

Understanding intentional food contamination attitudes: applying Ajzen's Theory of Planned Behavior to a sample of fruit and vegetable industry workers

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ABSTRACT

As a way of understanding the potential antecedents of intentional acts of food contamination, a framework that employs tenets of Ajzen's (1985) Theory of Planned Behavior (TPB) was utilized to assess employees' attitudes about committing such acts. In a sample of 123 employees from various links along a fruit and vegetable industry supply chain between Mexico and the United States, we found industry commitment and moral norm to be antecedents to attitudes toward intentional food contamination. We also found that both perceived behavioural controls (i.e. security measures) and attitude toward intentional food contamination positively related to intention to contaminate food. The value of applying the TPB model to this context is discussed.

KEYWORDS: Food defence; food security; perceived behavioural control; behavioural intentions

1. Introduction

Large scale product recalls are an increasing concern for both international and US based food companies as well as government agencies. While the effect of a recall can be significant in the US market, the impact on export markets worldwide can be devastating (Manning, Baines, and Chadd, 2005). Unintentional biological or chemical contamination of our food supply is an issue that has garnered much attention in recent times (Manning *et al*, 2005). However, scholars agree that both unintentional and intentional contamination of food systems is a distinct possibility that needs to be evaluated and analyzed at every level of preparedness planning (Bruemmer, 2003). Even though our food supply is much safer at this time than it has ever been, the public might not necessarily view it as such (Hutter, 2004). Arguably, this may be partially due to acts of intentional contamination from individuals or disgruntled employees that are reported in the media. There are many different dysfunctional behaviours that can be considered as injurious in workplace settings (Griffin and Lopez, 2005). Voluntary employee behaviours that violate organizational norms, such as intentional food contamination, can threaten the well-being of any organization, its members, or an industry (Robinson and Bennet, 1995). Recent examples of tainted food (e.g. tomatoes, peppers) in the US food supply clearly demonstrate the severe psychological and

financial impact that unintentional food contamination can have on consumers. As such, tied to the need to secure the integrity of any food supply chain are concerns about those individuals that have access to food along any food supply chain. Although large scale unintentional food contamination has occurred more frequently than intentional contamination in the past, the threat of intentional food contamination is real (Lyonga, Nganje, Sellnow, Kaitibie, and Vinette, 2006). Although there is some research on biological security and risk assessment of food supply systems that are vulnerable to deliberate food contamination (Elad 2005; Kennedy and Busta 2007; Manning *et al* 2005; Sobel, Khan and Swerdlow 2002), no research to date has examined the decision making process of individuals as it relates to intentional food contamination. Therefore, through use of a theoretical framework aimed at predicting behavioural intentions, this paper seeks to understand attitudes and intentions of individuals as they relate to smaller scale isolated intentional contamination events. By understanding how individual attitudes toward intentional food contamination may contribute to this phenomenon, perhaps prevention of such acts could be achieved.

Research on attitudes toward intentional contamination is not only timely, but also necessary for the protection of our global food supply chain. Moreover, no research has examined the attitudes and intentions of the individual or individuals that may be considering an

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act of intentional food contamination for produce that crosses borders. As a way of understanding the potential antecedents of such intentional acts of food contamination, a framework that employs tenets of Ajzen's (1985) Theory of Planned Behavior (TPB) will be utilized to assess employees' attitudes about committing such acts. The TPB has been utilized extensively in an effort to understand what factors motivate behaviour. The details of the TPB will be discussed later. Although other frameworks that focus on a more criminal aspect of intentional food contamination could be applied here, the attitude, subjective norms, and perceived behavioural control components of the theory provide a strong structure for our research.

Therefore, this research applies the framework of Ajzen's theory in order to better understand how an individual's attitudes, subjective norms and perceived behavioural control may impact their disposition to intentionally contaminate food within a produce supply chain. By doing so, we hope to add support to TPB literature by including a novel application that warrants attention. Moreover, the practical knowledge that can come from this research could be applied to preventing acts of intentional food contamination. This study is part of a larger study focused on assessing food defence for border transfer on the United States southern border. As such, we deemed it appropriate to test our model on this sample. Specifically, this study examines a sample of workers employed in a fruit and vegetable industry supply chain that handle produce traversing the Mexican border in to the southwest United States.

International Food Supply Chains

In recent years, food supply chains have experienced an increasing trend toward expanded global sourcing of food items (Manning, Baines, and Chadd, 2005). Improvements in modes of transportation along with trade have allowed for the importing of food from international markets into the U.S. food supply to be more available. Moreover, because changes in international markets have led to an increase in the demand for agricultural products domestically, the proliferation of willing international suppliers has increased. As a result, global expansion has worked to extend the length and complexity of food supply chains and has elevated the possibility of intentional food contamination, including the fruit and vegetable industry.

In the United States, fruit and vegetables comprise a large group of food products that are imported on a regular basis throughout the year. About twenty percent of all fruits and almost twenty-five percent of all vegetables are transported in to the US annually. The farm value of these fresh fruit and vegetables reached \$35 billion dollars in 2007 (NFAPP, Baseline Book, 2007), with this figure expected to exceed \$40 billion by 2016. Additionally, as a result of these increasingly complex supply chains, responding to food emergencies is becoming more and more challenging. Consequently, the inability to respond quickly to food contamination emergencies, whether from an intentional or natural source, could have detrimental consequences to public health as well as trade practices in many countries (World Health Organization, 2002). In essence, understanding factors that contribute to the

possibility of intentional food contamination could be very beneficial.

Although the United States has initiated several private and public efforts to mitigate the risk of a food emergency within the US food supply, imported foods are increasingly becoming vulnerable to intentional contamination. Examples of public sector investments in the United States include the Public Health Security and Preparedness Act of 2002; the Customs Trade Partnership against Terrorism (C-TPAT), the Container Security Initiative (CSI) along with several federal and state funded research initiatives (Dorgan, 2002; Koch, 2002). These efforts have increased in an attempt to prevent intentional food contamination by identifying the potentials risks involved in the movement of food products. By applying Ajzen's theory of planned behaviour to understanding attitudes toward intentional food contamination, we too seek to contribute practical knowledge. As such, understanding how and why individuals contemplate intentional food contamination in the first place could lead to a better realization of how to prevent occurrences of such acts.

Ajzen's Theory of Planned Behaviour

Ajzen's (1985, 1991) Theory of Planned Behaviour (TPB) is an extension of Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA). The TPB posits that *behavioural intentions* are the main determinants of behaviour. An individual's intentions are in turn determined by one's attitude toward the behaviour, subjective norms, and perceived behavioural control. In essence, people do things that they intend to do and do not do things that they do not intend to do. *Attitude* is the person's overall evaluation of what it would be like to perform a particular behaviour (e.g. 'It would be good/bad for me to do X'), while *subjective norm* is the person's perception of social pressure to perform the behaviour (e.g. 'Most people who are important to me think that I should do X'). *Perceived behavioural control* represents perceptions regarding the ease or difficulty of performing the target behaviour. Along with intention, perceived control is regarded as a co-determinant of behaviour, although the perceived control-behaviour relationship is dependent on the accuracy of people's perceptions of control (Ajzen, 1985).

From an empirical perspective, the TBP model has received a substantial amount of support, and has been successfully applied across a wide array of situations in an attempt to predict diverse human behaviour (Ajzen, 1991, 2002; Armitage and Conner, 2001; Conner and Armitage, 1998; Ravis and Sheeran, 2003). For example, the TBP has been applied to understanding computer abuse within organizations (Lee and Lee, 2002), binge drinking among young people (Norman, Bennett and Lewis, 1998), people's recycling behaviour (Tonglet, Phillips and Bates, 2004), the use of illicit substances (Orbell, Blair, Sherlock, and Conner, 2001), and software piracy in the workplace (Peace, Galleta and Thong, 2003). By applying this framework to understanding potential acts of intentional food contamination, we seek to contribute to a better understanding of the cognitive processes that potential perpetrators of such acts might go through. Doing so would not have practical implications, but this research would add to

the rich literature that has garnered support for this robust theoretical framework.

TBP and Intentional Food Contamination

As noted earlier, Ajzen’s Theory of Planned Behaviour (1985, 1991) has distinct components that are posited to impact a person’s behaviour with one’s intention being the immediate antecedent to that behaviour. In recent years, examples of outbreaks resulting from intentional food contamination illustrate how effectively food can be used to wreak havoc. Moreover, a wide range of people for a variety of reasons have committed these acts of intentional food contamination. Some examples of perpetrators include, cult members in 1984 injecting *Salmonella* into food in a salad bar in Oregon in an attempt to influence election outcomes, a disgruntled employee in 1996 contaminating pastries in a Texas hospital causing cases of Shigella dysentery, a baker in 2002 contaminating the flour of a competitor with rat poison killing thirty-eight people, and a Michigan grocery store employee intentionally contaminating 200 pounds of meat in 2003 with insecticide causing over 100 people to become ill. These examples illustrate the diversity of the individual’s willingness and ability to commit such acts of food contamination once they have intended to do so. Therefore, the need to better understand intentional food contamination from the perspective of the Theory of Planned Behaviour seems warranted. Arguably, the application of the TPB can provide valuable insight into the thought processes behind intentional food contamination behaviour.

2. Proposed Model and Hypothesis Development

To our knowledge, this is the first application of the TPB to examine intentional food contamination so it must be considered exploratory in nature. As such, the choice of non-directional hypotheses seems justified. This application of Ajzen’s TPB to intentional food contamination is visually depicted in Figure 1. This figure is similar to one previously used by Bailey (2006).

As with other applications of the TPB framework, our model suggests that intention to engage in food

Understanding intentional food contamination attitudes can be impacted by an individual’s attitude toward that behaviour, the subjective norms associated with that behaviour, and the perceived ease or difficulty of engaging in the act itself. As previous research has shown, the inclusion of additional antecedent variables can add to a better understanding of one’s intention to behave in a particular way (Ajzen, 2002; Bailey, 2006; Landridge *et al*, 2007). As such, we have chosen two additional variables to include in our model and the rationale for their inclusion will be explained below.

Generally speaking, favourable attitudes and supportive group norms can influence a strong intention to perform followed by actual performance of a behaviour (Stone, Jawahar and Kisamore, 2008). However, perceived behavioural control can impact both the level of one’s intentions as well as the intentions to behaviour relationship. For example, a disgruntled employee may have a favourable attitude toward contaminating food that is shared by his co-workers, but the level of security measures that monitor the food distribution may make intentional contamination extremely unlikely.

Individual Factors

As previously mentioned, TPB allows for additional variables to be included in the model and researchers have done so with much support (Ajzen, 2002; Bailey, 2006; Landridge *et al*, 2007). Accordingly industry commitment and moral norm have been included as factors that contribute to one’s attitude toward intentional food contamination. A brief discussion on the inclusion of these individual factors in our model follows.

Industry commitment

The industry commitment scale utilized in this study was derived from the organizational commitment scale that gauges an individual’s degree of loyalty to his/her particular employer. Because the food supply chain examined in this study includes entities such as field workers, growers, truckers, and distributors that contribute collectively to the fruit and vegetable industry, measuring an overall degree of commitment to the fruit and vegetable industry was appropriate. Each link along

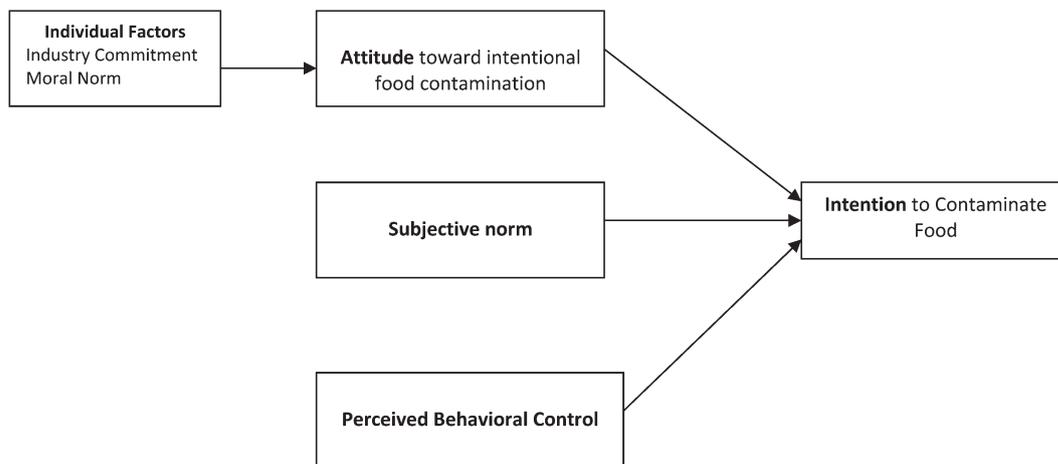


Figure 1: Theory of Planned Behavior applied to intentional food contamination (Bailey, 2006)

the supply chain depends on the other in order to get the product to the client. If the industry as a whole is to be successful, each separate entity must be committed to do its part for the industry. As such, each entity is aware that they are part of a larger entity that is the fruit and vegetable industry. Organizational commitment refers to the psychological attachment of workers to their workplaces (Allen and Meyer, 1990; O'Reilly and Chatman, 1986) that makes it less likely that the employee will voluntarily leave or harm the organization (Allen and Meyer, 1996). As applied to this model, it is argued that one's level of commitment to the fruit and vegetable industry will impact one's attitude toward intentional food contamination. To our knowledge, this is the first adaptation of the organizational commitment measure to represent commitment to an industry. If one has a high level of commitment to the industry, one's attitude toward intentional food contamination would be negative. In other words, someone committed to the industry would not think of intentional food contamination as a good thing. Accordingly, the following hypothesis is suggested:

H1: Industry commitment is related to attitude toward intentional food contamination.

Moral norm

Moral norm refers to a person's sense of obligation to perform ethical behaviours as opposed to unethical ones (Langridge, Sheeran and Connolly, 2007). Scholars suggest that one's moral norm is independent of the influence and expectations of even significant others (Manstead, 2000). Previous scholars employing a TBP perspective have included a moral norm measure when examining shoplifting attitudes (Tonglet, 2002) information technology (IT) ethical behaviour (Leonard, Cronan, and Kreinie, 2004), and have examined the link between an individual's moral code and their subsequent behaviour (McMillan and Conner, 2003). We chose to include this variable in our model because this issue of intentional food contamination includes a component of what people may consider 'right' or 'wrong'. As applied here, it is posited that if an individual has a high moral norm, their attitude toward intentional contamination would be negative. In other words, someone with a high moral norm would not think of intentional food contamination as a good or 'right' thing to do. As such, the following hypothesis is suggested:

H2: Moral norm is related to attitude toward intentional food contamination.

TPB Factors

Attitude toward intentional food contamination

As previously mentioned, attitude is a person's overall evaluation of what it would be like to perform a particular behaviour (e.g. 'It would be good/bad for me to do X'). In other words, attitude represents the degree to which a behaviour or action is positively or negatively valued. In general, if a person has an unfavourable attitude toward a particular behaviour, the less likely it is that the person will engage in that behaviour. Accordingly, we expect that a person with a negative attitude toward intentional food contamination will be

less likely to intend to contaminate food. It therefore follows that:

H3: Attitude toward intentional food contamination is related to intention to engage in food contamination.

Subjective norms

Subjective norms represent perceived social pressure to engage or not to engage in a particular behaviour (Ajzen, 1991). What this suggests is that people consider the perceptions of significant others when deciding whether to engage or not to engage in a certain behaviour. Significant others may or may not include family members, friends, supervisors, or co-workers. Previous studies have garnered support for the impact of subjective norms on drivers' intentions to commit specific driving violations (Parker, Manstead, Stradling, Reason, and Baxter, 1992), drivers' intentions to comply with speed limits (Elliott, Armitage, and Baughan, 2003), and consumer decision making (Ajzen and Driver, 1992). We expect that the more unsupportive an individual's subjective norms are of intentional food contamination, the less likely will be an individual's intention to contaminate food.

H4: Subjective norms are related to intention to engage in food contamination.

Perceived behavioural control

Perceived behavioural control is the person's perception of the extent to which performing a behaviour is under his/her control and typically is measured by ratings of the ease versus difficulty of performing the behaviour (e.g. 'For me to do X would be easy/difficult'). Basically, perceived behavioural control should be associated with intentions because a person is less likely to perform a behaviour that is perceived to be outside of their control. Previous research has linked perceived behavioural control to intentions to engage in shoplifting (Tonglet, 2002), exercise intentions (Rhodes and Courneya, 2004), online transaction intentions (Pavlou and Chai, 2002) and breakfast choice intentions in adolescents (Gummesson, Jonsson, and Conner, 1997). Regarding intentional food contamination, perceived behavioural control may be impacted by the level of security measures in place along the supply chain. For example, security cameras may be used in packing areas at production locations, storage areas, and warehouses. Moreover, shipment tracking tools such as 'smart box' technology can be utilized while produce is in transport mode on trucks. Such tracking systems cannot only provide security benefits, which are the foremost goal in food contamination prevention, but, they can also provide importers and exporters significant cost savings from decreased shrinkage or spoilage. The presence of such security and tracking measures are therefore put in place to dissuade individuals from participating in dysfunctional or destructive behaviour. In the current study, it is expected that a lack of perceived behavioural control will dissuade individuals from intending to engage in food contamination. In other words, we expect that if individuals perceive no control over being undetected while contaminating food intentionally, they will be less likely to intend to contaminate food. Accordingly, it follows that:

H5: Perceived behavioural control is related to intention to engage in food contamination.

3. Methods

Sample and Procedure

A Food Defence Plan Assessment survey developed by the U.S. Department of Homeland Security (DHS) and the Department of Agriculture-Food Safety and Inspection Service (USDA-FSIS) for meat and poultry was customized to include unique features of fruit and vegetable growers, with particular emphasis on cross border food shipment security. An iterative review process was utilized to ensure content validity. A preliminary version of the survey was pilot tested with numerous academic experts and industry participants. Based on feedback gathered from this process, the survey was modified and the original English version was translated into Spanish and back-translated into English. Review by native Spanish speaking research assistants found no evidence of any significant difference between the original and the translated and back-translated versions. Participants were offered the choice of a Spanish or English questionnaire.

Because the produce industry involves many entities along a supply chain, a paper and pencil questionnaire was filled out by, and collected from, each full-time employee representing various links along this particular supply chain. All respondents were employed at the time of the survey and all data collection occurred on-site, face-to-face, and during work hours. Because of the nature of the survey it was completely anonymous and other than the specific link along the supply chain (e.g., trucker), no individual identifiers were collected. The diverse sample includes, farm workers, truckers, wholesalers and distributors of fruits and vegetables coming from Mexico. As a result, it seems reasonable to suggest that this study gauged a viable representation of the fruit and vegetable industry as it pertains to produce traversing the Mexican border in to the southwest United States. One hundred and twenty three completed questionnaires were collected ($n=123$) and used in our analyses. The demographic breakdown of the participants was: 82% male; 54% Hispanic, 28% Caucasian, 16% other, 2% African-American; 45% had high school, and 30% had some college; and a mean age of 39.32 ($SD=10.49$).

Measures

Survey participants responded to several measures including: industry commitment, moral norm, attitudes toward intentional food contamination, subjective norms toward intentional food contamination, perceived behavioural control over intentional food contamination, and intention to contaminate food. With the exception of industry commitment, all measures have been previously validated in prior research utilizing a Theory of Planned Behaviour framework.

Industry commitment

Industry commitment was measured with five items adapted from Meyer, Allen, and Smith's (1993) organizational commitment affective component measure.

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Employees rating high in affective commitment stay with organizations because they *want* to. An example item of this measure is, '*I would be very happy to spend the rest of my career working in the fruit and vegetable industry*'. Subjects were asked how much they agree with statements on a 5-point Likert scale with 1='strongly disagree' to 5='strongly agree'. Cronbach's alpha is ($\alpha=.93$).

Moral norm

Moral norm was measured with 3 items adopted from Tonglet (2002). An example item of this measure is, '*contaminating food at work on purpose is against my principles*'. Subjects were asked how much they agree with statements on a 5-point Likert scale with 1='strongly disagree' to 5='strongly agree'. Cronbach's alpha is ($\alpha=.89$).

Attitude

Attitude toward intentional food contamination was assessed with three pairs of semantic differentials (Elliott, *et al.* 2003). For example, the statement '*To me, contaminating food on purpose is:.....*' was completed with the semantic differential choices of *unattractive/attractive, foolish/wise, dishonest/honest*. Respondents were asked to circle the word that they felt best completed each statement. Scores of 1 were given to negative attitudes while a score of 2 was given to positive attitudes. In other words, a lower score reflects a negative attitude toward intentional food contamination. The mean of the three items was calculated to produce a composite scale. Cronbach's alpha is ($\alpha=.83$).

Subjective norm

Subjective norms toward intentional food contamination were measured with four items adapted from Elliott, *et al.* (2003). An example item of this measure is, '*most of the people who are important to me would look down on me if I were to contaminate food at work on purpose*'. Subjects were asked how much they agree with statements on a 5-point Likert scale with 1='strongly disagree' to 5='strongly agree'. Cronbach's alpha is ($\alpha=.90$).

Perceived behavioural control

Perceived behavioural control over intentional food contamination was measured with three items adapted from Elliott *et al.*, (2003). An example item of this measure is, '*the control systems in place at work makes it easy for other employees and me to contaminate food on purpose*'. Subjects were asked how much they agree with statements on a 5-point Likert scale with 1='strongly disagree' to 5='strongly agree'. Cronbach's alpha is ($\alpha=.75$).

Intention to contaminate food

Intention to contaminate food was measured with three items. An example item of this measure is, '*Even if I had the opportunity, it is highly unlikely that I would*

Table 1: Descriptive statistics, reliability coefficients, and correlations

Variables	Mean	SD	1	2	3	4	5
1. Industry Commitment	2.84	1.43	(0.93)				
2. Moral Norm	3.71	1.66	0.66**	(0.89)			
3. Attitude	1.16	0.33	0.34**	0.31**	(.83)		
4. Perceived Behavioral Control	2.24	1.26	0.46**	0.62**	0.23**	(0.75)	
5. Intentions	3.99	1.76	0.64**	0.87**	0.27**	0.58**	(0.94)

Note: Coefficient alphas estimating reliabilities are in parentheses along the diagonal

*p<0.05

**p<0.01

contaminate food at work on purpose'. Subjects were asked how much they agree with statements on a 5-point Likert scale with 1='strongly disagree' to 5='strongly agree'. Cronbach's alpha is ($\alpha=.94$).

4. Results

The descriptive statistics and correlations for all variables appear in Table 1. The hypotheses were tested using regression analysis. Two-tailed tests were used in interpreting statistical significance. All scales were subjected to content validation and were analyzed for reliability.

Exploratory Factor Analyses (EFA) using principle components analysis and varimax rotation were conducted on the eight individual factor items. The EFA showed the expected two factor solution loading on each factor for both industry commitment and moral norm measures equal to or larger than 0.40 with an eigenvalue greater than 1. Table 2 shows the final result of a two-factor solution retaining 5 items for industry commitment and 3 items for moral norm. Reliability analyses yielded acceptable Cronbach alphas.

Exploratory Factor Analyses (EFA) using principle components analysis and varimax rotation were conducted on the 13 items representing Ajzen's Theory of Planned Behaviour model. After several iterations, the subjective norm items did not converge on a unique factor. Previous research has suggested that the normative component of the TBP model may be the weakest component due to weak measurement (Armitage and Conner, 2001). Because prior meta-analyses have found subjective norm to be the weakest predictor of intentions (Godin and Koch, 1996), researchers have deliberately removed subjective norms from analysis (Armitage and Conner, 2001). As a consequence of the less than optimum factor analysis results for this variables in the

overall model, subjective norms was removed from the model and hypothesis 4 was not tested. A subsequent EFA conducted on the remaining items showed the expected three-factor solution loading on each factor for attitudes, perceived behavioural control, and intention measures equal to or larger than 0.40 with an eigenvalue greater than 1. Table 3 shows the final result of a three-factor solution retaining 9 items; 3 items for attitude, 3 items for perceived behavioural control and 3 items for intentions. Again, reliability analyses yielded acceptable Cronbach alphas.

Hypothesis 1

To examine the relationship of industry commitment and attitude toward intentional contamination, a univariate regression analysis was conducted. It was hypothesized that industry commitment would be related to a negative attitude toward intentional contamination. As shown in Table 4, when attitude toward intentional food contamination was regressed on industry commitment, the regression equation was statistically significant as follows: ($F=15.93, p<.01$). There was also a significant positive beta weight ($b=0.34, p<0.01$). Thus, Hypotheses 1 was supported.

Hypothesis 2

To examine the relationship of moral norm and attitude toward intentional contamination, a univariate regression analysis was conducted. It was hypothesized that moral norm would be related to a negative attitude toward intentional food contamination. As shown in Table 4, when attitude toward intentional contamination was regressed on moral norm, the regression equation was statistically significant as follows: ($F=12.76, p<.01$).

Table 2: Exploratory factor analysis results: industry commitment and moral norm

Industry Commitment	Factor1	Factor2
I really feel as if the fruit and vegetable industry's problems are my own.	0.88	0.19
I feel like I am part of the fruit and vegetable industry.	0.83	0.35
I feel "emotionally attached" to the fruit and vegetable industry.	0.81	0.31
The fruit and vegetable industry has a great deal of personal meaning for me.	0.80	0.31
I would be very happy to spend the rest of my career working in the fruit and vegetable industry.	0.79	0.38
Moral Norm		
Contaminating food at work on purpose is morally wrong.	0.34	0.86
I would feel guilty if I were caught contaminating food at work on purpose	0.23	0.91
Contaminating food at work on purpose is against my principles.	0.36	0.79
Eigenvalue	5.04	0.77
Percent of Explained Variance	87%	13%

n=123; Factor 1=Industry Commitment, Factor 2=Moral Norm

Table 3: Exploratory Factor Analysis: Intentions, Attitude, Perceived Behavioural Control

Intention to Contaminate Food	Factor1	Factor2	Factor3
If I saw someone contaminating food at work on purpose, I would not report them because it is none of my business	0.90	0.15	0.33
I have no intentions of ever contaminating food at work on purpose	0.81	0.06	0.23
Even if I had the opportunity, it is highly unlikely that I would contaminate food at work on purpose.	0.92	0.15	0.31
Attitude Toward Intentional Food Contamination			
To me, contaminating food on purpose is: Unattractive /Attractive	0.02	0.85	0.08
To me, contaminating food on purpose is: Foolish/Wise	0.12	0.85	0.04
To me, contaminating food on purpose is: Dishonest/Honest	0.12	0.70	0.20
Perceived Behavioral Control			
The control systems in place at work makes it easy for other employees and me to contaminate food on purpose.	0.15	0.13	0.64
There are many opportunities at work for other employees and me to contaminate food on purpose.	0.28	0.21	0.63
It is unlikely that I would get caught if I were to contaminate food at work on purpose	0.38	-0.04	0.60
Eigenvalue	2.60	2.04	1.47
Percent of Explained Variance	42%	33%	24%

n=123; Factor 1=Intentions, Factor 2=Attitudes, Factor 3=perceived behavioral control

There was also a significant positive beta weight (b=0.31, p<0.01). Thus, Hypotheses 2 was supported.

Hypothesis 3

To examine the relationship of attitude toward intentional contamination and intention to contaminate food, a univariate regression analysis was conducted. It was hypothesized that attitude toward intentional contamination would be related to intention to contaminate food. As shown in Table 4, when intention to contaminate food was regressed on attitude toward intentional contamination, the regression equation was statistically significant as follows: (F=9.62, p<.01). There was also a significant positive beta weight (b=0.27, p<0.01). Thus, Hypotheses 3 was supported.

Hypothesis 5

To examine the relationship of perceived behavioural control and intention to contaminate food, a univariate regression analysis was conducted. It was hypothesized that perceived behavioural control would be related to intention to contaminate food. As shown in Table 4, when intention to contaminate food was regressed on perceived behavioural control, the regression equation was statistically significant as follows: (F=61.58, p<.01). There was also a significant positive beta weight (b=0.58, p<0.01). Thus, Hypotheses 5 was supported.

Table 4: Regression Analysis Results

	Intentions	Attitude	R ²	Adjusted R ²	ANOVA F
Perceived Behavioral Control	0.58** (0.05)		0.34	0.33	61.58**
Attitude	0.27** (0.28)		0.07	0.06	9.62**
Industry Commitment		0.34** (0.22)	0.11	0.10	15.93**
Moral Norm		0.31** (0.26)	0.09	0.08	12.76**

Note: Regression weights are standardized beta weights (β) standard errors (SE β) appear in parenthesis; n=123

*p<0.05
**p<0.01

5. Discussion

Researchers suggest that a key vulnerability that we as individuals have is our fear for our health (Homer-Dixon, 2002). Possibly, one way to strike at the health of any industrialized nation would be to attack its food-supply system (Homer-Dixon, 2002). Without a doubt, intentionally contaminating a food source would not only prove to be physically detrimental to the public by potentially causing illnesses and perhaps even deaths, but it could also foster wide-spread panic. Moreover, as we have seen from recent occurrences of unintentional food contamination, the negative financial and economic impact intentional food contamination could have would be devastating. The present study provides some evidence supporting the application of the Theory of Planned Behaviour in understanding intentional food contamination. An intentional attempt to contaminate food along any of the various nodes of the food supply chain (i.e., farm, packing, check points) could be detrimental to the economies of several local communities across the US border, whose livelihood depends on operating within a secure food delivery system. Accordingly, information gathered from research in this area is vital for the implementation of a viable food defence plan for organizations.

Strengths, Limitations, and Future Research

One strength of our study is that it offers initial support for the viability of our industry commitment measure.

Where appropriate, measuring the level of industry commitment individuals have and understanding the impact that it may have on employee attitudes and subsequent behaviours could be valuable. Another strength of this research is a solid theoretical framework. As previous research has found, the application of the Theory of Planned Behaviour can and should continue to be applied in a variety of settings and contexts in order to predict behaviour.

One limitation of this study was our inability to include subjective norms in our analyses. As explained earlier, this is not uncommon and previous research has excluded the subjective norm component from their investigations. Although we would have preferred including the entire model, perhaps our measure was unable to capture the essence of the subjective norm concept, and as a result our participants could not distinguish it from other measures on the survey.

Further limitations of the present study are also apparent and require attention. The relatively small sample size in this study and the fact that all the data collected came entirely from self-reports both represent major limitations. The cross-sectional nature of the data collection represents another limitation. Although collecting data from independent samples could alleviate this limitation, perhaps a longitudinal design with a series of data collections could be employed in subsequent research.

Considering the strengths and limitations of this research, our findings hold promise for further inquiry. Future research could focus on testing this model in a variety of industry contexts. For example, given the recent problems in the financial sector of the US economy, it would be interesting to see how commitment to that industry would impact attitudes, social norms, perceived behavioural control and intentions to behave ethically. Future research should also continue the validation process in a larger field sample or with a set of field samples. Further work on the subjective norm variable will also need to be conducted in order to test the complete theoretical model in the future. For instance, future research may examine perceptions of perceived behavioural control in order to determine what area along the food supply chain employees may indicate the relative ease of access in an effort to commit such a damaging act. Future research should also further examine the moral norm construct in other workplace settings. For example, instances of organizational corruption or unethical corporate behaviour might be viewed from the moral norm lens as it relates to the TPB framework. Lastly, future research should employ a multi-source design to substantiate claims made by participants. By continuing to develop this model and applying it to other industries, its inclusion could provide an avenue for additional theorizing regarding its impact on other workplace attitudes. Until then, our findings must be viewed as incomplete.

6. Conclusion

Although we were unable to test the model of Ajzen's Theory that includes a measure for subjective norms, our findings involving the remaining variables provide valuable information. Consistent with prior research, we

found that the relationship between attitudes and intentions was indeed a positive one. In other words, in this sample, we found that a negative attitude toward intentional food contamination contributed to a lowered intention to contaminate food. As previously mentioned, if organizations can increase the level of commitment that employees share about the industry as a whole, they may be able to positively impact attitudes in such a way that intentional food contamination would be unlikely. Another interesting finding from this sample was that the strongest relationship in our model seems to be between perceived behavioural control and intentions to contaminate food. This too is consistent with prior research that has found this relationship to be strong. Our results suggest that individuals in fact see the security measures that are in place as a deterrent to such negative behaviours. In other words, the possibility of being discovered committing such acts by security measures in place goes a long way to influencing intentions. This is good news for organizations in the fruit and vegetable industry that invest a lot of money on surveillance equipment in warehouses and tracking devices on modes of transportation. Although there is a considerable upfront cost for such security measures, the cost of not doing so could be much higher. Because preventing acts of intentional food contamination is a high priority for all participants along the food supply chain, an understanding of what steps to take in order to dissuade individuals or groups from considering such acts is invaluable.

One contribution of this research is our inclusion of industry commitment as an antecedent of attitude. Consistent with the perspective that attitudes toward intentional food contamination can be influenced by individual factors such as industry commitment and moral norms, it was hypothesized that both individual factors would be related to negative attitudes toward intentional food contamination. Our results suggest that the more an individual felt committed to the fruit and vegetable industry, the more likely they would be to perceive acts of intentional contamination as a bad thing. Managers could benefit from this information and take steps to increase all employees' level of commitment as a way to prevent attitudes that are tolerant of intentional food contamination. Additionally, we found that the more a person felt a sense of obligation to perform ethical behaviours as opposed to unethical ones (moral norm), the more likely they would be to perceive acts of intentional contamination as corrupt. These findings are consistent with previous research that has suggested that moral norms are closely linked to attitudes and may in some instances be able to be an antecedent to behaviours (Conner and Armitage, 1998).

Suppliers of produce are still recovering from the economic losses they suffered as a result of food contamination occurrences. The high level of trust that consumers have in the US food supply system is something that cannot be taken for granted. Although unintentional food contamination in the system can reduce consumer's levels of trust, an act of intentional food contamination can potentially cause widespread panic that would be even more difficult to overcome. Assessing the combined health, economic and psychological impacts of such an attack within the food

industry would be challenging to quantify. Reactions to this emerging source of food safety risks are often variable with some individuals developing symptoms of depression, post-traumatic stress disorder, and high levels of general anxiety or stress. As such, the psychological impact that such events can have on individuals, communities, or nations for that matter must not be overlooked. Accordingly, agencies and researchers should continue to investigate ways to prevent such acts. Because this study is the first to examine intentional food contamination from the perspective the Theory of Planned Behaviour and an international origin, the results must therefore be viewed as exploratory. However, the value of continued research in this area seems reasonably high.

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REFERENCES

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In: Kuhl, J., Beckmann, J., eds. *Action control*:

- Understanding intentional food contamination attitudes
From cognition to behavior. Berlin, Germany: Springer-Verlag, pp. 11–39.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, pp. 179–211. DOI: 10.1016/0749-5978(91)90020-T
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32, pp. 665–83. DOI: 10.1111/j.1559-1816.2002.tb00236.x
- Ajzen, I. and Driver, B. L. (1992). Application of the theory of planned behavior to leisure choice. *Journal of Leisure Research*, 24(3), pp. 207–24. DOI: psycnet.apa.org/psycinfo/1993-07716-001
- Allen, N. J. and Meyer, J. P. (1990). The measurement and antecedents of affective, continuance and normative commitment. *Journal of Occupational Psychology*, 63, pp. 1–18. DOI: 10.1111/j.2044-8325.1990.tb00506.x
- Allen, N. J. and Meyer, J. P. (1996). Affective, continuance, and normative commitment to the organization: An examination of construct validity. *Journal of Vocational Behavior*, 49, pp. 252–76. DOI: dx.doi.org/10.1006/jvbe.1996.0043
- Armitage, C. J. and Connor, M. (2001). Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology*, 40, pp. 471–99. DOI: 10.1348/014466601164939
- Bailey, A. (2006). Retail employee theft: A theory of planned behavior perspective. *International Journal of Retail and Distribution Management*, 34(11), pp. 802–16. DOI: 10.1108/09590550610710219
- Bruemmer, B. (2003). Food biosecurity. *The Journal of The American Dietetic Association*, 103(6), pp. 687–691. DOI: 10.1053/jada.2003.50154
- Connor, M. and Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, 28, pp. 1429–64. DOI: 10.1111/j.1559-1816.1998.tb01685.x
- Dorgan, B. (2002). “Keynote Address, Bioterrorism and Food Security: Issues and Challenges.” Conference Proceedings CAPTS, NDSU, October 28–29 2002.
- Elad, D. (2005). Risk assessment of malicious biocontamination of food. *Journal of Food Protection*, 68, pp. 1302–05.
- Elliot, M. A., Armitage, C. J. and Baughan, C. J. (2003). Drivers' compliance with speed limits: an application of the theory of planned behavior. *Journal of Applied Psychology*, 88(5), pp. 964–72. DOI: 10.1037/0021-9010.88.5.964
- Fishbein, M. and Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Addison-Wesley, Reading, MA.
- Griffin, R. and Lopez, Y. P. (2005). “Bad behavior” in organizations: A review and typology for future research. *Journal of Management*, 31, pp. 988–1005. DOI: 10.1177/0149206305279942
- Gummesson, L., Jonsson, I. and Conner, M. (1997). Predicting intentions and behaviour of swedish 10–16 year olds at breakfast. *Food Quality and Preferences*, 8(4), pp. 297–306. DOI: 10.1016/S0950-3293(97)00013-X
- Homer-Dixon, T. (2002). The rise of complex terrorism. *Foreign Policy*, 128, pp. 52–63.
- Hutter, L. (2004). Food safety: find the source, *Food Chain Magazine*, [online] Available at: <http://www.foodchain-magazine.com> [Accessed 2008].
- Kennedy, S. P., Busta, F. F. (2007). Biosecurity: food protection and defense. In: Doyle, M. P., Beuchat, L. R., eds., *Food Microbiology: Fundamentals and Frontiers*. ASM Press. pp. 87–102.
- Langridge, D., Sheeran, P. and Connolly, K.J. (2007). Analyzing additional variables in the theory of reasoned action. *Journal of Applied Social Psychology*, 37(8), pp. 1884–1913. DOI: 10.1111/j.1559-1816.2007.00242.x
- Lee, J. and Lee, Y. (2002). A holistic model of computer abuse within organizations. *Information Management and Computer Security*, 10(2), pp. 56–63. DOI: 10.1108/09685220210424104
- Leonard, L. N. K., Cronan, T. P. and Kreie, J. (2004). What influences IT ethical behavior intentions-planned behavior,

- reasoned action, perceived importance, or individual characteristics? *Information and Management*, 42(1), pp. 143–158. DOI: 10.1016/j.im.2003.12.008
- Lyonga, A., Nganje, W., Sellnow, T., Kaitibie, S. and Vennette, S. (2006). Human Factor Risk in Turkey Processing and High Reliability Culture. *Food Protection Trends*, 26(7), pp.593–600.
- Manning, L., Baines, R. N. and Chadd, S. A. (2005). Deliberate contamination of the food supply chain. *British Food Journal*, 107(4), pp. 225–245. DOI: 10.1108/00070700510589512
- Manstead, A. S. R. (2000). The role of moral norm in the attitude-behavior relationship. In Terry, D. J., Hogg, M. A., eds. *Attitudes, behavior, and social context: The role of norms and group memberships*. Philadelphia, PA: Psychology Press. pp. 11–30.
- McMillan, B. and Conner, M. (2003). Applying and extended version of the theory of planned behavior to the use of illicit drugs among students. *Journal of Applied Social Psychology*, 33(8), pp. 1662–83. DOI: 10.1111/j.1559-1816.2003.tb01968.x
- Norman, P., Bennett, P. and Lewis, H. (1998). Understanding binge drinking among young people. An application of the theory of planned behavior. *Health Education Research*, 13, pp. 163–69.
- Orbell, S., Blair, C., Sherlock, K. and Conner, M. (2001). The Theory of planned behavior and ecstasy use: Roles for habit and perceived control over taking versus obtaining substances. *Journal of Applied Social Psychology*, 31(1), pp. 31–47. DOI: 10.1111/j.1559-1816.2001.tb02480.x
- O'Reilly, C. and Chatman, J. (1986). Organizational commitment and psychological attachment: The effects of compliance, identification and internalization on prosocial behavior. *Journal of Applied Psychology*, 71(3), pp. 492–99. DOI: 10.1037/0021-9010.71.3.492
- Parker, D., Manstead, A. S. R., Stradling, S. G., Reason, J. T. and Baxter, J. S. (1992). Intention to commit driving violations: an application of the theory of planned behavior, *Journal of Applied Psychology*, 77(1), pp. 94–101. DOI: 10.1037/0021-9010.77.1.94
- Pavlou, P. A. and Chai, L. (2002). What drives electronic commerce across cultures? A cross-cultural empirical investigation of the theory of planned behavior. *Journal of Electronic Commerce Research*, 3(4), pp. 240–53. Available at: <http://www.csulb.edu/journals/jecr/issues/20024/paper4.pdf> [Accessed 6 September 2013].
- Peace, A. G., Galletta, D. F. and Thong, J. Y. L. (2003). Software piracy in the workplace: A model and empirical test. *Journal of Management Information Systems*, 20(1), pp. 153–77.
- Rhodes, R. and Courneya, K. (2004). Differentiating motivation and control in the theory of planned behavior. *Psychology, Health and Medicine*, 9(2), pp. 205–15. DOI: 10.1080/13548500410001670726>
- Robinson, S. L. and Bennett, R. J. (1995). A typology of deviant workplace behaviors. A multidimensional scaling study. *Academy of Management Journal*, 38, pp. 555–72. DOI: 10.2307/256693>
- Sekheta, M. A. F., Sahtout, A. H., Sekheta, N. P. and Omari, A. T. A. (2006). Terrorist threats to food and water supplies and the role of HACCP implementation as one of the major effective preventative measures. *Internet Journal of Food Safety*, 8, pp. 30–34. [pdf] Available at:<<http://www.foodhaccp.com/internetjournal/ijfsv8-7.pdf>>[Accessed 2012].
- Sobel, J., Khan, A. S. and Swerdlow, D. L. (2002). Threat of a biological terrorist attack on the US food supply: the CDC perspective. *The Lancet*, 359, pp.874–880. Available at: DOI: 10.1016/S0140-6736(02)07947-3
- Stone, T. H., Kisamore, J. L. and Jawahar, I. M. (2007). Using Ajzen's theory of planned behavior to predict academic misconduct intentions and behaviors. *Proceedings of the Academy of Management Annual Meeting*, Anaheim, CA.
- Tonglet, M. (2002). Consumer misbehavior: an exploratory study of shoplifting, *Journal of Consumer Behavior*, 1(4), pp. 336–354. DOI: 10.1002/cb.79
- Tonglet, M., Phillips, P. S. and Bates, M. P. (2004). Determining the drivers for householder pro-environmental behavior: waste minimization compared to recycling. *Resources, Conservation and Recycling*, 42, pp. 27–48. DOI: 10.1016/j.resconrec.2004.02.001
- Wieck, C., Rudloff, B. and Wahl, T. (2005). The Bioterrorism Act of the USA and international food trade: Evaluating WTO conformity and effects on bilateral imports. *Selected paper:Annual Meetings of the Western Agricultural Economics Association*, San Francisco, CA.
- World Health Organization (2002). *Food Safety Issues: Terrorists Threat to Food: Guidance for Establishing and Strengthening Prevention and Response Systems*, ISBN 9241545844. [online] Available at: <[http://books.google.com/books?hl=en&lr=&id=6Qj8TawaTjAC&oi=fnd&pg=PT2&dq=World+Health+Organization+\(2002\).+Food+Safety+Issues:+Terrorists+Threat+to+Food:+Guidance+for+Establishing+and+Strengthening+Prevention+and+Response+Systems,+ISBN+9241545844.&ots=TxmAQbHirO&sig=XdBp9w_hvHJl-fABuXvnd_Cq5XU#v=onepage&q&f=false](http://books.google.com/books?hl=en&lr=&id=6Qj8TawaTjAC&oi=fnd&pg=PT2&dq=World+Health+Organization+(2002).+Food+Safety+Issues:+Terrorists+Threat+to+Food:+Guidance+for+Establishing+and+Strengthening+Prevention+and+Response+Systems,+ISBN+9241545844.&ots=TxmAQbHirO&sig=XdBp9w_hvHJl-fABuXvnd_Cq5XU#v=onepage&q&f=false)> [Accessed 2011].