author.

I have tried to capture the key points in an executive summary. We hope you find this report useful. Please let us know if you have any questions.

Sincerely,

Kevin Quigley, PhD

Acting Director and Associate Professor

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1.0 Executive Summary

Important Note

The goal of the report is to provide information about themes and controversies that have occurred during two past food contaminations and were included in media coverage of these events. The observations are drawn primarily from four sources: (1) a media database that we developed and maintain at the School of Public Administration at Dalhousie University that includes various aspects of media coverage of 25 critical infrastructure and emergency management events; (2) detailed analysis of three months of coverage in *The New York Times* of the 2006 E-coli contamination of spinach; (3) detailed analysis of three months of coverage in *The Globe and Mail* of the 2008 Maple Leaf Foods / Listeriosis event; and (4) risk and media literature.

There are aspects of any emergency management event that are unique, and therefore it is extremely difficult to make general claims; this is especially so when we have small sample sizes, as we have here. With this in mind, we have reviewed the two food contamination cases (as depicted in the media coverage) and have tried to identify key controversies that may provide insights into the public management challenges associated with these types of events. While the research generated interesting insights, recall that the food contamination observations are based on two very different cases. The more general claims noted below are based on a sample size of 25 events, which is also relatively small. Note also that there may be fundamental cultural and institutional issues at play: the coverage of the e-coli contamination concerns the US and the US governments whereas the coverage of Maple Leaf concerns Canada and the Canadian governments.

General Observations

Natural disasters receive more coverage than industrial failures. Industrial failures receive more alarming coverage than natural disasters.

There is a much more aggressive search for accountability after an industrial failure than a natural disaster.

Performance assessment of government following an industrial failure tends to be negative. These negative assessments of government performance are not immediate. They tend to come later in the process.

Social science literature suggests trustworthiness depends on individuals and organizations being open, knowledgeable and concerned. These characteristics often inform successful communications strategies.

Medical doctors and scientists tend to be trusted more than politicians. This dynamic can be important when determining who communicates key messages to the public. There are times, however, when it is appropriate for elected officials to play public leadership roles.

Reporting information quickly is important, however, if information turns out to be inaccurate and has to be corrected, the agency's credibility can be damaged.

Observations Concerning the Two Food Contamination Events (E. Coli and Listeriosis)

'Types' of events often exhibit similar trends in media coverage (e.g. natural disasters, industrial failures, and failed terrorism). Food contamination has characteristics that suggest it can be interpreted as either a natural disaster or an industrial failure. Arguably, the Maple Leaf/ Listeriosis case has strong industrial failure characteristics; the e. coli spinach contamination case is somewhat less clear.

It took approximately one week before national newspapers started running fully developed editorials.

Each food contamination case showed different patterns in volume, tone and assessment of government performance.

Maple Leaf/ Listeriosis received more coverage, which was dispersed more evenly over the year; and the federal government was criticized much more frequently.

Both stories had a similarly alarming tone for the first 28 days of coverage. After 28 days, the e. coli story reduces significantly and adopts a more neutral tone whereas the listeriosis case continues to generate coverage, and much of it continues to have an alarming tone.

The listeriosis case has features that lend themselves to more alarming coverage: the listeriosis event seems more industrial; there were strong personalities associated with the case; there was conflict between government agencies; and there were a relatively larger number of deaths, which included vulnerable populations.

Selected Controversies in the Two Food Contamination Events

Industry

There was blame-shifting between subsectors in the agricultural sector (e.g., produce versus meat producers).

In the Maple Leaf case in particular, leadership that was perceived as accountable and transparent in the private sector was praised in the short-term.

There was debate over the adequacy of voluntary standards in food safety. (Meat tends to have mandatory standards; many produce standards are voluntary.)

Recalls affected related commodities (e.g., recall on spinach affected consumer confidence on leafy greens).

Industries (e.g., organic farmers) that are competing with the affected industry (e.g. non-organic, larger commercial farms) used the event to try to promote favourable behaviour change among consumers and preferred regulatory positions.

Government

The complexity of the regulatory arrangement featured prominently: there are many agencies from different levels of government. This complexity can obscure accountability, slow reporting to the public and generate blame-shifting between agencies.

Border: such stories can have a negative impact on trade and tourism. Comparison with US food safety standards showed Canadian standards to be wanting.

It was argued that adding regulations may have a perverse effect: more regulation increases costs; drives smaller businesses out of business; concentrates power in larger suppliers, which can increase risks associated with industrial farming.

It was argued that it is important to have a longer term strategy when dissuading people from eating certain products. Discouraging people from eating spinach may result in poorer health in the long run, for example.

There may be conflict between government as regulator and promoter of agriculture (e.g. public health vs. local farming economy). This can be particularly problematic if the same organization or the same Minister has responsibility for both duties.

Organized labour used the event to criticize government policies and practices on food safety. Government budget cuts were cited as evidence of poor regulatory oversight and poor government performance, for example.

Human Interest

Lawsuits were filed.

Death of a vulnerable member of society, and particularly a child, can change the volume and tone of coverage immediately.

Rumours undermined government strategy and operations. Slow disclosure to the public created opportunities for rumours to spread.

Coverage focused on the role of poorly remunerated migrant labour in subsectors of agriculture.

The Government was criticized for celebrating its perceived achievements (e.g., how effectively it handled an aspect of the problem).

2.0 Literature Review: Learning About Disasters from the Media

Judging the performance of the public and private sector owners, operators and regulators of critical infrastructure via the manner in which they are depicted in the media presents particular challenges. Researchers have noted the media's propensity to report the dramatic over the common but more dangerous (Soumerai et al 1992), its tendency to sensationalize (Johnson & Cavello 1987), and sensationalize the most negative aspects of events, in particular (Wahlberg & Sjoberg, 2000). CI failures are sensational and lend themselves to this type of coverage, and therefore it is not clear whether the events receive the coverage they do due to their dramatic nature or because they genuinely reflect the sustained concerns of civil society.

Moreover, researchers have also been careful to note that there is no 'one view' about risks among the public. Risk perception is mediated through social context (Boholm, 2009, Slovic et al, 2004, Frewer, 2004, Alaszewski, 2005). It has been argued that risk perception among populations varies by gender (Drottz-Sjoberg, 1991), education (Kraus et al, 2001, Rundmo, 1999) degree of expertise in the subject matter (Slovic, 1987, Brun, 1994) as well as a variety of emotive factors (Baron et al, 2000, Rundmo & Moen, 2006). (See Rundmo & Moen 2006, for references 17-23). Therefore what one might consider important, newsworthy or even dangerous and alarming is subject to interpretation.

Further still, Wahlberg and Sjoberg (2000) note that the media's influence is too often taken for granted when in fact much of the evidence points the other way – that media are probably not a strong causal factor of (especially not personal) risk perception. Risk perception may be affected by the media but the effects are lessened by impersonal impact. Moreover, individuals' perceptions of broader risks to society are more easily changed than their perception of their own personal risk. Finally, it is not conclusive that individuals' perceptions of their personal exposure to risk will result in their changing their risk-related behavior (Slovic, 1998 as cited by Slovic, 2000).

Mutz and Soss (1997) note that the media raises people's perception of the salience of a subject in the community but is much less successful in changing people's mind on a particular subject. Similarly, Atwood and Major (2000) note that people do not think of themselves as being as vulnerable to risks as others are. Indeed, some suffer from cognitive dissonance; they are unrealistically optimistic, ignoring the news and denying personal vulnerability. In other areas of research, it has been suggested that most individuals gain information from a variety of sources, not just the media, (Verba & Nie, 1972) including other individuals, government organizations and advocacy groups. It has also been argued that research tends to focus on print media when in fact most receive their news from television and radio (Cottle, 2000). The rising prominence of social media makes this dilemma even more problematic.

Nevertheless, an examination of the print media coverage of CI failures offers some important insights. First, notwithstanding the fact individual perception may vary, researchers have noted that many people base their perceptions about risk primarily on information presented in the media (Fischhoff, 1985, Fischhoff, 1995, Kitzinger & Reilly, 1997) Hood *et al.* argue that high circulation newspapers do not necessarily reflect public opinion, but they do assume that it reflects "the flavour of the public debate,

not least because opinion leaders read such sources” (p.93) (2001). Hood *et al.* draw on Gaskell *et al.* (1999) for this analysis. In Gaskell *et al.*'s analysis, they conclude that increasing amounts of coverage of technological controversies are associated with negative public perceptions (p.385), or what is referred to as Quantity of Coverage Theory (Leahy & Mazur, 1980). Print media also has the advantage of being a stable document that is updated usually every 24 hours. So while the researcher may not be able to monitor how the story changes by the minute – as one might be able to do by researching TV or social media – the researcher can monitor the progress of the story on a 24 hour basis, in the same way that one might research TV or social media stories at 24 hour intervals. Looking at the daily paper also has the advantage of looking at a source that has eliminated many errors in reporting that happen throughout the day during a CI event – and can run amok on social media, for instance.

Contrary to Hood *et al.*'s claim that volume of coverage alone is an indicator of the views of the civil society, there is reason to believe that a more nuanced reading of media coverage is required. Media analysis of coverage of Hurricane Katrina, for instance, found that the story placement and the tone of media coverage had an impact on the force of government reaction (Barnes et al, 2008) Moeller (2006) distinguishes between ‘simple’ emergencies in which answers appear to be straightforward and ‘complex’ emergencies that require more political and social attention. Natural disasters, characterized as ‘simple’ emergencies, receive more media coverage because the events are dramatic, yes, but require relatively less research and background knowledge; cause and effect relationships are perceived to be straightforward or at a minimum outside of our control. Industrial failures, on the other hand, are characterized as ‘complex’ emergencies; they receive less media attention because they require significantly more media resources and are not as easy to explain (Moeller, 2006).

This is not to suggest the less coverage means less concern. Ironically, at times, the opposite may be true. For example, responses to hurricanes are often *ad hoc* and reflect on “social problems retrospectively while rarely if ever dealing prospectively with future disasters” (p.609). (Barnes et al, 2008) Coverage of industrial failures, on the other hand, while receiving perhaps less coverage seek more often to assign blame. Pidgeon (1997) argues that “despite the inherent complexity and ambiguity of the environments within which large-scale hazards arise, and the systemic nature of breakdowns in safety, cultural myths of control over affairs ensures that a culprit must be found after a disaster or crisis has unfolded” (p. 9).

Recent literature has identified several important research opportunities in this field. Bakir (2010) calls for an analysis of the responsiveness of private and public institutions to different types of risks. As many Western countries rely heavily on both private and public sector actors to provide critical services, the examination of emergency response must include both. A comparative approach across countries has particular advantages also. First, as CI failures are rare, it allows us to increase the number of cases. Second, while CI failures seem unique, an examination of media coverage allows us to determine if indeed there are patterns in media coverage after these events that in fact can help us to predict media coverage for future events.

3.0 Tables and Figures

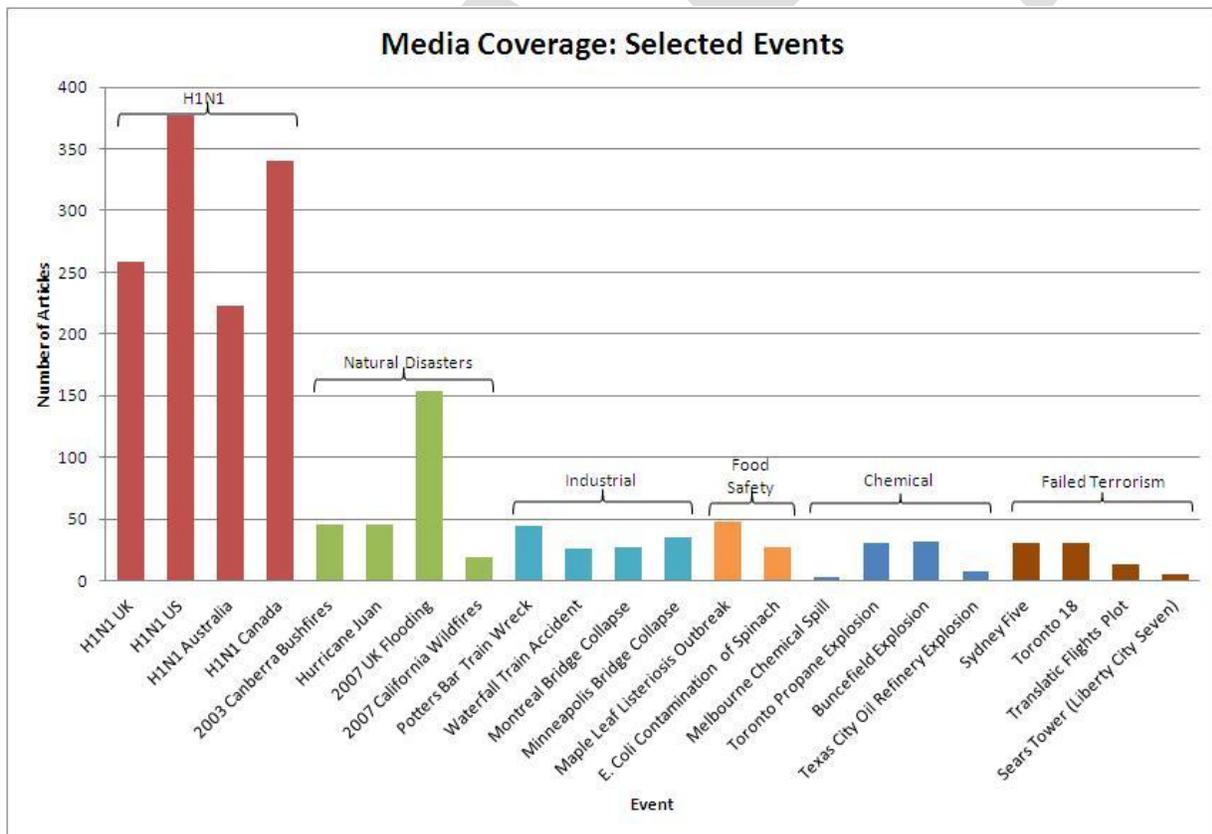
3.1 Volume of Coverage

Key message: Natural Disasters receive more coverage than industrial failures.

Media Coverage of Selected Critical Infrastructure / Emergency Management Events

The figure below shows the number of articles on the selected event that appeared over a 365 day period following the start of the event. The number represents the total number of articles that appeared in one national newspaper from the country in which the event occurred. Countries include Australia, Canada, the UK and the US. Events include natural disasters, industrial failures, food contamination, failed terrorist plots and H1N1. Sources - Australian events: *The Australian*; Canadian events: *The Globe and Mail*; UK events: *The Daily Telegraph*; and US events: *The New York Times*. All events are post 9/11.

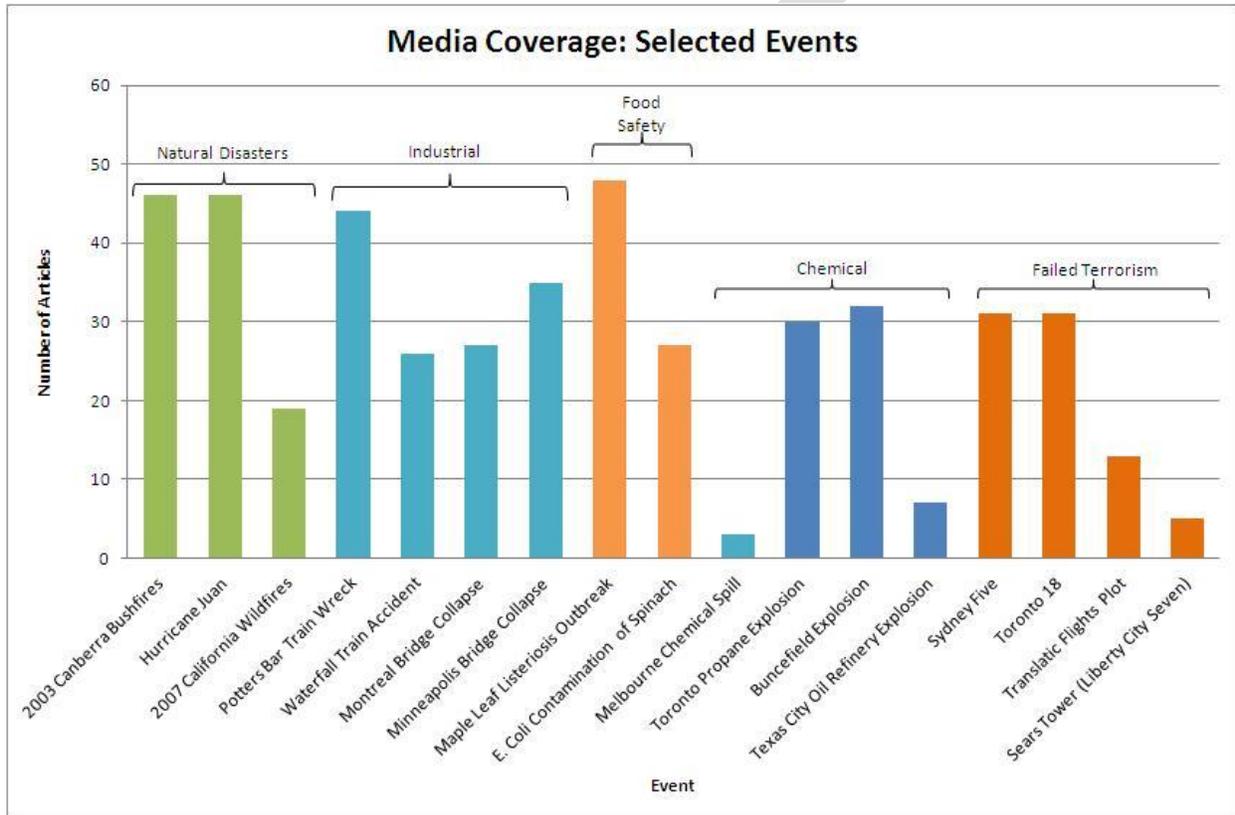
Figure 1: Media Coverage of Selected Events



Key message: Natural Disasters receive more coverage than industrial failures.

The figure below presents the same information as the figure above with the exception that the H1N1 cases and the UK Flooding case have been removed to facilitate a comparison of events with similar coverage.

Figure 2: Media Coverage of Selected Events (detail; without H1N1 or UK Flooding)



3.2 Tone of Headlines

We calculated the number of articles that had an alarming headline as a percentage of those that were either alarming or reassuring, which is summarized in the table below. Each headline was assigned a score based on its tone: (-1) for alarming; (0) for alarming and reassuring; (0) for neither alarming nor reassuring; or (+1) for reassuring. While the Maple Leaf/ Listeriosis Outbreak had a greater quantity of alarming and reassuring headlines, E. Coli Contamination of Spinach has a higher proportion of alarming to reassuring headlines. Trends are more pronounced when we control for the nation of the event; the UK generally has more alarming headlines.

At 76 and 82 percent, these events are typical of emergency management events in the US and Canada.

Key Message: Industrial Failures receive more alarming coverage than natural disasters.

Table 1: Tone of Headlines: 20 Critical Infrastructure/ Emergency Management Events

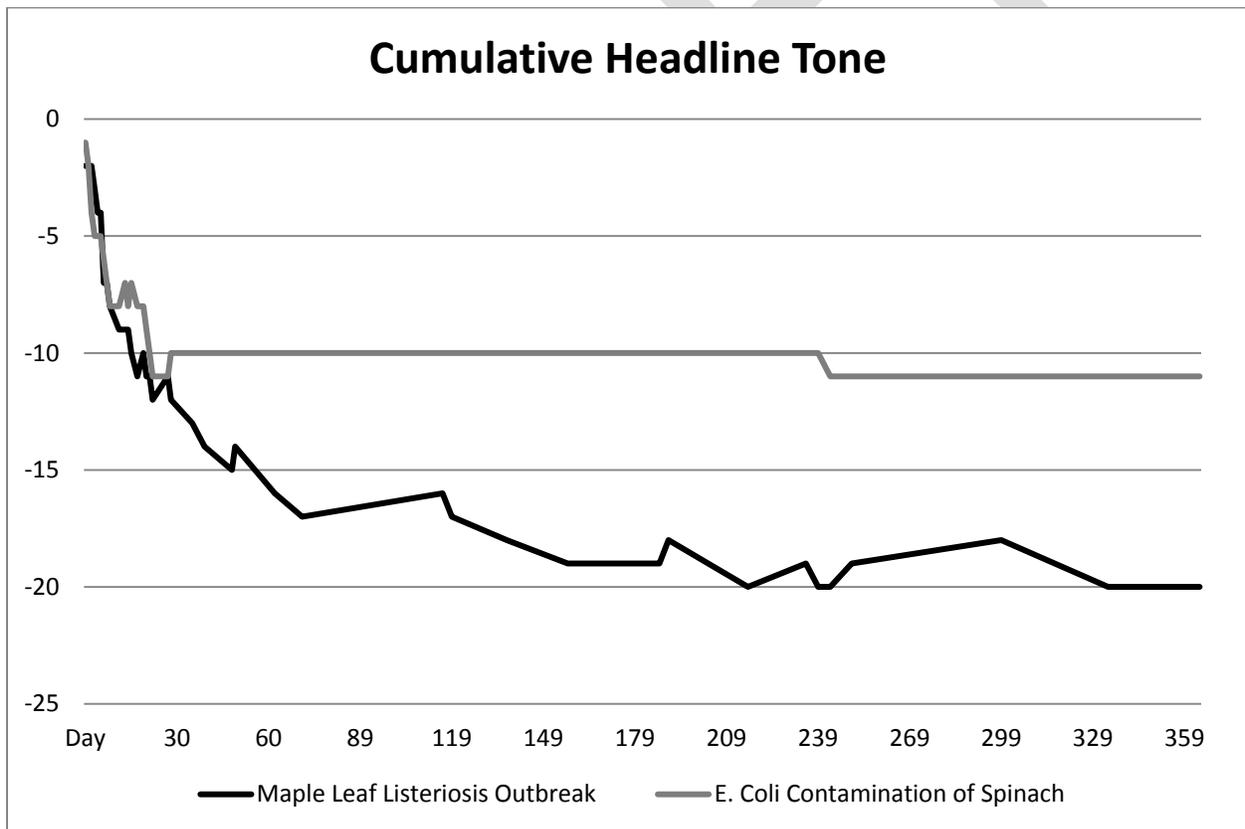
Event	Number of Alarming Headlines	Number of Reassuring Headlines	Percentage of Alarming Headlines
Food Safety			
Maple Leaf/ Listeriosis Outbreak (<i>The Globe and Mail</i>)	29	9	76.32%
E. Coli Contamination of Spinach (<i>The New York Times</i>)	14	3	82.35%
H1N1			
H1N1 Australia (<i>The Australian</i>)	127	24	84.11%
H1N1 Canada (<i>The Globe and Mail</i>)	157	64	71.04%
H1N1 UK (<i>The Daily Telegraph</i>)	172	28	86.00%
H1N1 US (<i>The New York Times</i>)	123	63	66.13%
Natural Disasters			
2003 Canberra Bushfires (<i>The Australian</i>)	22	8	73.33%
Hurricane Juan (<i>The Globe and Mail</i>)	25	11	69.44%
UK Flooding (<i>The Daily Telegraph</i>)	93	10	90.29%

2007 California Wildfires (<i>The New York Times</i>)	10	1	90.91%
Industrial Failures			
Waterfall Train Accident (<i>The Australian</i>)	11	3	78.57%
Montreal Bridge Collapse (De la Concorde Overpass) (<i>The Globe and Mail</i>)	15	5	75.00%
Potters Bar Rail Accident (<i>The Daily Telegraph</i>)	28	1	96.55%
Chemical			
Toronto Propane Explosion (<i>The Globe and Mail</i>)	18	6	75.00%
Buncefield Explosion (<i>The Daily Telegraph</i>)	16	7	69.57%
Texas City Oil Refinery Explosion (<i>The New York Times</i>)	4	1	80.00%
Failed Terrorism			
Sydney Five (<i>The Australian</i>)	10	3	76.92%
Toronto 18 (<i>The Globe and Mail</i>)	10	7	58.82%
Transatlantic Flights Plot (<i>The New York Times</i>)	9	1	90.00%
Sears Tower (<i>The New York Times</i>)	1	1	50.00%

Key Message: After having similarly alarming headlines for the first 28 days, Maple Leaf/ Listeriosis continues to have alarming headlines whereas the coverage of E. Coli in spinach slows and stops.

The figure below shows the cumulative tone of Maple Leaf/ Listeriosis outbreak headlines in the *Globe and Mail* and E. Coli contamination of spinach headlines in *The New York Times* over a one-year period. Each headline was assigned a score based on its tone: (-1) for alarming; (0) for alarming and reassuring; (0) for neither alarming nor reassuring; or (+1) for reassuring. If on the first day of the outbreak, for example, a newspaper had four alarming headlines (-4), two alarming and reassuring headlines (0) and two reassuring headlines (+2), the net effect for that particular day would be negative two (-4+ 0 +2= -2). If on the second day of the event, the newspaper had two alarming headlines (-2) and three reassuring headlines (+3), then the net effect for that day would be positive one (-2+3=+1). For the cumulative effect of both days, we would add day one (-2) and day two (+1), and arrive at (-1). Below we see this cumulative analysis for each case, and accumulated for 365 days of media coverage.

Figure 3: Cumulative Headline Tone

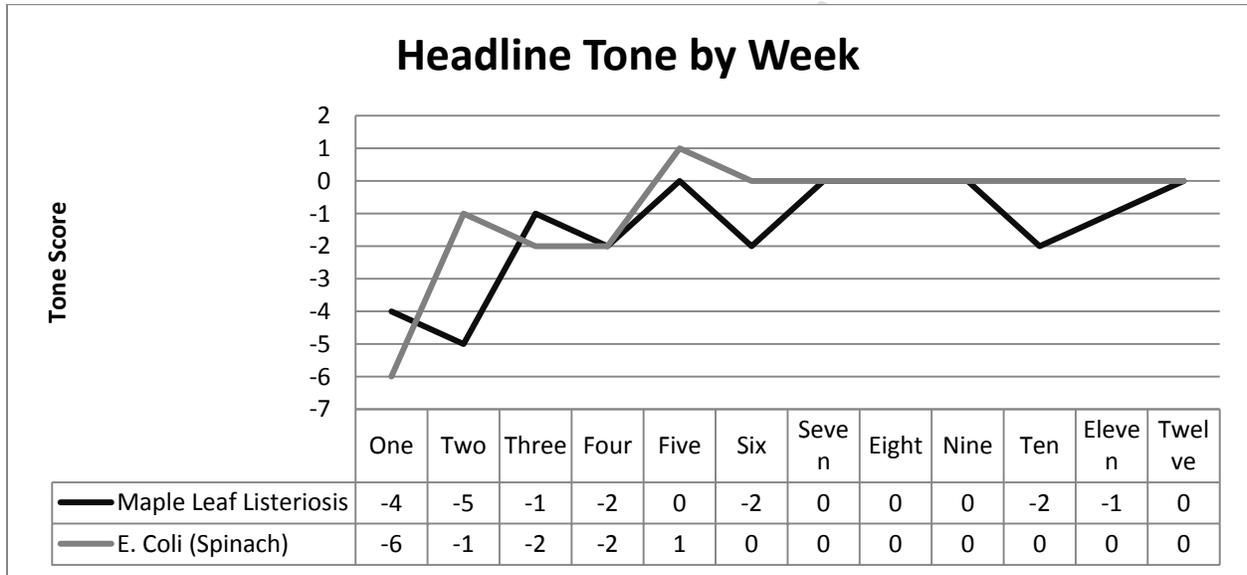


Both stories had a similarly alarming tone for the first 28 days of coverage. After 28 days the negative tone of the E. Coli headlines reduces significantly and adopts a more neutral tone whereas the listeriosis case continues to generate coverage, and much of it continues to have an alarming tone.

Key Message: After having had more alarming headlines in week one, E. Coli received relatively fewer alarming headlines over the next eleven weeks.

The figure below shows the comparative tone scores of both food contamination cases on a week-by-week basis for the first twelve weeks after the event is first reported. The tone is calculated, as above, for each week; however the score is not cumulative from week to week.

Figure 4: Headline Tone by Week



3.3 Rate of Publication

Key Messages:

The difference in the pattern of coverage for Listeriosis is not statistically significant from other Canadian Events.

The difference in the pattern of coverage between E. Coli and Listeriosis is statistically significant.

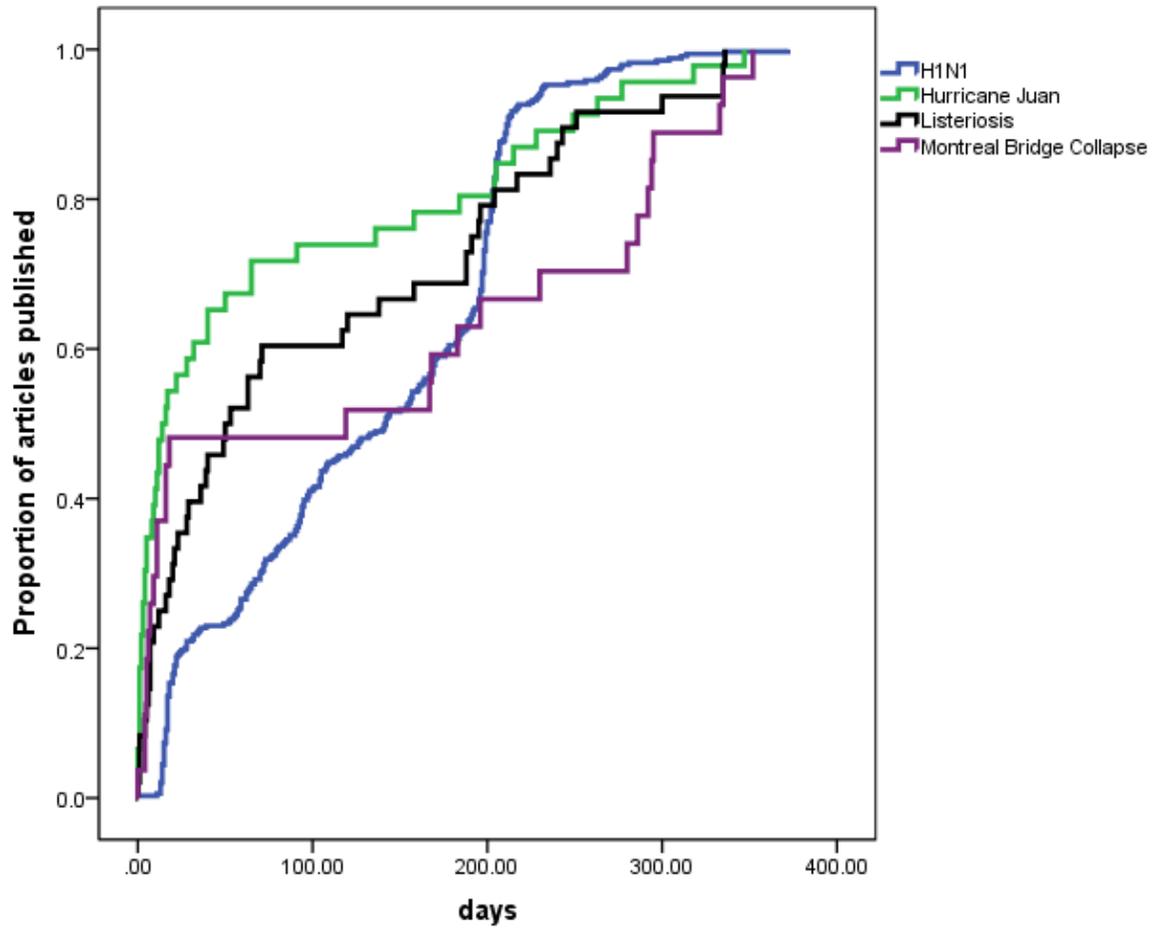
The half-life of the story comes more quickly in the E. Coli coverage than the Listeriosis coverage.

Negative assessments of government performance are not immediate; they tend to come later.

Figure 5 illustrates the publication rate for four different Critical Infrastructure/Emergency Management (CI/EM) events that occurred in Canada. The rate at which these are published is significantly different; however, if H1N1 was removed from the study then the differences between the three remaining events is not significantly different, although this may be due to small sample sizes.

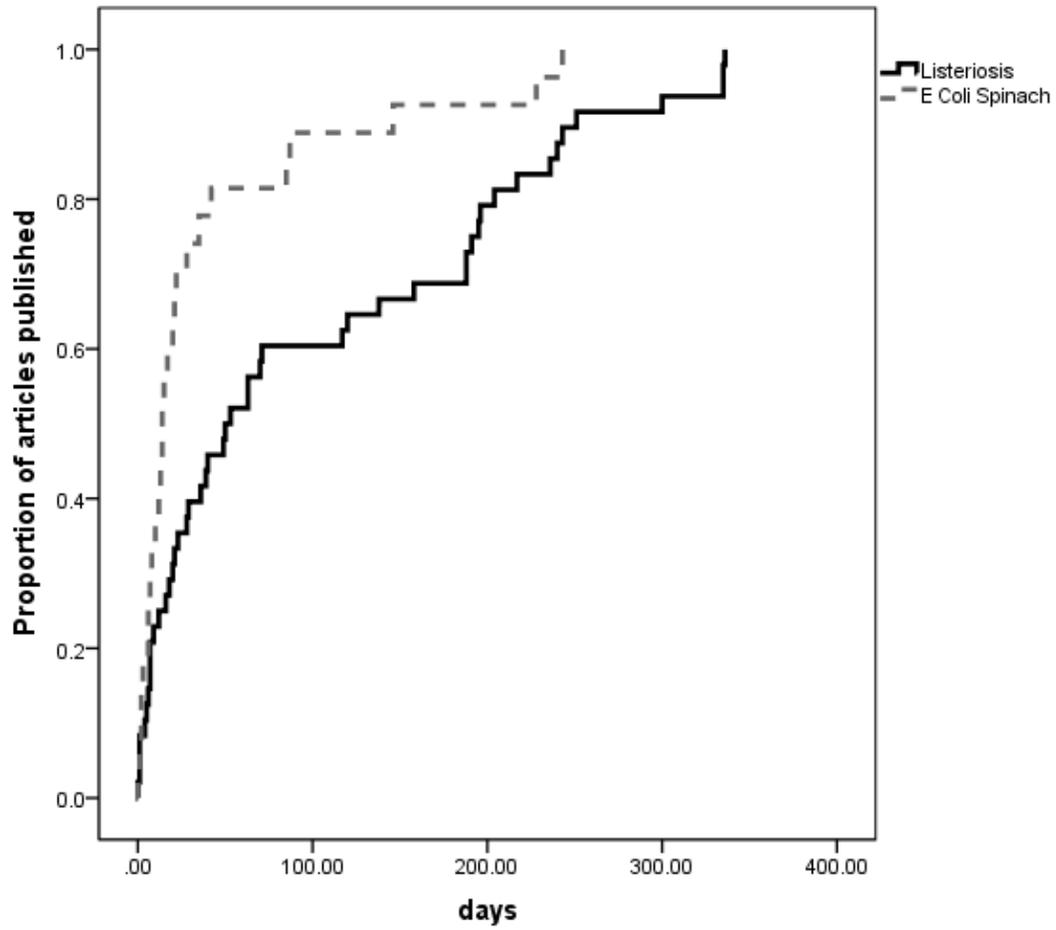
Figure 6 provides a comparison between two food related CI/EM events. The publication rates of these two events are significantly different, with the E-Coli event having published half its stories within the first two weeks of the event compared to the listeriosis event that published half its stories within the first 50 days. In other words, the Maple Leaf story lasted much longer.

Figure 5: Rate of Publication for Four Canadian Events



The difference in the pattern of coverage for Listeriosis is not statistically significant from other Canadian Events.

Figure 6: Rate of Publication for Two Food Events



The difference in the pattern of coverage between E. Coli and Listeriosis is statistically significant.

Table 2 provides the ‘half life’ of the story, in so far as it provides the number of days following an event that half the stories were published. Confidence intervals are provided, which indicate the interval between which the ‘half life’ should lie with 95% confidence, given a similar event under identical conditions. The width of these intervals will be determined by the variability in the data and the sample size. We see from the table that the two food events have non overlapping confidence intervals indicating that they are following a significantly different pattern.

Table 2: Number of days after an event when half the articles in the year will have been published with confidence intervals showing a range of such dates for similar events

Event	Publication of Half Stories (days)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
H1N1	142	115	169
Hurricane Juan	14	1	26
Listeriosis	50	22	77
Montreal Bridge Collapse	119	0	375
E Coli Spinach	14	10	17

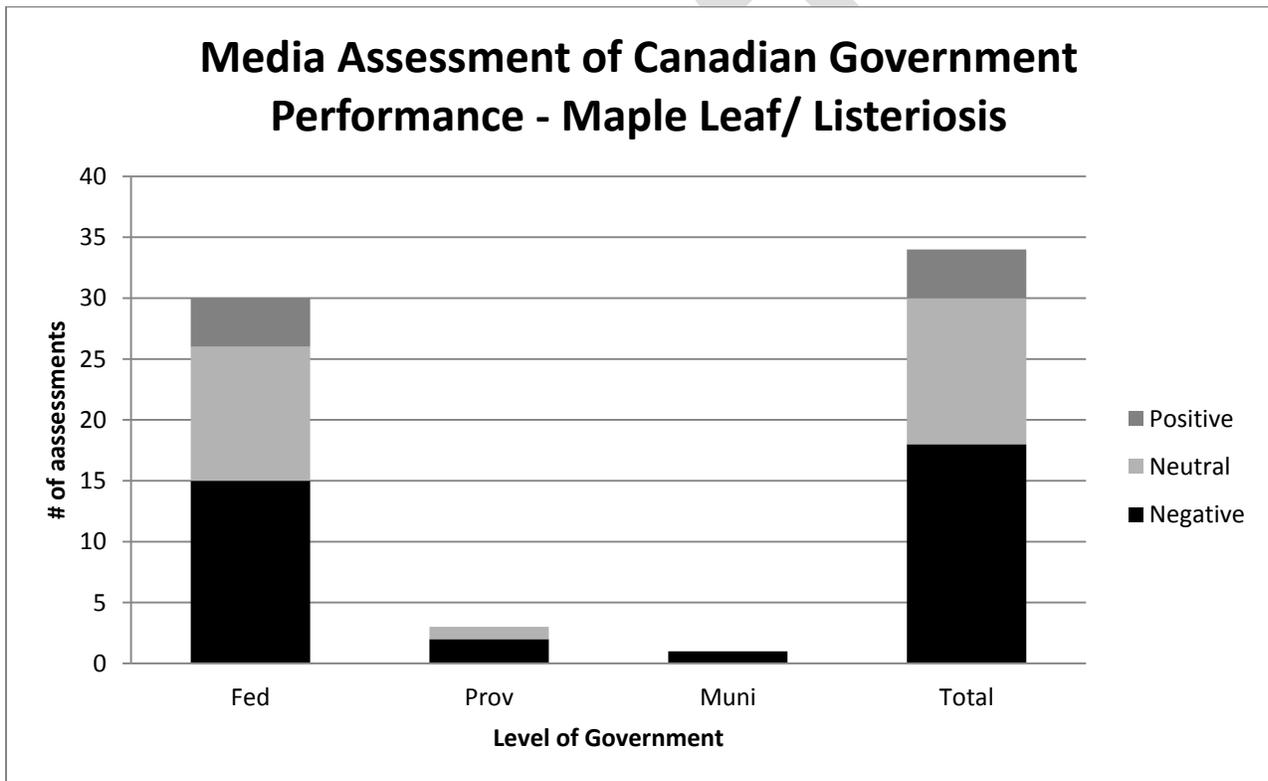
The half-life of the story comes more quickly in the E. Coli coverage than the Listeriosis coverage.

3.4 Performance Assessment of Government

Key message: Performance assessment of government following an industrial failure tends to be negative.

The following figures show the assessment of government performance, as reported by the media in each food contamination case. Assessments are categorized as negative, neutral and positive, then counted. The figure details media assessments for federal, provincial and municipal governments; it also combines assessments of all three levels for a total assessment of government performance.

Figure 7: Media Assessment of Government Performance: Listeriosis



Key message: Performance assessment of government following an industrial failure tends to be negative.

Figure 8: Media Assessment of Government Performance: E. Coli

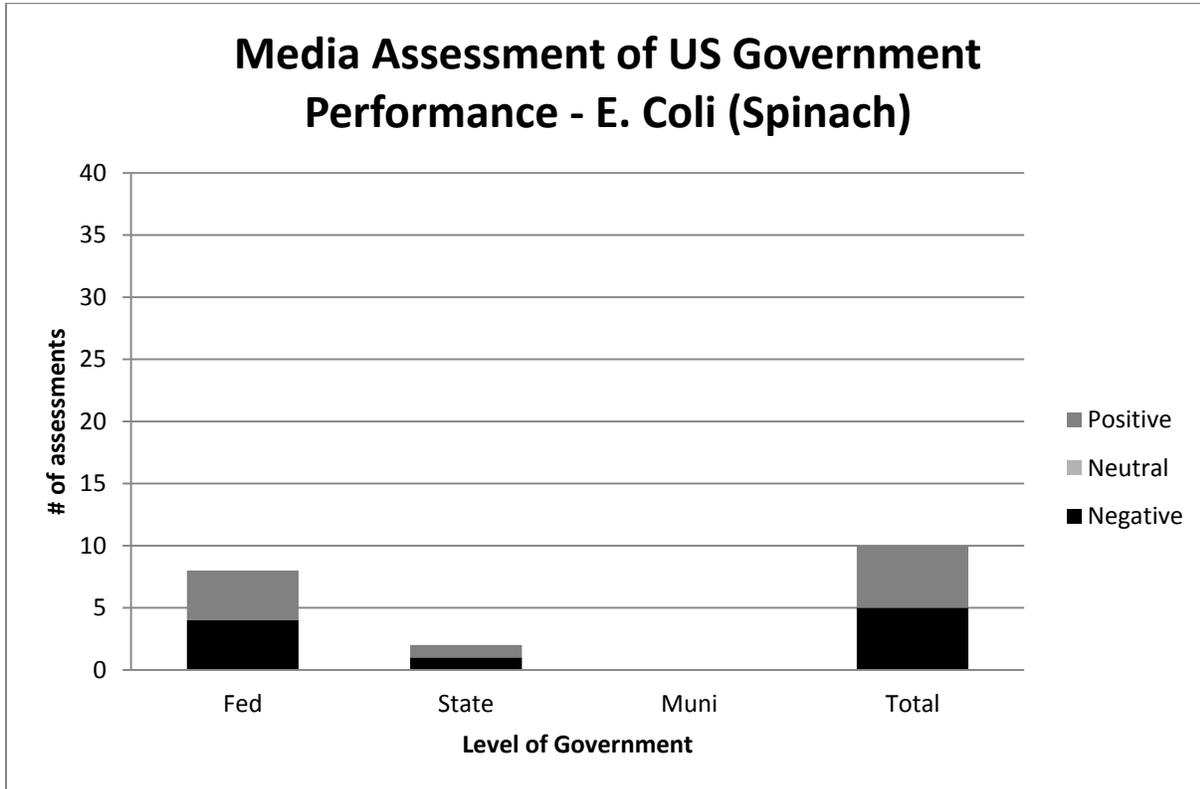


Figure 9, below, illustrates the publication rate for four CI/EM events in Canada, using only the articles that negatively or positively assessed government. The data are illustrated using a Box plot, where the solid black line in the middle represents the 'half life' of the particular articles, the coloured box represents the range of days that the middle half of the articles were published and the end points represent the first and last article published. If there are any outliers, i.e. extremely late-published articles relative to the data, then they are represented with a circle.

Figure 9: Distribution of publication rates for those that provide a negative or positive assessment of government for four CI/EM related events in Canada. This figure illustrates a delay in negative assessment for government.

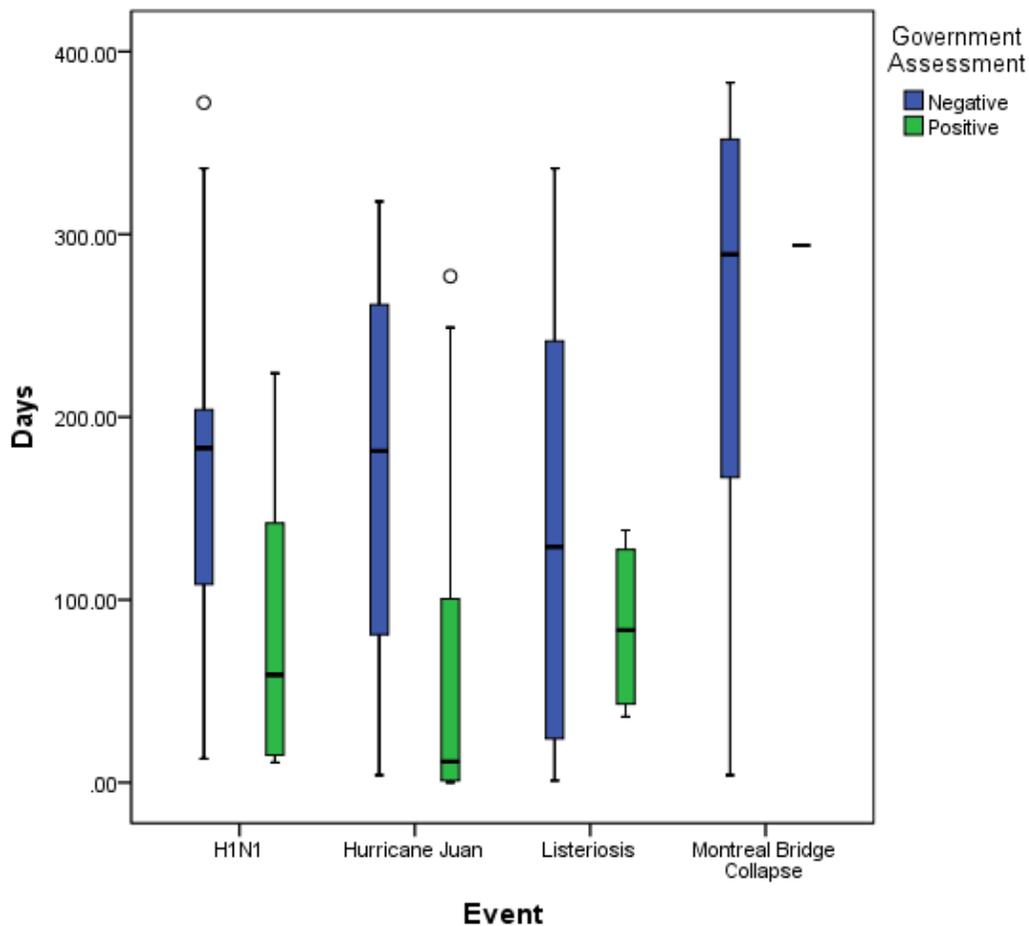


Figure 9 illustrates that there is a delay in the negative assessment of government for all four events, where the 'half life' for native assessments is later than positive. Moreover, the negative assessments span a longer period of time than the positive assessments.

Negative assessments of government performance are not immediate; they tend to come later.

4.0 Key Themes (Daily): E. Coli

Event: E coli contamination of spinach (2006)

Each row in the following table represents an article that appeared in *The New York Times* on the date listed. The 'Detail' column provides a brief summary of the article's key information, and the 'Extractable Observations' column provides some thematic insight into the article that may apply to other Food Contamination events.

Table 3: Key Themes (Daily): E. Coli

Date	Detail	Extractable Observation
September 15 th , 2006	49 cases, 1 dead	
	Federal health officials advise against eating fresh bagged spinach after an e coli outbreak in 8 states kills 1 and sickens 49	Blame shifting begins early. The agriculture industry is not necessarily unified (e.g., produce producers may criticize meat producers).
	Outbreak described as "significant" - spread across the country	
	Doctor interviewed notes it takes time to assess magnitude of outbreak (people have to be exposed, get sick, get sick enough to see a doctor, have samples tested, have sample confirmed positive and have it put into the public health system)	
September 16 th , 2006	94 cases, 1 dead, 14 gravely ill	
	Organic food producer in California identified as possible source of contaminated spinach	
	Suspected company voluntarily recalls spinach	
	{press is very informative/helpful/investigative: information about symptoms; brands that have been recalled; regions affected; details about washing food & food preparation etc.}	
	Questions raised about how e coli (typically found in meat) contaminated spinach	
September 17 th , 2006	100 cases, 1 death (102 by end of day)	
	Comment on how this is not first e coli outbreak, questions raised about why this (outbreaks) keeps happening	Criticism of government starts relatively early. Journalists can identify trends by simply doing desktop research from historical events.
	FDA criticized for being unable to identify point of contamination (by professor at UC Davis)	

	Conditions for field workers (sanitation) and manure cited as possible sources of contamination	If poor conditions for workers led to unsanitary practices and potentially contamination, labour and immigration issues may arise in a sector where migrant workers are often employed.
	Federal Health officials warn do not eat bagged spinach until further notice – warning extended to all spinach	
	Growers in California say virtually all harvesting and production has come to a halt	
September 18 th , 2006	109 cases, 1 death	
	Dr predicts surge in cases in the next few days as more are confirmed after a weekend. Suggests this does not mean the outbreak is out of control	
	A second company in California implicated in contamination	
	Interview with scientists – conclusion: tracing the source of an illness takes about two weeks	
	People with e coli referred to as victims	
September 19 th , 2006	Government points to industry: references made to number of cases (19) of e coli in recent years that have stemmed from production in California, reference letter FDA had previously written producers asking them to improve standards	Government may choose to point out that industry did not follow recommendations / voluntary standards laid out by the government. This approach may reduce criticism towards a particular department (e.g., FDA) but not the government as a whole, which does have the power to regulate.
September 20 th , 2006	18 critically ill, 1 death	
	FDA official confirms that cooking spinach (160 degrees for 15 seconds) kills e coli and that if you buy local (know your farmer), especially on the East Coast your chances of getting e coli decrease. Official says FDA wants a simpler message.	
September 21 st , 2006	146 cases, 1 death (76 hospitalized, 23 with serious kidney problems)	Approximately a week after the story breaks, comprehensive editorials begin. This is the same in both the E Coli case and the Maple Leaf/ Listeriosis case. These editorials may be a better barometer of the views of civil society.

	Farmers and food safety officials said to have a lot left to figure out	
	Bacteria linked to grain fed cattle (it doesn't live in the intestines of "naturally fed" cattle) – linked to industrial farming	Proponents of natural farming/ local food/ organics etc. may use the event to promote their industry as an alternative.
	Spinach industry is being blamed for an outbreak it likely did not cause. Cause: feeding grain to cattle (contamination of the meat itself, but also the waste they produce which gets into ground water). Author of editorial suggests readers direct their attention to those who can actually remedy the situation: beef and dairy farmers	
	"smoking gun" found: contaminated spinach in fridge of victim. E coli linked to particular company in California (Natural Selection Foods). The company recalled 24 brands.	
	First mention of economic impact on farmers: rural areas worried about the impact of the outbreak on local economy. Agricultural leaders were not talking about the economy, saying health issues far outweigh (economic) losses	
September 22 nd , 2006	Death of baby (2 year old boy) linked to e coli (brings body count to 2)	Death of a child changes tone of coverage, there is more talk of victims as opposed to the economy. This could lead to heightened anxiety and pressure on the healthcare system (e.g., if parents take their children to the emergency room for every gastrointestinal issue).
	Farmers in California promise new standards for growing, handling and shipping. Two trade associations publicly call these new standards a war on food borne illness and an opportunity to avoid new rules from lawmakers. The spokespeople say they have the support of industry and most regulators. Warning if law makers get involved the process could become political, as opposed to an approach based on science.	Industry may respond with voluntary standards to avoid further government regulation. Literature suggests people tend to trust scientists and doctors. This fact might be considered when delivering key messages to the public.
	FDA official says no timetable for lifting warning on spinach	
September 23 rd , 2006	Center for Disease Control and Prevention report 166 cases of e coli	
September 24 th , 2006	170 cases, 1 confirmed (others suspected including death of baby)	

	Editorial on children with e coli (stories of children on dialysis, anecdotes from their loved ones, stories about parents trying to get their children to eat vegetables). Very emotionally disturbing.	
	4 lawsuits filed	
September 25 th , 2006	170 cases, 1 confirmed death	
	Economic impact in California (from pickers to restaurateurs). Spinach crisis could cost 100 million if it goes on for a month.	Industry may be criticized in general, but small business owners, including farmers with small operations, may be portrayed as victims.
	Complaints about a lack of information: authorities have not said which farms they are looking at, but there is speculation; lab reports have not been made public	If citizens are not satisfied with the volume or the speed at which information is being delivered, lack of transparency may be criticised.
	Rumours about cause among locals (California): overturned portable washrooms; animals defecating on crops	Failure to provide information may lead to rumours.
	Lack of data: complains that government is too slow and media is too harsh (e.g., how many reported cases of e coli are there in an average two weeks)	
September 27 th , 2006	Editorial discusses regulations. Produce increasingly linked to outbreaks; big questions about agriculture: should cattle and produce be farmed in close proximity, should produce be subject to the same regulations as meat producers; problem compounded by consumer behaviour (not washing produce properly, not storing it properly; lack of conclusive science (some say plastic wrap is good, some say it is bad).	Questions about industrial farming and the eating habits of North Americans may be raised.
	Criticism of FDA – jurisdiction, but little regulatory authority over produce. Too few inspections (compared to meat [regulated by Department of Agriculture] where there are more inspectors than producers).	Government may be criticized for failing to take regulatory action. Comparisons to other industries where government has a lot of regulatory authority may be drawn (e.g., produce may be compared to a more highly regulated commodity like meat)
	Center for Science in the Public Interest reports that the Center for Food Safety and Applied Nutrition's budget has been cut by 30% since 2003. (Possible red flag in light of recent cuts to CFIA?)	Budget cuts may be cited if lack of regulatory oversight is blamed for the outbreak.
	FDA spokespeople say mandatory rules are being considered. Something like the Hazard Analysis Critical Control Point (system used in	

	meat/poultry/egg farming) may minimize risks.	
	Transportation and processing procedures compound the problem. Produce is left unrefrigerated at several points in the supply chain {horizontal issue}	As a result of the interdependencies inherent to the food supply chain, expect other related industries to be examined for possible vulnerabilities (e.g., in the e coli case the transportation industry was scrutinized because produce is often left unrefrigerated at several points in the supply chain)
	Supermarkets and consumers also increase risk	
	Six million packages of cut greens are sold every day, and 170 illnesses have been reported (suggests chances of getting sick are still small)	
September 28 th , 2006	East Coast supermarkets restock spinach (not from Salinas, California). Federal officials assure people spinach is safe as long as it is not from Salinas.	
September 29 th , 2006	187 confirmed cases, 95 hospitalized, 1 confirmed death	
	Natural Selections Foods offers to pay out-of-pocket medical expenses for those made sick by their spinach	
	Natural Selections faces federal lawsuits in three states	
	Consumers avoid all spinach (not just from contaminated farms/ regions)	
September 30 th , 2006	FDA chief medical officer says consumers can resume buying and consuming fresh spinach. All brands affected by the outbreak have been recalled.	
October 2 nd , 2006	187 people in 26 states, one confirmed death, 29 cases of kidney failure and 97 hospitalizations	
	Regulators are leaning on industry to clean up their act. Safest thing may be to give FDA more authority and more inspectors.	
	Suggestions that cattle and produce need to be separated	
October 5 th , 2006	Federal investigators have opened a criminal investigation into accusations that some Californian growers and producers of spinach failed to take proper precautions to ensure the safety of their product. FBI and Criminal Investigations in the FDA have search warrants for Natural Selections Foods.	
October 6 th , 2006	Babies death confirmed to be caused by E coli Death toll: 2	
October	Dell toll:3	

7 th , 2006	Nebraska woman's death attributed to e coli. Confirmed number of deaths: 3. Her family had to press for private tests to get this result, which public health officials feel would have otherwise gone unreported.	
	For every one e coli case that is reported, 20 go unreported. In this outbreak, as in most outbreaks, many people who are ill go unreported.	
October 9 th , 2006	Lettuce grown in Salinas recalled, no reported illnesses	
October 10 th , 2006	Call for more government oversight. NYU professor & food safety expert notes that there is no federal agency that deals with the fresh produce industry. "[it] falls through the cracks"	
	Consumer confidence in leafy greens has impact on whole region (California, where south of Salinas lettuce has just been planted)	A recall/ warning may impact other, related commodities (e.g., recall on spinach affected consumer confidence in other leafy greens)
October 13 th , 2006	Authorities investigating ranches in Salinas area, trying to pinpoint start of E coli outbreak. Same strain that caused outbreak identified at a particular ranch.	
	FDA has asked industry for long-term strategies for minimizing outbreaks, but hasn't rules out regulatory requirements	
	Mexico halts imports of US lettuce {horizontal issue: border/ trade}	Border issue: neighbouring countries (or others) may halt imports of a particular commodity. This could impact regional or national economy, depending on the scale. The outbreak may also impact tourism.
	Reference to people (or person) sickened in Canada	
October 15 th , 2006	Editorial on tendency of government to look for technological fix to problems	
	Same thing happened a few years ago when cow excrement was found in ground meat; rather than remove it, industry found a way to nuke the meat and sterilize the excrement	
	Genius of industrial capitalism: take a failing and turn it into a business opportunity	
	Expect to hear calls for more regulation and inspection (evidence in media review supports this supposition)	
	"Surely this points to one of the great advantages of	Governments may be criticized for

	a decentralized food system: when things go wrong, as they sooner or later will, fewer people are affected and, just as important, the problem can be more easily traced to its source and contained. A long and complicated food chain, in which food from all over the countryside is gathered together in one place to be processed and then distributed all over the country to be eaten, can be impressively efficient, but by its very nature it is a food chain devilishly hard to follow and to fix.”	the centralization of the food supply chain (e.g., regulation will further centralize the food supply chain: large businesses can manage a heavier regulatory burden than small businesses can, larger businesses consolidate their supply chains for efficiency and profit maximization). In other words, regulation has risks.
	Reference to Tommy Thompson (Department of Health and Human Services) quote, “For the life of me, I cannot understand why the terrorists have not attacked our food supply, because it is so easy to do” {horizontal issue: security}	If vulnerabilities in the food supply chain are identified, fears about intentional contamination (e.g., terrorism) may arise.
	Greatest threat is government’s good intentions. More regulations (scale neutral) = more expensive for farmers/small slaughter houses etc. to do business = squeezes small businesses out = fewer players = more concentrated supply chain & larger facilities = more risk for widespread contamination	
	Keeping animals away from produce makes industrial sense, not ecological sense (animals manure feed crops/ crops feed animals = solution from nature)	
	Mutually exclusive solutions – a) small farms b) federal watch dog with more authority	
	Produce scare could frighten people into doing something more dangerous than eating spinach: not eating it. People need access to cheap, safe produce and that means industrial farming. {horizontal issue: health – long term}	Dissuading the public from eating fresh produce (even temporarily) may have unintended consequences (e.g., lasting fears about eating fresh vegetables). Fresh produce does much more good than harm.
	Regulation promotes bigness: smaller producers consolidate to cope with burden	
October 20 th , 2006	According to the GAO federal responsibility for food safety is scattered across 15 agencies	Too many organizations involved in food safety can increase coordination costs; increase the likelihood of error; lost information; obscure accountability.
	Call to consolidate	
October	Specimens from California ranch test positive for	

27 th , 2006	particular strain in E coli deaths, including specimens from gut of a wild pig. Pigs were confirmed to have broken in and eaten spinach.	
	Consumers surprised that organic does not equal small business after Earthbound Farms (organic), a conglomerate of 185 growers, recalled spinach.	
December 7 th , 2006	Meat industry is regulated by the Department of Agriculture for processing and slaughter. The produce industry is not subject to similar regulations by the FDA who oversee the safety of fruits & veg	
December 11 th , 2006	FDA realized need to improve safety of packaged produce, but budget cuts and competing demands kept the project from moving forward {potential red flag: CFIA cuts}	

A second E. coli outbreak occurred in 2006. The second time the outbreak was contained to Taco Bell.

Date	Detail	Extractable Observation
December 5 th , 2006	E coli outbreak at Taco Bell kills two	
December 7 th , 2006	99 cases of e coli; green onions removed from menu	
December 13 th , 2006	More sophisticated tests suggest onions were not contaminated; culprit of e coli outbreak may never be known. This type of change in message can confuse the public. Businesses (like Taco Bell) have to react in the face of media scrutiny and economic losses, but they don't have all of the information. {lessons: managing risk without information/ credibility of industry compromised/ public trust in what they hear in media}	<p>Consistency and control are important. If government identifies a source of the outbreak quickly, but the government is wrong, its credibility is compromised.</p> <p>If government waits to be more certain before sharing information with the public, it may be criticised for a lack of transparency or worse withholding information that compromised the safety of citizens.</p>

Publication: *The New York Times*

5.0 Key Themes (Daily): Listeriosis

Event: Listeria contamination Maple Leaf (2008)

Each row in the following table represents an article that appeared in *The Globe and Mail* on the date listed. The 'Detail' column provides a brief summary of the article's key information, and the 'Extractable Observations' column provides some thematic insight into the article that may apply to other Food Contamination events.

Table 4: Key Themes (Daily): Listeriosis

Date	Detail	Extractable Observation
August 20 th , 2008	Maple Leaf issues recall and shuts down operations after 1 death and 16 illnesses are reported. - Symptoms listed in article	
	Document about proposed cuts to food inspection granting industry greater control over meat inspection.	Criticism of government begins almost immediately, with internal leaks being a possible source. Strategic and budgetary decisions made prior to the event may see increased scrutiny.
August 22 nd , 2008	Second death suspected of being linked to the outbreak, others being investigated as well. Origin still not identified. Elderly identified as susceptible.	
	Opposition criticizes government over proposed cuts to Canadian Food Inspection Agency (CFIA). Food safety advocate also criticizes government.	The political timing (e.g. election year) of the event may influence the quantity and tone of coverage.
August 23 rd , 2008	Four deaths confirmed. Maple Leaf issued warning to distributors prior to full recall. Head of union for CFIA inspectors claim department is short-staffed and that follow-up audits are not occurring.	Groups may use the event as an opportunity to further their interests (e.g. unions and their opposition to proposed budget cuts and recent changes in inspection procedure.
August 25 th , 2008	Information about incubation period, and average number of cases per year in BC.	
	Maple Leaf definitively linked to outbreak, issues public apology.	
August 26 th , 2008	FAQ on listeriosis. Article claims 12 deaths linked to the outbreak	
	6 confirmed deaths. The article is questioning the government's timing in informing the public – four days after Maple Leaf and distributors were notified – and criticizing government for praising its quick response.	The first highly critical editorial is written within a week. The media is beginning to question the government's communication of contamination risks to the general public. Positive self-assessments by government of performance may be received negatively.
	Government accused of "lack of leadership."	

	Contamination believed to be linked to one plant in Toronto.	
	Timeline	
August 27 th , 2008	Article detailing risks of sandwich-eating.	The coverage broadens its scope, moving away from contaminated meats to potential hazards around other types of food, such as produce.
	Government failed to learn from previous outbreaks in US. Scientists claim Canada failed to adopt similar policies implanted in US after 1998 outbreak. New CFIA audit system also blamed for a less “hands on” role.	The media begins reporting on past occurrences and lessons identified in these past events. The assessment of government’s ability to learn from past mistakes or other jurisdictions begins.
	Article about potential cases of younger (29 and 36 years old).	
August 28 th , 2008	Breakdown of provincial reactions – BC had previously advised hospitals and senior care facilities not to serve luncheon meats to seniors due to fears of listeria. In Quebec fears of listeriosis has spread to cheeses. In Alberta calls were being made to advise/warn of the recall, especially to those at high risk. Saskatchewan CFIA began coordinating with provincial government to monitor recall in hospitals and long-term care facilities.	Health departments will likely receive positive coverage for detecting and responding to a potential contamination. The analysis of how governments in various provinces are handling the event begins, such as specific actions being taken by CFIA in Saskatchewan.
	Personal accounts of listeriosis infection. Nationwide lawsuit launched against Maple Leaf Foods	A lawsuit is filed within the first week.
August 29 th , 2008	Reports leaked that Canada government along with Canadian Meat Council had lobbied the US to reduce standards for meat inspection.	More reports are leaked which highlight the conflict between government’s role as public health regulator and promoter of the economy.
	Ontario government criticized as being slow to respond to outbreak.	
August 30 th , 2008	University professor claims that Canada is failing at identifying food-related risks. Another professor suggests that Canada could have done more to warn high-risk persons, particularly pregnant women. Canadian system compared unfavourably to US.	Experts begin offering analysis of food standards and inspection in Canada and comparing them to the US.
	Article praising Michael McCain’s handling of the outbreak. Seen as dismissing recommendations, going above and beyond expectations in response.	Government may be compared to industry in its response to an event.
	9 deaths in ON, 1 in AB, 1 in BC. CFIA warned three BC communities not to eat certain sandwiches	Potential listeria contaminations are receiving increased attention.

	linked to another potential contamination at King Bean Wholesalers – a recall was issued as well.	
September 2 nd , 2008	Another death confirmed in ON.	
	Identified as potential election issue. Though poll indicates that public believes Conservatives (22%) would be most likely to aggressively monitor food supply (compared to 20% Liberals and 15% NDP).	
September 3 rd , 2008	Class action lawsuits in 6 provinces with over 1700 plaintiffs. The company “has all kinds of insurance.”	
September 4 th , 2008	Harper vows to launch “tainted meat inquiry” once infections have subsided. PM places blame on Maple Leaf but says an inquiry about Ottawa’s role is necessary, positioning himself as a concerned father.	Plans for a public inquiry are announced two weeks after the recall.
	Heightened food scrutiny as CFIA issues recall on mushrooms that may be contaminated with listeria. Improper handling of food by consumers considered a major food-borne illness risk. - A list of risky produce provided.	Informative articles are broadening the scope to educate the public on the prevalence of listeria.
September 5 th , 2008	Opposition using outbreak as an election issue. Union representing CFIA inspectors still arguing that new procedures have inspectors doing less physical inspections. Health ministers from provinces meeting with Canadian Minister of Health to discuss possible coordination.	Interest groups are still getting media attention about changes to operations that have led to decreased physical inspections.
	Cheese recall – CFIA says there is typically 3 to 4 recalls a year due to listeria, as opposed to 3 to 4 per month.	
September 6 th , 2008	Meat slicers at all Maple Leaf foods slicing facilities to be dismantled and sanitized. Another potential listeria contamination identified at a grocery store in Labrador.	
September 8 th , 2008	An unrelated listeriosis outbreak related to cheese in Quebec has a potential 24 reported cases, including 2 babies. Information provided about recalled brands. Maple Leaf identifies 2 meat slicing machines as the likely source of contamination.	
	Listeria crisis coupled with strong dollar and rising input costs are challenges for the meat packing industry.	
September 9 th , 2008	Breakout is causing increased safety regulations at grocers. Toronto Public Health indicates there are no	

	regulations for deli slicer cleaning.	
	2 elderly women die from listeriosis due to tainted cheese.	
September 10 th , 2008	Maple Leaf releases company investigation into outbreak. Company followed slicer manufacturer (Formax S-180) sanitization instructions, but the slicers became contaminated in areas that could not be cleaned easily and had never been dismantled for cleaning because the instructions did not require this.	Industry may identify a sole source of contamination. Media attention may focus more narrowly on the prevalence of that risk, in this case deli-slicers.
September 11 th , 2008	CFIA criticized for lack of transparency and slowness in informing the public. Government also criticized for giving industry too much authority on releasing food-borne pathogen information. Government compared unfavourably to Maple Leaf and Michael McCain in taking responsibility. Praise for Public Health in catching the illnesses quickly.	Comparisons may be made between government and industry response to the event.
September 12 th , 2008	Another cheese recall in Quebec	
September 13 th , 2008	Recall of frozen dinners for Meals on Wheels	
September 17 th , 2008	Death in NB linked to Maple Leaf/ Listeriosis.	
September 18 th , 2008	Maple Leaf reopens plant; vows to implement higher safety standards than those currently employed.	
September 20 th , 2008	Another leak about proposed meat-inspection cuts in BC, Manitoba, and Saskatchewan. Leaked by a union.	Region-specific criticism may arise, surrounding proposed budget cuts or operational changes. In this instance it was information leaked by a union.
	BC senior dies.	
September 22 nd , 2008	Experts say there is a crisis in the safety of the Canadian food supply. Cited as having low standards compared to many other nations. Believed to have inadequate surveillance systems.	Comparison to standards across a wider array of jurisdictions may occur as media becomes more familiar with the subject.
September 27 th , 2008	Health officials in Ontario ordered hospitals and nursing homes to stop serving Maple Leaf meats 5 days prior to the recall. Identify potential conflict of interest for CFIA in protecting economic interests and informing the public of potential health risks. CFIA argued that recalls must be “based on science.”	Conflict of interest for CFIA again identified as issue.

October 9 th , 2008	Four new samples test positive for listeria at reopened Maple Leaf plant. Product from this plant had not yet entered the market.	
October 10 th , 2008	Michael McCain comments on positive tests at reopened facility. Says negative media aimed at CFIA disproportionate to their share of blame.	
October 13 th , 2008	Maple Leaf considers listeria-curbing additive recently approved by Health Canada	Coverage may begin focusing on potential improvements in technology that could mitigate the risk in the future.
October 22 nd , 2008	Maple Leaf plant resumes distribution	
October 23 rd , 2008	More details on class action suit against Maple Leaf	
December 19 th , 2008	Lawsuit settled for \$27 Million	

Publication: *The Globe and Mail*

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6.0 Note about the Authors

Kevin Quigley is an associate professor and acting director of the School of Public Administration at Dalhousie University. In 2008 he published *Responding to Crises in the Modern Infrastructure: Policy Lessons from Y2K* (Palgrave). Quigley specializes in public sector risk, strategic management and critical infrastructure protection. He has published in respected academic journals, such as *Public Administration* and *Health, Risk & Society*. As principal investigator, he has secured over \$450,000 in research grants and contribution agreements over the last five years in the area of risk, resilience and CIP. His recent projects include *Risk Governance in Theory and Practice: Connecting Canadian and UK Risk Networks to Improve the Resilience of Critical Infrastructure* (SSHRC Partnership Development Grant); *Critical Infrastructure Protection in Comparative Perspective: Contextual Factors that Influence the Exchange of Sensitive Information* (SSHRC Standard Operating Grant); *A Multi-Disciplinary Approach to Risk Governance: Best Practices, Workshops and On-line Training* (Innovative Public Management Research Fund, Canada School of Public Service) and *Critical Infrastructure Protection: Building Information-Sharing Networks across Sectors and Jurisdictions* (Innovative Public Management Research Fund, Canada School of Public Service). He is the editor of the professional publication *The CIP Exchange* and the co-founder of the *CIP Initiative* at Dalhousie University. As part of this initiative, Dr. Quigley has hosted numerous CI events at Dalhousie. He is also a co-investigator of several other interdisciplinary risk-related research and public administration projects. Quigley has worked with government departments such as the Canada School of Public Service, Department of Foreign Affairs and International Trade, Defence Research and Development Canada, Public Safety Canada, Treasury Board Secretariat and the Government of Nova Scotia's Public Service Commission. His work on risk and CI has also been funded by the Economic and Social Research Council in the UK. He has been invited to speak on CI issues in several countries. Prior to starting graduate work, Kevin Quigley was a senior public servant in the Ontario Public Service. Among other responsibilities, he was Project Lead on Walkerton at Cabinet Office Communications.

Last year and as noted above, Quigley was awarded a SSHRC Partnership Development Grant valued at \$200,000 over three years. In this role, Quigley will lead a team of interdisciplinary scholars including an actuary, an industrial psychologist, an accountant and an industrial engineer who will examine five types of CI failures: bridge collapses, offshore oil spills, floods, pandemics and supply chain failures. The project includes a number of formal partners in Canada and the UK.

John Quigley is a professor and an industrial statistician at the University of Strathclyde. He received his BMath (Hons) in Actuarial Science from the University of Waterloo and his PhD in Management Science from Strathclyde. His main research expertise is in statistical inference, applied probability modeling and elicitation of prior probability distributions. In particular, he is interested in decision support methodologies with few observed data. He has extensive experience in modeling risk and reliability problems with decision-makers in the military, aerospace and railway industries. John is an Associate of the Society of Actuaries, a Chartered Statistician, and a member of the Safety and Reliability Society and

the Institute of Mathematical Statistics. He has been involved in consultancy with companies such as NASA, MoD, DSTL, Railway Safety Standards Board, BAE SYSTEMS, Goodrich, Siemens and Fairhurst. His recent publication “Estimating the Probability of Rare Events: Addressing Zero Failure Data” published in *Risk Analysis*, was shortlisted for the *Lloyds Science of Risk Prize* in Insurance Operations

Emily Pond was the lead researcher on the E coli case in this publication. Emily graduated from the MPA program at Dalhousie in 2011 and is a full-time research assistant for the *CIP Initiative* at the School of Public Administration

Colin Macdonald was the lead researcher on the Listeriosis case in this publication. He is a recent graduate of the MPA program at Dalhousie and a part-time research assistant at the School of Public Administration.

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7.0 Recommended Readings

Report of the Independent Investigator into the 2008 Listeriosis Outbreak
http://www.listeriosis-listeriose.investigation-enquete.gc.ca/lirs_rpt_e.pdf

Investigation of an Escherichia coli O157:H7 Outbreak Associated with Dole Pre-Packaged Spinach
http://www.marlerclark.com/2006_Spinach_Report_Final_01.pdf

Walkerton Commission of Inquiry
<http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/>

Improvements Needed in FDA Oversight of Fresh Produce
<http://www.gao.gov/assets/290/281865.pdf>

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Appendix 1: List of Events in Critical Infrastructure/Emergency Management (CI/EM) Database

- Pandemics
 - H1N1 UK
 - H1N1 US
 - H1N1 Australia
 - H1N1 Canada
- Natural Disasters
 - 2003 Canberra Bushfires
 - Hurricane Juan
 - 2007 UK Flooding
 - 2007 California Wildfires
- Industrial Failures
 - Potter's Bar Train Wreck (UK)
 - Waterfall Train Accident (AUS)
 - De la Concorde Overpass Collapse (Montreal)
 - Mississippi River Bridge Collapse (Minneapolis)
- Food Safety Issues
 - Maple Leaf/ Listeriosis Outbreak
 - 2007 North American E. coli outbreaks
- Chemical Disasters
 - Melbourne Chemical Spill
 - Toronto Propane Explosion
 - Buncefield Explosion (UK)
 - Texas City Oil Refinery Explosion
- Terrorist Conspiracies
 - Sydney Five
 - Toronto 18
 - Liberty City Seven (Sears Tower)
 - Transatlantic Flights Plot
- Cyber Attack
 - Ghostnet
 - Conflicker Computer Worm
 - Albert Conzalex (Hacker/Fraud)
 - CRA Software Defect 2007

Appendix 2: Methods for This Research Paper

We reviewed approximately 2000 newspaper articles from four different newspapers. We accessed the coverage of these events by using the Factiva database to search within a leading national newspaper in each country: *The Australian*, *The Globe and Mail* (Canada), *The Daily Telegraph* (UK), and *The New York Times*. These are all high-distribution newspapers and opinion leaders in each of the respective countries.¹ We identified our sample by drawing on all articles that appeared in the period of one year following the date at which each event began and that included in the article the term(s) most commonly used to refer to the event. For example, in addition to the “De la Concorde Overpass Collapse”, we used the terms “Montreal Bridge Collapse” or “Montreal Bridge.” We eliminated any articles that were clearly not principally about the event. These types of events tend to appear in large numbers of articles during the year in which they occurred for instance but the references to the events are often ‘asides’ in articles that are principally about something else. In all cases we chose to examine articles that were principally about the event in question.

For the analysis of the headlines, we drew on the analytical framework of Rowe, Frewer and Sjoberg (2000), which examines not only volume but also media tone and content when considering how risks² are communicated to the public. Headlines were categorized in one of four ways: alarming; reassuring; alarming and reassuring; neither alarming nor reassuring. We reduced the impact of the bias in assessments by using several strategies. We assessed all the articles during a short and fixed period of time (between February and August 2010). We also developed a standard template and applied it to all articles. All results were stored in an Access database that we developed and maintain. One research assistant classified all articles in *The Australian*; one classified all articles in *The Globe and Mail*; and one classified all articles in *The Daily Telegraph* and *The New York Times*. While this approach introduces some consistency in the analysis within each newspaper, it fails to have the same level of consistency across newspapers. The group did meet initially, however, to review articles together to introduce some level of consistency. The group also met occasionally throughout the assessment period to discuss the review process. Nevertheless, because different individuals assessed different newspapers we are hesitant to make strong comparative claims across the newspapers.

A few methodological constraints on the headline content analysis bear noting. First, and as noted in the literature review above, what constitutes alarming is often in the eye of the beholder. In general, we judged headlines to be alarming when they used dramatic language and implied the potential of a negative outcome or that the event and the consequences were ‘out of control.’ As best as possible, we tried to wear the hat of the newspapers’ (relatively broad) target audience and not that of an expert. While there were some difficult judgments, most headlines were categorized easily. Second, headlines are dramatic. Just because a headline is alarming it does not follow that the entire article is alarming.

¹ Local media coverage may well yield different results but they are not part of this particular research project.

² Rowe, Frewer and Sjoberg (Roux- Dufort, 2007) examine how science and technology risks are communicated to the public.

For analysis of the content of the articles, we counted the number of articles that referred to various key terms. The key search terms were selected based on conventional items that were relevant to public administration and risk management. We also determined whether key actors—such as government and owners and operators in CI sectors—were assessed positively, negatively or neutrally. (N/A was also an option.) To summarize the performance data, a value of + 1 was assigned to each article that was on the balance a positive assessment for each key public or private CI entity and a value of -1 to each article that was on the balance a negative assessment. (Neutral assessments were given 0.) We then calculated the total net sum, adding the number of positive and negative assessments together. We also present the data as a ratio (negative to positive assessments).

For analysis of the key themes of the two food contamination events, one research assistant analyzed articles in *The Globe and Mail* that pertained to Listeriosis (see pages 29 – 33). The analysis covered 12 weeks of media coverage beginning when the outbreak first appeared in that publication. The research assistant took note of the date when important details were reported and made extractable observations based on those details. Another research assistant analyzed articles in *The New York Times* that pertained to E. Coli (see pages 21 -28). The analysis covered 12 weeks of media coverage beginning when the outbreak first appeared in that publication. This research assistant followed the same methodology as the research assistant analyzing listeriosis.

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