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CONSUMER PERCEPTIONS OF PRODUCE SAFETY:

A STUDY OF PENNSYLVANIA

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Daniel Tobin

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The thesis of Daniel Tobin was reviewed and approved* by the following:

Joan S. Thomson
Professor of Agricultural Communication
Thesis Advisor

Luke F. LaBorde
Associate Professor of Food Science

Mark A. Brennan
Associate Professor of Agricultural and Extension Education

Rama B. Radhakrishna
Professor of Agricultural and Extension Education

Tracy S. Hoover
Professor of Agricultural and Extension Education
Head of the Department of Agricultural and Extension Education

*Signatures are on file in the Graduate School

ABSTRACT

As a leading cause of foodborne illnesses, fresh fruits and vegetables have received national attention, recently highlighted by the Food Safety Modernization Act which was signed into law in early 2011 by President Obama. Through this law [P.L. 111-353], the Food and Drug Administration will establish mandatory minimum standards based on known safety risks for the safe production and harvesting of produce. As the new law is implemented, continuing to assess consumer perceptions regarding produce safety will be particularly important, for those perceptions will allow stakeholders within the supply chain to better meet consumer demand.

The purpose of this study was to assess Pennsylvania consumer perceptions of produce safety and various factors that affect those perceptions. Using data collected among Pennsylvania consumers, this study presents evidence documenting how consumer demographics, along with their preferences for specific attributes in fresh produce, such as locally grown, organically grown, and inspected for food safety, affect their produce safety perceptions. In order to determine these relationships, telephone interviews with randomly sampled Pennsylvania consumers were conducted. Interviews included questions about consumers' produce safety perceptions, their preferences for local produce, organic produce, and produce that has been inspected for on-farm food safety, as well as demographic information. A total of 604 Pennsylvania consumers provided valid data, for a survey cooperation rate of 71.6%.

Among the most significant results from this study are that Pennsylvania consumers, regardless of gender, race, age, educational level, financial status, or residential location, believed produce safety is an important issue. A multivariate analysis also determined that preferences for locally grown produce, organically grown produce, and produce that has been inspected for on-farm food safety were the most significant predictors of produce safety perceptions among

consumers. Those who more strongly preferred these produce attributes placed higher importance on the issue of produce safety. The only demographic variable that emerged in the multivariate analysis as a significant predictor of produce safety perceptions was income group. Those in lower income groups perceived the issue of produce safety as more important than those in higher income groups.

The results from this study provide important information for other groups of stakeholders seeking to implement practices that reduce the risk of foodborne contamination. A better understanding of consumer produce safety perceptions and preferences will allow stakeholder groups, including growers and supermarkets, to make better informed decisions regarding their food safety policies and practices. Communicating this information to supermarkets and produce growers is particularly important, for these groups are not likely to capitalize on market opportunities without a thorough understanding of consumer perceptions. Extension, therefore, can fill a critical role as a communications facilitator among these groups of stakeholders. Through its educational programming, Extension can present the findings from this study to Pennsylvania supermarkets and produce growers to encourage the implementation of food policies and practices that reduce the risk of foodborne contamination.

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Chapter 1

Introduction

Industrialized agriculture in the United States, characterized by large units of farmland that rely on monoculture cropping and technological innovations to increase productivity and profitability (Gold, 2007), has produced a food system in which people are currently eating more calories (United States Department of Agriculture [USDA], 2003) but spending less money than ever on food (Economic Research Service [ERS], 2008). This feat, however, has not been achieved without substantial concerns regarding externalized environmental, health, and social costs. Since the early 1970s, industrialized agriculture has been criticized for an array of its consequences, including its contribution to air pollution, dependence on fertilizers and pesticides, violation of animal rights, genetic modification, and foodborne illnesses (Friedmann, 2005). In the backlash against agriculture's industrialization, organics, local food systems, small-scale farms, and direct marketing outlets such as farmers markets have evolved as alternatives.

Despite the expansion of alternatives to conventional food systems, some farmers, scholars, and alternative agriculture advocates are concerned that the issue of food safety will hamper further progress. Outbreaks of foodborne illnesses are becoming all too common. An estimated 48 million foodborne illnesses, including 3,000 deaths, occur each year (Centers for Disease Control and Prevention [CDC], 2010). Even nutritious foods, such as fresh fruits and vegetables, are among those that have been implicated in foodborne illnesses. In fact, the number of foodborne cases caused by fresh produce reported to the CDC is increasing (Doyle & Erickson, 2008; Sivapalasingam, Friedman, Cohen, & Tauxe, 2004).

Both the public and private sectors have acted in response to the risk that fresh produce poses to food safety. While Congress has recently enacted federal law, the Food Safety

Modernization Act [P.L. 111-353], that mandates on-farm food safety practices, a number of supermarkets are already implementing policies that require their produce suppliers to provide evidence of compliance with on-farm food safety practices. Both Congress and supermarkets view third-party certification (TPC) as an appropriate method to ensure that growers are implementing safe growing practices. TPC is a process in which an independent, third-party auditor conducts an on-site inspection to determine whether a supplier's practices and procedures comply with a certain set of standards (Hatanaka, Busch, & Bain, 2005). For fresh fruits and vegetables, a TPC inspection verifies that growers are properly implementing and documenting Good Agricultural Practices (GAPs), a set of standards based on known safety risks for the safe production and harvesting of produce (Food and Drug Administration, 1998). GAPs include recommendations for safe irrigation methods, use of raw and composted animal manure, worker health and hygiene, post-harvest handling practices, and traceability procedures. To adopt the TPC requirements for GAPs, therefore, growers must implement, document, and verify these minimum recommendations.

While support for more rigorous food safety standards is widespread, concerns regarding their impact on small-sized farms, conventionally classified by the ERS (2005) as operations with total agricultural sales under $250,000 annually, have also been voiced. One of the risks of TPC is that the financial demands and time commitment required to pass a TPC audit will force smaller-sized growers from business, while larger, financially secure operations will have no problem meeting the demand for TPC (Hatanaka et al., 2005). As a result, concerns have risen that alternative agricultural movements will be undermined.

Although documenting food safety requirements seems to present barriers to small and medium-sized growers, some research has shown that many consumers prefer local and organic produce for their perceived superior attributes (Berlin, Lockeretz, & Bell, 2005; Onozaka, Nurse, & McFadden; Pirog, 2004; Yiridoe, Bonti-Ankomah, & Martin, 2005). These findings indicate

that growers and supermarkets can position themselves advantageously by meeting consumer demands for produce that is both local and safe. However, for growers and supermarkets to capitalize on these market niches, evidence needs to empirically document the relationship between consumer preferences for fresh fruits and vegetables and their produce safety perceptions.

Although consumer demand for safer food presents business opportunities for growers, grower response to documenting their growing practices has been slow. Perceiving time and financial barriers to meet TPC requirements as extensive, growers are reluctant to prepare for a GAP audit. Some growers contend that consumers need to take more responsibility for food safety by being more careful when preparing food (Bagdonis, forthcoming). Whatever the motivation, grower inaction to verify GAP compliance could exclude them from accessing retail and wholesale markets, risking further financial difficulty. Even local growers who rely mostly on direct marketing outlets jeopardize consumer support if high consumer value is placed on food safety inspection.

For growers to implement, document, and verify GAPs, they must understand its value. Although many small-scale growers have expressed reluctance to adopting TPC requirements, they are nonetheless motivated to meet customer expectations (Eggers, Ackerlund, Thorne, & Butte, 2010). This finding suggests that if growers comprehend the importance consumers place on on-farm food safety certification, they will be more likely to implement, document, and verify GAPs. The slow adoption of TPC requirements by small scale growers thus suggests a gap in understanding between growers and consumers.

Consumer perceptions can also provide important information to supermarkets. Supermarkets with policies that require their fresh produce suppliers to verify GAP compliance must appreciate how consumers value GAP certified produce in order to fully benefit from the competitive advantages of TPC certification. By doing so, supermarkets will be more able to

target consumer demand and enhance their profits. Although supermarkets can gain consumer confidence by implementing food safety policies (Henson & Reardon, 2005), a study conducted among Pennsylvania supermarkets found that even markets with food safety policies are not indicating to consumers that the produce they sell has been inspected on the farm for food safety (Tobin, Thomson, LaBorde, & Bagdonis, forthcoming). In order to capitalize on their food safety policies, supermarkets must have a thorough understanding of consumer produce safety perceptions.

Likewise, comprehension of consumer fresh fruit and vegetable safety perspectives will help Extension develop relevant GAP educational programming (Tobin et al., forthcoming). Viewed by growers as one of the best sources for GAP information (Eggers et al., 2010), Extension can fill the critical role of communications facilitator among growers, supermarkets, and consumers. Information flow among these groups of stakeholders is critical because their different locations within the food system means they likely have different goals, needs, and values (Sobal, Khan, & Bisogni, 1998). By assessing the food safety perspectives among the multiple groups of involved stakeholders in different geographic areas, Extension can develop regional GAP programming that best serves diverse needs and interests (Tobin et al., forthcoming). Extension, therefore, must understand consumer food safety perceptions because "consumer concerns will allow for efficient development of food safety education programs to decrease actual risks" (Brewer & Rojas, 2008, p. 1).

Knowing consumer food safety perceptions is relevant information for growers, supermarkets, and Extension. The Theory of Planned Behavior (TpB) offers a sound theoretical framework to guide this study, for it emphasizes that the expectations of important others can influence an individual's behaviors. In the case of food safety policies and practices, the perspective of consumers, as the stakeholder group that drives demand, is essential for others in the commodity chain, like growers and supermarkets, to consider. To provide this information to

the multiple groups of stakeholders, consumers must be explicitly asked their perspectives. Beyond demographic differences, understanding how preferences for specific produce attributes, such as local, inspected for food safety, and organic, influence produce safety perceptions will provide a more comprehensive understanding. Although the existing literature provides some insight into this line of inquiry, state-by-state analysis of consumer produce safety perceptions and produce preferences is necessary. Inconsistency in consumer food safety perceptions and purchasing behaviors can be expected among states because not all have been equally affected by foodborne outbreaks (Scharff, 2010) and preferences for local produce vary among states (Carpio & Isengildina-Massa, 2009). In addition, because supermarket chains currently determine their own food safety policies (Tobin et al., forthcoming), consumer familiarity with GAP certification might fluctuate depending on which supermarket chains are present within their states.

Purpose and Research Questions

Pennsylvania offers a compelling case to investigate consumer perceptions of produce safety. The state's well-established local food systems consist of at least 203 farmers markets across the state, ninth most in the nation (Wasserman, 2010). However, Pennsylvania has also suffered from foodborne outbreaks, most of which are caused from sources outside of the state. According to Scharff (2010), Pennsylvania is one of the six states most impacted by foodborne illnesses. In light of growing food safety concerns, an increasing number of supermarkets in Pennsylvania are requiring their fresh produce growers to provide evidence of GAP compliance by participating in training, developing a food safety plan, or passing a GAP audit as a condition of purchase (Tobin et al., forthcoming). Pennsylvania growers, most of whom have diversified, small-sized operations (USDA, 2009), increasingly will need to prepare for and pass a GAP audit to maintain access to wholesale and retail market outlets, yet grower documentation of their GAP

practices has been slow. According to the AMS USDA (2011), which keeps public record of growers who are GAP certified, 133 grower operations in Pennsylvania are currently GAP certified as of March 2011. Of these 133, however, 37 are for apples only and 42 are for mushrooms only, one of the largest industries in the state.

The racial, ethnic, geographic, and cultural diversity of Pennsylvania provides further nuance to understanding consumer produce safety perceptions and preferences, an important feature since the literature has found that these types of demographic characteristics can influence perceptions regarding food safety risk. Access to food varies across the state as well. Research has identified 45 rural school districts as food deserts, or areas that lack access to retail food stores (Schafft, Jensen, & Hinrichs, 2009). Diversity in food access thus relates to geographic location, which might also affect consumer purchasing behaviors. For example, as supermarkets have emerged as the leading market venue for organic foods, options for organic will likely be limited for those who live in food deserts. By assessing how these types of variables influence food safety perceptions, supermarkets and growers will have valuable information when trying to tap into potential market niches.

This type of information is also pertinent for Extension to develop relevant and appropriate GAP educational programming for growers. Recognizing that growers view Extension as one of the best sources for GAP information (Eggers et al., 2010), Penn State Extension can play a vital role in helping growers maintain viability in the marketplace. In doing so, Extension must act as a communications facilitator among growers, supermarkets, and consumers. Penn State Extension, which has already assessed the perspectives of Pennsylvania supermarkets and produce growers (Bagdonis, forthcoming; Tobin et al., forthcoming), must also document consumer attitudes regarding produce safety in order to serve the needs of all three of these major stakeholder groups. By doing so, Extension will be better positioned to adapt its educational programming to meet public demand (Tobin et al., forthcoming).

The purpose of this study was to provide a thorough understanding of the factors related to produce safety perceptions of Pennsylvania consumers. Four research questions guided this study:

1) Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?
2) Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, residential location (rural vs. urban), educational status, financial status, or primary shopping venue for produce?
3) Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?
4) When analyzed collectively, which of the independent variables prove to be significant predictors of Pennsylvania consumer produce safety perceptions?

Collectively, these research questions allow for a complex look at Pennsylvania consumer produce safety perceptions. In turn, these produce safety perceptions represent consumer expectations regarding the safety of the produce supply, an essential component within the TpB framework. As such, consumer perceptions are helpful for produce growers and supermarkets to make more informed decisions regarding their food safety policies and practices and for Extension to continue to develop relevant programming.

Chapter 2

Literature Review

This chapter presents the past literature related to the study. The chapter is organized into seven separate sections that include 1) consumer perceptions of food safety, 2) demographic characteristics related to consumer perceptions of produce safety, 3) the rise and function of TPC, 4) consumer preferences for local produce, 5) consumer preferences for organic produce, 6) a discussion of the Theory of Planned Behavior, and 7) the purpose of the study and research questions.

Consumer Perceptions of Food Safety

The safety of the food supply has come under scrutiny due to occurrences of widespread foodborne outbreaks. An estimated 48 million foodborne illnesses, including 3,000 deaths, occur each year (CDC, 2010). Beyond the obvious personal suffering that foodborne outbreaks can cause, they have an economic cost as well. A recent report reported that of the estimated $152 billion per year the economy loses as a result of foodborne illnesses, produce is responsible for approximately $39 billion (Scharff, 2010).

Despite such stark numbers, consumer perceptions of food safety risks are not clear cut. Risk perceptions "represent a person's views about the risk inherent in a particular situation. Perceptions about food safety risk are what the individual believes would be the amount of health risk, if any, they would face from consuming a food product" (Schroeder, Tonsor, Pennings, & Mintert, 2007, p. 1). While some studies have shown consumer food safety concern to be rising

(Hart Research / Public Opinion Strategies, 2009), other studies indicate a steady confidence in the safety of the food supply (Pirog & Larson, 2007).

In research conducted among Illinois consumers, for example, Brewer and Rojas (2008) found that confidence in the safety of the food supply had decreased by 10% since 2002. Similarly, a more recent national study found 55% of consumers have lost confidence in the safety of the food supply (Hart Research / Public Opinion Strategies, 2009). However, Pirog and Larson (2007) found 70% of consumers believe the domestic food supply to be safe. A recent study conducted for the International Food Information Council (IFIC) (2010) revealed that only 18% of the population was not confident in the safety of the food supply. Consumer perceptions regarding food safety are thus somewhat murky. While some studies emphasize rising concern, others have shown solid confidence in the nation's food supply.

Part of the confusion stems from the complexity of the issue of food safety. Food safety does not only encompass the threat of foodborne illnesses. The study conducted for the IFIC (2010) considered all of the following categories as aspects of food safety: "foodborne illnesses from bacteria," "chemicals in food," "imported food," and "food allergens." Other facets of food safety might include "mad cow disease," "pesticides," "antibiotic overuse," "genetically modified food," and "irradiated food" (Bostrom, 2005). The intricacies of food safety have caused confusion among consumers, for their perceptions of which aspects constitute the greatest threat to their health do not always reflect scientific fact: "Microbiological risks are clearly the greater risk, but consumer concern with chemical/novel processes often far exceeds the true risk that they pose" (Brewer & Rojas, 2008, p. 3).

Still consumer concern regarding foodborne illnesses is increasing, for the population has identified contamination with human pathogens as a leading risk in several studies (Brewer & Rojas, 2008; Hart Research / Public Opinion Strategies, 2009; Pirog & Larson, 2007). According to Pirog and Larson (2007), 84% of consumers indicated bacteria to be a food safety risk,

followed by pesticide residues (72%) and bio-terrorism (72%). Another recent study documented 58% of consumers perceive bacterial contamination to be a health threat (Hart Research / Public Opinion Strategies, 2009). Still other research found that consumers named microbiological issues, which included shelf life (time before spoilage), restaurant sanitation, genetic modification, mad cow disease, microbial contamination, and pasteurization, as making the food supply more risky (Brewer & Rojas, 2008).

Although consumers are clearly concerned about the risk of foodborne illnesses, this concern extends beyond fresh fruits and vegetables. Among the foods regulated by the FDA, eggs, tuna, oysters, cheese, and ice cream are among the riskiest for foodborne illnesses (Klein, Witmer, Tian, & DeWaal, 2010). Produce accounted for only 12.3% of all foodborne outbreaks from 1990 to 2007, and of that, only "2.2% were associated with the growing, packing, shipping, or processing of produce" (Duman, 2010, p. 2). Although these statistics suggest that on-farm causes for contamination are relatively low, consumer food safety "concern, attitudes and behaviors are inconsistent" (Brewer & Rojas, 2008, p. 1). In other words, consumer food safety perceptions are dynamic, not static, and are not always consistent with scientific evidence.

Consumers also believe that their purchasing behaviors influence the products available for purchase (Thomson & Kelvin, 1996). Demand for a specific product has dropped when consumers perceive that product poses a threat to their health. Spinach sales, for example, severely suffered due to an *E. coli* outbreak in 2006. Between January and August, 2006, sales plummeted more than 50% (Fahs, Mittelhammer, & McCluskey, 2009). Estimates showed that fresh bagged spinach sales still suffered by 10% 16 months after the outbreak had occurred (Arnade, Calvin, & Kuchler, 2010).

The plight of the spinach industry displays the severe consequences that can occur when consumers deem a product to pose a health risk. The spinach case, however, does not signify that only fresh produce is vulnerable to the potential impact of a foodborne outbreak. Rather, any

product that is linked to a foodborne outbreak will suffer. For example, after a *Salmonella* outbreak in 2008-2009 was traced to two peanut-processing plants, retail sales of peanut products temporarily declined (Wittenberger & Dohlman, 2010). Given that a diverse range of products have been affected by foodborne outbreaks, research has not fully investigated consumer food safety perceptions for all of those specific products.

Demographics

Within the body of research regarding consumer perceptions of food safety, demographic variables have been consistently included in analysis (Dosman, Adamowicz, & Hrudey, 2001; Lin, 1995; Roseman & Kulrzynske, 2006; Tonsor, Schroeder, & Joose, 2009). Gender, age, race, education level, income level, and residential location have all been considered when investigating food safety risk perceptions, presenting a nuanced understanding of influential factors in attitudes and concerns regarding the safety of the food supply.

Gender

Females consistently have been shown to perceive greater risk in the food supply than males (Dosman et al., 2001; Flynn, Slovic, & Mertz, 1994; Lin 1995; Tomazic, Katz, & Harris, 2002; Tucker, Whaley, & Sharp, 2006). An investigation of risk perceptions regarding beef likewise documented females to have higher risk perceptions than males (Tonsor et al., 2009). Women are also more likely to alter their food behaviors, such as avoiding a specific product, because of food safety concerns (Roseman & Kurzynske, 2006).

Race

In terms of race, Flynn et al. (1994) documented that non-whites perceive higher health risks regarding bacteria in food than whites, a finding also indicated in a study conducted by Tomazic et al. (2002), which found that racial and ethnic minorities perceived the food supply as less safe than Euro-Americans. This result was also supported by the analysis conducted by Tucker et al. (2006), who documented that racial minorities in Ohio perceived greater risk in the food supply.

Age

Age has also been shown to be a factor related to food safety perceptions. Lin (1995) found that as households' main meal planners aged, they increasingly perceived the issue of food safety to be important. The study's findings, however, were not completely linear: at the age of 65, the perceived importance of food safety declined. This phenomenon is supported by Roseman and Kurzynske (2006), who found that people between the ages of 30 and 59 are most likely to perceive that "food with high risk for foodborne illness" is very common in the food supply. Contrasting these findings, were the results from a study conducted by Tonsor et al. (2009) on risk perceptions of beef safety, which documented American consumer risk perceptions to decrease with age. The age of most respondents in this study ranged from 35 to 64.

Income

Inconsistent findings have also been found regarding the influence income level has on food safety perceptions. Some studies have shown that higher levels of income positively correlate with trust in the food system (Dosman et al, 2001; Kennedy, Worosz, Todd, & Lapinski,

2008). In their analysis, Dosman et al. (2001) similarly found that respondents with higher levels of income had lower risk perceptions when considering the safety of the food system. Likewise, Tomazic et al. (2002) documented that those earning $50,000 or more per year were more likely to perceive the food supply as safe. This inverse relationship between income and food safety risk perception, however, is not uniform across all studies. Among Kentucky consumers, for example, Roseman and Kurzynske (2006) documented that those in the lowest income group (< $12,500) had the highest confidence in the food supply, followed by those with incomes above $75,000.

Education

The relationship between education level and food safety risk perception has been inverse across several studies. Although those with college education tend to have greater awareness of foodborne pathogens (Lin et al., 2005), those who are less educated often perceive greater risks in the food supply (Dosman et al., 2001; Kennedy et al., 2008; Roseman & Kurzynske, 2006; Tucker et al., 2005). Tomazic et al. (2002), for example, found that those with college degrees were more likely to perceive the food supply as safe. Several theories have emerged to explicate the inverse relationship between education level and food safety risk perceptions. Some explanations highlight that different consumers rely on various information sources for food safety information, which in turn, can influence their perceptions (Dosman et al., 2001; Kornelis, de Jonge, Frewer, & Dagevos, 2007). Highly educated consumers, for example, most often rely on governmental and institutional sources of information (Kornelis et al., 2007), which "may enable individuals to understand the risks and how to mediate these risks" (Dosman et al., 2001, p. 309). In turn, those who believe that actors in the supply chain will fulfill their responsibilities within the food system are more likely to trust the safety of the food supply

(Sapp, Arnot, Fallon, & Fleck, 2009). Corresponding to this assertion, consumers with higher levels of education are more likely to trust the food system, faithfully assuming that processors, regulators, and retailers take the necessary precautions to reduce food safety risks (Kennedy et al., 2008).

Location

Relationships between residential location and food safety risk perceptions have also been assessed in the literature, although less thoroughly than other demographic variables. According to Lin (1995), main meal planners from the Northeast and South believed food safety to be a more important issue than main meal planners in the Midwest and West. In their study of Ohioan consumers, Tucker et al. (2005) hypothesized that "individuals who were raised in a city, town, or suburb removed from agricultural production are more likely to perceive higher levels of food safety risk than individuals who were raised on a farm or in the country" (p. 138). Their analysis, however, found that place of residence did not prove to be a significant indicator of perceived safety risk. Pursuing differences in food safety risk perceptions between urban and rural residents, Tomazic et al. (2002) noted that although their results showed ranch and farm operators and owners to more likely perceive food to be safe, this finding still did not contribute much insight because most rural residents are not farmers. Thus, little data exist that provide convincing evidence of the ways in which location of residence helps to inform consumer food safety perceptions.

Third Party Certification

Free trade policies, such as the elimination of tariffs and import quotas, have allowed

international products to cross national borders with more ease. As the neoliberal economic structure has emerged, global trade in agricultural and food products has increased dramatically (Busch & Bain, 2004; Dolan & Humphrey, 2000). Before the creation of the World Trade Organization (WTO) in 1995, national governments primarily had the responsibility of assuring agrifood standards (Hatanaka et al., 2005; Hatanaka & Busch, 2008). Free trade policies, however, have created a difficult environment for governments to effectively regulate quality and safety because "an increasing quantity of food on supermarket shelves is produced in countries other than where it is purchased, and is purchased from suppliers operating under a diverse range of food safety and quality regulations" (Hatanaka et al., 2005, p. 356).

Ironically, while free trade policies have made available a diverse selection of food products to consumers, control within the food industry has become consolidated. Globally, three major supermarket chains – Walmart, Royal Ahold, and Carrefour - controlled the majority of retail food sales as of 2005, while five supermarket chains combined for 40% of retail food sales in the United States in 2000 (Hatanaka et al., 2005). While large supermarket chains have dominated competition, aggressively seeking markets in new countries, public regulation has diminished in relevance (Busch & Bain, 2004). These powerful supermarket chains, therefore, have had to increasingly bear the responsibility of maintaining agrifood standards (Hatanaka et al., 2005). As opposed to exclusively perceiving this new role as a burden, supermarkets have also seen private governance as a competitive tool (Busch & Bain, 2004). In fact, the requirements implemented by private retailers often surpass the stringency of standards set by international and national governing bodies (Dolan & Humphrey, 2000; Hatanaka et al., 2005).

The private governance mechanism of TPC permits supermarkets the opportunity to diversify their own selections while also distinguishing their products from other competitors (Hatanaka & Busch, 2008; Henson & Reardon, 2005). Because TPC verifies compliance with a particular set of production standards and compliance procedures, supermarkets are able to meet

diverse consumer demands. Fresh produce, for example, can be inspected and receive certification for standards that relate to food safety, labor conditions, environmental practices, or non-genetically modified material (Hatanaka et al., 2005). TPC thus makes production practices evident to consumers (Roff, 2009), thereby allowing consumers the ability to differentiate and choose products based on their attributes: "food safety and quality standards are central to meeting the market demands of consumers" (Henson & Reardon, p 243).

In the case of food safety, TPC provides a mechanism for supermarkets to assure consumers that their produce suppliers have been inspected for on-farm food safety practices. Like other certifications, food safety TPC provides supermarkets with the competitive benefits of product differentiation. With TPC, supermarkets can instill consumer confidence and loyalty by selling food that has been inspected for food safety (Henson & Reardon, 2005). In addition, supermarket food safety policies also provide a protective barrier in their risk management efforts. Should a foodborne outbreak occur, supermarkets can protect their reputation and reduce their liability by referring to their food safety policies (Hatanaka et al., 2005).

Although the literature indicates the various benefits that food safety policies provide supermarkets, very little empirical research has documented supermarket policies and practices regarding food safety in the United States. The evidence that does exist indicates that supermarkets are failing to fully capitalize on the benefits that TPC can provide. A study conducted among Pennsylvania supermarkets found that although supermarkets are increasingly implementing more stringent food safety policies, they are not indicating to consumers that their produce suppliers have been inspected for food safety practices (Tobin et al., forthcoming). Supermarkets that require their produce suppliers to verify their GAP compliance are missing important business opportunities outlined by the scholarly work on TPC. While food safety policies still reduce supermarket liability in the case of a foodborne outbreak, these policies cannot provide the product differentiation and consumer confidence benefits if customers are not

made aware that produce has been inspected for food safety. In short, without making information regarding food safety policies publicly available, consumers cannot be assured that they are purchasing produce that has been inspected for food safety practices.

In addition to the failure of supermarkets to fully tap into the potential advantages of food safety policies, scholars have criticized TPC for unfairly burdening processors and suppliers. According to Hatanaka et al. (2005), "as food retailing becomes more concentrated, large supermarket chains are better able to exert market power over upstream actors within the commodity chain and require that suppliers implement TPC" (p. 359). In turn, although TPC is considered a voluntary governance mechanism, suppliers increasingly perceive TPC requirements to be, in effect, mandatory (Bredahl, Northen, Boecker, & Normile, 2001). Producers and suppliers who do not prepare and pay for a TPC audit can be excluded from market access.

In the case of food safety, TPC requirements are likely no trouble for large-scale farm operations but present financial and time commitment challenges to smaller-scale growers (Eggers et al., 2010). Some blueberry growers in Michigan, for example, spent close to $100,000 to achieve TPC and were further burdened by the amount of time they were required to spend each day documenting their practices (Hatanaka et al., 2005). In light of these challenges, some scholars have argued that on-farm food safety mandates unfairly subject small-scale growers to be responsible for a problem that industrialized agriculture has exacerbated (DeLind & Howard, 2008). While DeLind and Howard (2008) conceded that produce from small-scale farms can also be contaminated, they contended that the complexity of the conventional food chain—from farm to fork—makes it very difficult to trace and, therefore, contain foodborne outbreaks.

The FDA Food Safety Modernization Act (H.R. 2751 - 111th Congress), signed into law [P.L. 111-353] by President Obama on January 4, 2011, has taken into consideration, at least to a limited degree, concerns that food safety mandates unduly burden small-scale growers. As part of the legislation, Congress mandated that the FDA, in conjunction with the USDA, develop

mandatory GAPs within one year of the law's implementation for fruit and vegetable growers to implement and document during growing, harvesting, packing, storing, and transporting (United Fresh, 2011). Growers who fail to comply with this new mandate will be in violation of the law. The law, however, provides limited flexibility for small and medium-sized growers. Growers whose gross annual sales are less than $500,000 and who sell a majority of their produce directly to supermarkets, restaurants, or consumers within their own state or within 275 miles if selling interstate, are exempt from the law. However, these exempt growers are nonetheless required to label their products to indicate place of origin, and the exemption can be withdrawn by the FDA, if the agency deems that the grower's on-farm food safety practices pose a food safety risk (United Fresh, 2011).

The FDA Food Safety Modernization Act, thus, does make an effort to consider the constraints faced by smaller-scale farmers. The qualifications for exemption, however, are multi-tiered and target various aspects of a grower's business, including total produce sales, location of customers, and type of customer. Failing to meet one of these requirements means that the grower sacrifices exemption. The likely result is that while some small-scale growers will qualify as exempt, many will be expected to comply. Furthermore, although small-scale growers might avoid the requirements of the federal law, they will still need to provide evidence of GAP compliance to the supermarkets to which they sell that have food safety policies.

Considering the limited nature of the law's exemption, previous frustrations voiced by growers regarding the burdens that food safety TPC presents are likely to continue. Small-scale growers often do not recognize "the value in adopting GAPs, largely because they do not see the public health need to change 'what they've always been doing'" (Eggers et al., p. 5). These grower concerns reflect the varying ways in which different actors in the food system can perceive an issue. In considering food safety requirements, growers highlight their concerns for the livelihood of their own economic well-being and of alternative agricultural systems, while

other stakeholders in the food system instead prioritize the need for federal regulations to protect consumers from foodborne hazards. For example, while the Food Safety Modernization Act was still under deliberation last year, three major national consumer group - the Center for Science in the Public Interest (CSPI), the Federation of State Public Interest Research Groups (USPIRG), and the Consumer Federation of America (CFA) - all publicly supported the bill (Schnirring, 2010). The different perspectives regarding food safety TPC between small-scale growers and consumers demonstrate the diversity in opinions among actors within the food system. Because different stakeholders have varying needs and interests, communication problems often occur among different actors within the food system (Sobal et al., 1998).

Other concerns expressed by scholars doubt whether TPC actually can adequately assure quality and safety attributes. The legitimacy of TPC largely rests on the perception that it is an objective certification process, mostly because independent auditors evaluate compliance procedures (Hatanaka & Busch, 2008). However, the independent companies that conduct TPC are subject to inconsistencies among individual certifiers (Tanner, 2000) or might compromise ethical standards to stay competitive in the marketplace (Hatanaka & Busch, 2008). A study conducted in Germany hypothesized and confirmed that independent "certifiers—whether due to deficiencies in competence or to economic pressure—do not all conduct their audits with the same diligence" (Albersmeier, Schulze, Jahn, & Spiller, 2009, p. 931).

Threats to the objectivity of food safety TPC are exacerbated by its current institutional structure. In the United States, several different certifying organizations, ranging from the USDA Agricultural Marketing Service (USDA AMS) to private companies, offer voluntary audit programs. Without a unified certifying body, inconsistencies arise because GAP standards and documentation requirements vary among audit agencies (Tobin et al., forthcoming). The credibility of TPC can also suffer due to large business influences (Roff, 2009). Once large industry senses that it can profit from TPC, it moves to appropriate TPC to make it favorable to

its own economic interests (Almeida, Pessali, & de Paula, 2010). This, in turn, "…threatens the standard's rigor and further centralizes control of agrifood regulation in the hands of industry" (Roff, p. 359).

Beyond the various grower and scholar concerns, the consumer perspective regarding TPC, created in part to respond to consumer demand for food safety (Henson & Reardon, 2005), must also be assessed. Although TPC is supposed to provide transparency into production procedures for consumers, research with British consumers indicated their ambivalence - and even skepticism - towards private food assurance governance mechanisms (Eden, Bear, & Walker, 2008). The participants of the study doubted that TPC organizations can maintain autonomy from industry and government influences. Therefore, "the effect of assurance schemes and information can be counter-intuitive, in that more information and discussion prompted our participants to re-consider, often negatively, food production and regulation process" (Eden et al., 2008, p. 13).

The existing research conducted in the United States addressing consumer perceptions of food assurance schemes suggests strong support for TPC inspection for food safety. Pirog and Larson (2007) found that 79% of consumers perceived information regarding whether the farm of origin had been inspected for food safety practices to be important. Another report, assessing consumer perspectives on federal food safety legislation, found 94% support "requiring tracing systems that enable the FDA to trace food back to its source" and 90% support "requiring produce growers meet standards for water quality, manure use, and worker sanitation" (Hart Research Associates / Public Opinion Strategies, 2009, ¶ 3). These initial findings indicate that consumers who are concerned about the safety of their produce would more likely purchase produce that has been inspected for food safety. However, considering the skepticism that scholars, growers, and consumers have voiced, further evidence needs to be gathered to

investigate the relationships between consumer produce safety perceptions and their produce purchasing preferences.

Local Produce

Many scholars have positioned food system localization as the "the neat antithesis to globalization" (Hinrichs, 2003, p. 33). According to Kloppenburg, Hendrickson, and Stevenson (1996), the production and consumption of local food in a bounded geographic area can help counter some of the destructive environmental and social consequences of the globalized agricultural system, which has succeeded, in part, because it is devoid of geography; industrialized agriculture is standardized and uniform, not decentralized and diverse (DuPuis & Goodman, 2005; Hinrichs, 2000). Other scholars have emphasized that local food systems can be important to community development and civic engagement (DeLind, 2002; Lyson, 2004).

That these conceptions offer romantic and overly simplistic solutions to the impacts of globalized agriculture has been critiqued. While some have challenged whether local food systems are necessarily more socially just than globalized agriculture (DuPuis & Goodman, 2005), others have observed that local food systems can be defensive and isolationist (Hinrichs, 2003). The pragmatic constraint that most local food systems cannot produce enough food to feed its local population has also been addressed (Peters, Bills, Lembo, Wilkins, & Fick, 2009).

Aside from theoretical critiques, a bounded definition of a "local food system" continues to be elusive. Although a geographic connotation is embedded in local food systems, the actual geographic distance between production and sales that qualifies a product as "local" varies among businesses, consumers, and regions (Adams & Salois, 2010; Martinez et al., 2010; Onozaka et al., 2010). In the 2008 Food, Conservation, and Energy Act, the U.S. Congress established that for a product to be considered locally grown, it had to be produced within state lines or within 400

miles (Martinez et al., 2010). This definition, however, has been updated by the Food Safety Modernization Act, in which requirements for exemption include selling produce either within one's own state or within 275 miles if selling in other states (United Fresh, 2011). Partially sharing the government's definition, Walmart considers local to mean products bought and sold in the same state (Walmart, 2008). Whole Foods Market, however, regards local to mean those products that can be transported to stores by car or truck within seven hours (Whole Foods Market, 2010). Consumers too have conflicting perceptions of what is required for a product to be considered local. Darby, Batte, Ersnt, and Roe (2008) found that Ohio consumers considered produce grown within state lines to be local. In another study, however, Midwestern consumers almost equally defined local as "grown in your state" and "grown 25 miles or less from purchase point" (Pirog, 2004, p. 24). Fully recognizing the existing inconsistencies regarding the definition of local, for the purposes of this study, local will be considered consistent with the U.S. Congress' most recent definition, which deems local to be those products that are produced either within state lines or within 275 miles.

Despite the complexities of defining local food, it nonetheless is growing in popularity among consumers. According to the USDA AMS (2010), the number of farmers' markets in the United States more than doubled between 2000 and 2010, from 2,863 to 6,132, whereas Community Supported Agriculture (CSA) schemes have increased from about 50 in 1985 to an estimated 2,500 in 2008 (Adams & Salois, 2010). Paralleling the sheer increase in types and numbers of direct marketing outlets, sales from these outlets have also increased more than twofold in the span of a decade. Between 1997 and 2007, sales from direct market outlets rose from $551 million to $1.2 billion (Martinez et al., 2010). Other estimates have figured that local food sales grew from $4 billion to $5 billion between 2002 and 2007 and are expected to increase to $7 billion by 2012 (Adams & Salois, 2012). Despite growing support by consumers, the economic impact of local foods should not be overstated. Direct market sales accounted for only

0.8% of total edible agricultural sales in 2007 (Martinez et al., 2010).

Although the popularity of local food has increased dramatically since the late 1990s, this short time frame does not indicate the length of time that scholars have been interested in consumer preferences for local food. In 1987, consumers in Tennessee were not found to have any strong predilection towards local produce except for a weak preference for tomatoes (Eastwood, Brooker, & Orr, 1987). Thomson and Kelvin (1996) likewise found only a weak preference for locally grown produce among consumers in Southeastern Pennsylvania. Indiana consumers also only slightly preferred food locally grown within state lines (Jekanowski, Williams, & Schiek, 2000), while Colorado consumers indicated that they would be more willing to pay for locally grown potatoes as opposed to potatoes labeled as organic or GMO-free (Loureiro & Hine, 2002). In southeastern Missouri, 22% of consumers claimed that they would pay at least 5% more for products locally grown (Brown, 2003). Research has suggested that consumers in South Carolina place an even higher value on local, indicating they are willing to pay a 27% premium for produce grown within state boundaries (Carpio & Isengildina-Massa, 2009). Although these studies indicate that consumers have a preference for locally grown food, the degree of consumer support varies among states.

Many studies, beyond simply understanding consumer preferences for local, have also investigated specific consumer motivations for valuing local food. Reflecting the concern over the negative social and environmental consequences of industrialized agriculture, "some consumers intend to also make civic and society-focused statements with their purchase decisions" (Onozaka et al., 2010, ¶ 6). Specific reasons include support for the local economy, farmland preservation, and reducing environmental impact (Bond, Thilmany, & Bond, 2008; Bostrom, 2005; Carpio & Isengildina-Massa, 2009; Govindasamy, Italia, & Adelaja, 2002; Onozaka et al., 2010; Pirog, 2004). Despite these perceptions, scholars have interrogated these assumptions regarding local produce. For example, research has challenged whether local food

production can always be considered more ecologically sensitive than conventional agriculture, especially in terms of greenhouse emissions (Edwards-Jones et. al, 2008). The perceived economic benefits of buying locally grown products have also come under scrutiny. Lusk and Norwood (2011), for example, argue that the expense of local produce limits consumers' ability to support other local markets, which in turn, might actually damage the local economy.

Beyond the altruistic motivations of consumers to purchase local, research has documented that consumers purchase local produce because they perceive it to have superior attributes to products grown elsewhere. Finding that consumers highly value the freshness of produce, Eastwood et al. (1987) suggested that consumer support for local could be enhanced by developing campaigns highlighting this attribute. Since then, the quality attributes that consumers consistently have cited for purchasing local produce are freshness, eating quality, taste, and nutritional benefits (Berlin et al., 2009; Bostom, 2005; Govindasamy et al., 2002; Jekanowski, 2000; Ozonaka et al., 2010; Pirog, 2004; Thomson & Kelvin, 1996). Despite these consumer perceptions, studies have pointed out that produce sourced locally does not guarantee freshness or nutritional benefits. Poor storage conditions, postharvest handling techniques, or transportation methods by growers, processors, distributors, and supermarkets can all negatively affect the quality attributes of local produce (Harvard Medical School, 2010).

In addition to the attributes of freshness, taste, and nutrition, food safety has also been increasingly listed as an important reason that consumers prefer local produce (Bond et al., 2008; Berlin et al., 2009; Onozaka et al., 2010; Yue & Tong, 2009). Pirog and Larson (2007) found that while 85% of consumers believed local food supply chains to be safe, 53% deemed global supply chains to be unsafe. Despite the general perception that local produce is safer than products grown elsewhere, the vast majority of consumers (88%) still rely on the supermarket or grocery store for most of their food purchases (IFIC, 2010). However, according to Bond, Thilmany, & Bond (2006), consumers increasingly sought other shopping outlets as their primary purchasing

locations for produce. Supermarkets were the primary location for general food purchasing for 76% of consumers but declined to 56% when consumers named their primary shopping location for produce; the popularity of farmers' markets increased to 25% when consumers indicated their primary shopping location for produce, up from 1% when consumers identified their primary shopping outlet for general food purchases (Bond et al., 2006).

Consumer preferences for local food can be further understood by assessing supermarket sales. Supermarket chains like Hannaford Brothers in the Northeast and Wegmans in the Mid-Atlantic have claimed a 20% increase in their local produce sales (Burros, 2008). With the economic advantages clear, Walmart has also embarked on its own campaign to sell locally produced food, announcing its intention to double locally sourced produce sales within the United States (Walmart, 2010). Supermarket support for local produce will likely continue into the future. In Pennsylvania, for example, 8 of 15 supermarket chains surveyed indicated that they planned to purchase more local produce in 2012 than they did in 2009, while none intended to purchase less (Tobin et al., forthcoming). In addition, the same study found that supermarkets perceived that consumers prefer local produce for the same reasons that consumers have cited in other studies: freshness, benefits to the local economy, better flavor, more environmentally friendly, healthier, and safer to eat (Tobin et al., forthcoming).

The evidence thus indicates that there is some truth to the consumer belief that their purchasing actions affect the availability of products (Thomson & Kelvin, 1996). As consumer perceptions towards food safety continue to change and evolve, farmers and supermarkets must understand the relationship between these risk perceptions and their purchasing preferences. Beyond demographic characteristics, other important factors, such as preference for local produce, might also play a significant role in shaping produce safety perceptions. This type of investigation will help farmers and supermarkets better position themselves to meet consumer demand. Studies in pursuit of this knowledge should not overlook that because consumer

perceptions of local produce vary among states, the relationship between consumer produce safety risk perceptions and their preferences for local produce might also differ by state.

Organic Produce

Like locally produced food, the organic industry has also undergone major growth during the past two decades. Between 1990 and 2009, sales of organic food and beverages rose from $1 billion to $24.8 billion (Organic Trade Association, 2010a). Of the total organic sales, fruits and vegetables are among the most popular products, comprising 38% of the $24.8 billion. While total organic sales represented a mere 3.7% of total food sales in the United States in 2009, organic fruits and vegetables comprised 11.4% of total fruit and vegetable sales. The rising popularity of organic fruits and vegetables is further indicated by its 11.4% increase in sales from 2008 figures (Organic Trade Association, 2010b).

Similar to the growth of local produce, studies have shown that consumers also often prefer organic produce for their perceived quality attributes (Bostrom, 2005; Byrne, Toensmeyer, German, & Muller, 1991; Yiridoe et al., 2005; Yue & Tong, 2009; Zepeda, Chang, & Leviten-Reid, 2006). According to Bostrom (2005), consumers preferred organic produce for reasons relating to the environment, support for small and local farmers, nutrition, and taste. Yue and Tong (2009) confirmed that consumers perceive organic produce to provide enhanced nutritional benefits and to be more environmentally friendly, while Dimitri and Greene (2002), summarizing industry findings, reported that consumers cited the environment, health, taste, and nutrition as reasons for purchasing organic.

Food safety is also often frequently named as an important attribute for consumers who prefer organic (Berlin et al., 2009). Specifically, Yue and Tong (2009) found that most consumers (83%) believed organic produce to be safe to eat, while Zepeda and Deal (2009)

reported that nearly all consumers named pesticide concerns as a leading motivation to support organic. These food safety perceptions, however, do not necessarily reflect scientific studies. In fact, much of the research that has been conducted on whether organic produce tends to be less susceptible to pesticide and microbiological contamination is conflicting (Yiridoe et al., 2005).

This gap between perception and fact is further evident when considering that many consumers relate organically produced food to local, small scale farms (Berlin et al., 2009). The perceived connection between local and organic might stem in part from the fact that the organic movement originated as an alternative model to the conventional food system (Guthman, 2004; Shreck, Getz, & Feenstra, 2006). The emerging reality, however, is that organics are increasingly being consolidated in the conventional food system (Guthman, 2004). Major food corporations, perceiving the financial benefits, are either acquiring organic food companies or starting their own organic brands (Howard, 2009). Simply stated, organic food is being industrialized (Adams & Salois, 2010). As a result, the association between organic and local made by consumers is slowly becoming disentangled:

> [Consumer] preference for local over organic foods was because they perceived that corporations had *already* taken over organic foods. They viewed the availability of organic foods at Walmart through brands like Kellogg's, etc. negatively, with typical comments like 'I'm just suspicious of Walmart. I don't trust them at all' (Zepeda & Deal, 2009, p. 702).

As organic food has become increasingly integrated into the conventional food system, organic food's availability has also risen. According to Dimitri and Greene (2002), not until 2000 did supermarkets lead all other market venues as the primary seller of organic products. Supermarket dominance of organic sales has continued, as the Organic Trade Association found that in 2009, conventional retailers like supermarkets comprised 54% of all organic sales, while only 6% of sales occurred through direct market outlets like farmers' markets (Organic Trade

Association, 2010b). Consumers thus seem to be increasingly relying on supermarkets for their organic purchases.

The case of organics provides a distinct lens from which to assess how consumer preferences for specific produce attributes affect their perceptions of produce safety. Although studies have found that consumers often prefer organic food for perceived safety attributes (Berlin et al., 2009; Yue & Tong, 2009), this preference has been affected by the continuing consolidation of organic products into the conventional food system (Adams & Salois, 2010). Will consumer perceptions regarding the safety of organic food suffer as organics loses its reputation for being local and small-scale, or will consumers continue to prefer organic products for their perceived food safety attributes?

Theory of Planned Behavior

Different stakeholders within the food system have varying interests, meaning that misunderstandings are likely if little interaction occurs among stakeholder groups (Sobal et al., 1998). In the case of TPC for food safety, the literature indicates that while consumers are concerned for their health and well-being, supermarkets are interested in risk management and growers fear that they will be unduly burdened. As such, little compromise is likely to occur without sufficient communication. Assessing the consumer perspective on food safety is, therefore, essential for growers and supermarkets to understand and respond to customer concerns and interests. Ascertaining how consumers value TPC provides important information for growers, who have been slow to implement TPC requirements to comply with GAPs (Eggers et al., 2010), and for supermarkets, which are missing some of the competitive advantages that food safety policies can offer (Tobin et al., forthcoming). For growers to maintain their market outlets and for supermarkets to take advantage of the business opportunities of their food safety policies,

their behaviors and actions must shift. Growers must prepare for and pass a GAP audit, while supermarkets must communicate to consumers that the produce they sell has been inspected for food safety. Although these seem like simple solutions, behavior changes are difficult to accomplish. Furthermore, these solutions assume that growers and supermarkets do not have sensible reasons for not adopting changes in their policies and practices.

The Theory of Planned Behavior (TpB) provides a theoretical framework to understand the decision-making processes of growers and supermarkets regarding their food safety policies and practices. In the interest of shifting the food safety actions and behaviors of grower and supermarkets, TpB also offers a rationale for the importance of assessing consumer produce safety perceptions and how these perceptions are affected by their produce preferences. According to TpB, the decision to perform a particular behavior is influenced by the opinions and perspectives of important others (individuals or groups) regarding that behavior. Thus, understanding the food safety perceptions of consumers, no doubt an important group to growers and supermarkets alike, will help growers and supermarkets make more informed decisions regarding their food safety policies and practices.

Stemming out of social psychology, TpB is an extension of the Theory of Reasoned Action (TRA), which sought to explain the reasons underlying individual behaviors (Ajzen, 1991). Grounded in the previously determined finding that intentions often determine behaviors, TRA seeks to elucidate the underlying aspects that influence intentions. Asserting that behaviors depend on a process of sensible and reasoned decisions, based on available information and perceived implications, TRA hypothesizes that intentions are based on two fundamental determinants: attitudes toward the behavior and subjective norms (Ajzen, 1988). Attitudes towards the behavior are shaped by "the individual's positive or negative evaluation of performing the particular behavior of interest," whereas subjective norms are "the person's

perception of social pressure to perform or not to perform the behavior under consideration" (Ajzen, 1988, p. 117).

Although the TRA model proved to be useful in predicting and explaining many behaviors, it did not adequately consider behaviors not entirely under one's own control. Assuming that intentions are the primary predictors of behaviors, TRA simply presupposes that the achievement of behaviors depends on the strength of the individual's intentions to perform the behavior. In many cases, however, external factors, such as access to resources and opportunities, affect an individual's ability to perform a behavior (Ajzen, 1988). As a result, TRA was expanded into TpB, in which the additional determinant of perceived behavioral control, which "refers to people's perception of the ease or difficulty of performing the behavior of interest," was added to account for factors beyond individual control. (Ajzen, 1991, p. 183).

Perceived behavior control plays a particularly critical role in explaining behavior because it can have a direct link to both behavioral intentions and the actual behavior. As explained by Ajzen (1988), those who perceive that they lack the resources or opportunities to achieve the behavior are unlikely to develop the intention to perform the behavior. In this way, perceived behavior control itself acts as an important predictor of behavior independent of intentions. Behavior can thus be explained, according to TpB, by intentions and perceived behavior control (Ajzen, 1988).

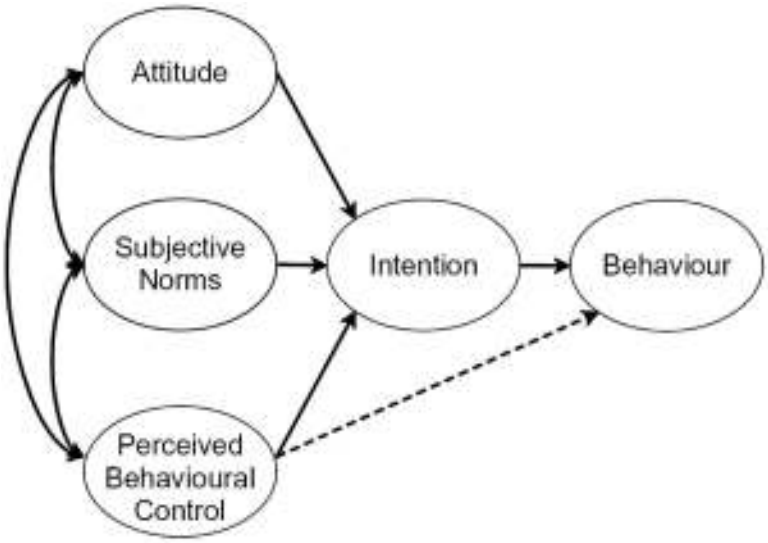

Figure **2-1**: Theory of Planned Behavior (Ajzen, 1991, p. 182)

Since its development, TpB has been a popular theoretical framework among scholars across a diverse range of areas (Ajzen & Albarracin, 2007). Among the fields in which TpB has been utilized to predict and explain behaviors is food safety (see Mullan & Wong, 2009; Clayton & Griffith, 2008). Although these studies have focused mostly on food handling and hygienic practices, such as hand-washing, they nonetheless indicate that TpB is a relevant model to consider for food safety concerns. In the context of GAPs, TpB provides a rationale for assessing consumer perceptions of food safety and their produce preferences. As a vital group to sales and profits, consumer expectations regarding food safety comprise a large portion of the subjective norms that growers and supermarkets must consider when making decisions about food safety behaviors. Indeed, although growers have been reluctant to adopt TPC requirements for a GAP audit, they are nonetheless motivated to meet customer expectations (Eggers et al., 2010). Understanding consumer perceptions is thus necessary for growers and supermarkets to make accurate and informed decisions regarding their food safety policies and practices.

These consumer expectations are obviously not the only relevant information for growers and supermarkets. As outlined by the TpB model, attitudes and perceived behavior control are also essential elements in predicting behavior. Therefore, simply ascertaining the subjective norms of consumers is unlikely to spur behavior changes among growers and supermarkets. In the case of the growers, for example, the literature has found that they perceive time and financial barriers (perceived behavior control) to be limitations to passing a GAP audit (Hatanka et al., 2005). In addition, growers sometimes question whether on-farm practices will significantly reduce the threat of foodborne outbreaks (attitudes). In doing so, growers have claimed that the lax behaviors of other actors in the food chain, such as processors, retailers, and consumers, are often the cause of foodborne contamination (Bagdonis, forthcoming). These attitude and perceived behavior control aspects must no doubt be addressed in order for growers and supermarkets to change their behaviors regarding food safety policies and practices. Nonetheless, the importance of understanding consumer perceptions cannot be overlooked. According to TpB, assessing and communicating consumer food safety expectations and preferences regarding food safety can still influence grower and supermarket intentions regarding their own food safety policies and practices. This study thus does not seek to comprehensively attend to all aspects within the TpB model but rather attempts to thoroughly address the one critical component of subjective (consumer) norms.

Summary of the Literature Review

A review of the literature identified both theoretical and empirical studies related to consumer perceptions of produce safety. As fresh fruits and vegetables have emerged as a rising cause of foodborne illnesses, fresh produce has, correspondingly, received attention from scholars. In their investigations, scholars have found that certain demographic variables,

including gender, age, race, education level, and income level, influence consumer perceptions regarding the safety of the produce supply.

Beyond these sociodemographic variables, studies have also begun to link specific produce attributes to produce safety. As local produce and organic produce have experienced increased consumer demand in the last decade, research has investigated the reasons underlying the growth of the local and organic markets. Among the reasons that consumers prefer local and organic produce are that they often perceive those products to pose less of a safety threat than non-local and conventional produce. However, support for this connection between produce attributes and consumer perceptions of produce safety has mostly been concluded through descriptive statistics, not inferential analyses. As such, the literature review revealed a need to further explore the relationship between consumer preferences for specific produce attributes and consumer produce safety perceptions.

Such a line of inquiry is particularly apt, given the rise of TPC as a private governance mechanism to assure safety. While some supermarkets have been implementing their own food safety policies that require their produce suppliers to provide evidence of compliance with GAPs, the recent Food Safety Modernization Act will likely mean that TPC for GAPs will become the norm for most growers in the near future. This new federal mandate will inevitably influence certain stakeholder groups such as growers and supermarkets to adapt their policies and practices. For growers and supermarkets to effectively do so, they must understand consumer perceptions of produce safety. In addition to how preferences for local produce and organic produce influence consumer produce safety perceptions, assessing consumer preferences for GAP certified produce is also essential, especially because this attribute is not yet widely known among consumers.

While the past literature has explored these various issues piecemeal, a comprehensive assessment of produce safety perceptions that includes both demographic variables and consumers' preferences for produce attributes is lacking. The intent of this study, therefore, is to

address this gap by analyzing the combined effect that demographic variables and consumer preferences for produce attributes have on their produce safety perceptions.

Purpose and Research Questions

The purpose of this study was to investigate the factors related to produce safety perceptions of Pennsylvania consumers. The study first considers Pennsylvania produce safety perceptions and the demographic characteristics that might influence those perceptions before also including other potential influences, such as preferences for specific produce attributes. The research then aims to provide a more complex analysis that considers all of the independent variables together.

Specifically, the first two research questions are:

1) Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?
2) Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, residential location (rural vs. urban), educational status, financial status, or primary shopping venue for produce?

The analysis of these first two research questions will establish important foundational information regarding consumer produce safety perceptions and the factors that influence those perceptions. Based on the literature, the expectation is that Pennsylvania consumers will indeed understand produce safety to be an important issue. In addition, based on prior research, this study anticipates that females, older populations, those in lower educational and financial brackets, and those who rely on direct marketing outlets will have higher risk perceptions regarding the safety of the food supply. No expectation exists regarding geography since a clear precedent has not emerged from previous studies.

After assessing Pennsylvania consumer food safety perceptions from a demographic perspective, the study shifts to investigate the relationship between consumer produce preferences and their produce safety perceptions. This angle of analysis provides deeper insight into the various factors that influence consumer produce safety perceptions. The third research questions, therefore, is:

3) Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?

Although findings from prior research indicate that consumers who are concerned about food safety are more likely to purchase food that has been inspected for compliance with on-farm food safety practices, that is local, and that is organic, few studies have provided statistically significant relationships that explicitly document these trends.

While the first three research questions analyze produce safety perceptions from a variety of angles, they do so independently from one another. The final research question, thus, seeks to allow all of the independent variables, along with the dependent variable, to interact with one another:

4) When analyzed collectively, which of the independent variables prove to be significant predictors of Pennsylvania consumer produce safety perceptions?

This research question allows for more nuanced findings to emerge because all consumer demographics and consumer produce preferences are analyzed simultaneously. From the TpB framework, these findings will shed insight into consumers' subjective norms regarding produce safety. These findings, in turn, are helpful for produce growers and supermarkets to make more informed decisions regarding their food safety policies and practices and for Extension to continue to develop relevant programming.

Chapter 3

Research Methodology

This chapter presents the research methodology used for this study. Six sections comprise this chapter: 1) research design, 2) population and sample, 3) instrumentation, 4) data collection, 5) data analysis, and 6) data quality.

Research Design

The intent of this study was to assess Pennsylvania consumer perceptions of produce safety and the various factors that influence those perceptions. This study can, therefore, be characterized as descriptive-correlational research. To answer the research questions, randomly sampled Pennsylvania consumers were contacted by telephone and asked to respond to a series of survey questions. This research, thus, is also a cross-sectional study because the survey was administered only once to the participating sample. Only the primary data collected from the telephone interviews were used for analysis.

Population and Sample

Pennsylvania consumers in 50 of 67 counties served as the population for this study. The study, intending to sample along the geographic considerations of rural and urban, purposefully excluded 17 counties. The distinction between rural and urban used in the study was based on the definition for rural adopted by the Center for Rural Pennsylvania, a legislative agency within the Pennsylvania General Assembly, in 2003. By dividing the total population of a specific area by

the total number of square land miles of that area, the Center for Rural Pennsylvania (n.d.) found 48 of 67 counties to be rural, because they had less than Pennsylvania's average of 274 persons living per square mile. Allegheny County, containing the city of Pittsburgh, and Philadelphia County, which holds the city of Philadelphia, represented the two urban areas for the study.

Relying on telephone exchanges from Philadelphia County, Allegheny County, and the 48 rural counties, the Penn State Harrisburg Center for Survey Research (CSR) randomly sampled Pennsylvania consumers until at least 200 telephone interviews were achieved within each of three geographic areas. CSR utilized random-digit-dialing (RDD) sampling procedure in order to ensure that all telephone numbers within the three geographic areas had an equal chance for selection. The Marketing Systems Groups (MSG) of Fort Washington, Pennsylvania, constructed the sample frame. Only residential landlines numbers were eligible in the random selection process because CSR does not include wireless telephone numbers when conducting random-digit-dial telephone surveys. To further ensure generalizability, CSR employed the last-birthday method for second-stage sampling so all residents over 18 within the household had an equal probability of being interviewed. Distributed between urban and rural regions, CSR conducted a total of 604 completed interviews: 203 residents were randomly interviewed from Allegheny County, 201 residents from Philadelphia County, and 200 residents from the 48 rural counties. For a sample of this size, the margin of error is 4% plus or minus at the 95% confidence level. To further account for sampling error, the demographics of the data sample were compared with the target population demographics.

In total, CSR attempted 18,039 total phone calls to 7,004 different telephone numbers. Of the 7,004, CSR removed 1,547 numbers that were determined to be ineligible (language problem, physically or mentally incompetent, fax line, cell phone, not in service, etc.), reducing the viable sample to 5,457 telephone numbers. Of these, 203 (3.7%) refused to participate, and 4,627 (85.0%) were never reached for an interview. The CSR successfully completed or partially

completed 627 (11.5%) surveys. According to the formula to measure the survey cooperation rate, as derived by the American Association of Public Opinion Research (2009), the survey cooperation rate for this study was 71.6%. While the response rate considers the number of completed or partial interviews divided by the sample of both respondents and non-respondents, the cooperation rate is the number of respondents who provided partial or complete data among all of those with whom contact was made (American Association of Public Opinion Research, 2009). Upon data cleaning, 604 of the 627 partial or completed interviews were determined to be adequate for analysis.

Despite the study's efforts to randomly sample Pennsylvania consumers to accurately assess public perceptions of produce safety and preferences, the sole reliance on landline telephones has potential implications for this study. Cellular phones are becoming increasingly common as the primary means for telephone service among Americans. A recent government study estimated that 20.2% of Americans used only wireless telephones in the latter half of 2008 (Blumberg & Luke, 2009). Even among Americans who had landlines, 14.5% received phone calls primarily on their wireless telephones. In Pennsylvania, an estimated 10.8% of households use only wireless telephones (Blumberg, Luke, Davidson, Davern, Yu, & Soderberg, 2009). The CSR, along with most major survey research organizations, however, does not include wireless telephone numbers when utilizing the random-digit dial method to conduct telephone surveys. With wireless numbers excluded, the data of this study cannot measure whether differences exist between those who primarily use residential landlines and those who primarily use wireless telephones and therefore limits the generalizability of the findings.

Instrumentation

The survey instrument used for interviewing was developed with the intent to assess consumer perspectives of food safety and their produce preferences (Appendix). Divided into five sections, the survey utilized semantic differential scales, a survey method that measures attitudes by having respondents select a number on a scale with two antonyms representing opposite poles (Heise, 1970; Uebersax, 2006). Although themes differed by section, all scale items on the survey spanned from 1 to 7.

The first section of the survey consisted of six semantic differential items (unimportant/important, of no concern/of great concern, means nothing/means a lot, doesn't matter/matters to me, insignificant/significant, irrelevant/relevant) regarding whether consumers perceived fresh fruit and vegetable safety to be an important issue in the United States.

The second section of the survey asked consumers to respond to nine statements (1=Strongly Disagree to 7=Strongly Agree) regarding their attitudes towards fresh fruit and vegetable safety in the United States. Specifically, these statements related to the perceived threat that fresh produce poses to health, the perceived superior attributes of local produce compared to other produce, and the role of government regulation in maintaining a safe food supply.

The third section asked consumers to reflect on the likelihood that they would purchase local produce, if given the opportunity. Six semantic differential items (Unlikely/Likely, Nonexistent/Existent, Improbably/Probable, Impossible/Possible, Uncertain/Certain, Definitely would not/Definitely would) comprised this section.

The fourth section of the survey focused on the attributes that consumers deemed important when purchasing fresh produce. Eight attributes were presented to consumers who were asked to select the degree of importance (1=Unimportant to 7=Important) for each attribute. Attributes measured in this section related to cost, size/appearance, locally grown, organic, and

inspected for safety by the government.

Demographic information was collected in the final section of the survey. Demographic questions included gender, race, age, household income, education, shopping outlet for fresh produce purchases, and county of residence. While gender, race, household income, and education were all measured categorically, respondents were asked to provide their exact age. In open-ended questions, participants were asked to provide information regarding shopping outlets and county of residence, both of which were later grouped into nominal categories.

The instrument was developed and reviewed for content validity by the three co-investigators of the study, an assistant professor of communication, a professor of agricultural communication, and an associate professor of food science. The Office for Research Protections approved the survey instrument, IRB #30705, in March 2009. Before full-field interviewing began, the survey instrument was pre-tested by CSR with a small sample of respondents to ensure that it had been properly programmed into the Voxco computer-assisted telephone interviewing (CATI) software. CATI software allowed the respondent to directly talk to an interviewer but register their responses to the CSR computer system by pressing one of the numbers on their telephone.

Data Collection

Approximately 40 telephone interviewers collected the data, all of whom received training on proper interviewing techniques and had passed an online test required by the university's Office for Research Protections in order to conduct research with human participants. All interviewers also participated in continuing training during the data collection period, focusing on techniques to increase respondent cooperation and maintain consistency in delivering the survey across interviews. The lead research associate of CSR, along with six field

supervisors, trained, monitored, and evaluated the interviewers during the data collection period.

The CATI software that CSR utilized allowed up to 20 interviewers to attempt phone calls simultaneously. All interviews occurred between April 6, 2009 and June 1, 2009. Interview hours were Monday through Thursday from 5:00 p.m. to 9:00 p.m., Saturdays from 10:00 a.m. to 6:00 p.m., and Sundays from 1:00 p.m. to 8:00 p.m. Interviewers began phone calls by informing the potential respondent that the survey was strictly voluntary and confidential, and that the respondent had the option to refuse to answer any of the questions or to end the interview at any time. The interviewers also willingly rescheduled phone calls with household members to find a convenient time. When the interviewers reached answering machines, busy signals, or there was no answer, they attempted follow-up calls at different times of the day to further increase the response rate. Interviewers tried a phone number a maximum of 18 times, although the average number of call attempts per phone number was 2.58. This data collection continued until at least 200 interviews had been completed in each of three geographic areas. Completed interviews averaged 10.5 minutes.

After completing the 604 interviews, the data were transferred from the CATI system to the Statistical Package for Social Sciences (SPSS) software version 15.0. The senior staff of CSR conducted a final review of the dataset for accuracy and consistency.

Data Analysis

The quantitative data gathered from the telephone interviews were analyzed using SPSS software version 19.0. A variety of descriptive and inferential statistics were utilized to answer the research questions. Table **3-1** summarizes the data analysis approach according to each research question.

Table **3-1**: Variables, Scale of Measurement, and Statistical Analysis by Research Question

Research Question	Independent Variables	Dependent Variables	Scale of Measurement	Method of Analysis
1. Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?	Pennsylvania consumer perceptions of food safety (Summated responses from 1st survey scale)	---	Interval/ Ratio	Descriptive Statistics (Means, Standard Deviations, Range)
2. Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, residential location (rural vs. urban), educational status, financial status, or primary shopping venue?	Demographic Characteristics	Pennsylvania consumer perceptions of produce safety	Nominal (Dummy Coded), Ordinal (Dummy Coded), Interval/ Ratio	Descriptive Statistics (Means, Standard Deviations, Frequencies, Percentages); Bivariate Statistics (independent t-tests, one-way ANOVA, PPMR); Multiple Regression
3. Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?	• 8-item construct regarding preferences for local produce • 2 individual items regarding preferences for produce inspected for safety by the government • 1 individual item regarding preference for organic produce	Pennsylvania consumer perceptions of produce safety	Ordinal (Dummy Coded into Nominal); Interval/ Ratio	Descriptive Statistics (Means, Standard Deviations, Frequencies, Percentages); Bivariate Statistics (independent t-tests); Simple Regression; Multiple Regression
4. When analyzed collectively, which of the independent variables prove to be significant predictors of produce safety perceptions?	All independent variables from Research Questions 2 and 3	Pennsylvania consumer perceptions of produce safety	Nominal (Dummy Coded), Ordinal (Dummy Coded), Interval/Ratio	Multiple Regression

To answer the first research question, which sought to assess Pennsylvania consumer produce safety perceptions, responses to the six items comprising the first section of the survey measuring the importance consumers placed on the issue of produce safety, were summated. Although summation more commonly occurs when using a Likert-type scale, composite scores can also be used with semantic differential scales (Desselle, 2005; Heise, 1970). The decision to summate this scale was made in accordance with its high reliability (Cronbach's α=.915). George and Mallery (2003) deem α >.70 to be an acceptable alpha score. As a summated scale, possible scores ranged from 6 (produce safety is unimportant) to 42 (produce safety is important). When normality was checked, the skewness of the sample was determined to violate the statistical assumptions of normality. To facilitate data analysis, 12 extreme outliers were deleted from the sample. Although the sample was still somewhat skewed (-1.70), assumptions of normality are flexible, especially in large samples (Morgan, Leech, Gloeckner, & Barrett, 2011; Tabachnick & Fidell, 2001). A skewness of -1.70 was thus determined to be within a reasonable range given the large size of the sample (n=592). Descriptive statistics (means, standard deviations, and percentiles) were then used to assess produce safety perceptions.

The second research question pursued the relationship between demographic characteristics and produce safety perceptions. The composite scores of produce safety perceptions, calculated to answer the first research question, were used as the dependent variable for this research question. The demographic profile of the respondents (gender, age, race, household income, education, geography, and primary shopping outlet for fresh produce purchases) was first analyzed using descriptive statistics (frequencies and percentages).

Before this analysis occurred, the variables asked in open response format were categorized. For residential location, respondents from either Allegheny County or Philadelphia County were grouped as urban, whereas the participants from the 48 rural counties formed the rural group. The variable of primary shopping outlet for fresh fruits and vegetables was also

asked in open response form. Upon review of the responses, coding and categorizing into two groups was determined to be appropriate. Those answers that mentioned a direct outlet, including farmers' markets, farm stands, CSAs, and home gardens were considered as one group that sometimes or always sourced its produce locally. Those answers that did not indicate any direct outlet were categorized into a second group considered to primarily shop at outlets that sourced their fresh produce non-locally.

The demographic characteristics were then analyzed as the independent variables in a series of bivariate analyses, as well as a multivariate analysis. The variable of income group posed a challenge. Of the 592 respondents, missing data existed for 110 of the respondents. Although the easiest way to contend with missing data is to exclude the missing values from analysis, another approach, when possible, is to categorize those who did not respond to a particular item in its own group and then include this group in analysis to check for differences between non-respondents and respondents. If no differences exist, the non-respondents can be eliminated with the confidence that their responses are not significantly different from the respondents. However, if differences do occur, this non-response error needs to be considered in interpreting and generalizing the results (Howell, 2003). When this procedure was done, no significant differences were found to exist between the missing data group and the other income groups. The category of missing data was then excluded for all other analyses that included income group as a variable.

In order to run the bivariate and multivariate analyses, the nominal demographic variables (gender, race, primary shopping outlet, geography) were dummy coded. Age, asked in open response format, was maintained as interval/ratio data. Education level and income group, which were measured categorically, were dummy coded. For the bivariate analyses, both variables were condensed into five levels in order to achieve closer equality in the number of

respondents in each level. For the multiple regression analyses, education level and income level were dummy coded.

The third research question analyzed the influence consumer preferences for specific attributes in produce have on their produce safety perceptions. To do so, several constructs based on consistency in content were formed from the items on the instrument to serve as independent variables. To develop the construct for local produce, eight items that related to survey respondents' perceptions of and preferences for local produce were included in the construct. The construct's adequate reliability (Cronbach's α=.780) allowed for summation of the eight items so that scores ranged from 8 (no preference for local produce) to 56 (strong preference for local produce). Normality was checked and determined to be appropriate given the large sample size. Descriptive statistics (means, standard deviations) were initially used to characterize the data. A simple regression analysis was then run to determine whether a significant relationship existed between local produce preferences and produce safety perceptions.

Another produce preference of interest to this study is produce that has come from a farm that has been inspected for on-farm food safety practices. To develop a construct for this preference, two items from the instrument were selected that related to the degree to which consumers value produce that has been inspected by the government to assure produce safety. Two items, however, were deemed not sufficient to develop a construct, test for reliability, and summate. They were thus maintained as separate items.

Debate exists among scholars regarding how to treat single Likert-type or semantic differential items. While some maintain that single items can be considered interval data, others assert that single items are ordinal data at best (Jamieson, 2004). For the purposes of this study, all single items were treated as nominal data, collapsed into two categories and dummy coded. This decision was facilitated when responses on the individual items were tested for normality. One of the single items was found to violate the assumptions of normality. Testing for normality

is especially important because multiple regression requires that both independent and dependent variables meet the assumptions of normality (Morgan et al., 2011). In order to maintain consistency, the other items were dummy coded as well. Those answers that were from 1 to 4 on the item were determined to have a lower preference and were thus all grouped into one category. Answers from 5 to 7, judged to indicate a stronger preference as they were all above the point of neutrality, were categorized into the other nominal group. Descriptive statistics (frequencies and percentages) were first run on these nominal categories. Although a significant discrepancy exists in the number of respondents composing each category, Tabachnick and Fidell (2001) noted, "In nonexperimental work, unequal *n* often results from the nature of the population. Differences in sample sizes reflect true differences in numbers of various types of subjects. To artificially equalize *n* is to distort the differences and lose generalizability" (p. 47).

In order to determine whether differences existed between the nominal categories on both of the individual items and the composite scores of produce safety perceptions, t-tests were run. Afterwards, the two individual items were treated as the independent variables in a multiple regression analysis. The summated scores of produce safety perceptions served as the dependent variable.

The other attribute of interest for the purposes of this study was organic. The value that consumers place on organic was considered by a single semantic differential item, meaning that no construct could be developed. Deeming this item to nonetheless be relevant in order to provide insight for the answer to the third research question, this single item was dummy coded in the same manner as the individual items related to produce inspected for food safety. Doing so maintained consistency throughout the study. Descriptive statistics (frequencies and percentages) were then used to initially analyze the data before an independent t-test, in which the summated scores of produce safety perceptions served as the dependent variable, analyzed for differences in means.

The final research question sought to understand how all of the independent variables, when collectively analyzed, interacted with each other and the dependent variable of consumer produce safety perceptions. To do so, a saturated multiple regression model was developed so that all of the independent variables from the previous research questions were entered as inputs.

Interpreting the findings requires careful attention to the limitations of the data. Failing to do so risks inappropriate generalizations. For this study, several factors that potentially affect the generalizability of the findings need to be carefully considered, including the utilization of only landlines telephone numbers, non-response error (especially of income), and the skewed nature of the sample.

Data Quality

Data quality is generally understood as the degree to which data meet the needs of users (Vale, 2010). Among the critical aspects to consider when assessing data for quality are relevancy, validity, reliability, objectivity, integrity, completeness, and utility. Relevancy is the degree to which data are important to users and their needs (Organisation for Economic Co-operation and Development [OECD], 2003; Vale, 2010). Validity, or accuracy, refers to the "closeness between the values provided and the (unknown) true values" (OECD, 2003, p. 7). Reliability is determined by the degree to which measurements are the same or similar on repeated measurements (Centers for Disease Control [CDC], 2009). The objectivity of data means that conclusions are based on statistically sound methods (Guba & Lincoln, 1981). Data integrity concerns minimizing error through the processes of collecting, recording, and analyzing data (CDC, 2009). Data completeness refers to the number of missing values that exist in a given dataset (CDC, 2009). The last dimension of data quality, utility, includes aspects of timeliness, punctuality, and accessibility. Timeliness means the data have been collected and made available

according to an appropriate timeline so that the data maintain their relevance to their users (OEDC, 2003; CDC, 2009). Punctuality refers to the length of time between when the data are released and when the data were planned to be released (Vale, 2010), and accessibility relates to the ways in which the data are made available to intended users.

In considering the different dimensions, Table **3-2** assesses the quality of data used for this study. The table notes whether each aspect posed a threat to quality, and if so, the measures that were taken to enhance quality.

Table **3-2**. Data Quality Threats

Aspect of Data Quality	Was It a Threat?	If yes, procedures taken
Relevancy	No	
Validity	Yes	Review by Co-investigators; Random Sampling; Extreme outliers eliminated
Reliability	Yes	Cronbach's α determined for constructs; those below adequate α not summated into composite scores
Objectivity	Yes	Assumptions of Normality tested; Scales of measurement considered and treated accordingly
Integrity	Yes	Interviewers trained; Dataset reviewed for mistakes
Completeness	Yes	Missing data for income group compared to other income groups; Limitations to frame considered
Utility	Yes	Findings from study will be reported in journal articles, posters, and on website that can be accessed publicly

Chapter 4

Findings

The findings of the study, presented according to research question, are the focus of this chapter. This chapter has five sections: 1) purpose and objectives of the study, 2) Pennsylvania consumer produce safety perceptions (RQ 1), 3) Pennsylvania consumer produce safety perceptions according to demographic characteristics (RQ 2), 4) Pennsylvania consumer produce safety perceptions according to their preferences for specific produce attributes (RQ 3) , and 5) significant predictors of Pennsylvania consumer produce safety perceptions (RQ 4).

Purpose and Research Questions

The purpose of this study was to understand the various influences that affect Pennsylvania consumer perceptions of produce safety. Specifically, four research questions guided the study:

1) Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?
2) Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, geography (rural vs. urban), educational status, financial status, or primary shopping venue for produce?
3) Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?

4) When analyzed collectively, which of the independent variables prove to be significant predictors of Pennsylvania consumer produce safety perceptions?

Research Question 1: Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?

After adjusting the data for normality by eliminating 12 extreme outliers, the sample had a total of 592 respondents. The perceptions of produce safety were measured on a summated semantic differential scale that included six individual items asking the respondents to consider the level of importance that they placed on the issue of produce safety. The composite scores ranged from 6 (Not Important) to 42 (Important) with a theoretical midpoint of 24.

All 592 respondents provided valid data. Descriptive statistics indicate that Pennsylvania consumers place high importance on the issue of produce safety. Responses indicate that actual scores ranged from a low of 22 to a high of 42, with a mean of 39.18 and a standard deviation of 4.45. The mean score for produce safety perceptions was thus well above the theoretical midpoint of 24. Table **4-1** describes the mean, standard deviation, and range of the composite scores of produce safety perceptions.

Table **4-1**: Descriptive Statistics for Consumer Produce Safety Perceptions

N	Theoretical Midpoint	Summated Mean Score*	Standard Deviation	Range	
				Low	High
592	24	39.18	4.45	22	42

*Summated Mean Score could theoretically range from a low of 6 to a high of 42.

Research Question 2: Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, geography (rural vs. urban), educational status, financial status, or primary shopping venue for produce?

To determine the demographic characteristics that influence produce safety perceptions, the demographic profile of the sample was first considered. Basic demographic data were collected from the respondents, including gender, race, age, income group, educational level, place of residence (rural or urban), and shopping venue for fresh produce. Although shopping venue for fresh produce was asked in open response format, the responses were categorized into two groups. One group was comprised of answers that indicated that the consumer sometimes or always accessed produce from local sources, while the other group indicated that they shopped from outlets that primarily sourced fresh produce non-locally. Residential location, also asked in open response format, was also categorized into rural and urban groups.

The demographic profile indicated that there were more females (69.8%) than males (30.2%) and more whites (79.6%) than non-whites (20.4%). In terms of place of residence, the percentage of those living in urban areas (67.1%) about doubled those living in rural areas (32.9%). This discrepancy is because sampling for the survey was evenly distributed across Philadelphia County, Allegheny County, and 48 rural counties. When considering place of residence in terms of rural and urban, Philadelphia County and Allegheny County together comprised the urban category. Regarding shopping outlet for fresh produce, the distribution was relatively even, as 44.7% of the respondents sometimes or always accessed fresh produce from direct outlets, whereas 55.3% primarily relied on sources offering non-local produce. In terms of education level, those who had a high school diploma, a GED, or less represented the largest proportion of the sample (36.4%). Representation of income groups was distributed relatively

evenly, for percentages of representation ranged from a low of 13.1% ($100,000 or more) to a high of 24.3% ($20,000-$39,999). Ages for survey respondents ranged from 18 to 90 with a mean of 54.94. Table **4-2** provides the demographic profile of the sample.

Table **4-2**: Demographic Profile

Variable and Level	Frequency	Percent	Population Percent (50 counties)*
Gender			
Male	179	30.2	49.8
Female	413	69.8	50.2
Total	592	100.0	100.0
Race			
White	464	79.6	82.2
Non-White	119	20.4	17.8
Total	583	100.0	100.0
Residential Location			
Rural	195	32.9	56.2
Urban	397	67.1	43.8
Total	592	100.0	100.0
Shopping Outlet			
Local	263	44.7	
Non-Local	325	55.3	----
Total	588	100.0	
Education Level			
High School Diploma, GED, or less	214	36.4	60.7
Some College	105	17.9	15.0
2 year Technical Degree	60	10.2	5.6
4 year College Degree	92	15.6	11.5
Graduate Work	117	19.9	7.2
Total	588	100.0	100.0
Income Group			
Under $19,999	89	18.5	28.5
$20,000-$39,999	117	24.3	28.3
$40,000-59,999	100	20.7	19.6
$60,000-$99,999	113	23.4	16.7
More than $100,000	63	13.1	6.9
Total	482	100.0	100.0
Age (n=580)	54.95 (*M)*	16.35 (*SD)*	40.84 (*M)*, 2.68 (*SD)*

*Data for Pennsylvania population gathered from the United States Census Bureau, American FactFinder (n.d.).

A comparison with the population demographics of Pennsylvania residents within the 50 counties surveyed indicates that the sample appears to be skewed. In particular, while the representation of the population is almost evenly split among males (49.8%) and females (50.2%), males are less represented in the sample (30.2%) than females (69.2%). The median age of the sample (54.95) is 14 years more than the median age in the population (40.84) for these 50 counties. Furthermore, rural respondents are underrepresented in the sample (32.9%) as compared to the population (56.2%). In terms of education level, 60.7% of those in the population had received their high school diploma, GED, or less, while only 36.4% qualified for this category in the sample. The estimates for the population's education levels were derived only from those who were 25 years or older, while the sample included all respondents 18 and older, a discrepancy that might have exacerbated the difference between the population and sample. Comparisons regarding race and income level between the sample and population showed that the sample was relatively representative.

In order to examine the influences of these various demographic variables on consumer perceptions of fresh produce safety, each variable was considered as the independent variable in a series of bivariate analyses with the composite scores of produce safety perceptions serving as the dependent variable. For those demographic variables with two levels (gender, race, residential location, shopping outlet), independent t-tests were used to test for significant differences in means. Because education level and income group both had more than two levels, one-way ANOVAs were run to examine the differences in means. For age, a Pearson Product Moment Correlation (PPMR) was appropriate since age was measured in interval/ratio data.

The results of the independent t-test found a significant difference between males and females ($t = -3.27$, $p < .001$, *Cohen's d* = .303). The mean for females ($M = 39.60$, $SD = 4.14$) was significantly higher than males ($M = 38.21$, $SD = 4.98$) regarding produce safety perceptions.

Although a difference in means of 1.39 existed, its power, as determined by the effect size, was on the low side of medium. According to Becker (2000), effect sizes of $d \leq .2$ are small, $d \leq .5$ are medium, and $d \geq .6$ are large. No significant differences were found in the other independent t-tests, when analyzed by race, place of residence, and shopping venue. Table **4-3** presents the results for RQ 2.

Table **4-3**: Independent t-test Results on Consumer Produce Safety Perceptions by Gender, Race, Geography, and Shopping Venue

Variable and Level	n	Mean*	SD	t	Cohen's d
Gender					
Male	179	38.21	4.98	-3.27**	.303
Female	413	39.60	4.14		
Total	592				
Race					
White	464	39.07	4.51	-1.16	.122
Non-White	119	39.60	4.18		
Total	583				
Residential Location					
Urban	397	39.15	4.53	-.244	.021
Rural	195	39.24	4.31		
Total	591				
Shopping Venue					
Local	263	39.29	4.38	-.565	.046
Non-Local	325	39.08	4.54		
Total	588				

* Mean scores could theoretically range from a low of 6 to a high of 42.
**Significant at $p < .001$; unequal variances assumed according to Levene's Test for Equality of Variances.

The results of the one-way ANOVA analyses indicated significant differences in means of produce safety perceptions occur among income groups but not among education levels (Table **4-4**). A significant difference in means ($F = 4.15$, $p < .05$), determined by the Games-Howell post-hoc analysis test, existed between those whose gross household income was more than $100,000 ($M = 37.12$, $SD = 6.07$) and those whose household incomes was $40,000-$59,999 ($M = 39.63$, $SD = 4.30$). A significant difference in means also was found between those whose

gross household income was more than $100,000 ($M$ = 37.12, SD = 6.07) and those whose household income was under $19,999 ($M$ = 39.64, SD = 3.80). These differences, however, have low power, as indicated by the effect size (η^2=.033).

Table **4-4:** ANOVA Results on Consumer Produce Safety Perceptions by Income Group and Education Level

Variable and Level	N	Mean*[a]	SD	F	η^2
Income Group					
Under $19,999	89	39.64[A]	3.80	4.15**[b]	.033
$20,000-$39,999	117	39.39	3.95		
$40,000-59,999	100	39.63[A]	4.30		
$60,000-$99,999	113	39.46	4.13		
More than $100,000	63	37.12[B]	6.07		
Total	482				
Education Level					
High School Diploma, GED, or less	214	39.55	4.07	1.74	.011
Some College	105	39.57	4.23		
2 year Technical Degree	60	39.28	4.08		
4 year College Degree	92	39.55	5.19		
Graduate Work	117	38.74	4.86		
Total	588				

* Mean scores could theoretically range from a low of 6 to a high of 42.

[a] Means followed by the same letter are not significantly different from each other using Games-Howell post-hoc test. Means followed by no letter are not significantly different at $p <$. 05.

**Significant at $p < .05$.

[b] Note: Brown Forsythe Anova F is reported because unequal variance assumed.

In order to assess the relationship between age and consumer produce safety perceptions, a PPMR test was used, for both the independent and dependent variables were measured in interval/ratio data. Although a statistically significant relationship exists ($p < .001$), the results indicate little relationship ($r < .129$) between the two variables. According to Fink (1995), a correlation (r) $\leq .25$ translates to little or no relationship.

While the bivariate analyses found significant relationships on consumer produce safety perception according to gender, income group, and age, a multiple regression analysis was then run in order to analyze all of the demographic variables collectively (n=474). The demographic variables of gender, race, shopping venue, and place of residence were dummy coded.

All of the demographic variables together accounted for 5.7% (R^2=.057) of the unique variance ($F = 2.33$, $p < .05$). Specifically, both income level (r = .164, $p < .05$) and gender (r = .102, $p < .05$) were the only independent variables found to be significant predictors, both of which had relatively weak relationships to consumer produce safety perceptions (Table **4-5**).

Table **4-5**. Multiple Regression of Consumer Produce Safety Perceptions according to Demographics

Variable	r
Gender	.102*
Race	.073
Residential Location	.018
Age	.026
Shopping Venue	.025
Education Level	.063
Income Group	.164*
Cases	474
F-Value	2.33*
R-Square	.057

*Significant at $p < .05$.

Research Question 3: Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?

The third research question of the study sought to understand the degree to which consumer preferences for specific produce attributes influence their produce safety perceptions. The attributes considered in this study were local, inspected for food safety, and organic.

Local Produce

Preferences for local produce were measured by summating the responses to eight semantic differential items, each of which asked consumers to consider their perceptions of and preferences for locally grown produce. The reliability for this construct was Cronbach's α=.780.

Composite scores could range from a low of 8 to a high of 56, meaning the theoretical midpoint was 32. Of the 592 respondents, 560 provided valid data on all eight items. Normality was checked and although the sample proved to be skewed (-1.69), this was nonetheless considered to be acceptable considering the large size of the sample (Morgan et al., 2011). The descriptive statistics found the mean score (M = 50.21, SD = 5.78) to be well above the theoretical midpoint of 32 (Table **4-6**).

Table **4-6**: Descriptive Statistics for Preferences for Local Produce

N	Theoretical Midpoint	Summated Mean Score*	Standard Deviation	Range Low	Range High
560	32	50.21	5.78	14	56

*Summated Mean Score could theoretically range from a low of 8 to a high of 56.

In order to test the relationship between consumer preferences for local produce and their produce safety perceptions, a simple regression analysis was run. The results of this analysis determined a significant relationship occurred (F = 28.88, p < .00), explaining 4.9% of the unique variance (R^2= .049). Table **4-7** presents the results from the simple regression analysis.

Table **4-7**: Simple Regression on Consumer Produce Safety Perceptions according to Preferences for Local Produce.

Variable	Standardized Coefficient (β)
Preference for Local Produce	.222*
Cases	560
F-Value	28.88*
R-Square	.049

*Significant at p < .00.

Produce Inspected for On-Farm Food Safety

Two individual semantic differential items related to consumer preferences for produce that had come from farms inspected by the government for GAP compliance. Although private firms also conduct TPC inspections for on-farm food safety standards, the items related to food safety inspection on the instrument related specifically to government inspection. One item asked

consumers to respond to the importance they placed on knowing that the government had conducted an on-farm food safety inspection. Consumers also answered the degree to which they would have fewer concerns about produce safety if the grower's farm had been inspected for on-farm safety practices. Both items were considered individually, for two items are not sufficient to test for reliability and summate (Morgan et al., 2011). In both cases, this study assumed that higher scores on the semantic differential scale translated to stronger preferences for government inspection of on-farm food safety practices.

Severe violations of normality occurred regarding the item related to how government inspection would affect consumer concerns. Responses were thus categorized into two nominal groups. The decision to categorize responses into two groups stemmed from the intent to later run multiple regression analyses. All semantic differential items were measured from a low of 1 to a high of 7. Those who answered from 1 to 4, comprised one group and those who answered from 5 to 7 were considered the other group. Those in the latter group were assumed to have a stronger preference for produce that came from a farm that had been inspected by the government for on-farm food safety practices.

Descriptive statistics were initially run on each of the two individual items. For both items, the overwhelming majority of respondents preferred that the government inspect farms for on-farm food safety practices. In fact, 87.6% placed high importance on knowing whether the produce they bought had been inspected by the government for on-farm food safety, while 86.6% strongly agreed that they would have fewer concerns about produce contamination if the produce they bought had been inspected by the government (Table **4-8**).

Table **4-8:** Descriptive Statistics for Preferences for Produce Inspected by the Government

Variable and Level	Frequency	Percent
Knowing Produce Had Been Inspected By Government		
Low Importance	73	12.4
High Importance	518	87.6
Total	591	100.0
Fewer Concerns if Produce Had Been Inspected by Government		
Weak Agreement	79	13.4
Strong Agreement	509	86.6
Total	588	100.0

In order to determine the difference that each of these individual items had with produce safety perceptions, independent t-tests were run to compare the difference in means between those with weak preferences for produce inspected by the government and those with strong preferences. A significant difference in means (t = -3.91, p < .01, *Cohen's d* = .421) occurred between those who placed high importance on knowing the government had inspected produce for safety (M = 39.44, SD = 4.15) and those who did not (M = 37.29, SD = 5.93) (Table **4-9**). The difference in means was 2.15.

In terms of the degree to which consumers agreed that they would have fewer concerns about the safety of produce if it had been inspected by the government, a significant different in means was also found (t = -2.92, p < .01, *Cohen's d* = .317). Those who strongly agreed that they would have fewer concerns had higher produce safety perceptions (M =39.39, SD = 4.22) than those who did not strongly agree (M = 37.83, SD = 5.52) (Table **4-9**). The difference in means for these two groups was 1.56, and the standardized difference, according to the effect size, is of medium strength (Becker, 2000).

Table **4-9**: Independent t-test Results on Consumer Produce Safety Perceptions by Preferences for Produce Inspected by Government

Variable and Level	n	Mean*	SD	T	Cohen's d
Knowing Produce Inspected by Govt.					
High Importance	73	39.44	4.15	-3.91**	.421
Low Importance	518	37.29	5.93		
Total	591				
Fewer Concerns with Govt. Inspection					
Strong Agreement	509	39.39	4.22	-2.92**	.317
Weak Agreement	79	37.83	5.52		
Total	588				

* Mean scores could theoretically range from a low of 6 to a high of 42.
**Significant at $p < .01$; unequal variances assumed according to Levene's Test for Equality of Variances.

While the independent t-tests found significant differences to occur, a multiple regression analysis was then run to provide a further level of analysis. Doing so simultaneously considered both of the individual items regarding preferences for produce inspected for safety by the government (n=588). Both individual items were dummy coded so that those who were categorized as having stronger preferences for government inspection were anticipated to have higher produce safety risk perceptions.

This regression model was found to be statistically significant ($F = 9.71$, $p < .000$), accounting for 2.9% (R^2=.029) of the unique variance. However, while the bivariate analyses showed that both individual items to have statistically significant differences in means, the regression model found only the item measuring the importance consumers placed on knowing the government had inspected produce for safety to be a significant predictor (β =.141, $p < .001$) (Table **4-10**).

Table **4-10**: Multiple Regression of Consumer Produce Safety Perceptions according to Preferences for Produce Inspected by the Government

Variable	Standardized Coefficient (β)
Knowing Produce Inspected by Govt.	.141*
Fewer Concerns with Govt. Inspection	.074
Cases	588
F-Value	9.71**
R-Square	.029

* Significant at $p < .001$.
**Significant at $p < .000$.

Organic Produce

The final produce attribute considered for the purpose of this study was preference for organic produce. One semantic differential item asked consumers to consider the importance they placed on organic when they purchased fresh produce. In order to maintain consistency with the other individual items included in the study, responses to this 7-point item were categorized into two nominal groups. Those responses from 1 to 4 were treated as the group with weak preferences for organic produce, while those responses from 5 to 7 were treated as the group with strong preferences for organic produce.

The descriptive statistics regarding preferences for organic produce indicate slightly more respondents have strong preferences for organic produce. Of the 590 who provided valid data, 46.3% had weak preferences for organic, whereas 53.7% had strong preferences for organic (Table **4-11**).

Table **4-11**: Descriptive Statistics for Consumer Preferences for Organic Produce

Variable and Level	Frequency	Percent
Preference for Organic Produce		
Weak Preference	273	46.3
Strong Preference	317	53.7
Total	590	100.0

Because preferences for organic were measured with one item, only bivariate statistics

were used to further understand its relationship with consumer produce safety perceptions. An independent t-test determined significant differences in means occurred on produce safety perceptions between those with strong preferences and those with weak preferences (t = -3.49, p < .001, *Cohen's d* = .290). Those with stronger preferences for organic produce had higher produce safety perceptions (M = 39.77, SD = 3.91) than those with weaker preferences for organic produce (M = 38.47, SD = 4.94) (Table **4-12**). The difference in means was 1.30, although the effect size indicates a low degree of power.

Table **4-12**: Independent t-test Results on Consumer Produce Safety Perceptions by Preferences for Organic Produce

Variable and Level	n	Mean*	SD	t	Cohen's d
Preference for Organic Produce					
Weak Preference	273	38.47	4.94	-3.49**	.290
Strong Preference	317	39.77	3.91		
Total	590				

* Mean scores could theoretically range from a low of 6 to a high of 42.
**Significant at p < .001; unequal variances assumed according to Levene's Test for Equality of Variances.

Research Question 4: When analyzed collectively, which of the independent variables prove to be significant predictors of produce safety perceptions?

The final research question of the study sought to determine which of the demographic variables and produce preferences proved to be significant predictors of consumer produce safety perceptions when analyzed collectively. In order to do so, a multiple regression analysis was used. The seven demographic variables, composite scores for local produce preferences, two individual items regarding preferences for produce that had been inspected by the government for safety, and one item regarding preferences for organic produce were thus entered as the input variables in a saturated regression model, in which the composite scores for produce safety perceptions served as the dependent variable.

To run the regression analysis, listwise deletion was used. Although this approach meant

that data for 148 of the respondents were excluded, pairwise deletion was determined to be a poor approach because the analysis would then be based on different sample sizes and standard errors (Howell, 2009). Using listwise deletion, valid data existed for 444 consumers. This overall model was found to be statistically significant ($F = 3.58$, $p < .00$). Of the 11 independent variables, the 4 variables that were found to be statistically significant were local produce preferences (r =.156, $p < .001$), organic produce preferences (r =.094, $p < .05$), importance of government inspection (r =.106, $p < .05$), and income level (r = .152, $p < .05$). These four variables accounted for 11.8% (R^2=.118) of the unique variance (Table **4-13**).

Because this overall model contained numerous variables with no statistically significant relationship to consumer produce safety perceptions, a parsimonious model was developed. This model was achieved by the systematic deletion of individual variables. The variable furthest from statistical significance was deleted, and the model was subsequently re-run. This process was continued until the most parsimonious model had been achieved. More respondents (n=454) were included in the parsimonious model. As opposed to the saturated model, a higher number of respondents provided valid data for all variables included in the parsimonious model. This parsimonious model ($F = 7.22$, $p < .00$) was found to include the same four variables that had been statistically significant in the saturated model and accounted for 10.2% (R^2=.102) of the unique variance (Table **4-13**). A difference of 1.6 percentage points existed between this parsimonious and the saturated model. Local produce preferences remained as the most significant predictor of consumer produce safety perceptions (r =.145, $p < .001$), followed by the importance placed on government inspection (r = .129, p < .01), income group (r = .145, $p < .05$), and then preferences for organic produce (r = .111, $p < .05$).

Table **4-13**: Saturated and Parsimonious Multiple Regression of Consumer Produce Safety Perceptions according to All Independent Variables

Variable	Saturated Model (r)	Parsimonious Model (r)
Gender	.047	
Race	.050	
Residential Location	.012	
Age	.007	
Shopping Venue	-.022	
Education Level	.031	
Income Group	.152*	.145*
Preference for Local Produce	.156***	.153***
Knowing Produce Inspected by Govt.	.106*	.129**
Fewer Concerns with Govt. Inspection	.050	
Preference for Organic Produce	.094*	.111*
Cases	444	454
F-Value	3.58****	7.22****
R-Square	.118	.102

* Significant at $p < .05$.
** Significant at $p < .01$.
*** Significant at $p < .001$.
**** Significant at $p < .00$.

Chapter 5

Summary, Discussion, Implications, and Recommendations

The purpose of this chapter is to summarize the procedures of this study and to present conclusions, implications, and recommendations. Five sections, therefore, will comprise this chapter: 1) review of the purpose of the study and research questions, 2) summary of the study's procedures, 3) summary and discussion of findings according to each research question, 4) limitations to the findings, and 5) implications and recommendations.

Purpose and Research Questions

The overall purpose of the study was to provide a thorough understanding of the factors that have a significant relationship with the produce safety perceptions of Pennsylvania consumers. Beyond simply describing demographic characteristics, the study sought to also consider preferences for specific attributes in produce, including locally grown, inspected for on-farm food safety standards, and organically grown. The specific research questions guiding the study were:

1) Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?
2) Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, residential location (rural vs. urban), educational status, financial status, or primary shopping venue?

3) Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?
4) When analyzed collectively, which of the independent variables prove to be significant predictors of produce safety perceptions?

Summary of Study Procedures

The study was conducted among Pennsylvania consumers. Pennsylvania provides a compelling case to study consumer perceptions of produce safety, for the state has geographic and demographic diversity, growers who tend to operate small and medium-sized farms (USDA, 2009), uneven access to food retailers (Schafft et al., 2010), and a history of foodborne outbreaks (Scharff, 2010).

Using a descriptive-correlational research design, the study sought to assess Pennsylvania consumer perceptions of produce safety and preferences for produce attributes. Before conducting telephone interviews, the Office of Research Protections at The Pennsylvania State University reviewed and approved the use of human subjects as participants in the study.

Telephone interviews occurred with randomly sampled Pennsylvania consumers in the 48 rural counties of Pennsylvania (Center for Rural Pennsylvania, n.d.) and the state's two urban centers (Philadelpia County and Allegheny County). The sample frame, consisting of residential landlines in these 50 rural and urban counties, was constructed by the Marketing Systems Groups (MSG) of Fort Washington, Pennsylvania. The Penn State Harrisburg Center for Survey Research (CSR), responsible for conducting the interviews, eliminated ineligible numbers ineligible (language problem, physically or mentally incompetent, fax line, cell phone, not in service, etc.) from the frame when they were dialed. Interviews continued until at least 600 had

been achieved, split evenly among Philadelphia County, Allegheny County, and the 48 rural counties.

The data were collected between April, 2009 and June, 2009. Valid data were collected from 604 consumers. The telephone interviewers from CSR were trained in proper interviewing techniques. Interviews began with the interviewer explaining that participation was strictly voluntary and that the participant could refuse to answer any question or terminate the interview at any time. The entire data collection process was overseen by the lead research associate at CSR and six other supervisors. Upon completing data collection, the data were transferred into SPSS software version 15.0 and then reviewed by the senior staff of CSR for accuracy and consistency.

The instrument used for the study was organized into five sections. The first four sections were composed of semantic differential scales, each of which measured consumer perceptions and preferences on scales from 1 (low) to 7 (high). Specifically, the four sections measured: 1) the degree of importance consumers placed on the issue of produce safety in the United States, 2) attitudes towards fresh fruit and vegetable safety in the United States, 3) the likelihood that consumers would purchase local produce if given the opportunity, and 4) the attributes consumers deemed important when purchasing fresh produce. The final section of the survey collected demographic information, including gender, race, age, household income, education, shopping outlet for fresh produce purchases, and county of residence.

Using SPSS software version 19.0, descriptive and inferential statistics were used to analyze the data. Within the dataset, data for 12 extreme outliers were eliminated for data analysis. Conceptual constructs were developed based on the research questions. High reliability for the construct of produce safety perceptions (Cronbach's α=.915) allowed for summation. The construct of local produce preferences also had adequate reliability (Cronbach's α=.780) so responses were also summated. The other preferences of interest for this study (organic produce

and produce inspected by the government for compliance with on-farm food safety standards) did not have sufficient items to develop a construct. Individual items were thus considered for data analysis.

Summary and Discussion of Findings

This section presents summaries and discussions of the findings according to each research question.

Research Question 1: Do Pennsylvania consumers perceive fruit and vegetable safety to be an important issue?

Perceptions of produce safety were measured by composite scores from a six-item semantic differential scale regarding the importance consumers placed on the issue of fresh fruit and vegetable safety in the United States. The mean scores of the 592 respondents found that Pennsylvania consumers place high importance on the issue of fresh produce safety. High produce safety perceptions, however, do not automatically indicate high concerns regarding foodborne contamination. As discussed in the literature review, the issue of produce safety is complex, comprised of a host of distinct aspects beyond foodborne contamination (IFIC, 2010; Pirog & Larson, 2007). Although the scale measuring consumer perceptions of produce safety on this instrument asked generally about produce safety and not specifically about foodborne contamination, several other items on the instrument explicitly asked about the threat of contamination. Because contamination was the only aspect of produce safety that was mentioned throughout the instrument, consumer responses to perceptions of produce safety were in the context of foodborne contamination. The high produce safety perceptions, thus, are assumed to

reflect concerns regarding foodborne contamination causing illness, which corresponds to previous studies which have found consumers to perceive bacterial contamination as a leading risk to the safety of the food supply (Brewer & Rojas, 2008; Pirog & Larson, 2007). As a result, a conclusion can be inferred, based on the high produce safety perceptions of the respondents, that high concern exists among Pennsylvania consumers in 50 rural and urban counties regarding the safety of the produce supply.

Research Question 2: Do Pennsylvania consumer perceptions of produce safety vary by the demographic variables of gender, age, race, geography (rural vs. urban), educational status, financial status, or primary shopping venue?

The survey instrument asked consumers to provide information regarding the demographic characteristics of gender, age, race, residential location, educational status, financial status, and primary shopping venue for fresh produce. Each of these was treated as an independent variable in both bivariate and multivariate analyses, with the composite scores of produce safety perceptions serving as the dependent variable. Based on the previous literature, females, non-whites, older consumers, those in lower educational and income categories, and those who accessed their produce from local sources were anticipated to have higher produce safety perceptions. No expectation existed for residential location.

Gender

The results of an independent t-test found females to have slightly higher produce safety perceptions than males, thus confirming the study's expectation. That females have higher produce safety perceptions than males aligns with consistent findings from previous studies that women believe greater risk to exist in the food supply than males (Dosman et al., 2001; Flynn et

al., 1994; Tucker et al., 2006). Gender also emerged as a significant predictor of consumer produce safety perceptions in a regression analysis that considered all of the demographic variables together. As in the bivariate analysis, females tended to have higher produce safety perceptions in the multiple regression analysis. This finding indicates that among the various demographic variables, gender is an important component to consider when assessing consumer produce safety perceptions. The low effect size and beta levels, however, indicate that gender should not be overstated in importance. Perhaps a more important finding is that the overall means for both gender groups indicate that both males and females have high produce safety perceptions.

Race

Although evidence from prior research provides precedence to assume that non-white populations will have higher produce safety risk perceptions than whites (Tomazic et al., 2002; Tucker et al., 2006), no significant differences were found in this study. Regardless of race, respondents indicated that they had high perceptions of produce safety. Results from the multiple regression analysis that included all demographic variables maintained consistency in that race did not emerge as a significant predictor. Based on these findings, race does not appear to be a major influence on consumer produce safety perceptions.

Age

To test for a significant relationship between age and produce safety perceptions, a PPMR analysis was run, in which a significant positive correlation was found, although the relationship was very low. This finding generally coincides with previous studies, which

documented that food safety concerns increase with age (Lin, 1995; Roseman & Kurzynske, 2006). However, these previous studies also found that produce safety concerns began to decline once people reached their 60s, a trend not documented by the findings in this study.

Despite the significant relationship found in the bivariate analysis, age did not prove to be a significant predictor in the multiple regression analysis that included all demographic variables as inputs. The low correlation in the bivariate analysis indicates that the significant relationship could have emerged due to the large sample size (n = 580), but when all other variables were controlled, the relationship between age and produce safety perceptions further weakened. Thus, given the low correlation in the bivariate analysis and the lack of relationship in the multiple regression analysis, the findings for this study indicate that age does not have a high degree of importance when considering consumer produce safety perceptions.

Income

Previous studies have shown that those with higher incomes often have more trust in the safety of the food system (Dosman et al., 2001; Kennedy et al., 2008). Other findings have documented that those in low income groups (< $12,500) and higher income groups (> $75,000) have the highest confidence in the safety of the supply (Roseman & Kurzynske, 2006). The statistical analyses of this study, in part, support findings from these previous studies. Overall, the lowest overall mean score occurred for the highest income group (> $100,000), providing support to the precedent that high income groups have more confidence in the safety of the food system. A significant difference in means occurred between those whose household income was more than $100,000 and those whose household income was less than $19,999 and those who household income was $40,000-$59,999. These differences in means, therefore, contrast with the study by Roseman & Kurzynske (2006) which found that those in low income

groups have high confidence in the safety of the food supply. In fact, those in the lowest income group in this study had the highest produce safety perceptions. The significant differences among income groups found in the bivariate analyses were also significant when included in all regression models. Income group, therefore, appears to have a significant influence on consumer produce safety perceptions. In fact, based on the findings, income was the most important demographic variable that was analyzed.

Education

Education level was not found to have significant relationships in either the bivariate analyses or the multiple regression analysis. This lack of significance contrasts with previous studies that found those who have received more education have more confidence in the safety of the food supply (Dosman et al., 2001; Kennedy et al., 2008; Roseman & Kurzynske, 2006; Tucker et al., 2006). Although no significant relationships emerged in the statistical tests for this study, the overall mean scores for produce safety perceptions for each educational level, like all other demographic groups, was high.

Location

This study purposefully selected Pennsylvania residents living in either urban or rural locations with the distinct intent to compare their produce safety perceptions. In all statistical analyses, residential location failed to have a significant relationship to produce safety perceptions. This result was anticipated since no clear precedent has been set by previous studies regarding the relationship between residential location and produce safety perceptions. Mounting evidence from this study and prior research makes it likely that residential location is not an

important demographic characteristic to consider when assessing consumer produce safety perceptions.

Produce Shopping Venue

The way in which produce safety perceptions are influenced by consumers' selection of their shopping venue for produce has not been deeply explored in previous studies. However, Bond et al. (2006) documented that consumers, when shopping for local produce, increasingly chose farmers' markets as their primary shopping venue rather than supermarkets. This finding provided the rationale for this study to explore the relationship between produce shopping venue and produce safety perceptions, assuming that the reason that consumers opt for direct marketing outlets, such as farmers' markets, might relate to perceptions of the safety of the produce supply in supermarkets. Consumers were thus categorized into two groups: those who indicated that they sometimes or always accessed their fresh produce from local sources (farmers' markets, CSAs, local farms, home gardens, etc.) and those who made no mention of local marketing outlets. Despite the hypothesis that those who sought out direct marketing outlets to purchase fresh produce would have higher produce safety perceptions, no such relationship existed. In both the results from the independent t-test and the multiple regression analysis, produce shopping venue was independent of consumers' produce safety perceptions.

Research Question 3: Are Pennsylvania consumers who prefer specific produce attributes, such as local, inspected for food safety, or organic, more likely to perceive the issue of fresh produce safety to be important?

This research question was answered in three different pieces, each one dedicated to a specific attribute of interest to this study. For local produce, an eight-item construct was

developed from the instrument regarding consumer perceptions of and preferences for local produce. To assess consumer preferences for produce coming from a farm that had been inspected for on-farm food safety practices, two individual semantic differential items related to consumer perceptions of produce that had been inspected by the government were considered. One individual semantic differential item on the instrument related to consumer preferences for organic produce. For each case, this study anticipated that consumers with stronger preferences for a specific produce attribute would also have higher produce safety perceptions.

Local Produce

To assess the relationship between consumer preferences for local produce and their perceptions of produce safety, an eight-item construct was developed. Each of these items related to consumer perceptions of local produce or their likelihood to purchase local produce. Descriptive statistics indicated that Pennsylvania consumers place high value on local produce. This finding reflects similar evidence from previous literature that documents the rising popularity of local produce. As the number of farmers' markets in the United States has grown (USDA AMS, 2010), so too have sales from direct marketing outlets (Martinez et al., 2010). Reflecting this growth, many supermarket chains have also indicated their commitment to increasing their supply of local produce for consumers (Burros, 2008; Tobin et al., forthcoming).

As local produce has grown in popularity, studies have assessed the reasons that consumers increasingly are seeking out locally grown products (Bond et al., 2008; Govindasamy et al., 2002; Pirog, 2004; Thomson & Kelvin, 1996). One of the motivations frequently cited by consumers regarding their preferences for local produce is its safety (Bond et al., 2008; Berlin et al., 2009; Onozaka et al., 2010). This study thus hypothesized that a relationship would exist between Pennsylvania consumer preferences for local produce and their produce safety

perceptions. As anticipated, the simple regression analysis, which considered preferences for local produce as the independent variable and produce safety perceptions as the dependent variable, found local produce to be a significant predictor of produce safety perceptions, explaining 4.9% of the unique variance. Those consumers who prefer local produce are also more likely to perceive produce safety to be an important issue. Although the beta level was relatively low ($\beta = .222$, $p < .00$), this finding nonetheless provides further evidence that one of the reasons that consumers seek out local produce is for its perceived enhanced safety. Preferences for local produce, therefore, are worth considering in order to understand the factors related to consumer perceptions of produce safety.

Produce Inspected for On-Farm Food Safety

Beyond local produce, another attribute becoming increasingly available to consumers is produce coming from farms that have submitted to TPC in order to provide evidence of compliance with GAPs. With the new Food Safety Modernization Act, fresh produce growers will need to both implement and document GAPs on their farms, practices that had already been mandated by some supermarkets through their own individual food safety policies (Hatanaka et al., 2005; Henson & Reardon, 2005). These public and private regulations indicate the government and industry belief that on-farm food safety practices are important in reducing the risk of foodborne contamination in the food supply. Data collected among consumers show that they too value produce that has come from farms adhering to GAPs (Hart Research Associates / Public Opinion Strategies, 2009; Pirog and Larson, 2007). However, GAP certification is a relatively new food safety assurance scheme (Busch & Bain, 2004), meaning that GAP certified produce is not a well established produce attribute in the market. For example, although several Pennsylvania supermarket chains have food safety policies that require their produce suppliers to

provide evidence of GAP compliance, only one of those supermarket chains communicates to consumers its produce safety policy (Tobin et al., forthcoming).

This study thus sought to further explore consumer preferences for fresh fruits and vegetables that had been produced in accordance with GAPs. To do so, the instrument included two semantic differential items related to consumer preferences for produce that had been inspected by the government for on-farm food safety practices. One item asked consumers to consider the importance they placed on knowing that produce had been inspected by the government for on-farm food safety practices, while the other item asked the degree to which consumers agreed that they would have fewer concerns regarding foodborne contamination if the produce they purchased had been inspected by the government. In both cases, strong preferences existed: 87.6% of consumers placed high importance on knowing that the produce they purchased had been inspected, while 86.6% agreed that they would have fewer concerns about foodborne contamination if the produce they bought had been inspected by the government. These results thus provide further support that consumers desire further assurance regarding the safety of the produce supply.

Independent t-tests also found significant differences in means among those who place high importance on knowing that the government has inspected produce for on-farm food safety than those who did not, as well as those who strongly agreed that they would have fewer concerns regarding the safety of the produce supply with government inspection than those who did not strongly agree. For both items, those with stronger preferences had higher means than those who had weaker preferences. In both cases, therefore, those with the stronger preference for government inspection had significantly higher produce safety perceptions, a finding further supported by the medium strength of the effect size. These results thus confirm the expectation of this study that consumers with stronger preferences for produce that had been produced according to GAPs would have higher produce safety perceptions.

A multiple regression analysis, however, found that only one of the variables, knowing that the government had inspected produce for on-farm food safety practices, was a significant predictor of produce safety perceptions. Although this variable accounted for only 2.9% of the unique variance and had a low beta level ($\beta = .141$, $p < .001$), the finding nonetheless provides evidence that consumers concerned with the safety of the produce supply value the attribute of on-farm food safety adherence. Based on these findings, preferences for produce that has been inspected for on-farm food safety significantly influences consumer produce safety perceptions.

Organic Produce

This study also assessed the relationship between consumer preferences for organically grown produce and produce safety perceptions. A significant difference in means occurred among those with stronger preferences for organic produce and those with weaker preferences. The finding indicated that, as with the other produce attributes assessed in this study, those with stronger preferences for organic have higher produce safety perceptions. This finding begins to clarify the confusion existing in the literature regarding consumer perceptions of organic produce. While consumers have often associated organic with enhanced food safety (Berlin et al., 2009; Yue & Tong, 2009), this perception has often been related to the perceived harm that pesticides cause to health (Zepeda & Deal, 2009). Furthermore, as the organic industry has been increasingly integrated into the industrialized food system (Guthman, 2004), those skeptical of the safety of conventional supply chains will likely have doubts regarding the actual safety of organic products. The finding from this study suggests that those with stronger preferences for organic have higher produce safety perceptions, however, provides some support that consumers have faith in the safety of organic produce. Despite the consolidation of organic produce into the conventional agricultural system, consumers nonetheless seem to believe that organically grown

produce poses less threat of foodborne contamination. This finding, however, should not be overstated, considering the difference in means was only 1.30 and the effect size was low.

Research Question 4: When analyzed collectively, which of the independent variables prove to be significant predictors of produce safety perceptions?

The final research question of this study sought to determine which of the independent variables emerged as significant predictors of produce safety perceptions when all the variables interacted with one another. As opposed to considering variables in isolation, multivariate analyses allow for several variables to be analyzed together. Multivariate analyses thus allow for more complexity than bivariate analyses. Although multivariate analyses had been used to provide insight into the previous research questions, a saturated model, in which all independent variables were included as inputs, was appropriate for this research question. A parsimonious model was also achieved by systematically removing those variables that had the lowest relationship to the dependent variable.

Results from the previous research questions provided expectations for the variables that would emerge as significant in this multiple regression analysis. Gender and income, as the only demographic variables that had significant differences in both the bivariate analyses and the regression model that included only demographic variables, were anticipated to emerge as significant predictors of produce safety perceptions. Preferences for local produce, organic produce, and knowing the government had inspected produce for on-farm food safety practices were all also thought to hold potential to emerge as significant predictors, based on the findings from the previous research questions. The degree to which consumers agreed that they would have fewer concerns regarding foodborne contamination if the government inspected produce for on-farm food safety standards was also a possibility, although it did not emerge as significant in

the multiple regression analysis that also considered the other item for produce safety inspection.

The results from both the saturated and parsimonious models had similar findings. The saturated model was found to be significant, with four variables emerging as significant. In addition to income group, all of the preferences for specific produce attributes were significant predictors. Local produce preferences had the strongest relationship to produce safety perceptions, followed by the importance of knowing that the government has inspected for on-farm food safety standards and preferences for organic produce. These four variables accounted for 11.8% of the unique variance in the saturated model. The same four variables emerged as significant in the parsimonious model, which explained 10.2% of the unique variance. These findings suggest that among the demographic variables, income level is the most important. Beyond income level, more attention should be paid to preferences for produce attributes, given that preferences for all three produce attributes were found to be significant. Although the reasons that consumers seek specific attributes are varied (Berlin et al., 2009; Onozaka et al., 2010; Yue & Tong, 2009), findings from this study suggest that perceptions of produce safety are among their motivations. To consider only demographic variables, therefore, would overlook the complexity of factors related to consumer produce safety perceptions. As the results of this study have shown, consumer preferences for local, organic, and on-farm food safety inspection, although explaining only limited variance, are far more significant predictors of their concerns regarding the safety of the produce supply than demographic variables.

Limitations

Although data analysis documented several significant findings, the limitations of the study must also be considered in order to avoid overstatement. That not all 67 counties of Pennsylvania were included in the random sampling procedures means that generalization of the

results cannot apply to the entire commonwealth. Rather, the findings should be considered to only apply to the 50 counties that were included in the sample. Related to this limitation is that only residential landlines in the 50 counties were included in the sample frame. In Pennsylvania, an estimated 10.8% of households use only wireless telephones (Blumberg et al., 2009). A bias, therefore, exists in the results, in that no data were collected among Pennsylvania residents who can be contacted by telephone only through cellular phones. Such a bias affected the quality of the frame, and in turn, sampling, in that a representative sample could not be guaranteed. A comparison of the demographics of the sample with the population indicated discrepancies, especially related to gender, age, education level, and residential location.

Issues with data validity also present limitations to the study. Although the impetus for the study was well grounded in the literature, the instrument itself had shortcomings. While many of the focus areas relate to preceding studies, the overall content and some of the constructs did not achieve ideal validity. Items related to consumer preferences for produce that has been inspected for on-farm food safety practices are specific only to government inspection. Produce growers interested in documenting their compliance with GAPs through TPC, however, have other private options besides the audit offered by the USDA AMS. Thus, the content of the instrument's items related to produce safety inspection do not accurately reflect the reality of the TPC process. In addition, only one item on the instrument related to consumer preferences for organically grown produce. The limited number of items related to organic and produce inspected for on-farm food safety practices weakens the instrument's construct validity, which is the degree to which the items of an instrument reflect an actual psychological characteristic being measured (Yu, 2008). Although the individual items related to these consumer preferences do provide support for their relationships to produce safety perceptions, they cannot be considered comprehensive and thus conclusive evidence related to these produce preferences cannot be offered by this study.

Closely related to the issues with data validity is a weakness with data reliability. Reliability is determined by the degree to which measurements are the same or similar on repeated measurements (Centers for Disease Control [CDC], 2009). Data are not reliable when entirely different results occur from ensuing measurements. The most common strategy to ensure high reliability is to pilot test the instrument, which will help determine the level of internal consistency of the constructs that have been developed. When using data from semantic differential scales, reliability is enhanced by summating multiple items because utilizing individual items for data analysis often means low reliability (Gliem & Gliem, 2003). Because individual items were used for this study regarding preferences for organic produce and produce inspected for on-farm food safety practices, limitations must be recognized on the reliability of these results. While the significant findings related to these consumer preferences provide support that relationships do exist with produce safety perceptions, these relationships must be tested further.

History also poses a threat to the study. Because foodborne outbreaks are unpredictable, consumers' perceptions of produce safety likely fluctuate. One cross-sectional study, therefore, cannot possibly capture a complete understanding of consumer perspectives regarding the safety of the produce supply. Furthermore, when considering consumer preferences for specific produce attributes, the time of year might also influence responses. Consumer preferences for local produce, for example, might vary depending on the time of year. Had the interviews been conducted in the late fall or winter, as opposed to the spring, when fresh, local produce is beginning to become available, different findings regarding the likelihood that consumers would purchase local produce might have emerged.

Considering these limitations collectively, the generalizability of this study is restricted. At best, these findings can only be generalized to consumers in 50 counties who use residential landlines. The skewed sample, along with history threats, further limit the generalizability of the

study. Nonetheless, the findings from this study provide baseline data to which the results of future studies can be compared.

Implications and Recommendations

Implications

Despite the limitations of the study, the findings still provide several important implications, especially in the context of the Theory of Planned Behavior (TpB). TpB asserts that subjective norms, which are the social pressures stemming from the expectations of important individuals and groups, are a critical component to understand the motivations that influence behavior (Ajzen, 1988). In the case of produce safety practices and policies, consumers are an important group to both produce growers and supermarkets. Fresh produce growers have acknowledged their desire to meet customer demands for fresh produce safety (Eggers et al., 2010), and one of the benefits of food safety policies for supermarkets is the enhancement of customer confidence and loyalty (Henson & Reardon, 2005). For produce growers and supermarkets to make informed decisions regarding their produce safety policies and practices, a clear understanding of consumer expectations is critical. Therefore, this study begins to provide important information regarding consumer subjective norms.

When utilizing TpB as the theoretical framework for studying the issue of produce safety, consumer subjective norms translate to consumer perceptions regarding the safety of the produce supply. High consumer concern regarding produce safety indicates that consumers are not satisfied that the current food system is adequately attending to threats of foodborne contamination. In turn, these consumer perceptions insinuate an expectation that other actors along the commodity chain alter their policies and practices to assure a reduced threat of

foodborne contamination. Integrally related to these perceptions are the produce attributes that consumers perceive as enhancing safety. Through considering how preferences for produce are linked to produce safety perceptions, a more detailed portrait of consumer perceptions of produce safety (subjective norms) emerges.

One critical finding emerging from this study is that Pennsylvania consumers place a very high degree of importance on the issue of produce safety. While some statistical significant differences did occur among demographic groups, the overall means for all groups still indicated high produce safety perceptions. Thus, what can be inferred is that regardless of gender, race, age, location, income group, educational level, or shopping venue, Pennsylvania consumers in the 50 counties included in the study are concerned with the safety of the produce supply. The implication of this finding is that consumers do not believe that the current policies and practices of stakeholder groups, such as growers and supermarkets, provide sufficient protection from foodborne contamination. These consumer perceptions of produce safety indicate that consumers expect those in the commodity chain to change their behaviors to assure that the threat of foodborne contamination is reduced. This finding is critical to communicate to Pennsylvania produce growers and supermarkets so that they can understand and respond to consumer subjective norms.

For growers, these consumer perceptions of produce safety can help encourage them to prepare for a TPC audit that would verify GAP compliance. Although the Food Safety Modernization Act may require many Pennsylvania growers to undergo this audit process in order to maintain their client base, these consumer perceptions of produce safety are important to communicate to all growers, including those who are exempted from the federal mandates. An exemption from the federal regulation, after all, does not necessarily mean that the produce is not contaminated or that GAPs should be less important. Consumer perceptions of produce safety can also help all fresh produce growers understand that other stakeholders in the food system have

different food safety interests and concerns. Communicating consumer perceptions of produce safety to growers is especially important, for lack of interaction among different stakeholders in the food system often hamper efforts for improvement (Sobal et al., 1998). The findings from this study, which indicate that Pennsylvania consumers perceive that produce inspected for GAPs offers enhanced safety, are essential to convey to growers if they are to understand the value of implementing, documenting, and verifying GAPs.

Given open communication is often not achieved, supermarkets can similarly benefit from understanding consumer perceptions of produce safety. Although several Pennsylvania supermarkets have already or anticipate implementing food safety policies that require their produce suppliers to provide evidence of GAP compliance, the overwhelming majority of these supermarkets are not communicating their policies to consumers (Tobin et al., forthcoming). In turn, supermarkets are failing to capitalize on some of the aspects that food safety policies can provide for them (Henson & Reardon, 2005). Supermarkets that do not communicate their food safety policies to their customers can still reduce their liability should a foodborne outbreak occur, but they will not experience increased consumer confidence and loyalty if their customers are unaware of their efforts to assure safety. That Pennsylvania consumers have high produce safety perceptions is, therefore, necessary to convey to Pennsylvania supermarkets for them to reconsider the information that they make available to their consumers.

Although produce safety perceptions were high among Pennsylvania consumers regardless of demographic characteristics, the significant relationships should not be overlooked. According to this study, as well as previous studies, income had an inverse relationship to produce safety concern. Those in higher income groups perceived the issue of produce safety to be less important than those in lower income groups. In addition, females have higher produce safety perceptions than males. Higher concern among females was found in a bivariate analysis and a multiple regression analysis which included all demographic variables, but not in the

saturated regression model. Despite its lack of significance in the saturated model, gender was still the second most important demographic variable, behind income level. Based on this finding, supermarkets and produce growers should consider the income and gender profile of their client base when making decisions regarding their produce safety policies and practices. However, because the difference in means between income groups and between males and females was slight, supermarket policy decisions should not be driven by only customer demographics.

More important than the influence that demographic variables have on produce safety perceptions are the implications that consumer produce preferences hold. These preferences, after all, were all found to be significant predictors of produce safety perceptions in both the saturated and parsimonious regression models. Descriptive statistics showed that the majority of the Pennsylvania consumers included in this sample prefer local produce. In addition, all statistical analyses that included local produce preferences as an input found a significant positive relationship between stronger preferences and produce safety perceptions. Pennsylvania consumers, therefore, are linking produce safety with local produce, which supports previous findings that enhanced safety is among the attributes that consumers perceive local produce to provide (Berlin et al., 2009; Onozaka et al., 2010).

Pennsylvania produce growers and supermarkets can likely find benefits, therefore, in marketing produce that is local, for it will be perceived by consumers not only as fresher and more flavorful but also as safer to eat. To capitalize on this finding, growers should consider seeking direct marketing outlets, a possibility they can explore by contacting the managers of the farmers' markets close to their operations. In addition, growers should also investigate developing business relationships with supermarkets dedicated to sourcing locally grown produce. Partnerships with supermarkets are particularly viable since the findings from this study indicate that supermarkets can respond to consumer demand by providing more local produce.

As a result, supermarkets should increase their purchases of produce from local suppliers, a likely trend considering that the majority of Pennsylvania supermarkets have already indicated their intention to purchase more local produce by 2012 (Tobin et al., forthcoming).

Because a business relationship between local produce growers and supermarkets will likely benefit both parties, implementing and maintaining communication networks between the two groups is essential. Growers need to know which supermarkets are interested in expanding their local produce selection, and supermarkets need to know which local growers have the capacity to supply the increased demand for local produce. To facilitate this communication, the representative organizations of both groups should compile relevant and accessible information regarding the supermarkets and growers interested in forming partnerships. For example, the Pennsylvania Vegetable Growers Association (PVGA) and the Pennsylvania Association for Sustainable Agriculture (PASA) could maintain lists of growers that include their level of compliance with GAPs (e.g. none, participated in GAP training, conducted a self-audit, inspected and certified through TPC, etc.) and their level of interest in selling their produce to supermarkets. Likewise, the Pennsylvania Food Merchants Association (PFMA) could also develop a list of supermarkets that are interested in supplying more local produce for their customers and also include each supermarket's food safety policies. Growers and supermarkets could then contact the others' representative body to gather information regarding potential business partnerships.

Beyond local produce, consumers also favorably perceive the safety attributes of organic produce and produce that has been inspected for GAP compliance. Similar to the findings regarding local produce, Pennsylvania consumers who had stronger preferences for organically grown produce and produce that had been inspected by the government for compliance with on-farm food safety practices had higher produce safety perceptions. These findings, therefore, provide evidence that Pennsylvania consumers perceive these two produce attributes to also offer

increased assurance of safety. Supermarkets and produce growers, therefore, might find value in marketing produce that is organic or GAP certified as well as local. More broadly, consumers are likely to perceive fruits and vegetables that are local, organic, and GAP certified as the safest produce available. However, produce that achieves all three attributes is not likely to be found easily by either consumers or supermarkets, especially since Pennsylvania organic farms tend to be small, averaging just 96 acres (Center for Rural Pennsylvania, 2010). In order to provide produce that is local, organic, and GAP certified, supermarkets and growers will need to work more closely together. Instead of simply expecting growers to comply with their food safety policies, supermarkets, interested in meeting consumer demand, should consider offering financial or technical support to local and/or organic growers to ensure that they have the capacity to comply with supermarket policy.

In conveying this information related to organic and produce inspected for produce safety, supermarkets and produce growers must be made aware that these are only preliminary findings. The limitations of the study mean that sufficient evidence does not yet exist regarding the relationships between organic produce and produce safety perceptions or produce inspected for produce safety and produce safety perceptions. Furthermore, supermarkets and produce growers must also understand that the produce attributes of local, organic, and inspected for GAP compliance accounted for just over 10% of the variance, meaning that the vast majority of factors influencing produce safety perceptions are not explained. Therefore, produce growers and supermarkets interested in meeting consumer demand for safer produce cannot expect that simply providing local, organic, and/or GAP certified produce will fully address consumer concerns.

While the findings from this study hold several important implications, communication among produce growers, consumers, and supermarkets will not likely occur on its own. Extension, as a trusted source of information on GAPs (Eggers et al., 2010), can act as a communications facilitator so that the perspectives from different groups of stakeholders are

being heard by the others. In Pennsylvania, Penn State Extension has initiated educational programming regarding on-farm food safety practices aimed at produce growers and has also been in contact with major supermarket chains in order to assess their current and future GAP expectations. Extension should continue to rely on these established networks in its efforts to educate groups of stakeholders on food safety. Future programming should operate from a TpB framework that understands that the subjective norms of important stakeholder groups are essential to convey to other groups of stakeholders. The findings documented in this study provide Extension with increased information to include in its educational programming so that consumer perceptions are being conveyed to Pennsylvania produce growers and supermarkets. Specifically, growers and supermarkets must understand that consumers do not currently feel assured that the produce they are purchasing is safe. In communicating the perspectives of consumers, Extension must continue to gather baseline data regarding growers' and supermarkets' current policies and practices and then later assess the ways in which consumer perceptions have influenced growers and supermarkets.

Based on the findings from this study, an important educational aspect for Penn State Extension to consider is programming targeting other important stakeholder groups in addition to supermarkets and growers. Although educational programming must continue for supermarkets and growers, the threat of foodborne contamination is one that affects the entire commodity chain, from grower to processor to retailer and consumer. For example, although this study has found high concern regarding produce safety among Pennsylvania consumers, only 2.2% of foodborne outbreaks in the United States between 1990 and 2007 were connected with on-farm activities (Duman, 2010). Foodborne contamination does not necessarily mean poor practices by farmers; contamination threats exist elsewhere in the commodity chain. As a result, educational programming must target all those stakeholders involved in the handling, distribution, retailing, and consumption of fresh produce. Best practices should not only exist and be disseminated to

fresh produce growers but processors, distributors, supermarkets, and consumers must also understand the ways in which they too can reduce the risk of foodborne contamination. As a trusted source of information, Extension must develop programming for all important stakeholder groups that addresses their unique roles in reducing the risk of foodborne contamination. Simply passing the burden of responsibility to produce growers is not sufficient to assure the safety of the food supply.

One critical aspect that must be addressed in the effort to create integrated programming on produce safety is the financial realities of food safety regulation. For example, although Brewer and Rojas (2008) found rising concern among Illinois consumers regarding microbial contamination, those consumers did not place high importance on increasing funding for stricter regulatory activities. Fiscal concerns are now an even more immediate reality. Although the Food Safety Modernization Act prescribes an increased regulatory role for the government, the FDA (2011) has acknowledged that it will have difficulty implementing the law without additional funding. Extension is also experiencing shortages in funding, making it increasingly difficult to develop and implement effective and relevant programming. These financial constraints are important for all stakeholders to understand if the problem of foodborne contamination is to be alleviated. Without increased contributions from taxpayers, the implementation of public regulations and educational programming will likely confront difficulties and thus have limited success in reducing the threat of foodborne contamination. Beyond financial contribution, all stakeholder groups must also understand that each has a critical function to assure produce safety. Extension can help educate the stakeholder groups about best practices in the safe growing, handling, distribution, and consumption of fresh produce, but only through an integrated effort by all stakeholder groups to act responsibly will the threat of foodborne contamination be reduced.

Recommendations

Based on the findings and implications of this study, several recommendations related to future research are offered. Due to the various limitations of the study, future studies should continue to explore the relationships among consumer preferences on specific attributes in produce and produce safety perceptions. Although this study was able to document a positive relationship between preferences for local produce and produce safety perceptions, the relationships between produce safety perceptions and preferences for organically grown produce and produce inspected for GAP compliance were not as valid or reliable. Assessing consumer preferences for produce that has been GAP certified must include private TPC audits, rather than only government inspection. Despite these limitations, future research should use the initial findings from this study for further investigation, being sure to pilot test and field test the instruments. In addition, consumer preferences for other specific attributes of produce should be explored, given that the unique variance for this study is just over 10%. Following the Pirog and Larson (2007) study, documenting the correlation between origin of produce and produce safety perceptions should also provide further insight. Future studies should explicitly distinguish among produce which is sourced locally, nationally, and globally.

Further investigation into the correlations between consumer preferences for produce and their produce safety perceptions must also occur. For example, studies should distinguish between consumer perceptions of safety between locally and non-locally grown organic produce. Consumer perceptions of safety should also be assessed between locally grown produce purchased from direct marketing outlets and such produce purchased from supermarkets. Although this study attempted to investigate how shopping venues for produce influenced produce safety perceptions, the open response format for the question related to shopping venue made it difficult to categorize for statistical analysis. Future research should therefore develop

close-ended survey questions to gather data related to consumer preferences for fresh produce shopping venues. Specific categories should include those consumers who primarily purchase their produce from supermarkets and are unconcerned with source of origin, consumers who primarily shop at supermarkets and purchase local produce at those supermarkets when possible, consumers who prefer to purchase produce at direct marketing outlets, and consumers who grow their own produce in home gardens.

The sources on which consumers rely to access information regarding produce safety would also provide valuable insights. Previous work has addressed how information sources affect consumer perceptions of food safety (Dosman et al., 2001). In future research, assessing preferred information outlets of consumers is thus critical data in order to be able to consider the influences that shape consumer perceptions of produce safety.

More generally, future studies should also consider, if using a telephone survey, the limitation of only utilizing residential landlines. Researchers should thus investigate the possibility to include cellular phone numbers into their sample. If accessing cellular numbers is not possible, studies must consider combining different survey methods, including telephone interviews, email surveys, and mail surveys, to ensure a representative sample. This triangulation of data could minimize frame and sampling errors. To address history threats, surveys should be administered at two different times in the year, once during the growing season and once during the off-season. By doing so, studies could better understand how time of year affects consumers' preferences for locally grown produce. In addition, by maintaining a log that documents foodborne outbreaks, researchers could also trace the effects of those outbreaks on consumer perceptions of produce safety.

Beyond these suggestions for future research, several recommendations for Penn State Extension programming also emerge from this study. In its effort to provide educational programming regarding on-farm food safety, Penn State Extension must convey these findings to

both Pennsylvania produce growers and supermarkets. In additions, Extension should also convey consumer perceptions to other stakeholder groups in the food system, such as processors and distributors. Penn State Extension workshops on GAPs, which target produce growers, provide a possible venue to disseminate these consumer perceptions of produce safety. Penn State Extension also maintains a website dedicated to food safety. This site is a publicly accessible outlet that should be utilized to communicate the findings from this study.

While this website is a valuable tool for dissemination, Penn State Extension can also use its relationships with PFMA, PVGA, and PASA to ensure that Pennsylvania supermarkets and growers are receiving this consumer information. Using these representative bodies to ensure the dissemination of important findings can also foster more formal partnerships. Extension should communicate to PFMA, PVGA, and PASA the value of GAP verification, which might compel these organizations, in turn, to promote to supermarkets and growers the importance of GAP compliance. In doing so, PFMA, PVGA, and PASA can help recruit supermarkets and growers to participate in Extension programming on food safety and build communication networks between these two important stakeholder groups.

In making the effort to disseminate these findings, Penn State Extension should also evaluate and document the resulting behavior changes made by Pennsylvania produce growers and supermarkets. Using TpB as a guide, Penn State Extension can understand the degree to which the subjective norms of consumers have caused produce growers and supermarkets to reconsider their produce safety policies and practices. This recommendation, in particular, is important. By utilizing TpB as its theoretical framework, this study operated from the understanding that its value rested in the potential for produce growers and supermarkets to take the necessary actions to respond to consumer demands.

In doing so, understanding that TpB has other elements besides subjective norms is essential for Extension to understand and address. Neither supermarkets nor growers are likely to

change their food safety policies and practices based on the expectations of consumers alone. Supermarkets and growers will understandably want to know the financial benefits of changing their behaviors before doing so. As a result, integrated studies that investigate the impact of enhanced food safety policies and practices should be undertaken. Economists can help supermarkets determine whether conveying information regarding their food safety policies to consumers fosters financial gain. Supermarkets will want to know whether consumer confidence and loyalty is indeed enhanced by knowing that supermarkets have implemented policies to reduce the risk of contamination. Likewise, economists can also investigate the cost benefits of implementing, documenting, and verifying GAPs for growers. Growers will want to know whether the initial investment required for GAP compliance will help guarantee market viability. Such case studies also offer opportunities for food scientists to work alongside growers and supermarkets to document the impact that the implementation and documentation of GAPs has on reducing the risk of foodborne contamination. Given current budget issues affecting Extension's funding, these types of multidisciplinary research efforts will be critical in order for Extension to continue to provide high quality, effective programming.

In addition, Penn State Extension should also consider increasing its role in educating Pennsylvania consumers about produce safety. Acting as a communications facilitator, Penn State Extension should convey the perspectives of other stakeholders in the food system to consumers. Educational programming for consumers might include the opportunities and barriers that more stringent on-farm food safety practices present to growers and supermarkets. Extension could also provide consumers with the most recent scientific evidence regarding known safety risks for the production and harvesting of produce. In doing so, Extension must continue to document consumer perceptions of produce safety, especially as other stakeholders in the food system change their food safety policies and practices. Beyond just telephone interviews, other types of data collection methods can offer more thorough analyses of consumer perceptions.

Along with surveys, conducting focus groups and individual interviews provide the opportunity to triangulate data so that even more nuance emerges regarding the factors that influence consumer perceptions of produce safety.

In order to facilitate direct communication among the different stakeholders, Penn State Extension must also continue to work with its GAP advisory committee. Comprised of Pennsylvania produce growers, supermarket representatives, Extension agents, and academics, this committee was formed in winter 2010 as a forum for important groups of stakeholders to offer feedback to Penn State Extension. Including consumer representatives on this advisory committee would help ensure a broader representation of interests and potentially encourage Pennsylvania consumers to more actively engage with the issue of produce safety.

Importantly, these recommendations for programming should be considered appropriate for the Penn State Extension agents that represent the 50 Pennsylvania counties included in this study's sample. In the effort to reduce the risk of foodborne contamination, similar studies should be conducted in other states, especially since variations related to diversity in populations, experiences with foodborne outbreaks, and access to and preferences for produce exist in different states. For extension organizations in other states to incorporate consumers' perspectives in their educational programming on GAPs, they must assess the consumers residing in their states. When doing so, this study can help guide the research design, hypotheses, and analysis.

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Appendix

Produce Consumers Survey

9: **INTRO**

Hello, my name is _____, and I am calling from Penn State University on behalf of Dr. Michel Haigh of the Penn State College of Communications. We are currently conducting a 7 minute survey about food safety and purchasing habits. May I please speak with the person 18 years of age or older who last celebrated a birthday?

Yes, I am the correct person, and I will participate at this time……1	→INTRB
Yes, I am the correct person, but I cannot participate at this time……2	→INT
I will get the person 18+ with the last birthday……3	→INTRA
The respondent (person 18+ with the last birthday is not available……..4	→INT
No screener completed……..5	→INT
Refusal by gatekeeper……....6	→INT98
Refusal by proper respondent……....7	→INT98

10: **INTRA**

Hello, my name is _____, and I am calling from Penn State University on behalf of Dr. Michel Haigh of the Penn State College of Communications. We are currently conducting a 7 minute survey about food safety and purchasing habits. Your participation in this survey is strictly voluntary. You may refuse to answer any questions I ask, and you may terminate our conversation at any time. All of your responses will be kept completely confidential. I will not ask you for your name or other personal information that can identify you as an individual and only approved Penn state research personnel will have access to the survey data collected. If you have any questions about this research, you may contact Dr. Auden Thomas at the Center for Survey Research at Penn State Harrisburg toll-free at 1-888-778-2775. Completion of the interview implies your consent to participate. Would you be willing to answer our questions?

Yes…… ……1	→T01
No……..……2	→INT98
Call back later……...…….3	→INT

11: **INTRB**

Your participation in this survey is strictly voluntary. You may refuse to answer any questions I ask, and you may terminate our conversation at any time. All of your responses will be kept completely confidential. I will not ask you for your name or other personal information that can identify you as an individual and only approved Penn state research personnel will have access to the survey data collected. If you have any questions about this research, you may contact Dr. Auden Thomas at the Center for Survey Research at Penn State Harrisburg toll-free at 1-888-778-2775. Completion of the interview implies your consent to participate. Would you be willing to answer our questions?

Yes…… ……1	→T01
No……..……2	→INT98
Call back later……...…….3	→INT

12: **T01**

The first set of questions asks you about fruit and vegetable produce safety.

Continue……...1 D

13: **Q1A**

How important is the issue of fruit and vegetable produce safety in the US on a scale from 1 to 7, where 1 is "unimportant" and 7 is "important"?

1 – Unimportant……1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Important……..7
Don't know……8
Declined to answer……9

14: **Q1B**

How important is the issue of fruit and vegetable produce safety in the US on a scale from 1 to 7, where 1 is "of no concern" and 7 is "of great concern"?

1 – Of no concern……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Of great concern……..7
Don't know……8
Declined to answer……9

15: **Q1C**

How important is the issue of fruit and vegetable produce safety in the US on a scale from 1 to 7, where 1 is "means nothing" and 7 is "means a lot"?

1 – Means nothing...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Means a lot……..7
Don't know……8
Declined to answer……9

16: **Q1D**

How important is the issue of fruit and vegetable produce safety in the US on a scale from 1 to 7, where 1 is "doesn't matter" and 7 is "matters to me"?

1 – Doesn't matter...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Matters to me…..……..7
Don't know……8
Declined to answer……9

17: **Q1E**

How important is the issue of fruit and vegetable produce safety in the US on a scale from 1 to 7, where 1 is "insignificant" and 7 is "significant"?

1 – Insignificant…...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Significant.……..7
Don't know……8
Declined to answer……9

18: **Q1F**

How important is the issue of fruit and vegetable produce safety in the US on a scale from 1 to 7, where 1 is "irrelevant" and 7 is "relevant"?

1 – Irrelevant……...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Relevant…..……..7
Don't know……8
Declined to answer……9

19: **T02**

The next set of questions asks you about your attitude toward fresh fruit and vegetable safety in the U.S. Please state how much you agree or disagree with each statement, where 1 is "strongly disagree" and 7 is "strongly agree.

Continue……...1 D

20: **Q2A**

Fruit and vegetable contamination is common in the U.S.

1 – Strongly disagree...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Strongly agree…..……..…….……..7
Don't know……8
Declined to answer……9

21: **Q2B**

It is likely other people will eat contaminated fresh fruits and vegetables.

1 – Strongly disagree...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Strongly agree…..……..…….……..7
Don't know……8
Declined to answer……9

22: **Q2C**

It is likely I will eat contaminated fresh fruits and vegetables.

1 – Strongly disagree...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Strongly agree…..……..…….……..7
Don't know……8
Declined to answer……9

23: **Q2D**

Eating contaminated food is a serious problem.

1 – Strongly disagree...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Strongly agree…..……..…….……..7
Don't know……8
Declined to answer……9

24: **Q2E**

Produce grown locally is safer than other produce.

1 – Strongly disagree...1
2...2
3...3
4...4
5...5
6...6
7 – Strongly agree...7
Don't know...8
Declined to answer...9

25: **Q2F**

I would have fewer concerns about the safety of fruits and vegetables if the grower's farm was inspected by the government for food safety practices.

1 – Strongly disagree...1
2...2
3...3
4...4
5...5
6...6
7 – Strongly agree...7
Don't know...8
Declined to answer...9

26: **Q2G**

I think produce available in grocery stores is safe to eat.

1 – Strongly disagree...1
2...2
3...3
4...4
5...5
6...6
7 – Strongly agree...7
Don't know...8
Declined to answer...9

27: **Q2H**

Government agencies are doing a good job protecting us from contaminated fruits and vegetables.

1 – Strongly disagree...1
2...2
3...3
4...4
5...5
6...6
7 – Strongly agree...7
Don't know...8
Declined to answer...9

28: **Q2I**

Locally grown fruits and vegetables taste better.

1 – Strongly disagree...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Strongly agree…..……..…….……..7
Don't know……8
Declined to answer……9

29: **T03**

The next set of questions asks you about purchasing local fruits and vegetables

Continue……...1 D

30: **Q3A**

Assuming you had the opportunity, what are the chances you would purchase local fruits and vegetables on a scale from 1 to 7, where 1 is "unlikely" and 7 is "likely"?

1 – Unlikely……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Likely……..……..…….……..7
Don't know……8
Declined to answer……9

31: **Q3B**

Assuming you had the opportunity, what are the chances you would purchase local fruits and vegetables on a scale from 1 to 7, where 1 is "nonexistent" and 7 is "existent"?

1 – Nonexistent…....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Existent…..…..……..…….……..7
Don't know……8
Declined to answer……9

32: **Q3C**

Assuming you had the opportunity, what are the chances you would purchase local fruits and vegetables on a scale from 1 to 7, where 1 is "improbable" and 7 is "probable"?

1 – Improbable……...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Probable……..……..……..……..7
Don't know……8
Declined to answer……9

33: **Q3D**

Assuming you had the opportunity, what are the chances you would purchase local fruits and vegetables on a scale from 1 to 7, where 1 is "impossible" and 7 is "possible"?

1 – Impossible……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Possible……..……..……..……..7
Don't know……8
Declined to answer……9

34: **Q3E**

Assuming you had the opportunity, what are the chances you would purchase local fruits and vegetables on a scale from 1 to 7, where 1 is "uncertain" and 7 is "certain"?

1 – Uncertain…….....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Certain...…….……..……..……..7
Don't know……8
Declined to answer……9

35: **Q3F**

Assuming you had the opportunity, what are the chances you would purchase local fruits and vegetables on a scale from 1 to 7, where 1 is "definitely would not" and 7 is "definitely would"?

1 – Definitely would not……...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Definitely would…….……..…….……..7
Don't know……8
Declined to answer……9

36: **T04**

The next set of questions asks you about purchasing fresh fruits and vegetables. Please rate the importance of each statement using a scale from 1 to 7, where 1 is "unimportant" and 7 is "important."

Continue……...1 D

37: **Q4A**

When you purchase fresh fruits and vegetables, how important is that they are locally grown?

1 – Unimportant…….……...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….……..…….……..7
Don't know……8
Declined to answer……9

38: **Q4B**

When you purchase fresh fruits and vegetables, how important is that they are organic?

1 – Unimportant…….……...……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….……..…….……..7
Don't know……8
Declined to answer……9

39: **Q4C**

When you purchase fresh fruits and vegetables, how important is the origin of produce, in other words, you want to know from where your fruits and vegetables come?

1 – Unimportant……..……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….…...…….……..7
Don't know……8
Declined to answer……9

40: **Q4D**

When you purchase fresh fruits and vegetables, how important is their size, shape, and appearance?

1 – Unimportant……..……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….…...…….……..7
Don't know……8
Declined to answer……9

41: **Q4E**

When you purchase fresh fruits and vegetables, how important is their cost?

1 – Unimportant……..……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….…...…….……..7
Don't know……8
Declined to answer……9

42: **Q4F**

When you purchase fresh fruits and vegetables, how important is it to know that the government has inspected the grower's farm?

1 – Unimportant……..……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….…...…….……..7
Don't know……8
Declined to answer……9

43: **Q4G**

When you purchase fresh fruits and vegetables, how important is it for you to know how the produce you buy is grown?

1 – Unimportant……..……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….…...…….……..7
Don't know……8
Declined to answer……9

44: **Q4H**

When you purchase fresh fruits and vegetables, how important is it to support the local economy?

1 – Unimportant……..……....……...1
2……..2
3……..3
4……..4
5……..5
6……..6
7 – Very important..…….…...…….……..7
Don't know……8
Declined to answer……9

45: **Q5**

Where do you most often buy fresh fruits and vegetables?

Continue to open-ended box……..……....……....1 O
Don't know……2
Declined to answer……3

46: **T05**

Now I'm going to ask you some information about yourself to be used for statistical purposes only. Your responses will remain confidential.

Continue……....1 D

47: **D1**
Gender?
Male.....1
Female.....2

48: **D2**
Do you consider yourself to be Hispanic or Latino?
Yes.....1
No.....2
Don't know.....3
Declined to answer.....4

49: **D3**
Which of the following best describes your race?
White.....1
Black-African American.....2
Asian.....3
Native Hawaiian or Pacific Islander.....4
American Indian or Native Alaskan.....5
Other.....6
Don't know.....7
Declined to answer.....8

50: **D4**
Enter 888 for Don't know and 999 for Declined to answer
What is your age?

51: **D5**
Which of the following categories best describes your educational level?
Less than high school.....1
High school diploma or GED.....2
Some college.....3
Two-year technical degree.....4
Four-year college graduate.....5
Graduate work.....6
Don't know.....7
Declined to answer.....8

52: **D6**

What is your total annual household income, before taxes?

Under $10,000……...……1 →INT99
$10,000 to $19,999…….……....2 →INT99
$20,000 to $39,999…...……...3 →INT99
$40,000 to $59,999……...……..……4 →INT99
$60,000 to $74,999……...…….……...5 →INT99
$75,000 to $99,999……..…….……...6 →INT99
$100,000 to $124,999……..7 →INT99
$150,000 or more…….8 →INT99
Don't know…….……9 →INT99
Declined to answer…….……10 →INT99

53: **INT98**

Thank you for your time. Have a nice day (evening).

Continue……..1 D →INT

54: **INT99**

Thank you for participating in our research. If you have any questions about the research, please feel free to contact the Center for Survey Research at Penn State Harrisburg at 1-888-778-2775. Thank you again and have a good day (evening).

Completed……1 D →INT

55: **INT**

Completed…..…….....……CO →END
Refusal by Gatekeeper…….……RG →END
Refusal by Proper Respondent…...……...RP →END
Break off: Call Back……...……..……BC →CB
Break off: Don't Call Back……...BD →END
Respondent Unavailable: Definite Appointment……..……....RD →CB
Respondent Unavailable: Indefinite Appointment……..…….....RI →CB
Answering Machine – Confirms Household……AH →END
Physically or Mentally Unable/Incompetent……UI →END
Language Problem……LP →END
Busy…….……..BU →END
No Answer…….NA →END
Answering Machine – Don't Know if Household…….AD →END
Call Blocking (e.g. Embarq)……..BL →END
No Screener Completed……NS →CB
Fax/Data Line……FD →END
Non-working/Disconnected Number…….NW →END
Temporarily Out of Service……...TO →CB
Number Changed……...NC →END
Cell Phone……..CP →END
Non-residence…….NR →END
Not Eligible – Geography……...NG →END
Not Eligible – Other……NO →END
RC – FOR USE BY REFUSAL CONVERSION INTERVIEWERS ONLY! RC →END

……..
(INTRO) Yes, I am the correct person, and I will participate at this time……..1 N
(INTRO) Yes, I am the correct person, but I cannot participate at this time…..2 N
(INTRO) I will get the person 18+ with the last birthday……...3 N
(INTRO) The respondent (person 18+ with the last birthday) is unavailable…4 N
…….
(INTRO) No screener completed……5 N
(INTRO) Refusal by gatekeeper……..6 N
(INTRO) Refusal by proper respondent……..7 N

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56 **CB**

When may I call back?
