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**The Effect of Consumers' Trust on Stated Responses to Food Safety Incidents: Case of
Meat in Canada and the U.S.**

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Abstract

In this study the effect of consumers' trust in agencies on risk perceptions, risk attitudes and self-reported responses to food safety events is assessed. The particular focus is on how trust has influenced self-reported reductions in consumption of beef in the U.S. and Canada, and pork in Canada arising from food safety concerns. Data for this analysis was collected through online surveys and was analysed using tobit and probit models. Results show that general trust significantly influences risk perceptions and risk attitudes about beef and pork consumption in Canada and beef consumption in the U.S. Although there are some variations in results, trust in agencies significantly influence risk perceptions, risk attitudes and reductions in consumption of beef and pork in Canada and beef in the U.S. Compared to males, female respondents have higher risk perceptions and lower risk attitudes about beef and pork in Canada and beef in the U.S. and were more likely to reduce their pork consumption in Canada and beef in the U.S. Respondents that recalled a food safety event had higher risk perceptions and significantly reduced their meat consumption in both countries. Respondents that perceived the consumption of beef and pork as being risky reported that they had significantly reduced their consumption of these meats while those that were more willing to accept the risks of consuming these meats reported that they had not changed their consumption levels. Results suggest that risk perceptions, risk attitudes and trust play significant roles in terms of influencing consumer response to food safety concerns. The occurrence of food safety incidents in one period can influence consumer responses to later food safety incidents through the effect on changing risk perceptions, risk attitudes and trust in the food system.

1.0 Introduction

Food industries in Canada and the U.S. have been affected by perceived food safety events such as BSE and real food safety incidents such as *Salmonella*, *Listeria* and *Escherichia coli* (*E. coli*). There have been a number of recalls of food products in Canada and the U.S. due to problems ranging from microbial infections, presence of chemicals, allergens and extraneous materials among others (Table 1 and Table 2). Recurrence of food safety events or food recalls might compromise consumers' perceptions about the safety of food. The issue of food safety is important for public health especially for vulnerable populations (Antle, 2001). According to Antle (2001), there might be imperfect information or information asymmetries which exist when either the producer or consumer might have more information about the safety of the food product. On the other hand, imperfect information exists when both sellers and buyers do not have equivalent information about the safety of the food product. (Patterson and Hiebert, 2012) state that most Canadians are not aware of food safety initiatives and traceability systems used in the food supply chain. Consumers trust in general or trust in agencies involved in the supply of food might play an important role in cases where there is imperfect information or information asymmetry since it might simplify the consumer's decisions about consuming a given product after a food safety event.

Table 1 approximately here

Table 2 approximately here

The issue of consumers' trust in food agencies has been shown to significantly influence confidence in the safety of food (de Jonge, 20008a; de Jonge 2008b and Aubeeluck, 2010) and perceptions about product and on farm production attributes (Aubeeluck, 2010 and Romanowska, 2009). In addition consumers' trust has been shown to significantly influence risk

perceptions or perceived risk (e.g. Setbon et al., 2005), risk attitudes, intentions to purchase products or to adopt protective measures (van der Weerd et al., 2011; Stefani et al., 2008) and acceptance of technologies such as genetic modification (Poortinga and Pidgeon 2005).

Other studies have linked issues such as risk perceptions and risk attitudes to consumer behaviour in the presence of or after food safety events. Schroeder et al. (2007) and Pennings et al. (2002) analysed the factors (e.g. risk perceptions and risk attitudes) that determined self-reported reductions in beef consumption due to food safety concerns and due to BSE respectively. Yang and Goddard (2011a) used a predictive difference approach to analyse the effect of the quantity and quality of BSE information on consumer BSE risk perceptions under the Social Amplification of Risk Framework. Their results showed that the quantity and quality of BSE media information either attenuated or amplified consumer BSE risk perceptions. Consumer risk perceptions were amplified by BSE information from national media and about 'devastated' farmers and scientists. Although the effect was not very large as compared to other sources of information, BSE information from the government attenuated consumer's risk perceptions. Yang and Goddard (2011b) found that risk attitudes and risk perceptions influenced household purchasing behaviour. The researchers found that more risk averse consumers had more elastic beef demand and they were more willing to substitute beef for other meats as compared to less risk averse consumers. However, few studies have analysed the linkages between general trust, trust in agencies (the government, farmers, retailers and manufacturers), risk perceptions, risk attitudes, recall of food safety events and consumers' self-reported behaviour in case of food safety events which is the aim of this study. The study focuses on the self-reported food safety responses for beef in the U.S. and beef and pork in Canada. Although

this research is similar to research by Schroeder et al. (2007) and Pennings et al. (2002), the research adds the dimensions of general trust and trust in food agencies to the analysis. The research also contributes to the literature on the effect of trust on consumer behaviour in cases where there are food risks. Although it is difficult to change people's trust, monitoring people's trust in general or trust in food agencies might suggest the extent of consumer's potential responses to food safety events. Understanding the effect of consumers' trust in food agencies on their response to food safety events is important to being able to understand food purchasing and consumption, particularly in the event of future food safety incidents.

1.1 Conceptual framework

Trust, which is a form of social capital is important in the food system in cases where there are market failures due to information asymmetries, for example in terms of quality of products and credence attributes such as production systems and food safety (Janssen and Hamm, 2012). Trust is important in an individual's decision making in situations where there is risk and uncertainty such as food safety events because it simplifies the process of considering complex information in the decision making process ((Lewis and Weigert, 1985 and Savadori et al., 2007).

Trust is defined by Rousseau et al. (1998, pg 395) as "... a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another". In the context of a food safety event, it has been pointed out that there are three levels of trust (individual trust, structural/ system oriented trust and relational trust) (Kjaernes and Dulsrud, 1998; Savadori et al., 2007). Individual trust refers to a person's attitude towards a product (decision to eat or not eat if the person suspects that a product is affected by a food

safety crisis) while system oriented or structural trust refers to people's trust in food producers and the government with regards to guaranteeing food safety (Savadori et al., 2007).

Previous studies have shown that respondents that trust are more confident in the safety of foods (de Jonge et al., 2008a and de Jonge et al. 2008b). In cases where consumers trust in general or trust agencies, they might not significantly reduce their consumption of meat products due to food safety concerns. In this study, it is assumed that general trust and trust in agencies significantly influences consumers risk perceptions and risk attitudes and also directly influences reduction in meat consumption due to food safety concerns (Fig 1).

Following the studies by Pennings et al. (2002) and Schroeder et al. (2007), it is assumed that risk perceptions (positively) and risk attitudes (negatively) influence reduction in meat consumption due to food safety concerns. In this context, risk perception refers to the degree to which people perceive eating meat as risky while risk attitudes refer to the degree to which they are willing to accept the risks about eating it. People who perceive beef or pork consumption as risky are likely to have reduced their consumption of these meats due to food safety concerns over the past years. Those that are more willing to accept the risks of consuming these meats might have maintained their consumption of the meats due to the food safety concerns.

Figure 1 approximately here

de Jonge et al. (2008b) found that respondents that recalled a food safety event were less optimistic and more pessimistic about the safety of food in Canada and the Netherlands as compared to those that did not recall any food safety event. It is therefore assumed in this study that respondents that recalled a food safety event are assumed to have decreased their

consumption of meat products. It is also assumed that since women have been shown to be more risk averse in previous studies, they decreased their consumption of beef more as compared to their male counterparts due to food safety concerns. Studies have also shown that older respondents are more risk averse as compared to younger respondents. In this study it is hypothesized that older respondents reduced their consumption of meat more than younger respondents in their response to food safety concerns. It is also hypothesized that respondents that have children less than 18 years old reduced their consumption of meat more than those that do not have children. Lastly, it is assumed that respondents that live in rural areas did not reduce their beef or pork consumption as compared to those that live in urban areas.

2.0 Data

Data for this study was collected in Canada (2011) and in the U.S. (2010) through online surveys. Sample sizes were 1603 in Canada and 1079 in the U.S. Surveys were conducted on major household food shoppers through market research companies. Data was collected on demographic characteristics of respondents, their trust in food agencies, general trust, their recall of food safety events, risk perceptions, risk attitudes, whether they had lowered their consumption of beef and pork over the past four or five years.

Table 3 approximately here

The samples are representative of people aged between 25 and 49 years in both countries and people living in urban and rural areas. The U.S. sample is roughly representative of the population in terms of gender. Both samples are not representative of the population in terms of people aged between 18-24 years and are over-representative of people aged over 50 years of age. The samples are not representative of respondents who attained elementary school or junior

high. However, although the samples are not representative of the overall population in Canada and the US, results presented in this study provide information for the demographic segments represented in Table 3.

3.0 Trust in general and trust in food agencies

General trust was assessed by asking respondents the General Social Survey question (Glaeser et al., 2000) which is stated as follows “Generally speaking would you say that most people can be trusted?” (1) people can be trusted, (2) can’t be too careful in dealing with people, (3) don’t know. These three responses were collapsed into one variable (general trust) such that the option that people can be trusted becomes “yes” while the other two options become “otherwise”. Trust in the government, retailers, manufacturers and farmers is assessed using six constructs that were adopted from de Jonge (2008) which assess people’s perceptions about the competence, knowledge, care, attention, openness and honesty of these agencies with regards to the safety of food. Responses were anchored on a five point Likert item (1. strongly disagree.....5. strongly agree).

Results show that more Canadians have higher trust in people in general as compared to U.S. respondents (Table 4). General trust results from the Canadian sample are similar to results obtained from the General Social Survey that was conducted by Statistics Canada in 2008. A study by Statistics Canada (2003) found that 56% of the population stated that most people can be trusted. Males and people aged 45-64 years were more trusting than females and other age groups respectively and Canadians were more trusting than respondents from other countries such as Germany, US, Italy, United Kingdom and France. For the U.S., current results on

general trust are higher than the results from the U.S. 2010 General Social Survey (General Social Survey, 2010).

Table 4 approximately here

Table 5 approximately here

Farmers in Canada and the U.S. and manufactures in Canada were ranked highly in terms of having competence in controlling the safety of food (Table 5). Manufactures in both countries were ranked highly in terms of having the knowledge to guarantee the safety of food. In both countries, farmers were ranked highly in terms of being honest, taking good care and paying attention to the safety of food. However, US respondents ranked retailers highly in terms of being open about the safety of food.

For trust measured with equal weights on all elements, Canadian respondents trust their government and manufacturers more than U.S. respondents (Table 6). U.S. respondents had more trust in retailers as compared to Canadian respondents. Respondents in both countries trusted farmers more than the government, retailers and manufacturers.

Table 6 approximately here

Results also show that there are significant positive relationships (Table 7 and Table 8) between the trust variables (general trust, trust in the government, trust in farmers, trust in retailers and trust in manufacturers). Correlations between general trust and trust in agencies are lower than correlations between trust in the different agencies.

Table 7 approximately here

Table 8 approximately here

3.1 Risk perceptions and risk attitudes about beef and pork in Canada and the U.S.

Following Pennings et al. (2002) and Schroeder et al. (2007), risk perceptions about consuming beef and pork were assessed by asking respondents three questions that were phrased as follows: (i) When eating...(beef/pork), I am exposed to 1. very little risk....5. a great deal of risk. (ii) I think eating...(beef/pork) is risky 1. strongly disagree...5. strongly agree. (iii) For me, eating ...(beef/pork) is ...1. not risky.....5. risky. Risk attitudes are measured using the following questions (i) I accept the risks of eating ...(beef/pork) 1. strongly disagree....5. strongly agree. (ii) For me, eating(beef/pork) is worth the risk 1. Strongly disagree.....5. strongly agree. (iii) I amthe risk of eating(beef/pork) 1. not willing to accept.....5. willing to accept. Risk perception and risk attitude indices were calculated by averaging the responses to the questions outlined above across the US and Canadian samples and results are summarised in Table 8.

Results show that U.S. respondents have higher risk perceptions about consuming beef as compared to Canadian respondents while their willingness to accept the risks of consuming beef are the same between the two countries (Table 9). In Canada, respondents perceive pork consumption to be riskier as compared to beef consumption and respondents are less willing to accept the risks of consuming pork. Schroeder et al. (2007) compared risk perceptions among four countries, Canada, U.S., Mexico and Japan. Results showed that Canadian respondents perceived beef as being safer (had lower risk perceptions) as compared to respondents from the other three countries. However, American respondents were slightly less risk averse than Canadian respondents. Muringai and Goddard (2011) compared risk perceptions between Canada (2006 and 2009 data) and Japan and found that Canadians perceived eating beef as less risky and they were more willing to accept the risks of consuming beef. Pennings et al. (2002)

compared risk perceptions and risk attitudes across three countries (U.S., Netherlands and Germany). Results showed that American respondents were more risk averse than Dutch respondents and less risk averse than German respondents. American respondents perceived beef consumption as less risky than German respondents and vice versa for Dutch respondents. Yang and Goddard (2011a) examined risk attitudes and perceptions in Canada and found a risk perception index (RPI) of 2.00 and risk attitude index (RAI) of 3.46. In summary, results generally suggest that Canadian perceive beef consumption as less risky as compared to American respondents. Comparing current results with Yang and Goddard (2011a) and Muringai and Goddard (2001), risk perceptions for beef are higher in this study and risk attitudes are higher than results from Yang and Goddard (2011a) and lower than results from Muringai and Goddard (2011).

Table 9 approximately here

3.2 Reduction in consumption of meat in Canada and the U.S.

Approximately 25% of the respondents reduced their consumption of beef due to food safety concerns over the previous four years (2006-2009) in the US. In Canada, approximately 17.7% and 14.6% of the respondents lowered their pork and beef consumption respectively due to food safety concerns over the previous five years (2006-2010). Schroeder et al. (2007) found that 19.6% of respondents in Canada and 20.6% of respondents in the U.S. had reduced their consumption of beef relative to the previous four years due to food safety concerns. Pennings et al. (2002) found that 17.8% of U.S. respondents had reduced their consumption of beef due to the BSE crisis (survey was conducted in January and February 2001). Muringai and Goddard (2011) found that 20% of Canadian respondents and 61% of Japanese respondents reduced their

consumption of beef due to food safety concerns (2005-2008). Therefore, current results on the percentage of people that reduced beef consumption due to food safety concerns are higher for the US and lower for Canada as compared to previous results.

Approximately 37% of the Canadian respondents and 50% of American respondents recalled a food safety event (Table 10). Most beef and pork recalls were due to Listeria outbreaks while most recalls of beef in The U.S. were due to *E. coli*. Recall of meat safety incidents (beef and pork in Canada and beef in the U.S.) by respondents are positively related to actual meat recalls in both countries.

Figure 2 approximately here

3.3 Factors that influence risk perceptions, risk attitudes and response to food safety events

Tobit models were used to determine the factors that influence risk perceptions and risk attitudes about beef and pork in Canada and beef in the U.S. since there could be some truncation in the responses and the responses are bounded by 0 and 5. The tobit models are represented as follows:

$$y_i^* = x_i' \beta + \varepsilon_i$$

$$y_i = \begin{cases} y_i^*, y_i^* > \gamma \\ 0, y_i^* \leq \gamma \end{cases}$$

β represents the vector of coefficients while x represents independent variable (age, gender, presence of children aged less than 18 years of age, education, where the respondents lives, recall of a food safety event, general trust and trust in agencies).

Table 10 approximately here

Table 11 approximately here

Regression models were used to assess the factors that influence whether or not the respondents reduced their consumption of beef in the U.S. (probit regression) and beef and pork in Canada (bivariate probit regression model) since the dependent variables are binary (1. yes, 0. otherwise). In Canada, respondents were asked about both meats while U.S. respondents were asked about beef only. The bivariate probit model was used in Canada since there might be correlations between error terms between the equations on the self-reported reductions in beef and pork consumption. In the first model, the 6 constructs of trust in each agency (competence, knowledge, care, openness, attention and honesty) were summed and a trust variable was developed for each actor. In the second model, two trust variables were created for each actor i.e. competence (which includes competence and knowledge) and trust (which includes care, openness, attention and honesty). This was done because de Jonge (2008a) found these were different constructs in Canada.

According to Greene (2008), a probit model can be represented as follows:

$$\text{Pr ob}(y = 1 | x) = F(x, \beta), \text{ Pr ob}(y = 0 | x) = 1 - F(x, \beta)$$

where $F(x, \beta) = x' \beta$

A bivariate regression model is represented as follows:

$$y_1^* = x_1' \beta_1 + \varepsilon_1, y_1 = 1 \text{ if } y_1^* > 0, 0 \text{ otherwise}$$

$$y_2^* = x_2' \beta_2 + \varepsilon_2, y_2 = 1 \text{ if } y_2^* > 0, 0 \text{ otherwise}$$

$$E[\varepsilon_1 | x_1, x_2] = E[\varepsilon_2 | x_1, x_2] = 0, \text{ Var}[\varepsilon_1 | x_1, x_2] = \text{Var}[\varepsilon_2 | x_1, x_2] = 1,$$

$$\text{Cov}[\varepsilon_1, \varepsilon_2 | x_1, x_2] = \rho$$

β represents the vector of coefficients while x represents the vector of independent variables, in this case being female, age, education, number of children less than 18 years of age, recall of food safety events, trust in agencies, risk perceptions, risk attitudes and an interaction term between risk perceptions and risk attitudes.

Table 12 approximately here

Table 13 approximately here

Table 14 approximately here

Results show that female respondents perceived beef and pork consumption as risky and they were more risk averse as compared to male respondents in both countries (Table 11 and Table 12). Older respondents perceive beef consumption in the U.S. as less risky and are more willing to accept the risks of consuming beef in the U.S. and pork in Canada. Respondents that had children aged less than 18 years perceived pork consumption as being less risky and were more willing than those without children to accept the risks of consuming pork in Canada. Respondents that recalled a food safety event had higher risk perceptions about beef and pork in Canada as compared to those respondents that did not recall a food safety event. In both countries, general trust in people is negatively related to risk perceptions and positively related to risk attitudes. This implies that respondents that generally trust people perceive consumption of beef in the U.S. and beef and pork in Canada as being less risky and are more willing to accept the risks of consuming these meats as compared to respondents that do not generally trust people.

For trust measured with equal weights on all elements, trust in farmers and manufactures strongly influence risk perceptions (negatively) and risk attitudes (positively) in both countries. Respondents that trust farmers and manufacturers perceive eating beef and pork in Canada and beef in the US as less risky and they are more willing to accept the risks of consuming these meats.

From the second set of regressions with two trust variables (competence and trust which is measured by care, openness, attention and honesty), respondents that perceive retailers to be competent with regards to food safety perceive consumption of beef and pork in Canada and beef in the U.S. to be less risky and are more willing to accept the risks of consuming these meats. Respondents that perceive the government to be competent have higher risk perceptions and lower risk attitudes for beef and pork in Canada and higher risk perceptions for beef in the U.S. However, respondents that trust (with four constructs (care, openness, attention and honesty) the government and farmers perceive beef and pork consumption in Canada as less risky and are more willing to accept the risks of consuming those meats. Trust in manufacturers is negatively related to risk perceptions about beef and pork in Canada and beef in the U.S while trust in retailers is negatively related to risk perceptions about beef in both countries. Trust in farmers is negatively related to beef risk perceptions in the U.S.

From the model with trust measured with equal weights on all elements, respondents that trust the government reduced their consumption of beef more than those that have less trust in the government in the U.S. (Table 13). Compared to respondents that have less trust in retailers in the U.S., respondents that have more trust in retailers did not reduce their consumption of beef

due to food safety concerns. From the second set of regressions (Table 14), competence and knowledge of retailers and the government seem to play a significant role on reductions of beef consumption in the U.S. Trust (in terms of care, openness, attention and honesty) in government is significantly positively related to reductions in pork consumption in Canada.

Compared to male respondents, female respondents in Canada and the U.S. more frequently significantly reduced their consumption of pork and beef respectively over the past four or five years due to food safety concerns. Respondents that recalled a food safety event reduced their consumption of beef due to food safety events more than those who did not recall any event in both countries. Being female and recall of a food safety event increases the probability of reducing the consumption of beef due to food safety concerns by 7% in the U.S. Canadian respondents living with children less than 18 years old reduced their consumption of beef due to food safety concerns. Education and living in an urban area increase the probability of reducing consumption of beef and pork respectively in Canada.

People with higher risk perceptions about beef and pork in Canada and beef in the US reduced their consumption of the meats more than those that had lower risk perceptions. Respondents with higher risk attitudes (more willingness to accept the risks) did not reduce their consumption of beef and pork in Canada over the past five years and beef in the U.S. over the past four years due to food safety concerns. The interaction term between pork risk perceptions and risk attitudes in Canada significantly influence the reduction in consumption of pork due to food safety concerns. Studies by Schroeder et al. (2007) and Muringai and Goddard (2011) also found that people's risk perceptions and risk attitudes about beef affect their probability of reductions

in consumption of beef due to food safety concerns. Schroeder et al. (2007) found that risk perceptions and risk attitudes significantly influenced people's decisions to consume beef in Canada and the U.S. while the interaction term between risk perceptions and risk attitudes significantly influences people's reduction in beef consumption due to food safety concerns in both countries. Pennings et al. (2002) found that risk attitudes negatively influenced the reduction of beef consumption due to BSE in the US. Kalogeras (2010) compared the effect of risk perceptions, attitudes and the interaction term between the two on participation and consumption reduction decisions between two periods (2001-pre-phase and 2004-incipient phase) in the US and Canada during a BSE crisis. Results showed that risk attitudes significantly influenced both the participation and consumption decision in 2001 and not in 2004. Risk perceptions significantly influenced the participation and consumption decision in 2004. The interaction term between risk perceptions and risk attitudes significantly influenced the participation and consumption decision in both periods. In a 2008 study, Kalogeras also found that risk attitudes and risk perceptions significantly influence reduction in consumption of beef due to BSE and time was an important component on the effect risk perceptions and attitudes on the behavior of consumers. In summary, results from this analysis are consistent with other studies in terms of the effect of risk perceptions and risk attitudes on reduction in consumption of beef due to food safety concerns.

4.0 Conclusion

In this study the aim was to determine the effect of consumers' trust in general and trust in agencies (farmers, the government, retailers and manufacturers) on their risk perceptions, risk

attitudes and decisions to lower consumption of beef in the U.S. and beef and pork in Canada. Data was analysed using tobit and probit models.

In summary, general trust significantly influence risk perceptions (negatively) and risk attitudes (positively) about beef and pork in Canada and beef in the U.S. Although there are some variations in the results, trust in agencies influence risk perceptions, risk attitudes and reduction in the consumption of beef and pork in Canada and beef in the U.S. Being female significantly influences reductions in pork and beef consumption in Canada and beef in the U.S. due to food safety concerns. Recall of a food safety event was positively related to reductions in beef and pork consumption in Canada. Risk attitudes (negatively) and risk perceptions (positively) influenced the reductions in meat consumption in both countries. The interaction term between risk attitudes and risk perceptions was negatively related to reductions in pork consumption in Canada.

In summary, this study show that there is a certain proportion of the population that reduced their consumption of beef in Canada (14.6%) and the U.S. (25%) and pork in Canada (17.7%) due to food safety concerns. There have been meat recalls in both countries especially with regards to Listeria in Canada and *E.coli* in the U.S. and other issues like BSE which affected beef industries. The costs of food safety incidents may be borne by industries for a longer time period and consumers' perceptions about safety of products might be gradually eroded as successive food safety incidents occur. Trust plays a significant in terms of risk perceptions, risk attitudes and reduction in beef and pork consumption. Based on recalls, pork and beef in Canada should

have same profiles since consumers' recall of food safety events is positively related to risk perceptions.

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Table 1: Beef and pork recalls in Canada, 2006-2011

	2006	2007	2008	2009	2010	2011
Beef						
Allergens		5	1	5	3	1
<i>E. coli</i>		2	4		4	2
<i>Listeria</i>			26	10	15	6
<i>Clostridium Botulinum</i>	1	1	1		2	
Extraneous material				1		1
Tampering						
<i>Total</i>	<i>1</i>	<i>8</i>	<i>32</i>	<i>16</i>	<i>24</i>	<i>10</i>
Pork						
Allergens	2	6			3	
<i>E. coli</i>						
<i>Listeria</i>	1		27	15	19	11
<i>Salmonella</i>		2	3		1	
Tampering	1				2	
Other					1	
<i>Total</i>	<i>4</i>	<i>8</i>	<i>30</i>	<i>15</i>	<i>26</i>	<i>11</i>

Source: Own computations from data from Canada Food Inspection Agency, 2007-2012, available at <http://www.inspection.gc.ca/english/corpaffr/recarapp/recal2e.shtml>

Table 2: Beef and pork recalls in the U.S., 2006-2011

	2006	2007	2008	2009	2010
Beef					
Allergens	3		1	1	5
<i>E. coli</i>	8	22	15	16	12
<i>Listeria</i>	1	1	3	3	2
<i>Salmonella</i>				3	2
Other microbiological					
Extraneous material/unapproved substance	1	1		2	1
Tampering					
Other	2	2	5	9	6
Total	15	29	24	34	28

United States Department of Agriculture Food Safety and Inspection Service (2012), available at http://www.fsis.usda.gov/fsis_recalls/Recall_Case_Archive_2010/index.asp

Table 3: Summary statistics for demographic variables as compared to the national population

		Canada		U.S.	
		Sample	Population	Sample	Population
Gender of respondent	Male	39.5	49.5	47.5	49.1
	Female	60.5	50.5	52.5	50.9
Age of respondent	18-24	4.8	13.7	4.4 ^a	13.9 ^a
	25-29	5.5	6.9	2.2	52.2
	30-39	14.3	13.6	7.8	
	40-49	16.9	16.0	12.7	
	50-64	37.5	19.5	32.3	
	65+	21.0	14.3	40.6	12.4
Number of home-living children <18years	0	73.9	38.5	81.1	54.0
	1	12.3	27.3	8.8	19.0
	2	9.2	24.0	6.4	17.0
	3	3.1	10.3	2.6	9.0
	4	1.0		0.7	
	More than 4	0.5		0.4	
Education level attained by respondent	Elementary or junior high school	2.6	23.7	1.1	14.5
	High school	29.5	25.5	23.1	29.6
	Technical training / Business School / Community college	36.5	28.0	39.4	27.5
	University	23.6	16.0	24.3	17.3
	Post Graduate studies (Masters or PhD)	7.7	6.5	12.1	10.1
	Household income	\$ 24,999 or under	14.5	9.9	24.1
	Between \$ 25,000 and \$ 39,999	18.8	14.0	23.5	16.2
	Between \$ 40,000 and \$ 64,999	26.5	36.5	23.8	20.9
	Between \$ 65,000 and \$ 79,999	14.05		9.5	9.0
	Between \$ 80,000 and \$ 99,999	11.2	13.4	7.3	8.7
	Between \$ 100,000 and \$ 119,999	7.7	26.1	6.1	6.4
	\$ 120,000 or more	7.2		5.6	13.8
Where the household live?	In a city (>100,000 inhabitants)	62.6	80	43.5	80
	In a town (> 10,000 inhabitants)	18.7		34.0	
	In the countryside / rural	18.7	20	22.5	20

area

a- includes people aged 15-24 years old; Sources: Statistics Canada (2006); Statistics Canada (CANSIM) (2009); U.S. Census Bureau (2009); U.S. Department of Commerce (2001)

Table 4: Generally speaking, would you say that most people can be trusted?

	Canada		U.S.	
	Sample (n=1603)	2008 General Social Survey ^a	Sample (n=1603)	General Social Survey ^b
1-Yes	45.85	46.50	41.03	31.42
0-otherwise	54.15	53.50	58.94	68.58

^a Statistics Canada (2009); US General Social Survey (2010), <http://www3.norc.umd.edu/gss+website>

Table 5: Results on the 6 constructs of trust in Canada and the U.S (1. strongly disagree5. strongly disagree)

	Canada (n=1603)						US (n=1079)					
	Government	Farmers	Retailers	Manufacturers	Government	Farmers	Retailers	Manufacturers	Government	Farmers	Retailers	Manufacturers
have the competence to control the safety of food	3.44 (0.98)	3.61 (0.80)	3.30 (0.89)	3.61 (0.84)	3.23 (1.04)	3.64 (0.80)	3.34 (0.88)	3.59 (0.84)	3.23 (1.04)	3.64 (0.80)	3.34 (0.88)	3.59 (0.84)
have sufficient knowledge to guarantee the safety of food products	3.56 (0.95)	3.60 (0.82)	3.32 (0.87)	3.65 (0.83)	3.33 (1.01)	3.59 (0.80)	3.35 (0.91)	3.62 (0.86)	3.33 (1.01)	3.59 (0.80)	3.35 (0.91)	3.62 (0.86)
are honest about the safety of food	3.04 (0.96)	3.43 (0.79)	3.04 (0.83)	3.02 (0.89)	2.95 (1.00)	3.47 (0.79)	3.14 (0.85)	3.00 (0.90)	2.95 (1.00)	3.47 (0.79)	3.14 (0.85)	3.00 (0.90)
are sufficiently open about the safety of food	3.03 (0.98)	3.40 (0.81)	2.99 (0.86)	2.98 (0.92)	2.93 (1.01)	3.41 (0.78)	3.55 (0.88)	2.94 (0.93)	2.93 (1.01)	3.41 (0.78)	3.55 (0.88)	2.94 (0.93)
take good care of the safety of our food	3.17 (0.95)	3.53 (0.78)	3.16 (0.81)	3.25 (0.85)	2.97 (0.97)	3.41 (0.80)	3.26 (0.85)	3.21 (0.86)	2.97 (0.97)	3.41 (0.80)	3.26 (0.85)	3.21 (0.86)
give special attention to the safety of food	3.23 (0.95)	3.47 (0.79)	3.16 (0.85)	3.30 (0.85)	3.10 (0.98)	3.50 (0.78)	3.21 (0.86)	3.23 (0.87)	3.10 (0.98)	3.50 (0.78)	3.21 (0.86)	3.23 (0.87)

Standard errors are in parentheses

Table 6: Trust in agencies in Canada and the U.S. (aggregate of all six statements)

Trust in	U.S. (n=1079)	Canada (n=1603)	U.S. vs Canada
	Mean	Mean	Welsh t statistic
The government	18.52 (4.99)	19.45 (4.82)	-4.81
Farmers	21.08 (3.91)	21.04 (4.00)	0.24
Retailers	19.43 (4.24)	18.97 (4.22)	2.76
Manufacturers	19.58 (4.19)	19.81 (4.20)	-1.40

Table 7: Correlation between trust variables in the U.S.

	General trust	Government	Farmers	Retailers	Manufacturers
General trust	1				
Government	0.1738*	1			
Farmers	0.1694*	0.2981*	1		
Retailers	0.2034*	0.4597*	0.5356*	1	
Manufacturers	0.1815*	0.5220*	0.5505*	0.6570*	1

*significant at 1% level of significance

Table 8: Correlation between trust variables in Canada

	General trust	Government	Farmers	Retailers	Manufacturers
General trust	1				
Government	0.1721*	1			
Farmers	0.1559*	0.4137*	1		
Retailers	0.1935*	0.5645*	0.4782*	1	
Manufacturers	0.1712*	0.6358*	0.4962*	0.6825*	1

*significant at 1% level of significance

Table 9: Risk perceptions and risk attitudes for meats in Canada and the U.S.

	U.S.	Canada		Canada vs U.S.	Canada
	Beef Mean	Beef Mean	Pork Mean	Beef t-statistic	beef vs pork t-statistic
RPI	2.53 (0.98)	2.38 (1.02)	2.52 (1.06)	3.99	-3.92
RAI	3.55 (0.99)	3.55 (1.05)	3.37 (1.10)	-0.08	4.68

Table 10: Summary statistics for variables in the model

	Canada (n=1603) (Mean/%)	U.S. (n=1079) (Mean/%)
Age (years)	49.99 (13.21)	54.63 (12.57)
% female	60.45%	52.46%
Presence of children <18years (yes)	26.01%	18.91%
Education (years)	14.03 (2.07)	14.44 (2.01)
Living in an urban area (% yes)	81.35%	77.48%
Recall of a food safety event (% yes)	37.06%	49.95%
Trust in the government (5-strongly disagree...30 strongly agree)	19.45 (4.82)	18.52 (4.99)
Trust in farmers (5-strongly disagree...30 strongly agree)	21.04 (4.00)	21.08 (3.91)
Trust in retailers (5-strongly disagree...30 strongly agree)	18.97 (4.22)	19.43 (4.23)
Trust in manufacturers (5-strongly disagree...30 strongly agree)	19.81 (4.20)	19.58 (4.19)
Beef risk perception index (RPI) (1-low risk perception...5-high risk perception)	2.38 (1.02)	2.53 (0.98)
Beef risk attitude index (RAI) (1-low attitude...5-high risk attitude)	3.55 (1.05)	3.55 (0.99)
Pork risk perception index (RPI) (1-low risk perception...5-high risk perception)	2.52 (1.06)	-
Pork risk attitude index (RAI) (1-low attitude...5-high risk attitude)	3.37 (1.10)	-

Standard errors are in parentheses

Table 11 Tobit model results on the factors influencing meat risk perceptions and risk attitudes in Canada and the US

	Canada Beef (n=1603)		Canada Pork (n=1603)		U.S. Beef (n=1079)	
	Risk perceptions	Risk attitudes	Risk perceptions	Risk attitudes	Risk perceptions	Risk attitudes
Constant	3.64*** (0.28)	2.34*** (0.25)	3.87*** (0.28)	1.76*** (0.27)	4.71*** (0.31)	1.44*** (0.28)
Age	-0.01 (0.02)	0.03 (0.02)	-0.03 (0.03)	0.06*** (0.02)	-0.09*** (0.03)	0.09*** (0.02)
Female	0.19*** (0.06)	-0.34*** (0.05)	0.19*** (0.06)	-0.31*** (0.06)	0.31*** (0.06)	-0.28*** (0.06)
Presence of children <18years	-0.10 (0.07)	0.10 (0.07)	-0.13* (0.08)	0.12* (0.07)	-0.13 (0.09)	0.10 (0.08)
Education	0.02 (0.03)	0.02 (0.03)	0.004 (0.03)	0.05 (0.03)	-0.05 (0.03)	0.05 (0.03)
Living in an urban area	0.11 (0.08)	-0.06 (0.07)	0.04 (0.08)	-0.10 (0.07)	0.12 (0.08)	0.01 (0.07)
Recall of a food safety event	0.17*** (0.06)	0.07 (0.05)	0.17*** (0.06)	-0.04 (0.06)	0.08 (0.06)	-0.02 (0.06)
General trust	-0.35*** (0.06)	0.22*** (0.06)	-0.27*** (0.06)	0.17*** (0.06)	-0.18*** (0.07)	0.15*** (0.06)
Trust in the government	-0.003 (0.008)	0.003 (0.01)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	-0.004 (0.007)
Trust in farmers	-0.02*** (0.009)	0.03*** (0.01)	-0.022*** (0.009)	0.04*** (0.01)	-0.03*** (0.01)	0.04*** (0.01)
Trust in retailers	-0.01 (0.01)	-0.01 (0.01)	0.003 (0.01)	-0.01 (0.01)	-0.02** (0.01)	0.003 (0.01)
Trust in manufacturers	-0.05*** (0.01)	0.04*** (0.01)	-0.05*** (0.01)	0.05*** (0.01)	-0.06*** (0.01)	0.05*** (0.01)
Pseudo R ²	0.04	0.03	0.03	0.03	0.06	0.05

*** Indicates significant at 1%, **significant at 5%, and *significant at 10%, standard errors are in parentheses and are robust for heteroskedasticity

Table 12: Tobit model results on the factors influencing meat risk perceptions and risk attitudes in Canada and the US

	Canada Beef (n=1603)		Canada Pork (n=1603)		U.S. Beef (n=1079)	
	Risk perceptions	Risk attitudes	Risk perceptions	Risk attitudes	Risk perceptions	Risk attitudes
Constant	3.55*** (0.29)	2.39*** (0.30)	1.78*** (0.03)	1.84*** (0.29)	4.65*** (0.30)	1.40*** (0.28)
Age	-0.004 (0.03)	0.03 (0.02)	-0.03 (0.03)	0.06*** (0.02)	-0.09*** (0.02)	0.09*** (0.02)
Female	0.17*** (0.06)	-0.33*** (0.05)	0.18*** (0.06)	-0.30*** (0.06)	0.30*** (0.06)	-0.28*** (0.06)
Presence of children <18years	-0.09 (0.07)	0.09 (0.06)	-0.12 (0.08)	0.11 (0.07)	-0.12 (0.08)	0.11 (0.08)
Education	0.03 (0.03)	0.01 (0.03)	0.01 (0.03)	0.04 (0.03)	-0.04 (0.03)	0.04 (0.03)
Living in an urban area	0.12 (0.08)	-0.07 (0.07)	0.05 (0.08)	-0.11 (0.07)	0.11 (0.08)	0.003 (0.07)
Recall of a food safety event	0.16*** (0.06)	0.07 (0.05)	0.16*** (0.06)	-0.03 (0.06)	0.07 (0.06)	-0.03 (0.06)
General trust	-0.34*** (0.06)	0.21*** (0.05)	-0.27*** (0.06)	0.17*** (0.06)	-0.16** (0.07)	0.14** (0.06)
Competence-Government	0.04* (0.024)	-0.06*** (0.02)	0.05** (0.02)	-0.06*** (0.02)	0.07*** (0.03)	-0.03 (0.02)
Competence-Farmers	0.04 (0.03)	-0.02 (0.03)	0.01 (0.03)	-0.01 (0.03)	-0.01 (0.03)	0.07** (0.03)
Competence-Retailers	0.03 (0.03)	-0.01 (0.02)	0.02 (0.03)	-0.02 (0.03)	0.02 (0.03)	-0.03 (0.02)
Competence-Manufacturers	-0.08*** (0.03)	0.10*** (0.02)	-0.05* (0.03)	0.09** (0.03)	-0.08*** (0.03)	0.11*** (0.03)
Trust in the government	-0.02* (0.01)	0.03** (0.01)	-0.04*** (0.01)	0.04*** (0.01)	-0.019 (0.014)	0.01 (0.01)

Trust in farmers	-0.05*** (0.01)	0.06*** (0.01)	-0.04*** (0.01)	0.06*** (0.016)	-0.04*** (0.016)	0.02 (0.016)
Trust in retailers	-0.03* (0.016)	-0.01 (0.02)	-0.001 (0.02)	-0.01 (0.02)	-0.04*** (0.017)	0.02 (0.02)
Trust in manufacturers	-0.03* (0.02)	0.02 (0.02)	-0.04*** (0.016)	0.02 (0.02)	-0.04*** (0.017)	0.02 (0.015)
Pseudo R ²	0.04	0.04	0.03	0.04	0.07	0.06

*** Indicates significant at 1%, **significant at 5%, and *significant at 10%, standard errors are in parentheses and are robust for heteroskedasticity

Table 13: Factors influencing reduction in meat consumption due to food safety concerns

Variable	Canada			U.S.	
	Pork	Beef	Marginal effects Pr($y_1=1 y_2=1$)	Beef	Marginal effects
Constant	-1.24*** (0.46)	-1.72*** (0.49)	-	-1.42** (0.67)	-
Age	0.03 (0.03)	0.03 (0.04)	0.01	0.01 (0.04)	0.003
Female	0.15* (0.09)	0.13 (0.09)	0.02	0.23*** (0.09)	0.07***
Presence of children <18years	0.21** (0.10)	0.22** (0.10)	0.04	-0.12 (0.12)	-0.03
Education	-0.01 (0.04)	0.07* (0.04)	0.04**	0.02 (0.05)	0.005
Living in an urban area	0.19* (0.11)	0.01 (0.11)	-0.06	-0.08 (0.11)	-0.02
Recall of a food safety event	0.28*** (0.08)	0.29*** (0.08)	0.05	0.26*** (0.09)	0.07***
General trust	-0.11 (0.09)	0.02 (0.09)	0.05	-0.08 (0.10)	-0.02
Trust in the government	-0.01 (0.01)	-0.01 (0.01)	-0.002	0.02* (0.01)	0.01*
Trust in farmers	0.01 (0.01)	0.01 (0.01)	0.004	0.017 (0.015)	0.005
Trust in retailers	0.001 (0.01)	-0.01 (0.01)	-0.01	-0.04*** (0.01)	-0.01***
Trust in manufacturers	-0.005 (0.02)	0.003 (0.02)	0.003	-0.003 (0.02)	-0.001
Pork RPI	0.21*** (0.08)		-0.07***		
Pork RAI	-0.41*** (0.08)		0.13***		
Pork RPI*RAI	0.05** (0.02)		-0.02*		
Beef RPI		0.31*** (0.09)	0.16***	0.48*** (0.16)	0.14***
Beef RAI		-0.30*** (0.09)	-0.15***	-0.25* (0.14)	-0.07**
Beef RPI*RAI		0.01 (0.03)	0.01	-0.002 (0.05)	-0.001
rho	0.79*** (0.03)				
Pseudo R ²				0.18	

Likelihood ratio test of $\rho=0$: $p = 0.000$; *** Indicates significant at 1%, **significant at 5%, and *significant at 10%. Standard errors are in parentheses and are robust for heteroskedasticity, RPI-risk perception index, RAI-risk attitude index

Table 14: Factors influencing reduction in meat consumption due to food safety concerns

Variable	Canada			U.S.	
	Pork	Beef	Marginal effects Pr($y_1=1 y_2=1$)	Beef	Marginal effects
Constant	-1.33*** (0.46)	-1.77*** (0.50)		-1.32** (0.68)	
Age	0.02 (0.03)	0.02 (0.03)	0.003	0.004 (0.04)	0.001
Female	0.15* (0.09)	0.12 (0.09)	0.01	0.22** (0.09)	0.06**
Presence of children <18years	0.22** (0.10)	0.22** (0.10)	0.04	-0.11 (0.12)	-0.03
Education	-0.01 (0.04)	0.07 (0.05)	0.04*	0.01 (0.05)	0.004
Living in an urban area	0.20* (0.11)	0.02 (0.11)	-0.06	-0.09 (0.11)	-0.03
Recall of a food safety event	0.28*** (0.08)	0.27*** (0.09)	0.05	0.22** (0.09)	0.06**
General trust	-0.11 (0.09)	0.01 (0.09)	0.04	-0.06 (0.11)	-0.02
Competence- Government	0.04 (0.03)	0.03 (0.03)	0.004	0.09** (0.04)	0.02**
Competence- Farmers	0.02 (0.04)	0.003 (0.04)	-0.005	0.05 (0.05)	0.02
Competence- Retailers	-0.02 (0.04)	-0.01 (0.04)	-0.001	-0.08** (0.04)	-0.02**
Competence- Manufacturers	-0.01 (0.04)	0.04 (0.04)	0.03	-0.02 (0.02)	0.01
Trust in government	-0.03* (0.018)	-0.03 (0.02)	-0.004	-0.01 (0.02)	-0.003
Trust in farmers	0.005 (0.02)	0.02 (0.02)	0.008	-0.005 (0.02)	-0.001
Trust in retailers	0.01 (0.02)	-0.01 (0.02)	-0.009	-0.02 (0.02)	-0.01
Trust in manufacturers	-0.001 (0.02)	-0.02 (0.02)	-0.008	-0.02 (0.02)	-0.004
Pork RPI	0.22*** (0.08)		-0.07***		

Pork RAI	-0.40*** (0.08)		0.13***		
Pork RPI*RAI	0.046* (0.025)		-0.01*		
Beef RPI		0.30*** (0.09)	0.15***	0.44*** (0.17)	0.13***
Beef RAI		-0.31*** (0.09)	-0.15***	-0.29*** (0.14)	-0.08**
Beef RPI*RAI		0.02 (0.03)	0.01	0.006 (0.05)	0.002
rho	0.79*** (0.03)				
Pseudo R ²				0.19	

Likelihood ratio test of rho=0: p = 0.000; *** Indicates significant at 1%, **significant at 5%, and *significant at 10%. Standard errors are in parentheses and are robust for heteroskedasticity, RPI-risk perception index, RAI-risk attitude index

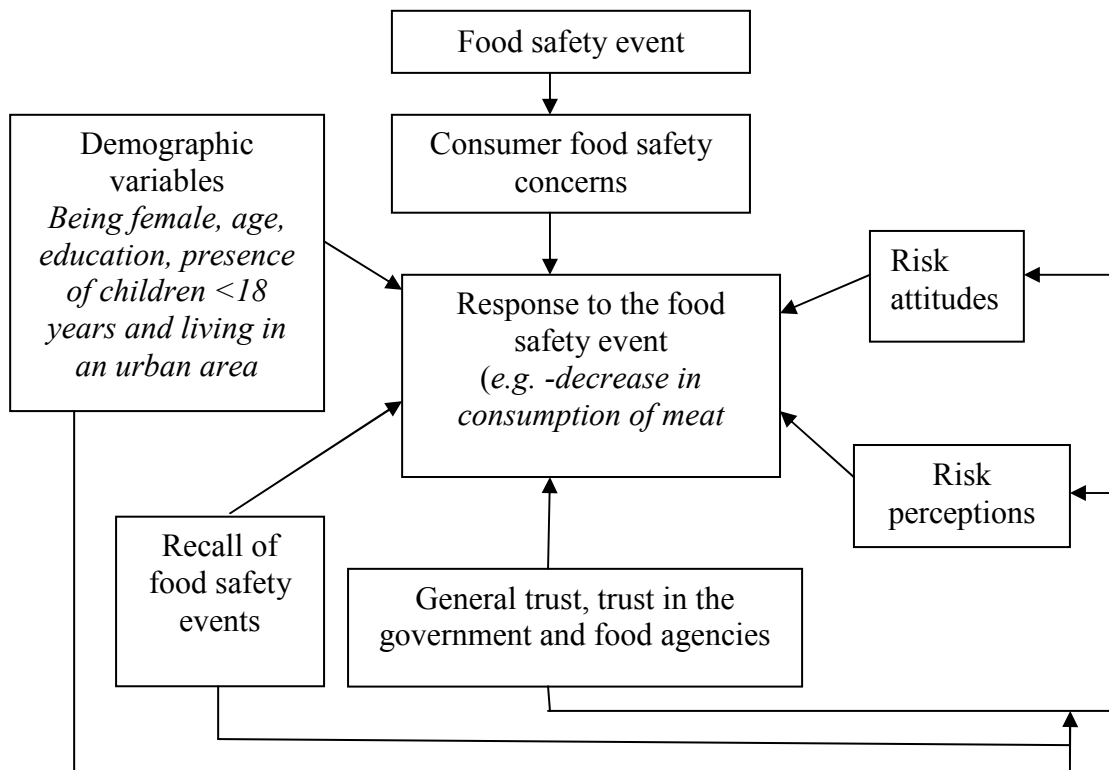


Fig 1: Conceptual framework

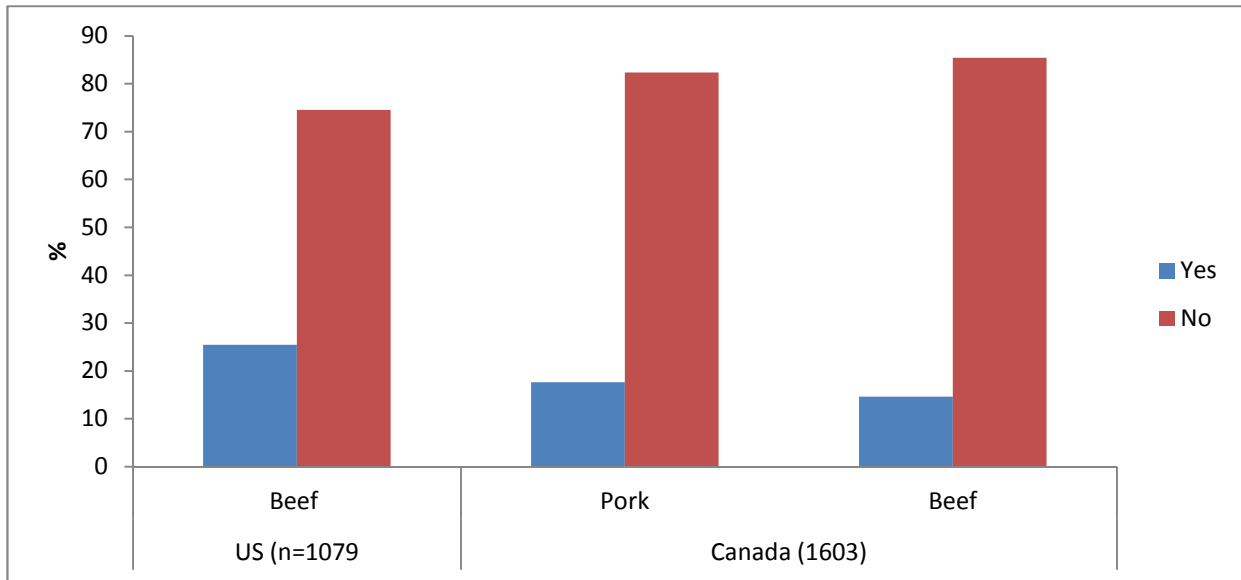


Fig 2: Over the past four/five years, have you lowered your beef/pork consumption because of food safety concerns?