COST COMPARISON OF FOODS PURCHASED FOR AN ALL-ORGANIC DIET AND A CONVENTIONAL, NON-ORGANIC DIET

by

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The objectives of this study were: To determine if there are mean cost differences between all-organic foods and conventional (non-organic) foods; to determine if there are differences in the mean cost of all-organic foods among higher, moderate, and lower price grocery venues; and to determine if the mean cost difference between all-organic and conventional foods varies among higher, moderate, and lower price grocery venues. The sample included selected organic food items and their conventional counterparts at a lower price (Walmart Supercenter), moderate price (Food City) and higher price (The Fresh Market) grocery venues in Kingsport, TN. Product price and package size in ounces or fluid ounces were collected. Cost per ounce was calculated for analysis. A repeated measures analysis of variance (ANOVA) with two within-subjects factors was used to determine statistically significant differences. A p value ≤ 0.05 was chosen as statistically significant. There was a significant main effect of organic status, $F(1, 27) = 27.497$, $p < 0.001$, for all foods e.g., food costs were significantly higher for organic foods compared with conventional foods. There was not a significant main effect of organic status in the Dairy group, $F(1, 4) = 5.779$, $p = 0.074$, though there was a trend towards significance since the p value was not much larger than 0.05. There was not a significant main effect of organic status in the Fruit group, $F(1, 1) = 4.267$, $p = 0.287$.

There was a significant main effect of organic status in the Grain group, $F(1, 8) = 10.318$, $p = 0.012$; in the Protein group, $F(1, 3) = 52.658$, $p = 0.005$; and in the Vegetable group, $F(1, 7) = 7.763$, $p = 0.027$ e.g., food costs were significantly different for organic and conventional foods in the Grain group, Protein group, and Vegetable group. There was not a significant main effect of grocery venue, $F(2, 54) = 0.664$, $p = 0.519$, for all organic foods e.g., organic food costs were not significantly different among the lower price, moderate price, and higher price grocery venues. There was a significant interaction between the organic status and grocery venue, $F(2, 54) = 8.633$, $p = 0.001$ e.g., the difference in mean food costs between organic and conventional foods was significantly different among lower price, moderate price, and higher price grocery venues. It was found that organic foods were significantly more expensive than their conventional counterparts. Organic food costs were not influenced by grocery venue. Therefore an all-organic shopper may not significantly benefit by shopping for organic food at a lower price grocery venue. The differences in food costs between organic and conventional foods, however, were significantly different among grocery venues. Perceived cost increases between conventional and organic food items may depend on a chosen grocery venue. Further research is needed to analyze cost and availability of organic food items at various grocery venues including food cooperatives, superstores, health food stores, bargain grocers, and traditional national and local grocery stores.

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AI: Adequate Intake

ALA: Alpha-Linolenic Acid

AMDR: Acceptable Macronutrient Distribution Range

ANOVA: Analysis of Variance

CLA9: Conjugated Linoleic Acid

CSA: Community-Supported Agriculture

DGA: Dietary Guidelines for Americans

DMI: Dry Matter Intake

DPA: Docosapentaenoic Acid

EPA: Eicosapentaenoic Acid

EPA: Environmental Protection Agency

FDA: Food and Drug Administration

GH: Growth Hormone

GM: Genetically Modified

GMO: Genetically Modified Organism

GRAS: Generally Recognized As Safe

MPN: Most Probable Number

NOP: National Organic Program

OC: Organochlorine

OFPA: Organic Foods Production Act

OP: Organosphosphorus

OSP: Organic System Plan

POP: Persistent Organic Pollutant

PUFA: Polyunsaturated Fatty Acid

RDA: Recommended Dietary Allowance

SOM: Soil Organic Matter

TFP: Thrifty Food Plan

UNFI: United Natural Foods, Inc.

USDA: United States Department of Agriculture

VA: Vaccenic Acid

WTP: Willingness to Pay

CHAPTER 1: REVIEW OF SCIENTIFIC LITERATURE

Introduction

Organic food demand and sales are continually on the rise, as demonstrated by increased sales from $3.6 billion in 1997 to $21.1 billion in 2008 (Greene et al., 2009) and to $28.6 billion in 2010 (Forman & Silverstein, 2012). Over two-thirds of United States consumers occasionally purchase organic products while 28 percent purchase organic products at least weekly. Between 1997 and 2008, organic food sales have increased yearly between 12 and 21 percent (Greene et al., 2009). Organic foods are perceived to be more nutritious (Forman & Silverstein, 2012). While research is limited surrounding whether organic foods are healthier, many consumers may believe choosing to eat organic foods over conventional foods will result in positive health effects (van de Vijver & van Vliet, 2012). Despite the growing market and nutritional quality of organic foods, the public believes organic foods are more costly (Zepeda, Chang & Leviten-Reid, 2006; Thompson & Kidwell, 1998). Few studies have analyzed the cost of organic food. Thompson and Kidwell (1998) found organic price premiums ranged from 40 percent to 175 percent of the conventional prices. Brown and Sperow (2005) found the all-organic diet studied using the United States Department of Agriculture (USDA) Thrifty Food Plan (TFP) was 49 percent more expensive than the non-organic diet. The USDA's Thrifty, Low-Cost, Moderate-Cost, and Liberal Food Plans were created based on the 2005 Dietary Guidelines for Americans and the 2005 MyPyramid (Carlson, Lino, Juan, Hanson, & Basiotis, 2007), (Carlson, Lino, & Fungwe, 2007). A more current plan has not been developed using the 2010 Dietary Guidelines for Americans and the 2010 MyPlate. With information about the cost of an organic diet based on current dietary recommendations, dietitians could provide more accurate benefits and barriers to purchasing organic food. The goal of this research was to compare costs of foods purchased for an all-organic diet and a conventional, non-organic diet.

Organic Definition

Public Interpretation of Organic

The definition of the term organic is often misunderstood by the general public. Gil, Gracia, and Sanchez (2000) found many individuals in the regions of Navarra and Madrid of Spain considered their own food products organic simply because they had not used fertilizers. Zepeda, Chang, and Leviten-Reid (2006) found shoppers defined organic as “no chemicals.” A group of African American non-organic shoppers described organic foods as expensive, homegrown, better for you, and higher quality. Participants in this group agreed the difference in prices between organic and conventional food items was justified because of lower production yield, additional labor hours for weeding, potential pest damage and lower quality, and the need for more management. Consumers may not know what foods are organic unless they are aware of labeling rules (Bellows et al., 2008).

USDA Organic Definition

Organic farming must avoid the use of synthetic chemicals, hormones, antibiotics, genetic engineering, or irradiation. An organic product meets the following requirements: 1. Produced without genetic engineering, ionizing radiation, or sewage sludge, 2. Produced by the National List of Allowed and Prohibited Substances, 3. Follow all USDA organic regulations, and 4. Overseen by a USDA National Organic Program (NOP) certifying agent (USDA AMS, 2012).

Organic Labeling

The USDA has developed food product terms that may be used on food labels to help the consumer differentiate organic foods from conventional foods (Forman & Silverstein, 2012). A food may not carry any organic claim on the label unless it is certified organic. If some of its ingredients are certified organic, they may say so on the ingredients list with a percentage of organic ingredients (USDA AMS, 2012). A product is certified organic if it carries the USDA organic seal. This means at least 95 percent of the ingredients are certified organic. Any food labeled as organic must follow the USDA organic regulations. If 100 percent of the ingredients are certified organic, all processing aids are organic, and a product label lists the name of the organic certifying agent, that product may carry the USDA organic seal and may carry a 100 percent organic claim. If at least 70 percent of the product contains certified organic ingredients not including water and salt, the package may state "made with organic…" and list up to three ingredients as long as the name of the organic certifying agent is listed. These foods, however, may not carry the USDA organic seal (USDA AMS, 2012). While some product marketing terms relate to organic farming, these statements do not necessarily mean the food product is organic. Such terms include free range, no hormones, no antibiotics, certified, vegetarian fed, and chemical free (Forman & Silverstein, 2012).

Organic Regulation

The Organic Foods Production Act (OFPA) was introduced as part of the 1990 Farm Bill to create standards for marketing organic products and the List of Allowed and Prohibited Substances related to organic production and handling. NOP standards were fully implemented in 2002 (Winter & Davis, 2006). The United States also accepts organic products from other countries such as those in the European Union that have equivalent organic guarantees as the

USDA NOP. The USDA NOP regulates organic farming, harvesting, handling, and selling agricultural products that are organically produced. The NOP also certifies foreign and domestic agents who inspect organic production and handling (Dimitri & Greene, 2002). The NOP does not certify organic operations itself, rather it accredits certifying agents.

Organic products have many control points to ensure the product remains organic from farm to table. Organic farmers are regulated at many points including use of fertilizers, pest management, synthetic substances, cycling resources, and developing soil. Organic handlers are likewise regulated at points including, drying, grinding, slaughtering, and packaging. They must prevent contamination by nonorganic or prohibited substances and contact with nonorganic products. For a farm to be certified as organic, buffer zones must be between organic and conventional land. The land must have also been free of USDA organic prohibited substances for at least three years before it is eligible for certification. Organic operations work with a certifying agent, submit annual updates of their organic system plans (OSP), and pay annual fees to remain certified (USDA AMS, 2012).

Fertilizers

Plant and animal materials used to improve soil organic matter content must not contain plant nutrients, pathogens, heavy metals, or residues of prohibited materials that may contaminate crops, soil, or water (NOP Handbook, 2013). If a liquid fertilizer has a nitrogen analysis greater than three percent, it must be approved by a material evaluation program before it can be used on organic or transitional land (NOP handbook, 2013). Green waste may be used as organic fertilizers. Green waste includes grass, flower cuttings, hedge trimmings, animal manure, and other biodegradable plant and animal materials that have not been treated with synthetic or nonsynthetic substances, even if they have been allowed for use in organic crop production (NOP handbook, 2013). Animal manure may also be used as a fertilizer in organic crop production, but regulations apply. Unprocessed manure may not be applied less than 90 days before crop harvest if the edible portions do not come in contact with the soil. If edible portions do come in contact with soil, unprocessed manure must be applied at least 120 days before crop harvest. Processed manure may be used to build soil in organic farming. Processed manure must reach a minimum temperature of 150 degrees Fahrenheit for at least one hour and must be dried to a twelve percent maximum moisture level. Processed manure must contain less than 1,000 Most Probable Number (MPN) fecal coliform per gram of manure and less than 3 MPN Salmonella per four grams of manure (NOP handbook, 2013).

Improving Soil Content

Soil fertility is maintained in organic farming through many natural methods. Crop rotation is used to prevent the soil from becoming depleted of nutrients. Cover crops are used to prevent soil erosion. Green manures are special crops planted to be plowed down to enrich the soil. Organic animal and plant wastes not only keep the soil nutrient dense, they also serve as food for microorganisms in the soil. Organic soil has a high number of microorganisms compared with conventional farming. Conventional farming does not address soil structure or microorganisms. Conventional farming also uses chemical fertilizers, which may be higher in nitrates (Worthington, 2001). Soil managed with organic farming methods has higher water retention. This may increase yields in years with droughts (Forman & Silverstein, 2012).

Pesticides

Organic farms may use synthetic substances on the National List only if other organic methods of pest management will not prevent or control pests. Some substances approved for use include soap based herbicides, calcium hypochlorite, lime sulfur, and copper sulfate (Winter

& Davis, 2006). Conventional farming is regulated less when it comes to pesticides. The United States Environmental Protection Agency (EPA) has set a “reasonable certainty of no harm” standard. This standard means a lifetime risk of cancer due to pesticide exposure must be below 1 excess cancer per 1 million people exposed. Additionally, the EPA must consider risks to infants and children in setting pesticide tolerances (Winter & Davis, 2006).

Seeds and Seedlings

Organic seed, annual seedlings, and planting stock must be certified organic. If an equivalent organically produced variety of organic seed and planting stock is not commercially available, non-organic seed and planting stock may be used. Availability may be influenced by a number of factors including days until harvest, yield of harvested crop, disease and pest resistance. This does not permit the use of genetically modified (GM) organisms to grow organic crops (NOP Handbook, 2013).

Organic Livestock

Dry matter intake (DMI) is the daily amount of food a cow or dairy goat consumes, minus the water content of the feed. DMI must be estimated so cows are no over- or underfed. At least 30 percent of DMI must come from pasture grazing over an entire grazing season (NOP Handbook, 2013). This regulation helps to ensure an optimal quality of life for organic livestock. Animal feed is regulated by the United States Food and Drug Administration FDA). Feed additives must be on the generally recognized as safe (GRAS) list. Other substances are prohibited and are published throughout 21 CFR. Ingredients included in the ingredients list must all be organically produced. Pasture and forage crops that certified organic livestock graze from must also be certified organic (NOP Handbook, 2013). The routine use of growth hormones (GH) may not be used on organic livestock and they must have access to the outdoors (Forman & Silverstein, 2012).

Preventing Nonorganic Contamination

Management practices should be in place so steps of farming, receiving, storing, and processing areas and equipment are not cross-contaminated. Written plans must be submitted, reviewed, approved, and periodically checked for compliance (NOP Handbook, 2013). Organic farmers must prevent contamination by nonorganic or prohibited substances and contact with nonorganic products. Buffer zones must be between organic and conventional land. The land must also have been free of USDA organic prohibited substances for at least three years before it is eligible for certification.

Disinfecting Facilities

Chlorine may be used to wash and disinfect areas designated for handling, storing, and processing organic products. Chlorine content in the water in direct contact with organic products must fall below the maximum residual disinfectant limit but chlorine content in wash water discharged from an organic operation is not regulated (NOP Handbook, 2013).

Genetically Modified Organisms

Genetically modified organisms (GMOs) may not be used in any area of organic farming (NOP Handbook, 2013). GMOs include organisms created by methods not possible under natural conditions, such as recombinant DNA technology. The OFPA in 1990 and the first NOP rule in 1997 did not address or prohibit GMOs. GMOs were not addressed in organic regulations until the year 2000. The 2000 NOP proposed a rule eliminating the use of GMOs in organic production and handling (McEvoy, 2012).

Organic farms may not use GMO seeds, organic livestock may not eat feed containing GMO ingredients, and processed organic products may not contain any GMO ingredients. Steps are taken so cross-contamination will not occur. For example, organic farms may plant their seed before or after neighboring farms' conventional and/or GMO seeds so there will be no cross-pollination. There may also be transitional lands between organic and conventional farm lands. These lands will be managed organically but the crops will not be sold as organic (NOP Handbook, 2013). Organic producers can also ensure their seeds do not contain GMO residues by testing the seed for the presence of GMOs (McEvoy, 2012). While the use of GMOs is prohibited in organic farming, the presence of GMO material is not. If practices are in place according to a farmer's OSP to eliminate the use of, commingling of, or contamination of GMOs during farming, processing, and handling, a minimal amount of GMO contaminants may still be present and those products will still be considered organic (McEvoy, 2012).

The Increasing Popularity of Organic Food and Farming

The USDA NOP 2012 list of certified organic operations lists 17,750 certified USDA organic farms and processing facilities in the United States. Since the NOP began recording certified organic operations in 2002, this count has increased by 240 percent (USDA AMS, 2012). Organic production in the United States has increased from \$3.6 billion to \$21.1 billion between 1997 and 2008 (Greene et al., 2009). Over two-thirds of United States consumers purchase organic food products occasionally and over 28 percent purchase organic food products at least weekly (Greene et al., 2009). As of 2000, organic products were available in almost 20,000 natural food stores and in about 73 percent of conventional grocery stores (Dimitri & Greene, 2000).

Health Effects of Conventional and Organic Food

Health Perceptions

Consumers believe organically labeled products are healthier and have better nutritional quality (Palupi et al., 2012). Van de Vijver & van Vliet (2011) found about 40 percent of those studied mentioned a health complaint before they began consuming organic food. Of those who had a health complaint, 78 percent reported that was why they switched to organic food. About 70 percent of the total respondents reported they noticed one or more positive health effects, including improvement in condition of hair, skin, and nails.

Nutrition Practices

Almost half of young adults studied by Pelletier et al. (2013) believed alternative production practices (organically grown, made with organic ingredients, not processed, locally grown, or grown using sustainable agricultural practices) were of moderate or high importance. Those people who believed alternative production practices were very important had healthier dietary practices than those who placed less importance in alternative production practices. They ate more fruits, vegetables, and dietary fiber daily and less added sugars and fat.

Nutrient Content

Organic foods may have higher nutrient contents than conventional foods, though this is difficult to assess due to the number of factors affecting nutritional profiles including growing season, climate, maturity at harvest time, and storage time (Forman & Silverstein, 2012). Dangour et al. (2009) found no significant difference in calcium, copper, magnesium, phenolic compounds, potassium, vitamin C, zinc, and total soluble solids between organic and conventional produce. Conventional crops contained significantly higher nitrogen while organic crops contained significantly higher phosphorus and titratable acidity. Researchers concluded organic and conventional produce are similar in nutrient content and any differences were most likely due to types of fertilizer used and ripeness of produce. In a meta-analysis by Palupi et al. (2012), significant amounts of nutrients in organic milk were not related to nonorganic milk to enable support of human health. Protein, alpha-linolenic acid (ALA), omega-3 fatty acids, conjugated linoleic acid (CLA9), vaccenic acid (VA), eicosapentaenoic acid (EPA), and docosapentaenoic acid (DPA) were found in significantly higher amounts in organic dairy products than in nonorganic dairy. This may be because organic dairy farms feed their cattle more fresh forage than conventional farms, which is associated with higher intake of polyunsaturated fatty acids (PUFAs), specifically ALA. Worthington (2001) found organic crops had more iron, magnesium, phosphorus, and vitamin C and less nitrates than conventional crops.

Pesticides

One reason consumers choose to purchase organic foods is because they have lower chemical pesticide residues than conventional foods. Chemical pesticides are used to increase crop yields in conventional farming. About 600 pesticide ingredients have been registered with the EPA (Baker et al., 2002). Many organochlorine (OC) pesticides have been banned for years, including DDT, aldrin, dieldrin, heptachlor, chlordane, and toxaphene. Trace amounts of these insecticide residues may still be found in the soil where some root crops and leafy greens may absorb them from the soil (Baker et al., 2002). Baker et al. (2002) analyzed three data sets of pesticide residues to determine if there were any differences in organic and conventional produce. Researchers found samples of organic crops were much less likely to contain detectable residues than conventional crops. Additionally organic samples containing residues were much less likely to have multiple residues than conventional samples. While organic produce had significantly lower pesticide residues, researchers concluded organic produce unavoidably contain some synthetic pesticide residues. OC pesticides among others raise environmental and health concerns because they are so resistant to degradation and therefore have a long half-life (Ritter et al., 1995). These pesticides are called persistent organic pollutants (POPs). POPs have been linked to many disorders including higher rates of atherosclerotic plaques and myocardial infarction (Lind et al., 2012), prostate cancer (Xu et al., 2010), insulin resistance (Lee et al., 2007), and non-Hodgkin lymphoma (Bräuner et al., 2012). Biological half-life refers to the time in which a chemical breaks down in an organism. A long biological half life for a pesticide may be greater than six months. This means that in six months the amount of the pesticide found in an organism's system will be half of what was originally consumed. While a relatively small amount of pesticides may be consumed on food at one time, consumption of foods that contain traces of pesticides will cause a buildup in the body if those pesticides have not degraded in a reasonable amount of time (Ritter et al., 1995). Pesticides also have a soil half-life, which refers to the length of time it takes for the substance to degrade by half. The longer the soil half-life, the more likely it is to end up on the foods people consume. Organophosphorus (OP) pesticides are approved for use in conventional farming. These pesticides have a much shorter biological half-life than POPs. Lu et al. (2008) found concentrations of OP pesticides in children were higher when they consumed conventional diets, fell when they switched to an organic diet, and rose when they stopped eating the organic diet. Pesticides used in conventional farming may also affect birds, mammals, and fish as pesticides are often detected in water and air samples (Winter & Davis, 2006). Rinsing produce to wash pesticides off may not always be effective. Krol et al. (2000) found out of twelve pesticides studied, rinsing with tap water removed nine pesticide residues but three (vinclozolin, bifenthrin, and chloropyrifos) were not removed.

Microbiological Safety

Both organic and conventional farming use animal manure as fertilizer, though it is more common in organic farming. This may drive the argument that organic crops are more susceptible to microbial contamination than conventional crops. As previously described, organic standards have been set forth to process animal manure if it comes in direct contact with edible portions of crops or must be set out over 90 days before harvest. These standards do not have to be followed for conventional farming methods (Winter & Davis, 2006). Some also argue because organic livestock farms are prohibited from using antibiotics, organic meat is more likely to have microbial safety risks. While research is inconclusive related to whether organic meat samples or nonorganic meat samples contain more microbial contaminants, eliminating antibiotic use in organic animal production has resulted in lower antimicrobial resistance in bacteria compared to bacterial samples from nonorganic animal production (Winter & Davis, 2006).

Hormones

Consumers may prefer organic food to avoid GH. Organic livestock farming may not use hormones to increase yield. Conventional livestock farming methods may use GHs to increase milk yield by up to 15 percent (Forman & Silverstein, 2012). However, bovine GH is inactive in humans. Additionally, GH must be given to cows by injection because stomach acid degrades the hormone. If any GH were consumed, it would denature in the consumer's gastrointestinal tract (Forman & Silverstein, 2012). Conventional livestock farming methods may also use sex steroids to increase lean muscle mass and accelerate growth, which in turn quickly increases yield of meat. Unlike GH, sex steroids are not inactive in humans and do not denature in stomach acid. Pape-Zambito, Roberts, and Kensinger (2010) found no significant difference in the concentration of estrone between conventional and organic milk and significantly more 17β-estradiol in organic milk than conventional milk, though the concentrations were so small they were not considered biologically significant.

Environmental Implications of Organic Production Systems

Organic production systems provide a number of environmental benefits. Since organic farming significantly reduces the use of synthetic pesticides, pesticide residues in water and food are lower (Greene et al., 2009). The process of improving soil content in organic farming systems may reduce carbon levels in the atmosphere due to the use of cover crops, crop rotation, animal manures, and green waste fertilizers (Greene et al., 2009). Crop rotation ensures one crop does not deplete the soil of nutrients that crop uses the most of (Worthington, 2001). Organic soil management increases soil organic matter (SOM) in surface soil. Organic soil management also leads to higher SOM concentrations in the soil than conventional soil management techniques for up to ten years (Marriott & Wander, 2006).

Perceived Significance of Organic Production Methods

Almost half of young adults studied by Pelletier et al. (2013) believed alternative production practices (organically grown, made with organic ingredients, not processed, locally grown, or grown using sustainable agricultural practices) were of moderate or high importance. Bellows et al. (2008) investigated characteristics of people who believed organic production methods were important. Those who had less education and a lower income were more likely to believe organic production methods were important when deciding what food to eat than those with more education and a higher income. Those who had at least one child or more than one adult in the household placed more importance on organic production methods when deciding what food to eat than those with no children or only one adult. Those who practiced regular religious observance placed more importance on organic production methods when deciding what to eat than those who never or occasionally practice. Women valued organic production when deciding what food to eat more than men. Lastly, Hispanic people valued organic production more than non-Hispanics (Bellows et al., 2008).

Characteristics of Organic Consumers

Studies investigating characteristics of consumers who purchase organic foods have demonstrated mixed results. Using only demographic characteristics to determine food shoppers' knowledge, attitudes, and behaviors towards purchasing organic foods may not lead to conclusive results (Zepeda, Chang, and Leviten-Reid, 2006).

Gender

Bellows, Alcaraz, & Hallman (2010) investigated gender differences in organic consumers. Female consumers who do most of their household's food shopping placed a higher importance on GM-free foods than female consumers who did not do most of their household's food shopping. While women reported purchasing organic foods occasionally and frequently more often than did men, gender did not play a significant role in the decision to purchase organic foods (Bellows, Alcaraz, & Hallman, 2010). Loureiro & Hine (2002) also found gender was not significant in willingness to pay for organic potatoes.

Education and Income

The relationship of education and income with purchasing organic food remains inconclusive. Loureiro and Hine (2002) found wealthy and well-educated consumers were willing to pay on average 2.39 cents more per pound for organic potatoes. Education and income levels were found to be related to both the tendency to buy organic foods and the perceived importance of organic food production methods. Likewise, those who had more education and those who had a higher income were more likely to purchase organic food regularly (Bellows et al., 2008).

Conversely, high household income was not found to be related to organic purchases, despite higher price premiums for organic products (Greene et al., 2009). Thompson & Kidwell (1998) also found consumers with higher educational degrees were less likely to select organic produce. They were also more likely to shop at specialty grocers, which carried less organic produce. Likewise, households with higher income were more likely to shop at specialty grocers and were less likely to purchase organic foods. Economic variables did not significantly impact the likelihood of purchasing organic food in a study by Zepeda & Li (2007).

Nationality

More Hispanics regularly purchased organic food than non-Hispanics according to research conducted by Bellows et al. (2008). However, among six race different categories including Hispanics, regularly purchasing organic food was not significantly different.

Household composition

It is unknown whether the presence of children in a household may influence the decision to purchase organic food. Thompson & Kidwell (1998) found consumers were more likely to select organic produce if they were from households with children under the age of eighteen. Conversely, Bellows et al. (2008) found the number of children and adults in a household did not influence the tendency to buy organic food.

Meal Preparation

Bellows, Alcaraz, & Hallman (2010) found consumers who are frequently involved in meal preparation placed a higher importance on organic and GM-free foods than consumers who were less involved, though the difference was not statistically significant.

Other Demographic Characteristics

Age, political affiliation, and religion have also been investigated. Bellows et al. (2008) found groups of people who were female, higher income, more liberal, and who claimed to understand organic food production purchased organic food more often than their counterparts. Religious observance, age, and political affiliation were not significantly related to buying organic food. About 25 percent of those studied by Gil, Gracia, & Sánchez (2000) included people who leaned towards more natural food consumption and felt they had a balanced life, but did not have an excessive concern for their own health. This group of people was labeled as a potential group of organic consumers because most occasionally consumed organic foods and were willing to taste organic foods in the near future. Age and willingness to pay for organic potatoes were negatively correlated in a study by Loureiro & Hine (2002). Those who had no religious affiliation, who were more educated, and who were younger in a study by Zepeda & Li (2007) were significantly more likely to purchase organic food.

Barriers to Purchasing Organic Food

Bellows et al. (2008) predicted consumers who did not purchase organic foods would have preferred to buy organic foods but faced barriers. Barriers could have been price, location of stores carrying organic products, organic food quality, food availability, trust about whether or not the food product is really organic as the package claims to be, or overwhelmed by the amount of information about organic foods.

Price

A qualitative study by Zepeda, Chang, and Leviten-Reid (2004) found conventional and organic food shoppers believed organic food was more expensive than conventional food. Some organic shoppers said it was two to three times more expensive than conventional foods and they would not purchase out of season because of price. Among all shoppers, cost was a limiting factor for almost half. Cost was also the most frequent reason why participants had not purchased organic foods. Conversely, Zepeda and Li (2007) found cost was not a significant factor influencing the probability of purchasing organic food products. Demographics may play a role in whether or not price is a barrier. People with lower education and lower income levels tend not to purchase organic foods as regularly as people with higher education and higher income levels (Bellows et al., 2008).

Familiarity

People with lower self-reported knowledge of organic food production are more often non-organic shoppers (Bellows et al., 2008; Zepeda, Chang, & Leviten-Reid, 2004). Familiarity with organic food may be linked to access of organic food (Zepeda, Chang, & Leviten-Reid, 2004). Interestingly, Zepeda, Chang, and Leviten-Reid (2004) found shoppers who were less familiar with organic food and organic farming had more trust in organic food. Organic and conventional shoppers were more familiar with organic produce than with meat, milk, and processed products. This may be one reason why consumers are willing to pay a higher premium for organic fruit and vegetables than for other organic products (Gil, Gracia, & Sánchez, 2000) and why organic produce is sold more than other categories of organic food (Greene et al., 2009).

Availability

Searching for organic foods and opportunity to purchase organic food has a large impact on purchasing organic food (Zepeda & Li, 2007). Zepeda and Li (2007) found the most significant factor influencing the probability of purchasing organic food products was shopping venue followed by convenience. Thompson and Kidwell (1998) found consumers who shopped at a local cooperative were more likely to purchase organic produce than those who shopped at a specialty grocer. This barrier may be somewhat less common now because as of 2000, organic products were sold in about 73 percent of conventional grocery stores in the United States (Dimitri & Greene, 2000). Availability of specific organic products may also be a barrier. In 2005, only 0.2 percent of all United States corn and soybean crops were grown using certified organic farming methods. Organic dairy farms often experience shortages of organic feed (Greene et al., 2009).

The Decision to Purchase Organic Food

Consumers often choose organic food products for health, environmental, and moral reasons (Bellows, Alcaraz, & Hallman, 2010). Zepeda and Li (2007) found the most significant factor influencing the probability of purchasing organic food products was shopping venue followed by convenience. Zepeda, Chang, and Leviten-Reid (2006) found the second most important factor reported by organic shoppers was the origin of the food. Another important factor in this group was health/nutrition. Conventional food shoppers reported they bought organic foods for taste, appearance, and it was the only product available at the time. Shoppers in a conventional African-American shopper group were concerned most with nutrition and freshness of food. Those in a conventional Caucasian shopper group were concerned most with appearance and price. Researchers concluded positive attitudes and motivations for buying organic foods were: concerns about health, dietary restrictions, environmental concerns, and energy concerns. Many consumers believe purchasing organic food is a morally right thing to do, though to what degree this moral belief influences organic purchasing decisions is unknown (Vassallo et al., 2007). Consumers perceive organic food products as healthier than conventional foods and therefore have positive attitudes towards organic food products (Gil, Gracia, & Sánchez, 2000). Van de Vijver & van Vliet, (2011) found consumers made the choice to consume organic foods because of health, environment, animal welfare, and taste, in order of reported importance. Loureiro and Hine (2002) found consumers who were concerned with freshness and nutrition were willing to pay more for organic potatoes.

Willingness to Pay for Organic Food

Consumer willingness to pay (WTP) for organic food products is influenced by cost of organic products compared with conventional food items (Bellows, Alcaraz, & Hallman, 2010; Bellows et al., 2008; Gil, Gracia, & Sánchez, 2000; Loureiro & Hine, 2002; Thompson & Kidwell, 1998; Zepeda, Chang, & Leviten-Reid, 2004; Zepeda & Li, 2007). WTP for organic food may also depend on the consumer and the organic product. Gil, Gracia, & Sánchez, (2000) found both potential and actual organic consumers of organic food were willing to pay a similar price premium for all types of organic products including produce, cereals, eggs, and meat. Among all types of organic food products, actual organic consumers were willing to pay a slightly higher premium for organic fruit and vegetables than for other organic products. Among unlikely organic consumers, WTP for organic products was almost zero. Zepeda, Chang, & Leviten-Reid (2004) found household income was not related to concern over the price of organic food, but it was related to organic food purchases. In a study by Loureiro & Hine (2002), WTP for organic potatoes was estimated to be 6.64 cents per pound and GMO-free potatoes was 5.55 cents per pound. As organic price premium increased, the percentage of positive responses to WTP decreased. Consumers who were concerned with freshness and nutrition were willing to pay an additional premium for organic potatoes and GMO-free potatoes. WTP may vary by region. Consumers in Madrid, Spain were willing to pay a smaller price premium for organic food than consumers in Navarra, Spain in a study by Gil, Gracia, & Sánchez (2000). Lastly, WTP may be influenced by where consumers choose to shop. Thompson & Kidwell (1998) found consumers who shopped at a food cooperative were less sensitive to organic price premiums than those who shopped at a specialty grocery store.

Retail Cost of Organic Food

Organic food products tend to be more expensive than conventional food products (Brown & Sperow, 2004; Thompson & Kidwell, 1998). If organic foods have a price premium of 70 percent as reported by Promar International in 1999, a household would spend seven percent more of its income on food than the United States average food expenditures of ten percent (Brown & Sperow, 2005). Brown and Sperow (2005) found the price premium of organic foods ranged from 74 percent below conventional foods for ground cumin to 450 percent above conventional foods for cornstarch. The food group with the lowest organic price premium was vegetables. The all-organic diet studied by Brown & Sperow (2005) using the USDA TFP was 49 percent more expensive than the non-organic diet. The TFP provides a list of food for a nutritious diet based on Recommended Dietary Allowances (RDAs), Acceptable Macronutrient Distribution Ranges (AMDRs), Adequate Intakes (AIs), Dietary Guidelines for Americans (DGA), and at the latest MyPyramid recommendations. It does so at a minimal cost and therefore serves as the basis for food stamp allotments (Carlson et al., 2007). With an average United States household income of $57,852 as reported by the USDA in 2002, the cost of the non-organic TFP food list was eleven percent of the average United States household income compared to sixteen percent for the all-organic TFP food list. Researchers concluded consumers who desire to purchase and consume an all-organic diet should expect to pay a larger percentage of income on food.

Organic food cost varies between food products. Out of all organic food categories, the two organic products that sell the most are produce and milk. These two products also tend to have the highest price premiums among organic food compared with their conventional counterparts (Greene et al., 2009). Lin, Smith, and Huang (2008) found price premiums for organic fruits and vegetables were significantly different from conventional prices and varied from 15 percent more than the average conventional price for carrots and tomatoes to over 60 percent for organic potatoes. Thompson and Kidwell (1998) found organic produce price premiums varied from 40 to 175 percent of their conventional counterparts.

Some time and effort on the part of the consumer may make an organic diet a little less expensive. Consumers can buy organic produce in bulk and in season and they can preserve produce for use in seasons where organic produce is more expensive. Searching for coupons, sales, and online deals can also be effective. Choosing to join a community-supported agriculture (CSA) operation and frequent farmers' markets may both increase availability and decrease total cost (Brown & Sperow, 2005).

Production Cost of Organic Food

The cost of production of organic food remains high while overall demand is still low, reportedly due to factors such as high cost (Gil, Gracia, & Sanchez, 2000). The higher costs of organic foods are influenced by many factors. The initial cost to transition to an organic farm and then to maintain organic certification is high (Greene et al., 2009). Organic feed is priced higher and organic farms have a smaller yield of crops, dairy, and meat (Forman & Silverstein, 2012; Greene et al., 2009). Labor costs for organic farms are higher due to increased efforts to weed and keep pests away (Forman & Silverstein, 2012). Exporting may also influence costs. About 75 percent of organic production in Spain is exported to other countries because food prices are higher than in domestic, Spanish markets. This drives the prices of organic food up in Spain (Gil, Gracia, & Sánchez, 2000).

Summary

The organic food market is increasing in popularity every year (Greene et al., 2009). People choose organic food for a number of reasons including increased nutrient content (Dangour et al, 2009; Worthington, 2001), reduced pesticide exposure (Winter & Davis, 2006), reduced pathogenic microorganism exposure (Winter & Davis, 2006), and environmental sustainability (Greene et al., 2009). While OC pesticides have been banned they persist in soils due to a long half-life (Ritter et al., 1995), and thus end up on some produce that consumers eat (Baker et al., 2002). While POPs can still be found on organic food, organic foods have lower pesticide concentrations (Baker et al., 2002). Serum concentrations of OP pesticides currently approved for use in conventional farming will decrease quickly in consumers who switch from a conventional to an organic diet (Lu et al., 2008). Despite the overwhelming reasons to choose organic food products over conventional ones, financial barriers still exist (Zepeda, Chang, & Leviten-Reid, 2004). This research was conducted to determine the financial cost of an organic diet compared with a conventional diet.

CHAPTER 2: METHODOLOGY

Research Questions, Objectives, and Hypotheses

This research attempted to answer the following questions:

1. Are there mean cost differences between all-organic foods and conventional (non-organic) foods?
2. Are there differences in the mean cost of all-organic foods among higher, moderate, and lower price grocery venues?
3. Does the mean cost difference between all-organic and conventional foods vary among higher, moderate, and lower price grocery venues?

The objectives of this research included:

1. To determine if there are mean cost differences between all-organic foods and conventional (non-organic) foods.
2. To determine if there are differences in the mean cost of all-organic foods among higher, moderate, and lower price grocery venues.
3. To determine if the mean cost difference between all-organic and conventional foods varies among higher, moderate, and lower price grocery venues.

The null and alternative hypotheses are listed in Table 1.

Table 1. Research questions and null and alternative hypotheses.

Research Questions	**Null Hypotheses**	**Alternative Hypotheses**
1. Are there mean cost differences between all-organic foods and conventional (non-organic)	H_{01a}: There is no difference in the mean cost per ounce of all-organic foods and conventional (non-organic)	$H_{A1a:}$ The mean cost per ounce of all-organic foods is greater than the mean cost per ounce of conventional (non-

foods?	foods.	organic) foods.
	H_{01b}: There is no difference in the mean cost per ounce of all-organic dairy and conventional dairy.	H_{A1b}: The mean cost per ounce of all-organic dairy is greater than the mean cost per ounce of conventional dairy.
	H_{01c}: There is no difference in the mean cost per ounce of all-organic fruit and conventional fruit.	H_{A1c}: The mean cost per ounce of all-organic fruit is greater than the mean cost per ounce of conventional fruit.
	H_{01d}: There is no difference in the mean cost per ounce of all-organic grains and conventional grains.	H_{A1d}: The mean cost per ounce of all-organic grains is greater than the mean cost per ounce of conventional grains.
	H_{01e}: There is no difference in the mean cost per ounce of all-organic protein foods and conventional protein foods.	H_{A1e}: The mean cost per ounce of all-organic protein foods is greater than the mean cost per ounce of conventional protein foods.
	H_{01f}: There is no difference in the mean cost per ounce of all-organic vegetables and conventional vegetables.	H_{A1f}: The mean cost per ounce of all-organic vegetables is greater than the mean cost per ounce of

		conventional vegetables.
2. Are there differences in the mean cost of all-organic foods among higher, moderate, and lower price grocery venues?	H_{02}: The mean cost per ounce of all-organic foods is the same among higher, moderate, and lower price grocery venues.	H_{A2}: The mean cost per ounce of all-organic foods is not the same among higher, moderate, and lower price grocery venues.
3. Does the mean cost difference between all-organic and conventional foods vary among higher, moderate, and lower price grocery venues?	H_{03}: The mean cost difference per ounce between all-organic and conventional foods is the same among higher, moderate, and lower price grocery venues.	H_{A3}: The mean cost difference per ounce between all-organic and conventional foods is not the same among higher, moderate, and lower price grocery venues.

Sample

The target population was all conventional and organic food items in all grocery venues in Kingsport, TN. Three grocery venues were selected within the city limits of Kingsport, TN. Walmart advertises lower prices than other grocery stores. Walmart was selected as the sample lower price grocery venue. The Fresh Market offers more specialty items and its prices tend to be more expensive. The Fresh Market was selected as the sample higher price grocery venue. Food City is located in a number of neighborhoods in Kingsport, TN and surrounding areas and is easily accessible to the majority of the population. Food City was selected as the sample moderate price grocery venue. All three grocery venues are chains that can also be found in regions outside of northeastern Tennessee. Ten to 20 food items in each of the five USDA

MyPlate food groups were selected based on food lists in the USDA Thrifty Food Plans (Anand et al., 1999; Carlson et al., 2006). Table 2 contains the sample food lists.

Table 2. List of food items in each of the USDA MyPlate food groups.

Dairy	**Fruit**	**Grain**	**Protein**	**Vegetable**
Milk, skim Milk, 1% lowfat Milk, whole Cheddar cheese Cottage cheese Cream cheese Mozzarella cheese Yogurt, Greek plain Yogurt, plain Buttermilk Butter Sour Cream Half & Half	Apples Bananas Grapes Melon, cantaloupe Oranges Applesauce Peaches, canned Pears, canned Mandarin oranges, canned Orange juice concentrate	Barley, pearled Flour, whole wheat Oats, rolled quick Rice, brown long grain Bagels, whole wheat Bread, whole grain Bread, white Bread, French enriched Bread crumbs English muffins, whole wheat Hamburger buns, whole wheat Ready-to-eat cereal, corn flakes Ready-to-eat cereal, flakes Ready-to-eat cereal, toasted oats Ready-to-eat cereal, toasted wheat Macaroni, enriched Noodles, yolk-free, enriched Spaghetti, whole wheat Crackers, whole wheat	Beef, chuck roast Beef, lean ground Chicken fryer, whole Chicken, thighs Pork, ground Turkey, breast Turkey, ground Turkey, deli Fish, fresh Tuna fish, chunk-style water-pack Eggs, Grade A large Beans, baked vegetarian Beans, garbanzo canned Beans, kidney canned Beans, northern canned Beans, lima dry	Cabbage, fresh Carrots, fresh Celery, fresh Green pepper, fresh Leaf lettuce, fresh Mushrooms, fresh Onions, fresh Potatoes, fresh Grape tomatoes, fresh Tomatoes, fresh Zucchini, fresh Broccoli, frozen Green beans, frozen Green beans, canned Green peas, frozen Spinach, frozen Pasta sauce Tomato paste Tomato sauce Tomato soup

		Popcorn, microwave		

If there was no organic counterpart to a conventional food item in any of the three grocery venues, that food item was removed from the list. Items had to be certified organic (have the USDA organic seal or carry a “100 percent organic” claim) in order to be selected for this research study. If more than one item existed in the conventional or organic categories then the least expensive item was chosen, excluding sale prices.

Data Collection

Grocery venues were visited in October through December 2013. Price, package size, and purchasing specifications related to weight and count were recorded for all food items. For packaged food items, the price and package size in ounces or fluid ounces of each food item were recorded. For fresh produce, price per pound or per item were recorded. If a produce item was sold per item, the average weight of five randomly selected pieces was recorded and all prices were converted to price per ounce for analysis. Walmart Supercenter’s online shopping option was used to gather additional data items for information missing in the store. Those items found online are noted in table 3 by $^{+}$ beside the food cost per ounce. Food City and The Fresh Market do not have online shopping options for traditional groceries nor do they list prices on the websites. The tool used for data collection can be found in Appendix A.

Statistical Analysis

Conventional food items were compared to their equivalent organic counterparts by price per ounce. Package or item weight was converted to ounces or fluid ounces. For produce items sold by count rather than by pound, the average weight of five randomly selected pieces was converted to ounces. Cost was divided by ounces to determine the price per ounce for each food item.

Statistical Package for the Social Sciences (SPSS) version 20 was used for all data analysis. Means and standard deviations were computed for conventional and organic food items among the three grocery venues (Table 4) and by USDA MyPlate food group (Table 5). The mean cost difference was also calculated between all-organic foods and conventional foods for each grocery venue. A repeated measures analysis of variance (ANOVA) with two within-subjects factors was used to determine statistically significant differences between organic and conventional foods (H_{01a}), among the three grocery venues, and the mean cost per ounce differences in organic and conventional foods between grocery venues (H_{03}). The two within-subjects factors were organic status and grocery venue. A repeated measures ANOVA with one within-subject factor of grocery venue was used to determine statistically significant differences in organic food costs per ounce among the three grocery venues (H_{02}). The data was split into the five USDA MyPlate food groups to test the null hypotheses H_{01b} through H_{01f}. Means and standard deviations were computed for conventional and organic foods in each USDA MyPlate food group among the three grocery venues (Table 5). Mauchly's Test of Sphericity was calculated to determine if adjustments needed to be made to the degrees of freedom for any F statistics. A *p* value greater than 0.05 indicated sphericity could be assumed to hold and an epsilon (ε) correction factor was not needed. A *p* value below 0.05 indicates sphericity did not hold and an epsilon correction factor was needed. When an epsilon correction factor was needed, Greenhouse-Geisser correction was used when $\varepsilon < 0.75$ and Huynh-Feldt correction was used when $\varepsilon > 0.75$. If there were statistically significant differences between mean costs per ounce, simple contrasts were conducted to see which grocery venue pairs had statistically significant differences. A p value less than or equal to 0.05 was considered statistically significant.

Relative cost of organic food costs compared to conventional food costs was also calculated by dividing organic food costs by conventional food costs and multiplying by 100. A repeated measures ANOVA with one within-subjects factor, grocery venue, was conducted to determine statistically significant differences between relative costs.

CHAPTER 3: RESULTS

Data Collection Results

Table 3 lists the cost per ounce or fluid ounce collected on food items from the food list at each of the lower, moderate, and higher price grocery venues for both organic foods and their conventional (Conv) counterparts. Information was found online for items at Walmart with plus signs (+) in Table 3. Items on the data collection tool (Appendix A) and the food list (Table 2) but not in Table 3 are items that no prices were collected for because they were not available at any of the three grocery venues.

Table 3. Costs per ounce of organic and conventional (Conv) food items from each of three grocery venues.

			Cost Per Ounce/Fluid Ounce		
Food Group	**Food Item**	**Organic Status**	**Walmart Supercenter**	**Food City**	**The Fresh Market**
Fruit	Apples	Organic		0.1531	0.1869
		Conv		0.1056	0.1556
Fruit	Bananas	Organic		0.0494	0.0619
		Conv		0.0369	0.0431
Fruit	Grapes	Organic		0.2306	0.1863
		Conv		0.1869	0.2494
Fruit	Orange	Organic		0.0967	0.1556
		Conv		0.0893	0.0925
Vegetable	Cabbage, fresh	Organic			0.0931
		Conv			0.0494
Vegetable	Carrots, fresh	Organic	0.0619	0.0869	0.1559
		Conv	0.0463	0.0556	0.2492
Vegetable	Celery, fresh	Organic	0.1613	0.2494	0.2494
		Conv	0.0939	0.0943	0.2494
Vegetable	Green pepper, fresh	Organic		0.2984	
		Conv		0.0963	
Vegetable	Leaf lettuce, fresh	Organic	0.6880	0.7980	0.2500
		Conv	0.5960	0.6709	0.2075
Vegetable	Mushrooms, fresh	Organic		0.3738	0.3125
		Conv		0.2863	0.3738
Vegetable	Onions, fresh	Organic		0.1244	0.1244

		Conv		0.1056	0.1056
Vegetable	Potatoes, fresh	Organic		0.0969	0.1056
		Conv		0.0619	0.0931
Vegetable	Grape tomatoes	Organic	0.3412	0.2265	0.2415
		Conv	0.2138	0.2743	0.2578
Vegetable	Tomatoes	Organic		0.2044	0.2494
		Conv		0.1244	0.1556
Vegetable	Zucchini	Organic		0.2244	0.1869
		Conv		0.0931	0.1056
Fruit	Applesauce	Organic	0.1650^{+}	0.1663	0.2494
		Conv	0.0700	0.0936	0.0996
Fruit	Peaches, canned	Organic	0.4669^{+}	0.2494	
		Conv	0.1175	0.1556	
Fruit	Pears, canned	Organic	0.4591^{+}	0.2494	
		Conv	0.0653	0.1556	
Fruit	Mandarin oranges, canned	Organic	0.5282^{+}	0.2494	0.4642
		Conv	0.0653	0.0764	0.1869
Fruit	Orange juice concentrate	Organic			0.0812
		Conv			0.0558
Vegetable	Broccoli, frozen	Organic		0.3325	0.2306
		Conv		0.1067	0.1559
Vegetable	Green beans, frozen	Organic		0.2244	0.2306
		Conv		0.1067	0.1559
Vegetable	Green beans, canned	Organic		0.1372	
		Conv		0.0469	
Vegetable	Green peas, frozen	Organic		0.2492	0.2306
		Conv		0.1067	0.1559
Vegetable	Spinach, frozen	Organic	0.2480	0.3390	
		Conv	0.1470	0.1390	
Vegetable	Pasta sauce	Organic	0.1033	0.1663	0.2396
		Conv	0.0575	0.0419	0.1496
Vegetable	Tomato paste	Organic	0.0967	0.2783	0.2483
		Conv	0.0733	0.1033	0.1650
Vegetable	Tomato sauce	Organic	0.0587	0.1660	0.1425
		Conv	0.0433	0.0488	0.0711
Vegetable	Tomato soup	Organic	0.1462	0.1728	0.1559
		Conv	0.1163	0.1309	0.3142
Grain	Barley, pearled	Organic	0.1389^{+}	0.1244	
		Conv	0.1673	0.1809	
Grain	Flour, whole wheat	Organic	0.1341^{+}	0.1249	0.1153
		Conv	0.0496	0.0624	0.0624

Grain	Oats, rolled quick	Organic	0.1825+	0.2217	0.1872
		Conv	0.0800	0.0950	0.1328
Grain	Rice, brown long grain	Organic	0.1675	0.2959	0.1330
		Conv	0.0513	0.2602	0.1247
Grain	Bread, whole grain	Organic		0.2079	0.2079
		Conv		0.1595	0.2119
Grain	Bread, French enriched	Organic			0.3325
		Conv			0.2863
Grain	English muffins, whole wheat	Organic		0.3394	
		Conv		0.1658	
Grain	Ready-to-eat cereal, corn flakes	Organic	0.2265		0.4708
		Conv	0.1100		0.4341
Grain	Ready-to-eat cereal, flakes	Organic	0.1869	0.2912	0.3766
		Conv	0.1400	0.1327	0.4009
Grain	Ready-to-eat cereal, toasted oats	Organic	0.2167	0.2850	0.4339
		Conv	0.1522	0.1825	0.4158
Grain	Ready-to-eat cereal, toasted wheat	Organic	0.2258	0.2448	0.3061
		Conv	0.1242	0.1460	0.3850
Grain	Macaroni, enriched	Organic		0.2075	0.2119
		Conv		0.0684	0.1244
Grain	Spaghetti, whole wheat	Organic	0.1459+	0.1869	0.2119
		Conv	0.0755	0.1200	0.1869
Grain	Crackers, whole wheat	Organic	0.5633+	0.6509	0.5817
		Conv	0.1978	0.3716	0.4363
Grain	Popcorn, microwave	Organic	0.3437+	0.3322	0.4155
		Conv	0.1262	0.1533	0.7843
Dairy	Milk, skim	Organic	0.0491	0.0468	0.0452
		Conv	0.0254	0.0312	0.0304
Dairy	Milk, 1% lowfat	Organic	0.0541	0.0468	0.0452
		Conv	0.0254	0.0312	0.0304
Dairy	Milk, whole	Organic	0.0491	0.0468	0.0452
		Conv	0.0254	0.0312	0.0304
Dairy	Cheddar cheese	Organic			0.8317
		Conv			0.5414
Dairy	Cottage cheese	Organic			0.2806
		Conv			0.1869
Dairy	Cream cheese	Organic			0.3488
		Conv			0.2238
Dairy	Mozzarella cheese	Organic			0.8317
		Conv			0.4988
Dairy	Yogurt, Greek plain	Organic	0.2415		0.3119

		Conv	0.1774		0.1559
Dairy	Yogurt, plain	Organic	0.1013	0.1184	0.1247
		Conv	0.0588	0.0841	0.1059
Dairy	Butter	Organic	0.3050	0.3119	0.3119
		Conv	0.1863	0.1988	0.2494
Dairy	Sour cream	Organic			0.2056
		Conv			0.1244
Dairy	Half & Half	Organic		0.1556	0.1556
		Conv		0.1056	0.1119
Protein	Eggs, Grade A large	Organic	0.1825	0.1663	0.1663
		Conv	0.0742	0.0783	0.1038
Protein	Beans, baked vegetarian	Organic	0.1751+	0.1327	0.1327
		Conv	0.0507	0.0711	0.1494
Protein	Beans, garbanzo canned	Organic	0.1118+	0.0961	0.1327
		Conv	0.0439	0.0667	0.0927
Protein	Beans, kidney canned	Organic	0.1420+	0.0961	0.1327
		Conv	0.0439	0.0527	0.0927
Protein	Beans, northern canned	Organic	0.1661+	0.1993	
		Conv	0.0439	0.0593	
Protein	Beans, lima dry	Organic		0.1869	
		Conv		0.0994	

+Product specifications found online.

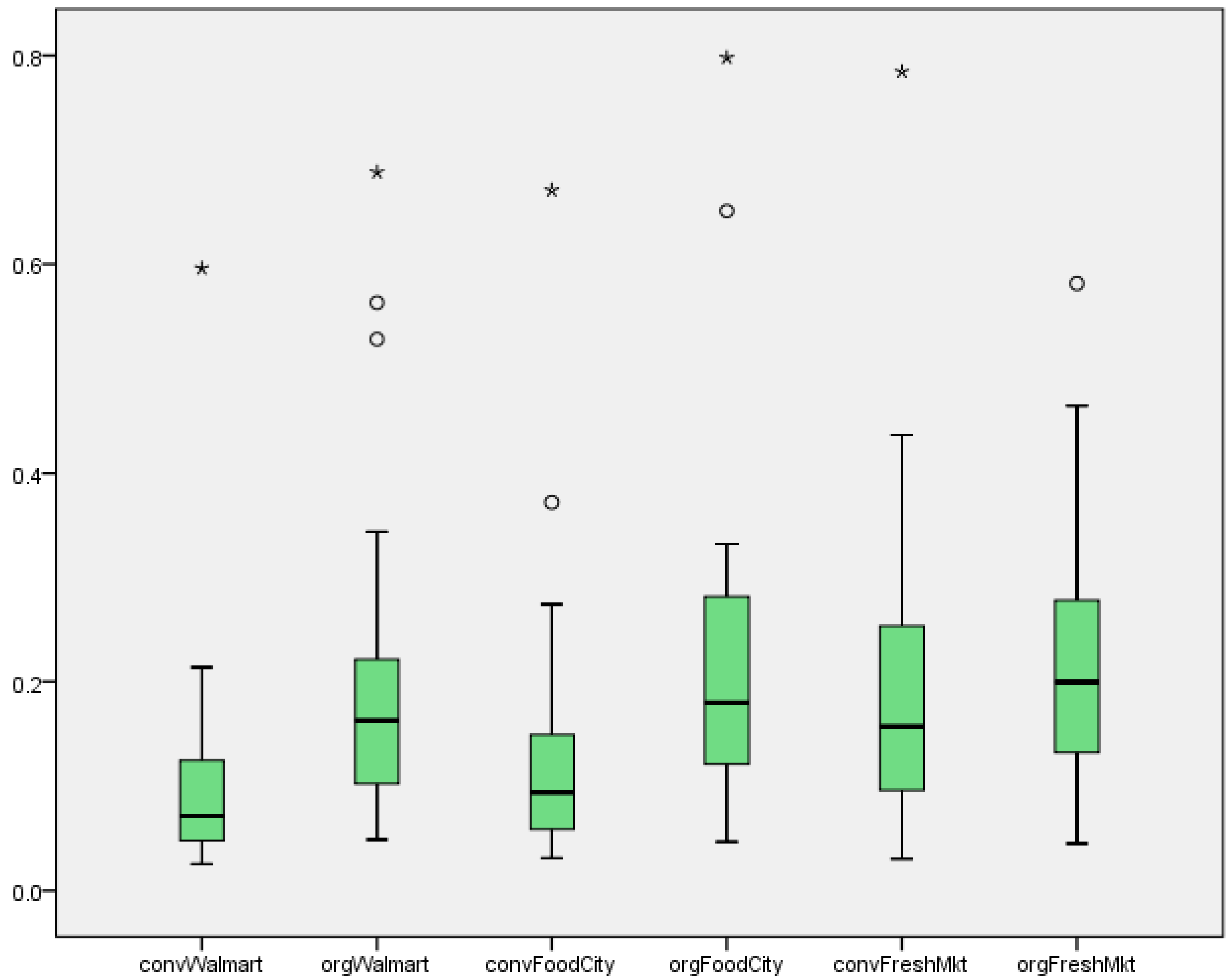
Costs were found for organic foods and conventional counterparts for 62 of the 79 (78.5%) food items. Costs were found at each of the three grocery venues for 28 out of 79 (35.4%) food items. These 28 food items were included in the analysis. Of the 79 total food items on the food list, costs for 35 (44.3%) organic foods and their conventional counterparts were found at Walmart, 52 (65.8%) at Food City, and 53 (67.1%) were found at The Fresh Market. Of the ten fruit items on the food list, costs were found at each of the three grocery venues on organic foods and their conventional counterparts for two (20%), of the twenty vegetable items, costs were found for eight (40%), of the twenty grain items costs were found for nine (45%), of the thirteen dairy items costs were found for five (38.5%), and of the sixteen protein items costs were found for four (25%).

Table 4 lists the means and standard deviations of cost per ounce for conventional and organic food groups at each of the three grocery venues. The Fresh Market appeared to have the greatest spread of costs per ounce compared with Food City and Walmart (Figure 1). Conventional foods at Walmart had the lowest mean and median cost per ounce for all organic and conventional groups at any grocery venue (Table 4, Figure 1, Figure 2).

Table 4. Mean (standard deviation) costs per ounce for organic status and grocery venue groups.

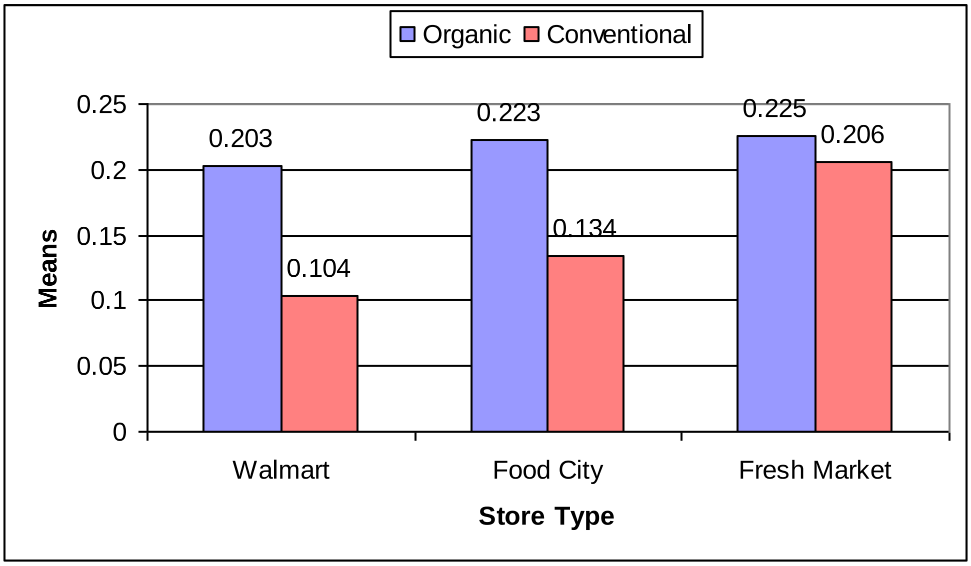
Grocery Store Venue	Conventional	Organic
Walmart Supercenter	0.1038 (0.1099) N = 28	0.2031 (0.1601) N = 28
Food City	0.1342 (0.1328) N = 28	0.2234 (0.1657) N = 28
The Fresh Market	0.2059 (0.1646) N = 28	0.2248 (0.1332) N = 28

Figure 1. Side-by-side boxplots of cost per ounce of organic and conventional foods grouped by grocery venue.



Walmart had the lowest median cost per ounce of organic as well as conventional foods, followed by Food City and then The Fresh Market (Figure 1). Walmart had the greatest difference in median cost per ounce between organic and conventional foods among the three grocery venues (Figure 1).

Figure 2. Mean costs per ounce by organic status and grocery venue.



The mean cost per ounce of organic food at Walmart was lower than conventional food at The Fresh Market. To determine if this cost difference was significant a paired samples *t*-test was conducted. Results of the *t*-test were $t(27) = -0.086$, $p > .05$. There was not a statistically significant difference between the mean cost per ounce of organic food items at Walmart and conventional food items at The Fresh Market.

Table 5. Means and standard deviations of cost per ounce for organic status and grocery venue by USDA MyPlate food group.

Food Group		Mean	Standard Deviation	N
Dairy	Conv Walmart Supercenter	0.06423437500	0.069721592522	5
	Organic Walmart Supercenter	0.11168750000	0.110275888046	5
	Conv Food City	0.07526562500	0.072729897989	5
	Organic Food City	0.11414062500	0.114807325750	5
	Conv The Fresh Market	0.08929687500	0.095278218092	5
	Organic The Fresh Market	0.11445312500	0.115600438164	5
Fruit	Conv Walmart Supercenter	0.06766666650	0.003299831881	2
	Organic Walmart Supercenter	0.34660852700	0.256833241926	2
	Conv Food City	0.08497669000	0.012180697780	2
	Organic Food City	0.20781250000	0.058778251186	2

	Conv The Fresh Market	0.14323750000	0.061712744328	2
	Organic The Fresh Market	0.35678052350	0.151894348007	2
Grain	Conv Walmart Supercenter	0.11074119689	0.050041698868	9
	Organic Walmart Supercenter	0.24069918500	0.135777667471	9
	Conv Food City	0.16930597644	0.094129528416	9
	Organic Food City	0.29261715367	0.148609364892	9
	Conv The Fresh Market	0.32544190911	0.225292442920	9
	Organic The Fresh Market	0.30679662700	0.157553460001	9
Protein	Conv Walmart Supercenter	0.05315572225	0.014373978030	4
	Organic Walmart Supercenter	0.15286111100	0.032530849671	4
	Conv Food City	0.06718452400	0.010808026652	4
	Organic Food City	0.12279368275	0.033704275328	4
	Conv The Fresh Market	0.10961458350	0.027016956449	4
	Organic The Fresh Market	0.14106250025	0.016791666500	4
Vegetable	Conv Walmart Supercenter	0.15505352912	0.186561753690	8
	Organic Walmart Supercenter	0.20714687937	0.214188595860	8
	Conv Food City	0.17749829725	0.212884971816	8
	Organic Food City	0.26802260688	0.222227316967	8
	Conv The Fresh Market	0.20795353475	0.076687150229	8
	Organic The Fresh Market	0.21040365338	0.049123158339	8

Table 5 lists the means and standard deviations of cost per ounce for conventional and organic MyPlate food groups at each venue.

Results from a repeated measures ANOVA follow. Grocery venue type and organic status were both within-subjects factors. Table 6 shows the results of Mauchly's Test of Sphericity that were necessary to answer the research questions. Grocery venue refers to higher (The Fresh Market), moderate (Food City), and lower price grocery venues (Walmart Supercenter). Organic Status refers to organic or conventional food items. Mauchly's Test of Sphericity did not need to be calculated for the main effect of Organic Status because there were only two levels of repeated measures (organic and conventional). A p value greater than 0.05 indicates sphericity can be assumed to hold and an epsilon (ε) correction factor is not needed. A p value below 0.05 indicates sphericity does not hold and an epsilon correction factor is needed.

When an epsilon correction factor is needed, Greenhouse-Geisser correction is used when $\varepsilon < 0.75$ and Huynh-Feldt correction is used when $\varepsilon > 0.75$.

Table 6. Mauchly's Test of Sphericity results.

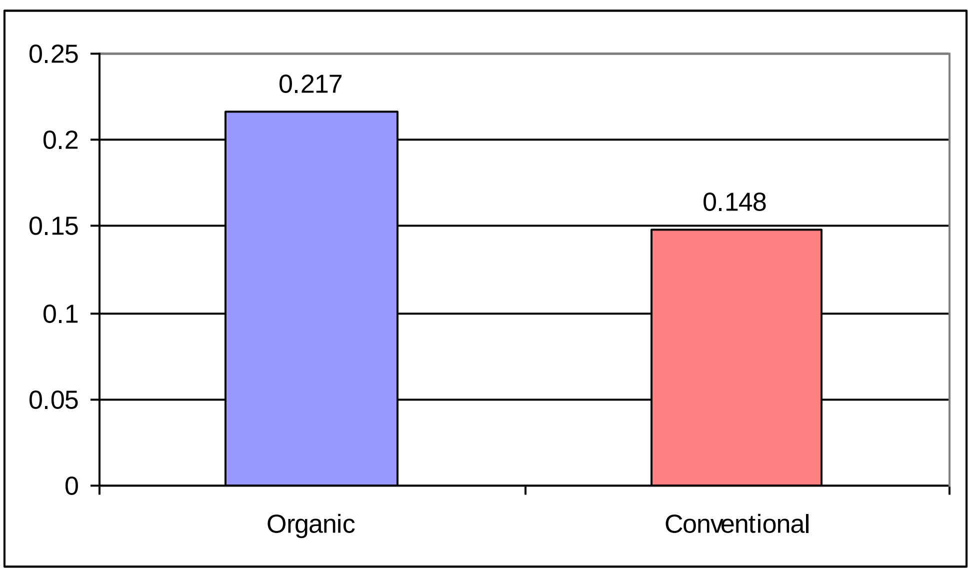
			Epsilon	
Research Question	**Within Subjects Effect**	***p***	**Greenhouse-Geisser**	**Huynh-Feldt**
Q2	Grocery Venue	0.000	0.620	0.635
Q3	Grocery Venue x Organic Status	0.097	0.859	0.912

Sphericity could be assumed for the interaction between grocery venue and organic status. For the main effect of grocery venue an ε correction factor was used.

Organic Status

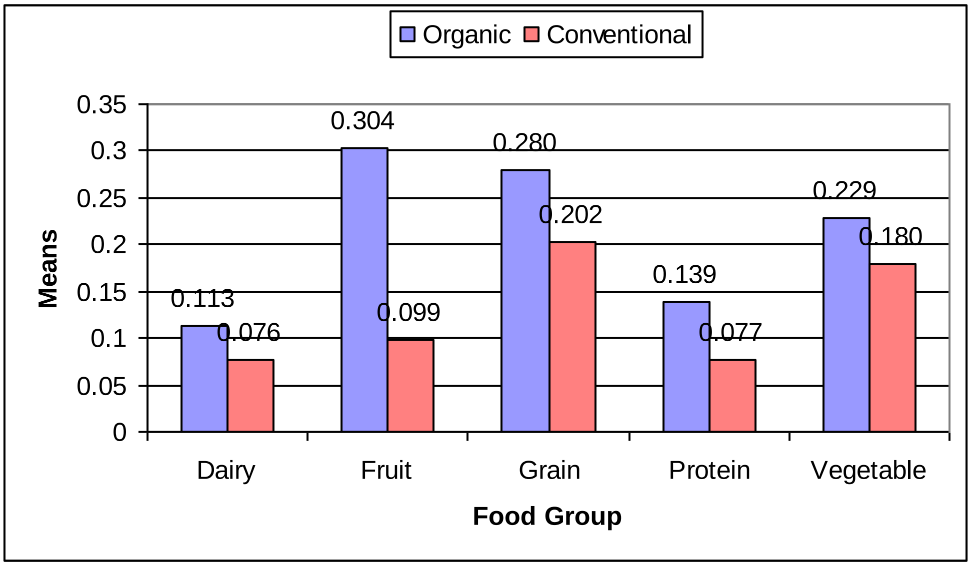
The mean cost per ounce of organic foods was greater than the mean cost per ounce of conventional foods (Figure 3).

Figure 3. Mean costs per ounce by organic status.



The mean cost per ounce of organic foods was greater than the mean cost per ounce of conventional foods for each of the five USDA MyPlate food groups (Figure 4). Fruit had the greatest mean cost per ounce for organic foods while dairy had the least (Figure 4). Grain had the greatest mean cost per ounce for conventional foods while dairy had the least (Figure 4).

Figure 4. Mean cost per ounce differences by organic status and USDA MyPlate food groups.



There appeared to be a greater cost per ounce difference between organic and conventional foods in the fruit group than any other group (Figure 5).

Figure 5. Mean cost per ounce trends by organic status and USDA MyPlate food groups.

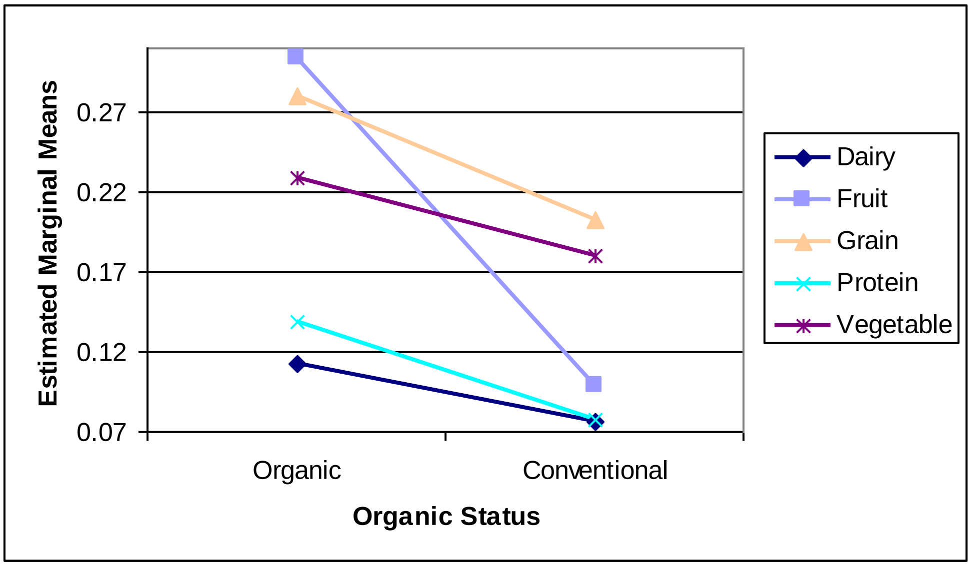


Table 7 shows the F test statistics (F), hypothesis degrees of freedom (df), error degrees of freedom (dfe), and *p* values for the main effect of organic status for each food group and for all food groups combined. A *p* value less than 0.05 was considered statistically significant.

Table 7. Repeated measures ANOVA with 2 within-subjects factors F test results for the main effect of organic status.

Food Group	**F**	**df**	**dfe**	***p***
	27.497	1	27	< 0.001*
Dairy	5.779	1	4	0.074
Fruit	4.267	1	1	0.287
Grain	10.318	1	8	0.012*
Protein	52.658	1	3	0.005*
Vegetable	7.763	1	7	0.027*

*Statistically significant at 0.05 level.

There was a significant main effect of organic status, $F(1, 27) = 27.497$, $p < 0.001$, for all foods considered. There was not a significant main effect of organic status in the Dairy group, $F(1, 4) = 5.779$, $p > 0.05$, though there was a trend towards significance since the *p* value was not much larger than 0.05. There was not a significant main effect of organic status in the Fruit group, $F(1, 1) = 4.267$, $p > 0.05$. There was a significant main effect of organic status in the Grain group, $F(1, 8) = 10.318$, $p < 0.05$; in the Protein group, $F(1, 3) = 52.658$, $p < 0.01$; and in the Vegetable group, $F(1, 7) = 7.763$, $p < 0.05$.

If all other variables are ignored, food costs per ounce were statistically different for organic and conventional foods. There was enough evidence to reject H_{01a}. Food costs per ounce were not statistically different for organic and conventional foods in the Dairy group or Fruit group. There was not enough evidence to reject H_{01b} or H_{01c}. Food costs per ounce were statistically different for organic and conventional foods in the Grain group, Protein group, and Vegetable group. There was enough evidence to reject H_{01d}, H_{01e}, and H_{01f}.

Grocery Venue

There appeared to be lower food cost per ounce at the lower price grocery venue and higher food cost per ounce at the higher price grocery venue (Figure 2, Figure 6).

Figure 6. Cost per ounce mean trends by grocery venue.

There was a significant main effect of grocery venue, F(1.241, 33.497) = 4.132, p = 0.042, for all foods considered. If all other variables are ignored, there were significant differences in the mean costs per ounce among the three grocery venues. A simple contrast was conducted to test which differences were significant between grocery venues (Table 8). There were significant differences in the mean costs per ounce between Walmart and Food City and between Walmart and The Fresh Market. There was not a significant difference in the mean costs per ounce between Food City and The Fresh Market.

Table 8: Simple contrast to test which differences between grocery venues are significant.

Grocery Venues	**F**	***p***
Walmart vs. Food City	5.982	0.021*
Walmart vs. The Fresh Market	6.458	0.017*
Food City vs. The Fresh Market	1.892	0.180

*Statistically significant at 0.05 level.

Organic Food Costs by Grocery Venue

There appeared to be lower organic food cost per ounce at the lower price grocery venue and higher organic food cost per ounce at the higher price grocery venue (Figure 7).

Figure 7. Mean cost per ounce trends of organic foods by grocery venue.

To analyze organic food costs per ounce at each of the three grocery venues, a repeated measures ANOVA with one within-subjects factor, grocery venue, was conducted. Table 9 shows the results of Mauchly's Test of Sphericity that were necessary to answer the second research question.

Table 9. Mauchly's Test of Sphericity results for organic foods by grocery venue.

			Epsilon	
Research Question	**Within Subjects Effect**	***p***	**Greenhouse-Geisser**	**Huynh-Feldt**
Q2	Organic Foods by Grocery Venue	0.069	0.843	0.893

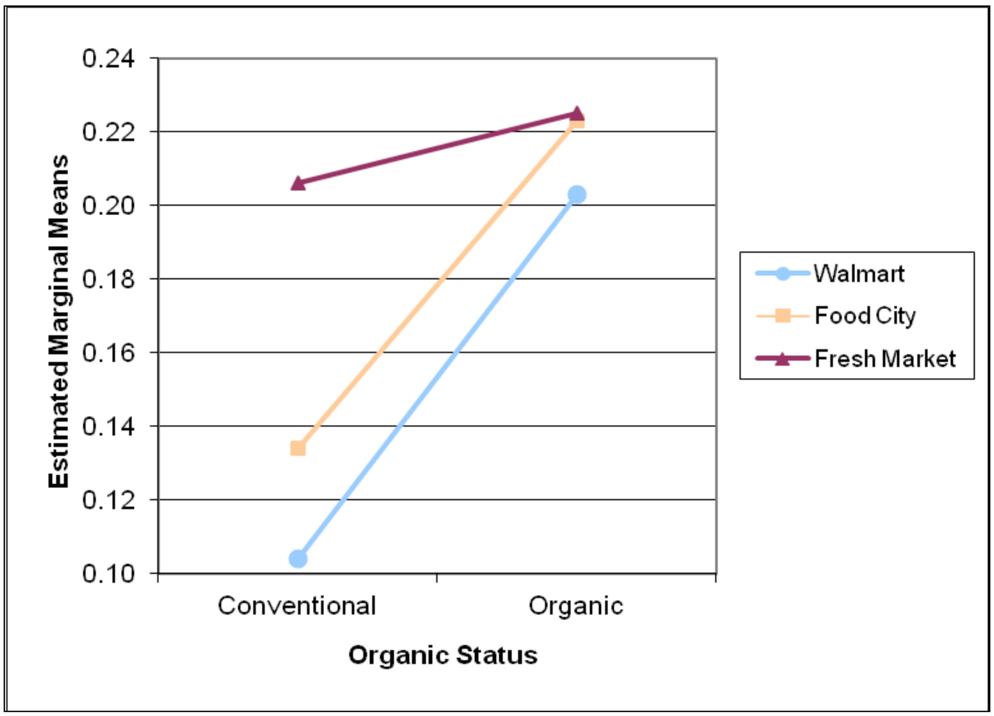
Sphericity could be assumed for the main effect of grocery venue for organic foods. An epsilon correction factor was not needed. There was not a significant main effect of grocery venue, F(2,

54) = 0.664, $p = 0.519$, for all organic foods. If only organic foods are considered, food costs per ounce were not significantly different for the lower price grocery venue, moderate price grocery venue, and higher price grocery venue. There was not enough evidence to reject H_{02}.

Organic Status and Grocery Venue Interaction

Figure 8 shows cost per ounce means of organic and conventional foods for each of the three grocery venues. Because the three lines are not approximately parallel, there was evidence for an interaction effect.

Figure 8. Mean cost per ounce trends of organic status by grocery venue.



There was a significant interaction between the organic status and grocery venue, $F(2, 54) = 8.633$, $p = 0.001$. The difference in mean food costs per ounce between organic and conventional foods was statistically different among lower price, moderate price, and higher price grocery venues. There was enough evidence to reject H_{03}. A simple contrast was conducted to test which differences were significant between the interaction of organic status and grocery venues (Table 10). There was not a significant difference in the mean costs per ounce between Walmart and Food City. There were significant differences in the mean costs per ounce between Walmart and The Fresh Market and between Food City and The Fresh Market.

Table 10. Simple contrast to test which differences between grocery venues are significant with an organic status interaction.

Grocery Venues	**Organic Status**	**F**	***p***
Walmart vs. Food City	Conventional vs. Organic	0.387	0.539
Walmart vs. The Fresh Market	Conventional vs. Organic	11.637	0.002*
Food City vs. The Fresh Market	Conventional vs. Organic	9.661	0.004*

*Statistically significant at 0.05 level.

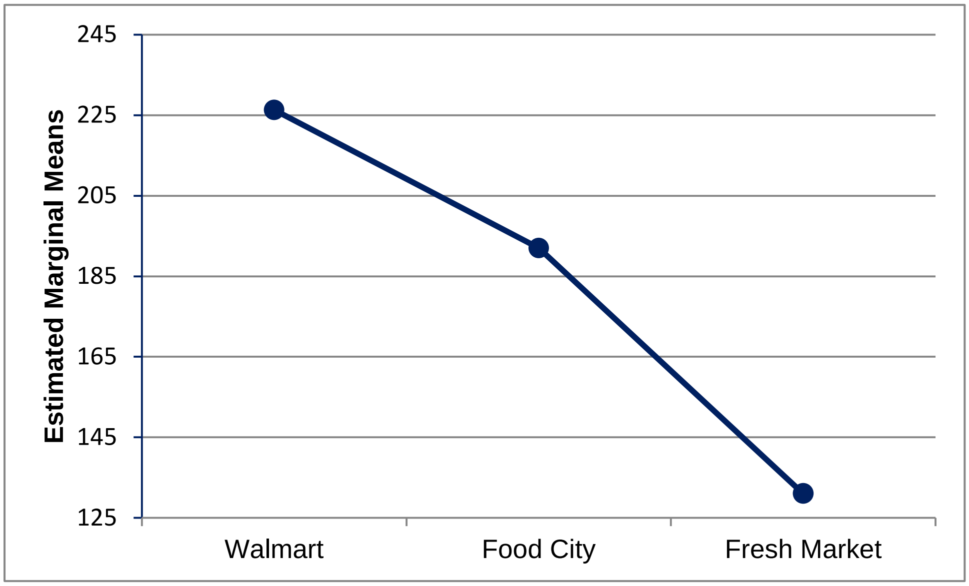
Relative Cost of Organic Food Compared to Conventional Food

Relative cost was calculated as cost per ounce of organic foods divided by the cost per ounce of conventional foods multiplied by 100. There appeared to be lower relative cost at the higher price grocery venue and higher relative cost at the lower price grocery venue (Table 11, Figure 9).

Table 11. Means and standard deviations of relative cost at grocery venue groups.

	Mean	**Standard Deviation**	**N**
Walmart Supercenter	226	132	28
Food City	192	72	28
The Fresh Market	131	50	28

Figure 9. Mean relative cost of organic food compared with conventional food by grocery venue.



Walmart appeared to have the greatest median and spread of relative cost among the three grocery venues (Figure 10). The Fresh Market had the lowest mean and median relative cost among the three grocery venues (Table 11, Figure 9, Figure 10).

Figure 10. Side-by-side boxplots of relative costs of organic foods compared to conventional foods.

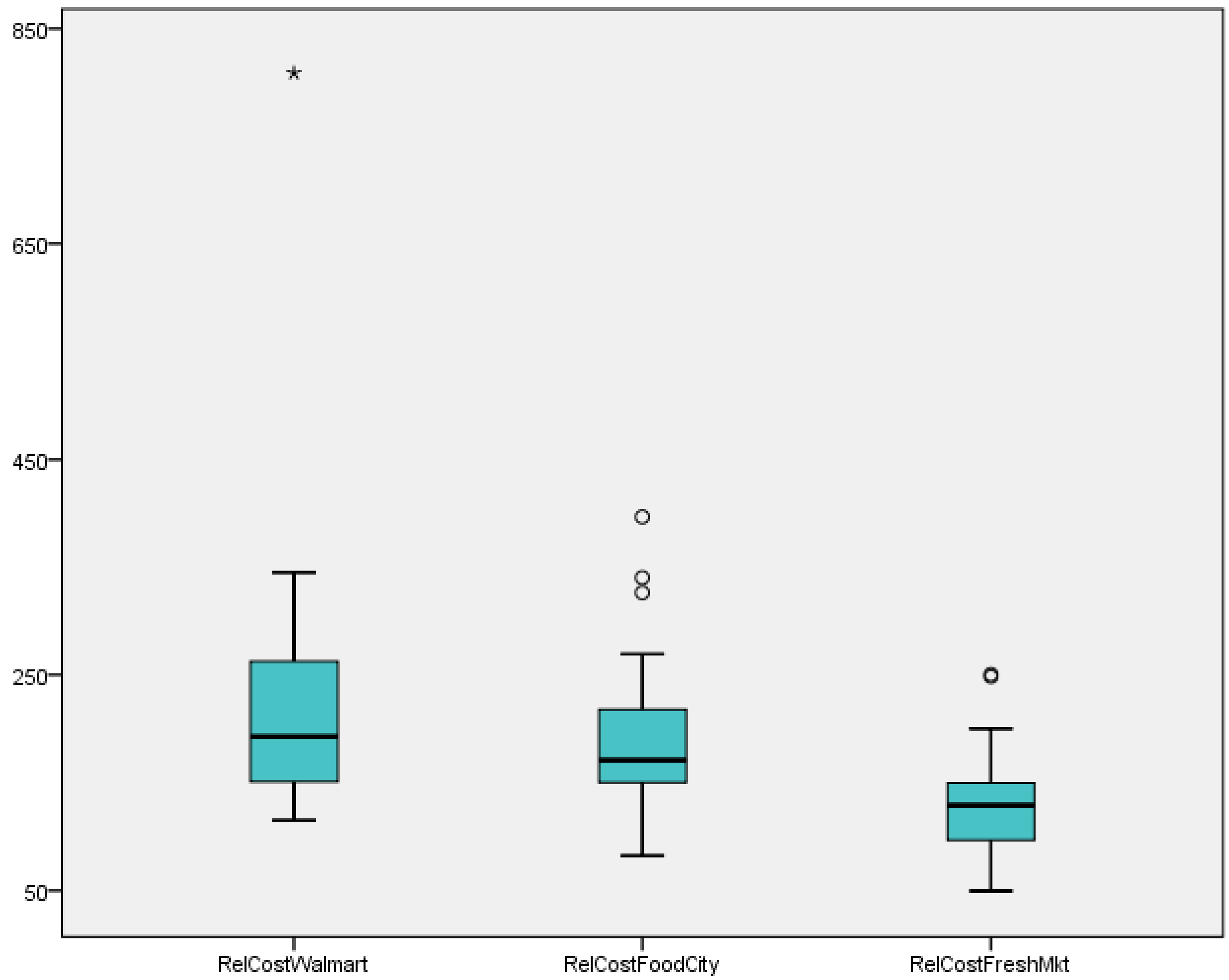


Table 12 shows the results of Mauchly's Test of Sphericity for relative costs. There was strong evidence that sphericity did not hold. An epsilon correction factor was used.

Table 12. Mauchly's Test of Sphericity results for relative costs of organic foods compared to conventional foods.

		Epsilon	
Within Subjects Effect	***p***	**Greenhouse-Geisser**	**Huynh-Feldt**
Relative Cost	0.001	0.705	0.732

There was a significant main effect of relative cost of organic foods compared to conventional foods, F(1.410, 38.066) = 10.933, $p = 0.001$, for all foods considered. There were statistically significant differences in the mean relative costs of organic foods compared to conventional foods among the three grocery venues. A simple contrast was conducted to test which differences were significant between relative costs at the three grocery venues (Table 13). There was not a significant difference in relative costs between Walmart and Food City. There were significant differences in the relative costs between Walmart and The Fresh Market and between Food City and The Fresh Market.

Table 13. Simple contrast to test which differences in relative cost between grocery venues are significant.

Grocery Venues	**F**	***p***
Walmart vs. Food City	1.897	0.180
Walmart vs. The Fresh Market	18.478	< 0.001*
Food City vs. The Fresh Market	23.267	< 0.001*

*Statistically significant at 0.05 level.

CHAPTER 4: DISCUSSION

Research is limited in analyzing costs of organic foods by USDA MyPlate food groups. Additionally, gaps exist in comparing costs of organic foods at various types of grocery venues. This research sought to: 1) To determine if there are mean cost differences between all-organic foods and conventional (non-organic) foods, 2) Determine if there are differences in the mean cost of all-organic foods among higher, moderate, and lower price grocery venues, and 3) Determine if the mean cost difference between all-organic and conventional foods varies among higher, moderate, and lower price grocery venues.

Organic Status

Of the food items considered in the analysis, food costs per ounce were statistically different for organic and conventional foods. Relative costs of organic foods compared to conventional foods were also statistically different. This is consistent with other studies involving cost of organic foods (Brown & Sperow, 2005; Thompson & Kidwell, 1998). Broken down by USDA MyPlate food group in the current analysis, food costs per ounce were not statistically different for organic and conventional foods in the Dairy group or Fruit group but were statistically different in the Grain group, Protein group, and Vegetable group. Brown and Sperow (2005) found higher organic price premiums among milk and cheese, fruit, and meat and meat alternatives groups from the USDA TFP. Difference between organic price and non-organic price relative to the non-organic price was smaller for grain products and vegetables. According to Forman & Silverstein (2012), organic food products cost up to 40% more than conventional products. The findings of this research further solidify the theory that organic food items are significantly more expensive than conventional food items.

Grocery Venue

Of the food items considered in the analysis, mean organic food costs per ounce were not significantly different for the lower price grocery venue, moderate price grocery venue, and higher price grocery venue. There were significant differences in the mean costs per ounce of all food items among the three grocery venues. While it was expected for food costs to be least expensive at the lower price grocery venue (Walmart) and most expensive at the higher price grocery venue (The Fresh Market), it was not expected for there to be less than significant differences in the mean costs per ounce of organic foods for the three grocery venues. Therefore, an all-organic shopper may not significantly benefit by shopping for organic food at a lower price grocery venue. No additional studies were found comparing organic food costs at various grocery venues. The findings of this research demonstrate organic food costs may be influenced by place of purchase.

Organic Status and Grocery Venue Interaction

Of the food items considered in the analysis, difference in mean food costs per ounce between organic and conventional foods was statistically different among lower price, moderate price, and higher price grocery venues. While there was not statistical significance in the mean cost per ounce differences between the lower and moderate price grocery venues, there was statistical significance in the mean cost per ounce differences between the lower and higher price grocery venues and in the mean cost per ounce differences between the moderate and higher price grocery venues. Therefore, a food shopper at a higher price grocery venue like The Fresh Market may not mind the minor cost increase if they were to shop for organic food items at the same grocery venue. A shopper may, however, notice the cost increase if they were to switch from conventional food items at a lower or moderate price grocery venue like Walmart and Food

City to organic food items at a higher price grocery venue like The Fresh Market. Perceived cost increases between conventional and organic food items may depend on a chosen grocery venue. No additional studies were found comparing organic food costs at various grocery venues.

Additional Findings

Availability of organic foods may also impact likelihood of purchasing organic products. While organic products were sold in about 73 percent of conventional grocery stores in the United States by the year 2000 (Dimitri & Greene, 2000), Zepeda and Li (2007) found the most significant factor influencing the probability of purchasing organic food products was shopping venue followed by convenience. Availability was a limitation of data collection for this study. Of the 79 items on the original food list, costs were found for both the organic foods and conventional counterparts on 62 (78.5%) food items in at least one of the three grocery venues. Costs of only 44.3% of the 79 original food item pairs were found at Walmart, 65.8% were found at Food City, and 67.1% were found at The Fresh Market. Only 28 (35.4%) of the original 79 food pairs were found at each of the three grocery venues. A person seeking to purchase food items for an all-organic diet may have trouble finding all they items they need. Finding a variety of foods in each of the five USDA MyPlate food groups may also be difficult. Of the food pairs considered in the analysis, costs for organic foods and their conventional counterparts were found at each of the three grocery venues for two out of ten (20%) fruit items, eight out of twenty (40%) vegetable items, nine out of 20 grain items (45%), five out of thirteen (38.5%) dairy items, and four out of sixteen (25%) protein items.

Limitations

Grocery venues and food items were not taken from an independent random sample. While an independent random sample is an assumption made for ANOVA, selection was intentional to ensure three types of grocery venues based on perceived cost and the lowest price available at each venue for one particular food item. Time and location may also limit the scope of the research. Prices were collected in the winter. Season impacts produce prices so the cost per ounce for fruit and vegetables may not have been representative of mean cost over a whole year. Prices were collected at grocery venues in Kingsport, TN. While these prices may be representative of organic food costs in the region, they may not be generalized to other regions. A larger sample size for each of the food groups may have provided different results. Due to availability limitations, organic items and their conventional counterparts could only be found for two fruit items. Further research could involve a greater variety of grocery venues, a more comprehensive list of food items, and a longer time period to capture or compare prices at different times of the year.

Future Research

Future research should further analyze cost and availability of organic food items at various grocery venues. Choosing venues including food cooperatives, superstores, health food stores, bargain grocers, and traditional national and local grocery stores may expand knowledge of average organic cost differences and product availability. A larger sample of organic and conventional foods should be studied at a larger sample of grocery venues. Knowledge of the increasing public interest in the organic food market may also encourage grocery venues to carry a greater variety of organic food items.

Conclusions

Public interest in the organic food market is on the rise. Organic food and beverage sales in the United States increased from $1 billion in 1990 to $24.8 billion in 2009 (PCG, 2010). United Natural Foods, Inc. (UNFI) reported 78% of families in the United States buy organic

(UNFI CSR, 2012), though the frequency of organic shopping and the types of products purchased was unclear. With the increasing awareness of potential nutritional benefits of organic food along with public attention related to pesticide use, potential microbiological safety issues, genetic modification, and hormone use in conventional foods, it is important to study the possible financial burden associated with purchasing organic foods. Consumers may be willing to pay a higher premium for organic food items most impacted by these factors. Gil, Gracia, and Sánchez, (2000) found actual organic consumers were willing to pay a slightly higher premium for organic fruit and vegetables than for other organic products. Providing individuals with information about organic food prices and availability at local grocery venues may help them in their decision to purchase organic food products more often.

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APPENDIX A: DATA COLLECTION TOOL

Food Group	Food Item	Organic or Conv	Store:		
			Product Description	Cost	ounces/pounds
Fruit	Apples	Organic			
		Conv			
Fruit	Bananas	Organic			
		Conv			
Fruit	Grapes	Organic			
		Conv			
Fruit	Melon, cantaloupe	Organic			
		Conv			
Fruit	Orange	Organic			
		Conv			
Vegetable	Cabbage, fresh	Organic			
		Conv			
Vegetable	Carrots, fresh	Organic			
		Conv			
Vegetable	Celery, fresh	Organic			
		Conv			
Vegetable	Green pepper, fresh	Organic			
		Conv			
Vegetable	Leaf lettuce, fresh	Organic			
		Conv			
Vegetable	Mushrooms, fresh	Organic			
		Conv			
Vegetable	Onions, fresh	Organic			
		Conv			
Vegetable	Potatoes, fresh	Organic			
		Conv			
Vegetable	Grape tomatoes	Organic			
		Conv			
Vegetable	Tomatoes	Organic			
		Conv			
Vegetable	Zucchini	Organic			
		Conv			
Fruit	Applesauce	Organic			
		Conv			

Food Group	Food Item	Organic or Conv	Store:		
			Product Description	**Cost**	**ounces/pounds**
Fruit	Peaches, canned	Organic			
		Conv			
Fruit	Pears, canned	Organic			
		Conv			
Fruit	Mandarin oranges, canned	Organic			
		Conv			
Fruit	Orange juice concentrate	Organic			
		Conv			
Vegetable	Broccoli, frozen	Organic			
		Conv			
Vegetable	Green beans, frozen	Organic			
		Conv			
Vegetable	Green beans, canned	Organic			
		Conv			
Vegetable	Green peas, frozen	Organic			
		Conv			
Vegetable	Spinach, frozen	Organic			
		Conv			
Vegetable	Pasta sauce	Organic			
		Conv			
Vegetable	Tomato paste	Organic			
		Conv			
Vegetable	Tomato sauce	Organic			
		Conv			
Vegetable	Tomato soup	Organic			
		Conv			
Grain	Barley, pearled	Organic			
		Conv			
Grain	Flour, whole wheat	Organic			
		Conv			
Grain	Oats, rolled quick	Organic			
		Conv			
Grain	Rice, brown long grain	Organic			
		Conv			
Grain	Bagels, whole wheat	Organic			
		Conv			
Grain	Bread, whole grain	Organic			

Food Group	Food Item	Organic or Conv	Store:		
			Product Description	**Cost**	**ounces/pounds**
		Conv			
Grain	Bread, white	Organic			
		Conv			
Grain	Bread, French enriched	Organic			
		Conv			
Grain	Bread crumbs	Organic			
		Conv			
Grain	English muffins, whole wheat	Organic			
		Conv			
Grain	Hamburger buns, whole wheat	Organic			
		Conv			
Grain	Ready-to-eat cereal, corn flakes	Organic			
		Conv			
Grain	Ready-to-eat cereal, flakes	Organic			
		Conv			
Grain	Ready-to-eat cereal, toasted oats	Organic			
		Conv			
Grain	Ready-to-eat cereal, toasted wheat	Organic			
		Conv			
Grain	Macaroni, enriched	Organic			
		Conv			
Grain	Noodles, yolk-free, enriched	Organic			
		Conv			
Grain	Spaghetti, whole wheat	Organic			
		Conv			
Grain	Crackers, whole wheat	Organic			
		Conv			
Grain	Popcorn, microwave	Organic			
		Conv			
Dairy	Milk, skim	Organic			
		Conv			
Dairy	Milk, 1% lowfat	Organic			
		Conv			
Dairy	Milk, whole	Organic			
		Conv			
Dairy	Cheddar cheese	Organic			
		Conv			

Food Group	Food Item	Organic or Conv	Store:		
			Product Description	Cost	ounces/pounds
Dairy	Cottage cheese	Organic			
		Conv			
Dairy	Cream cheese	Organic			
		Conv			
Dairy	Mozzarella cheese	Organic			
		Conv			
Dairy	Yogurt, Greek plain	Organic			
		Conv			
Dairy	Yogurt, plain	Organic			
		Conv			
Dairy	Buttermilk	Organic			
		Conv			
Dairy	Butter	Organic			
		Conv			
Dairy	Sour cream	Organic			
		Conv			
Dairy	Half & Half	Organic			
		Conv			
Protein	Beef, chuck roast	Organic			
		Conv			
Protein	Beef, lean ground	Organic			
		Conv			
Protein	Chicken fryer, whole	Organic			
		Conv			
Protein	Chicken, thighs	Organic			
		Conv			
Protein	Pork, ground	Organic			
		Conv			
Protein	Turkey, breast	Organic			
		Conv			
Protein	Turkey, ground	Organic			
		Conv			
Protein	Turkey, deli	Organic			
		Conv			
Protein	Fish, fresh	Organic			
		Conv			
Protein	Tuna fish, chunk-	Organic			

Food Group	Food Item	Organic or Conv	Store:		
			Product Description	**Cost**	**ounces/pounds**
	style water-pack	Conv			
Protein	Eggs, Grade A large	Organic			
		Conv			
Protein	Beans, baked vegetarian	Organic			
		Conv			
Protein	Beans, garbanzo canned	Organic			
		Conv			
Protein	Beans, kidney canned	Organic			
		Conv			
Protein	Beans, northern canned	Organic			
		Conv			
Protein	Beans, lima dry	Organic			
		Conv			