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Title: *Consumer Perception, Knowledge and Purchase Motivators for Organic and Genetically Modified Foods*

The accompanying research report is submitted to the **University of Wisconsin-Stout, Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: MS Food and Nutritional Sciences

Research Advisor: Carol Seaborn, Ph.D.

Submission Term/Year: Spring, 2013

Number of Pages: 47

Style Manual Used: American Psychological Association, 6th edition

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Galvao, Juliana B. *Consumer Perception, Knowledge and Purchase Motivators for Organic and Genetically Modified Foods*

Abstract

The purpose of this study was to identify specific purchase motivators for organic and genetically modified food, compare consumer perception and knowledge of organic and genetically modified food, and determine social/environmental impact upon selection of organic and genetically modified food.

A survey was applied to a random sample of 109 students (69 female, 40 male), aged between 18-61 years. Data were collected via a questionnaire that was specifically created for the purpose of this study. Seventy-nine out of 106 participants agreed that organic foods are grown without pesticides and chemical fertilizers. Seventy-eight participants (73%) disagreed that organic foods do not need to be certified organic to be sold as organic. Seventy-seven participants (73%) agreed that organic food has more nutrients than conventional or genetically modified food. Ninety-three (88%) agreed that supermarkets sell genetically modified products. The majority of the subjects demonstrated little knowledge of organic and genetically modified foods. Generally, the participants were unsure about the answers given. Areas of uncertainty included knowledge regarding genetically modified products, the definition of organic food, if supermarkets sold genetically modified products, and if organic products need to be certified organic to be sold as organic. These results indicate that further education regarding organic and genetically modified foods may be beneficial, especially for this population.

Acknowledgments

I would like to thank my parents, Eustáquio Galvão and Terezinha Cássia Galvão, for all their support, unconditional love and encouragement throughout this process. Heartfelt thanks to Patrick for the encouragement, friendship and love. A special thanks to my advisor, Dr. Seaborn, for the advice, prompt feedback and support in writing my thesis.

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Chapter I: Introduction

Studies have been conducted to determine consumers' knowledge and perception of organic and genetically modified foods. However, none of the studies included how the consumers are influenced by their social environment while growing up on their use of and perception of organic and genetically modified foods. This chapter will discuss some perceptions about organic and genetically modified food, and then will provide the purpose and assumptions of the study. The assumptions of the study, limitations of the study, and a brief methodology will also be provided.

Various studies have examined consumer's perceptions about organic foods. Anderson, Wachenheim and Lesch (2006) conducted a study and most respondents agreed that organic food is healthier. The majority agreed that consumption of organic foods can improve one's appearance and that scientists believe health can be improved by organic foods. More neutral responses occurred for responses that organic foods are useful in preventing disease and that eating organic foods will increase lifespan. Slightly more than half of respondents agreed that there is little risk in the consumption of organic foods and that organic food is completely safe to eat (Anderson, Wachenheim, & Lesch, 2006).

Consumers that are concerned about their health, the environment and the origin of the food tend to buy organic products (Millock, Wier, & Anderson, 2004). Gracia and Magistris (2007) determined purchase motivators, perception, and knowledge of organic foods. They found that consumers that are concerned about their health and the environment are more willing to buy as well as buy a larger quantity of organic products. Additionally, Garcia and Magistris (2007) reported that the greater the consumer knowledge of organic food, and concern for the environment and health, the higher the probability consumers would buy organic food.

Hallman, Hebden, Aquino, Cuite, and Lang (2003) conducted a study to determine public perceptions of genetically modified foods. Less than half of their participants had heard about genetically modified food. Only half of the participants knew that genetically modified products were sold in the supermarket and only one quarter believed that they had eaten genetically modified products. Anderson, Wachenheim, and Lesch (2006) found that half of the participants were concerned about the effects that genetically modified food has on the environment. Similarly, Ayaz et al. (2011) in a student population found that more than half of their participants thought that genetically modified products present risks to the environment.

Statement of the Problem

Studies have been conducted to determine consumers' knowledge and perception of organic and genetically modified foods. However, none of the studies included how the consumers are influenced by their social environment in their use or perceptions of organic or genetically modified food. The purpose of this study was to focus on the social environment and how consumers' ate while they were growing up as to how this influenced their use and perceptions of organic and genetically modified foods. There is a need to understand how the consumer's previous eating environment affects perception and consumer motivation when it comes to buying and consuming organic and genetically modified foods. This will impact both marketing and education that will be provided for consumers.

Purpose of the Study

The purpose of this study was to focus on how the social environment and how consumers' ate while they were growing up had influenced their purchases and perceptions of organic and genetically modified food. Specifically, objectives were to identify specific purchase motivators for organic and genetically modified foods, compare consumer perceptions and knowledge of organic and genetically modified foods, and determine if the social/environment impacted the selection or perceptions of organic and genetically modified foods.

Assumptions of the Study

It was assumed that all participants completed the survey properly and truthfully. It was also assumed that the developed survey question generated answers to adequately address the study and objectives.

Definition of Terms

Organic. Of, relating to, or derived from living organisms. Also relating to, yielding, or involving the use of food produced with the use of feed or fertilizer of plant or animal origin without employment of chemically formulated fertilizers, growth stimulants, antibiotics, or pesticides (Merriam-Webster, n.d.).

Genetically modified. An organism whose genetic characteristics have been altered by the insertion of a modified gene or a gene from another organism using the techniques of genetic engineering (Anderson, Wachenheim, & Lesch, 2006).

Limitations of the Study

The subjects' knowledge was a limitation to this study. It was unclear if subjects understood the meaning of organic or genetically modified food, which would impact the accuracy by which the survey questions were answered. This study was conducted in two colleges in Atlanta, Georgia. Therefore, the sample does not represent the whole country nor can the results be generalized to other demographic areas.

Methodology

A questionnaire was built for the purposes of this study that focused on participants' social behavior, perception and knowledge of organic and genetically modified food, purchase motivators for organic and genetically modified food, reasons for buying organic and/or genetically modified food, income, and education level. The survey consisted of 26 questions. Since the survey was specific for this study, the questions were not tested for validity or reliability.

The convenient sample was obtained at two different colleges in Atlanta, Georgia; Spelman College and Emory College. Participants were randomly selected and those that chose to participate were asked to sign a consent form. Chi square analyses were run to determine if the participants' knowledge and perception of organic foods and genetically modified foods and if the purchase motivators for buying organic foods and/or genetically modified foods were associated with the participants' social eating environments.

Chapter II: Literature Review

Organic Food

History of organic food. Organic farming started in 1940 with J. I. Rodale. He formed his ideas based on previous work done in England, Germany, and the University of Missouri. The purpose of organic farming was to maintain soil fertility without the use of chemical fertilizers and pesticides. In 1980, the USDA Berglund Report was published providing recommendations on organic farming. However, it wasn't until 1990, with the Organic Foods Production Act (OFPA) that organic farming changed significantly. The Organic Farming Production Act provided regulations for organic certification. The first draft of this proposal was published in 1997 (Thilmany, 2006).

With the new certification standards, the USDA created the National Organic Program (NOP) to oversee the products and decide which products meet their requirements. The NOP requires that producers send in an application for organic certification with a detailed description of the operation, a history of substances used in the land, a list of the products grown, raised and processed organically and a written plan describing the production process and the substances used (USDA-NOP, 2013). The NOP wrote the new regulations and implemented the new regulations in 2002 (Sustainable Agriculture Research and Education, 2012).

The USDA must certify a farm that produces over \$5,000 a year in gross income in order for the farm to sell their products as organic. Producers that are not certified but selling under the label of organic will have to pay a fine of \$10,000. Farms that produce less than \$5,000 a year in gross income do not need to be certified by the USDA to sell their products as organic. However, they cannot label their product as organic, they may only communicate to their customers that they produce organic products (Treadwell & Swisher, 2012).

The USDA has created four different categories for multi-ingredient organic products, which are 100% organic, certified organic, made with organic ingredients, and no label claims. The '100% organic' seal means that 100% of the ingredients are certified organic. The 'certified organic' seal means that 95% of the ingredients are certified organic. The seal 'made with organic ingredients' means that a minimum of 70% of the ingredients are organic certified. Lastly, the 'no label claims' seal means that less than 70% of the ingredients are organic certified.

Market growth in the US. Organic farming has grown tremendously since 1997 with almost every state in the United States producing organic food (Thilmany, 2006). With the growing demand for organic products, there are more farms that are certified organic. In 2000, there were approximately 800 new organic products available in which most of the new products were desserts. New organic beverages have also been introduced (Dimitri & Greene, 2002).

Organic foods are sold in farmer's market, conventional supermarkets and natural product supermarkets (Dimitri & Greene, 2002). Another way of selling organic products is through community-supported agriculture (CSA). Consumers pay the farmer upfront for a year's harvest as a way of supporting locally grown foods. There are 12,549 community-supported agriculture farms according to the USDA (United States Department of Agriculture, 2013).

Organic food can be divided into seven different categories, which are organic fresh fruits and vegetables; organic grains, oilseeds, and legumes; processed organic foods; organic dairy products; organic meat, poultry and eggs; organic fibers; and organic herbs and flowers. The top five organic foods are fresh fruits and vegetables, nondairy beverages, breads and grains, packaged food, and dairy products (Dimitri & Greene, 2002).

Purchase motivators, perception and knowledge of organic foods. Consumers that are concerned about their health, the environment and the origin of products tend to buy organic

products (Millock et al., 2004). Around 80% of the subjects surveyed by Millock et al. (2004) indicated that it is of great importance that there are no residues in the product. In contrast, between one third and less than half find it of great importance that products look appetizing, that animal welfare has been taken into consideration, that it is produced within the country, and that the production is environmentally friendly. The main stated barriers for not purchasing organic foods was not willing to pay a price premium for organic products, lack of trust in any health effect from eating organic, and lack of trust in organic certification and control (Millock et al., 2004).

Various studies have been done to determine purchase motivators, perception and knowledge of organic foods. Gracia and Magistris (2007) found that consumers that are more willing to buy organic, will tend to buy a larger quantity of organic products. In addition, they also found that the higher the knowledge of organic food and the more concerned consumers are about the environment and their health, the higher the probability that these consumer's will buy organic foods.

Ayaz et al. (2011) studied the acceptance, knowledge and attitudes of university students towards organic and genetically modified foods. According to Ayaz (2011), the cost of organic foods influenced purchase intent of the students. In addition, women are more knowledgeable regarding organic foods than men. Furthermore, students with higher incomes are more likely to purchase organic products.

Anderson et al. (2006) found that the majority of students agreed that organic food is healthier and disagreed that organic foods are dangerous for their health. Additionally, the students agreed that organic food is safe for the environment and that there is little risk associated with consumption of organic food.

Studies available in literature all come to the same conclusion; which is that consumers believe that organic farming is safer for the environment and that it is healthier. Additionally, knowledge will influence purchase of organic products as will income level and price of the organic product.

Genetically Modified Food

History of genetically modified food. Since the mid-1800's, scientists have been making improvements in plant breeding, followed by genetic mutation and DNA cloning. In 1987, there were a series of transgenic mice, which carried human genes. In 1993, the USDA approved Bovine somatotropin (bST), which is a protein with the purpose of increasing milk production in dairy cows. In 1996, there was the birth of the first cloned animal, which was a sheep named Dolly (GM Education, n.d.). In that same year the first genetically modified crops; corn, soybean and cotton were introduced in the market.

The United States has the largest seed market in the world. Instead of farmer's reusing the seeds from the previous year, new seeds are purchased every year, which helps the seed market thrive. In 1930, there was an introduction of hybrid seeds that provided higher yields but deteriorated faster than the non-hybrid seeds. This resulted in an incentive for companies to start their own research on seed development. With the amount of time and money that was required for seed research, only large companies were able to research new seed varieties and in the end these companies bought out the smaller companies. In 1997, there were only a few companies that were in control of the seed market; Pioneer Hi-Bred, Monsanto, Novartis, Delta and Pine Land (Table 1) (Fernandez-Cornejo & Caswell, 2006).

Table 1

Estimated U.S. Seed Market Shares for Major Field Crops, 1997

Company	Corn	Soybean	Cotton
Pioneer Hi-Bred	42.0	19.0	-
Monsanto	14.0	19.0	11.0
Novartis	9.0	5.0	-
Delta and Pine Land	-	-	73.0
Total	69.0	47.0	92.0

In 2007, however, Monsanto was already the top seed company in the world with seed sales of \$4,964 million followed by DuPont with seed sales of \$3,300 million (GM Watch, n.d.). Monsanto has been around since 1901 and it started out as a chemical company producing saccharin for Coca Cola. In the 1990's, Monsanto invested in biotechnology to develop new biotech products. In 1995, they introduced a genetically engineered canola and in 1996, they introduced their first biotechnological crops: soybean and cotton. With the growth in the company, in 1997, Monsanto bought out other seed companies. The company is known for their genetically modified crops and the production of round up which is supposedly used in genetically modified crops but does not decrease the yield (Monsanto, n.d.).

Since genetically modified crops have been introduced to the market new advancements have been made. In 2000, scientists discovered that genetically modified foods could be enhanced with nutrients and vitamins. The first crop developed was called the golden rice (Dawe & Unnevehr, 2007) and received a lot of attention from the media and consumers. The golden rice was developed with the purpose of feeding low income populations in South and Southeast Asia where consumers eat rice as a staple and often have low vitamin A levels. Daffodil genes were added to the rice to increase the amount of beta-carotene in the rice (Dawe & Unnevehr, 2007). After a series of trials, scientists determined that the amount of beta-carotene in the daffodil rice

would not be sufficient to have an impact in vitamin A deficiency. Therefore, scientists ran a second trial using cereal genes. The results showed that the second trial resulted in a much higher level of beta-carotene and would therefore benefit children with vitamin A deficiency (Stein, Sachdev, & Qaim, 2006). However, the golden rice is still not available for sale. Further research needs to be conducted to determine health impact, cost efficiency and determine if the genetically modified rice would indeed assist low-income populations that suffer from vitamin A deficiency

Major genetically modified crops and growth in the US. Farmer's have adopted the use of genetically modified crops due to their high yields and less time in the field due to easy production. Since 1996, the growth of genetically modified crops has grown in the United States Herbicide-tolerant soybean has been the top crop with growth increasing up to 87% in 2005 (Fernandez-Cornejo & Caswell, 2006). Currently, the major genetically modified food products are soy (89%) and corn (61%) (Anderson, Wachenheim, & Lesch, 2006).

Genetically modified products are divided into three generations; first generation, second generation, and third generation. We have experienced the first generation of genetically modified crops; these crops are resistant to herbicides and pests. As a result, they produce higher yields and take less time to manage during production. The second generation of genetically modified food is still being developed, which includes the golden rice. Foods in the second generation are believed to be focused on nutritional value. Third generation genetically modified products will be focused on pharmaceutical and industrial uses (Shoemaker, Johnson, & Golan, 2003).

Perception and knowledge of genetically modified food. Genetically modified products have been on the supermarket shelves for more than a decade. Hallman et al. (2003) conducted a study to determine public perceptions of genetically modified foods. Forty-three percent of the participants had heard about genetically modified foods and 52% knew that supermarkets sell

genetically modified products. Furthermore, one quarter of the participants believe that they have eaten genetically modified products.

Anderson et al. (2006) found that half of the participants were concerned about the unknown effects that genetically modified products will have on our environment. These authors also concluded that participants do not seem to fully be aware of what organic and genetically modified products are and the benefits that the products have. In a similar study, Ayaz et al. (2011) found that 57% of the students thought that genetically modified products present environmental risks. Only 28% thought that genetically modified products were an efficient method of food production. In addition, they found that men are more knowledgeable about genetically modified products.

Anderson et al. (2004) found that consumers were confused as to which genetically modified (GM) products were available in supermarkets when presented with the options: GM corn, GM rice, GM tomatoes, GM soy and GM chicken. In addition, participants were presented with a quiz to determine their knowledge of genetically modified products. Only three out of the 600 participants answered all questions correctly.

In conclusion, most Americans are still unaware that supermarkets sell genetically modified products. That being said, Americans who know that supermarkets sell these products seem to be unsure as to which genetically modified products are available.

Chapter III: Methodology

The methods of this study were utilized to identify specific purchase motivators for organic and genetically modified foods, compare consumer perceptions and knowledge of organic and genetically modified foods, and determine the social/environmental impact upon selection of organic and genetically modified foods. This chapter will include subject selection and description, instrumentation, data collection procedures, data analysis, and limitations.

Subject Selection and Description

This study was approved by the University of Wisconsin Institutional Review Board (IRB) for the Protection of Human Subjects in Research (see Appendix A for memo of approval). A random group of people were selected at two different colleges in Atlanta, Georgia; Spelman College and Emory College. Spelman College has approximately 2,000 full time students. Emory College has 12,755 full time students. These populations were chosen randomly in the Atlanta area.

Instrumentation

The purpose of this study was to identify specific purchase motivators for organic and genetically modified foods, compare consumer perceptions and knowledge of organic and genetically modified foods and determine social/environmental impact upon selection of organic and genetically modified foods.

A survey was created for the purpose of this study. The survey focused on gender, age, income, education level, social impact on participants' lives, perception and knowledge of organic and genetically modified foods and purchase motivators for buying organic and/or genetically modified foods. The survey only had 26 questions to ensure that more people would want to participate because the survey could be completed in five minutes or less (Appendix B).

Questions were asked about social behavior such as the influence of the following: the participants' family, local movements, media, eating home cooked meals, or eating fast food and processed foods on how the participant eats. Questions were also asked about the participants' perception and knowledge of organic foods such as "Organic foods are grown without any pesticides or chemical fertilizers – yes or no" and "Organic food has more nutrients than conventional or genetically modified foods – yes or no." Similarly, questions about the participants' perception and knowledge of genetically modified foods were also asked such as "Genetically modified foods are unhealthy – yes or no." Purchase motivators were also investigated by questions such as "Do you consume organic food to improve your health – yes or no" and "Do you consider genetically modified foods harmful for your health – yes or no." The last question asked participants' to rank the criteria used in choosing organic and genetically modified foods – environmental, taste, quality, and price.

Data Collection Procedures

The 26 questions survey was administered at two colleges in Atlanta, Georgia; Spelman College and Emory College. Students were randomly selected and asked to participate in the survey that would last approximately five minutes. Students that were willing to participate read an implied consent form and were informed that they were not obligated to respond to any questions that made them feel uncomfortable (Appendix C).

Data Analysis

The data was analyzed using chi-square and descriptive analysis. Chi-square is a statistical test commonly used to compare observed data with data that would be expected to be obtained according to a specific hypothesis. The chi-square test is used to determine whether

there is a significant difference between the expected frequencies and the observed frequencies in one or more categories.

Limitations

The limitation of the survey was due to the fact that respondents were not obligated to answer all of the questions if they were uncomfortable in doing so. Consequently, some of the participants did not answer all the questions. The data was collected in one state from college students, thus the data may not be generalizable to other states and all other population groups.

Chapter IV: Results

The purpose of this study was to determine people's knowledge and perception of organic and genetically modified foods as well as their purchase motivators. A survey was conducted in two colleges in Atlanta, Georgia; Spelman College and Emory College. A total of 109 subjects consented to participating in the survey, but the useable responses from individual questions ranged from 102 to 106. Thirty seven percent were male and 63% were female (Table 2).

Table 2

Number and Percentage of Participants

Gender	Number	Percentage
Male	40	37%
Female	69	63%
Total	109	

Purchase Motivators for Organic Foods and Social Behavior

Using chi-square no statistical difference was found between the purchase motivators of consumption of organic foods and family influence in the participant's food choices. Twenty-seven participants reported no consumption of organic foods and that family influences their food choices. Of the 68 participants consuming organic food, 52 (76%) also reported that family has an impact on what foods are chosen (Table 3).

Table 3

Purchase Motivators of Organic Food Consumption and Family Influences

Consumption of organic food	Family influences in food choices		Total
	No	Yes	
No	8 (23%)	27 (77%)	35
Yes	16 (24%)	52 (76%)	68
Total	24	79	103

No statistical difference, as analyzed by chi-square, was found between purchase motivators of organic food consumption and influence of local movements. Forty (68%) of 59 participants responded that they do not consume organic food; however, that they are influenced by local sustainability movements. Thirty-eight (88%) of the 43 participants reportedly consumed organic foods and were influenced by local movements; however, five individuals who consumed organic foods reported no influence by local movements (Table 4).

Table 4

Purchase Motivators of Organic Foods and Influence of Local Movements

Consumption of organic food	Influenced by local movements		Total
	No	Yes	
No	19 (32%)	40 (68%)	59
Yes	5 (12%)	38 (88%)	43
Total	24	78	102

Based on chi-square analysis, no statistical significance was found between purchase motivators for organic food consumption and media influence in how participants eat. Fifty-one (77%) of the 66 participants did not consume organic food but were influenced by the media

when making food choices. Twenty-seven of the 36 participants indicated that they consume organic foods and are influenced by the media when making decisions regarding their food choices (Table 5).

Table 5

Purchase Motivators of Organic Foods and Media Influence in Food Choices

Consumption of organic food	Influenced by media		Total
	No	Yes	
No	15 (23%)	51 (77%)	66
Yes	9 (25%)	27 (75%)	36
Total	24	78	102

There was no statistical difference found using chi-square between purchase motivators and consuming home cooked meals. Six of the seven participants did not purchase organic foods but consumed home cooked meals growing up. Of the 95 participants who consumed organic products, 72 ate home cooked meals during childhood (Table 6).

Table 6

Purchase Motivators of Organic Foods and Growing Up Consuming Home Cooked Meals

Consumption of organic food	Grew up eating home cooked meals		Total
	No	Yes	
No	1 (14%)	6 (85%)	7
Yes	23 (24%)	72 (76%)	95
Total	24	78	102

No statistical difference was found utilizing chi-square between purchase motivators and consuming fast food during youth. Forty-six (81%) of the 57 participants did not consume

organic food but grew up eating fast food. Of the 45 participants consuming organic food, 32 reportedly ate fast food during childhood (Table 7).

Table 7

Purchase Motivators of Organic Foods and Growing Up Eating Fast Food

Consumption of organic food	Grew up eating fast food		Total
	No	Yes	
No	11 (19%)	46 (81%)	57
Yes	13 (29%)	32 (71%)	45
Total	24	78	102

No statistical difference was found, using chi-square, between participants consuming or not consuming organic foods in relation to having homegrown produce growing up. Sixteen (27%) of 59 participants did not consume organic foods and did not grow up with a homegrown vegetable garden. Of the 44 participants consuming organic food, 36 (82%) grew up with homegrown produce (Table 8).

Table 8

Purchase Motivators of Organic Foods and Growing Up with a Homegrown Garden

Consumption of organic food	Grew up with a homegrown garden		Total
	No	Yes	
No	16 (27%)	43 (73%)	59
Yes	8 (18%)	36 (82%)	44
Total	24	79	103

Purchase Motivators for Genetically Modified Foods and Social Behavior

There was no statistical difference between family influence in food choices and consumption of genetically modified food. Of the 34 participants not consuming genetically

modified food, 29 (85%) reported being influenced by family when making food choices. Fifty-two (78%) of the 67 participants that consumed genetically modified food were also influenced by their family (Table 9).

Table 9

Consumption of Genetically Modified Food and Family Influence in Food Choices

Consumption of genetically modified foods	Family influence in food choices		Total
	No	Yes	
No	5 (15%)	29 (85%)	34
Yes	15 (22%)	52 (78%)	67
Total	20	81	101

Based on chi-square analysis, there was no statistical difference found between participant's consumption of genetically modified food and influence by local movements in participant's food choices. Forty-four (76%) of the 58 participants that did not consume genetically modified food also reported being influenced by local movements when choosing foods to consume. Of the 42 participants that did consume genetically modified food, 36 indicated being influenced by local movements (Table 10).

Table 10

Consumption of Genetically Modified Food and Influence by Local Movements in Making Food Choices

Consumption of genetically modified food	Influenced by local movements		Total
	No	Yes	
No	14 (24%)	44 (76%)	58
Yes	6 (14%)	36 (86%)	42
Total	20	80	100

When compared with media influencing food choices, the number of participants consuming or not consuming genetically modified food did not statistically differ based on chi-square analysis. Forty-eight of 62 participants reportedly did not consume genetically modified food but were influenced by the media. Thirty-two (84%) of the 38 participants consuming genetically modified food reported also being influenced by the media (Table 11).

Table 11

Consumption of Genetically Modified Food and Media Influence when Making Food Choices

Consumption of genetically modified food	Influenced by media		Total
	No	Yes	
No	14 (23%)	48 (77%)	62
Yes	6 (16%)	32 (84%)	38
Total	20	80	100

The number of participants consuming or not consuming genetically modified foods did not statistically differ according to chi-square analysis, when comparing to the consumption of home cooked meals during childhood. Of the eight participants that did not consume genetically

modified foods, 88% (7 participants) grew up eating home cooked meals. Seventy-three of the 92 participants consuming genetically modified food also indicated eating home cooked meals during youth (Table 12).

Table 12

Consumption of Genetically Modified Food and Growing Up Eating Home Cooked Meals

Consumption of genetically modified food	Grew up eating home cooked meals		Total
	No	Yes	
No	1 (13%)	7 (88%)	8
Yes	19 (21%)	73 (79%)	92
Total	20	80	100

As analyzed by chi-square, there was no significant difference when eating fast food in youth was compared to consumption of genetically modified food. Forty out of 55 participants grew up eating fast food and do not consume genetically modified food. Forty of 45 participants grew up eating fast food and do consume genetically modified food (Table 13).

Table 13

Consumption of Genetically Modified Food and Growing Up Eating Fast Food

Consumption of genetically modified food	Grew up eating fast food		Total
	No	Yes	
No	15 (27%)	40 (73%)	55
Yes	5 (11%)	40 (89%)	45
Total	20	80	100

No statistical significance, as analyzed by chi-square, was found between participants consumption of genetically modified food when compared with the presence of a homegrown

garden during childhood. Fifty-two (85%) of the 61 participants not consuming genetically modified foods grew up with a homegrown garden. Of the 40 participants consuming genetically modified food, 29 also reported having a homegrown garden during childhood (Table 14).

Table 14

Consumption of Genetically Modified Food and Growing Up with a Home Grown Garden

Consumption of genetically modified food	Grew up with a homegrown garden		Total
	No	Yes	
No	9 (15%)	52 (85%)	61
Yes	11 (28%)	29 (73%)	40
Total	20	81	101

Organic Food Perception and Knowledge and Gender

There was no statistical significance between gender and perception and knowledge that organic foods are grown without pesticides and chemical fertilizers. Sixteen (59%) out of 66 females and 11 (41%) out of 40 males did not know that organic foods are not grown without pesticides and chemical fertilizers. Fifty of the females and 29 males answered affirmative that organic foods are not grown without pesticides and chemical fertilizers (Table 15).

Table 15

Gender Perceptions of Organic Foods Being Grown without Pesticides and Chemical Fertilizer

Organic foods are grown without pesticides and chemical fertilizers	Gender		Total
	Male	Female	
No	11 (41%)	16 (59%)	27
Yes	29 (37%)	50 (63%)	79
Total	40	66	106

There was no statistical significance between gender and perception that organic foods do not need to be certified organic to be sold as organic. Forty-eight (62%) of the females and 30 (38%) of the males answered no to the statement that organic foods do not need to be certified organic to be sold as organic. Eighteen (64%) of the females and 10 (36%) of the males answered yes that organic foods do not need to be certified organic to be sold as organic (Table 16).

Table 16

Perception Based on Gender that Organic Foods Do Not Need to Be Certified to Be Sold as Organic

Organic foods do not need to be certified organic to be sold as organic	Gender		Total
	Male	Female	
No	30 (38%)	48 (62%)	78
Yes	10 (36%)	18 (64%)	28
Total	40	66	106

There was no statistical significance between gender and perception that organic foods have more nutrients than conventional or genetically modified foods. Thirteen (46%) of the females and 15 (54%) of the males stated no to the statement that organic foods have more nutrients than conventional or genetically modified foods. Fifty two (68%) of the females and 25 (32%) males answered that organic foods do have more nutrients than conventional or genetically modified foods (Table 17).

Table 17

Perception that Organic Foods Have More Nutrients than Conventional or Genetically Modified Foods Based on Gender

Organic foods have more nutrients than conventional or genetically modified foods	Gender		Total
	Male	Female	
No	15 (54%)	13 (46%)	28
Yes	25 (32%)	52 (68%)	77
Total	40	65	105

There was no statistical significance between gender and perception that organic foods are environmentally friendly. Only three females and six males stated that organic foods are not environmentally friendly. Of those indicating that organic foods were environmentally friendly, 63 (65%) were female and 34 (35%) were male (Table 18).

Table 18

Gender and the Perception that Organic Foods Are Environmentally Friendly

Organic foods are environmentally friendly	Gender		Total
	Male	Female	
No	6 (67%)	3 (33%)	9
Yes	34 (35%)	63 (65%)	97
Total	40	66	106

There was no statistical significance between gender and perception that all local foods are grown organically. Of those who disagreed with the statement, 35 (37%) were male and 59 (63%) were female. Only four males and seven females agreed that all local foods are grown organically (Table 19).

Table 19

Gender and Perception that All Local Foods Are Grown Organically

All local foods are grown organically	Gender		Total
	Male	Female	
No	35 (37%)	59 (63%)	94
Yes	4 (36%)	7 (64%)	11
Total	39	66	105

There was statistical significance by chi-square analysis between gender and perception that genetically modified foods are safe for the environment ($p=.0021$). Twenty three males stated genetically modified foods are not safe for the environment and 17 of the males stated the genetically modified foods are safe for the environment. The gender significance occurs in that only nine of the females stated genetically modified foods are safe for the environment whereas

56 of the females stated genetically modified foods are not safe for the environment (Table 20). Females are less likely to agree that genetically modified foods are safe.

Table 20

Gender and Perception that Genetically Modified Foods Are Safe for the Environment

Genetically modified foods are safe for the environment	Gender		Total
	Male	Female	
No	23 (29%)	56 (71%)	79
Yes	17 (65%)	9 (35%)	26
Total	40	65	105

There was no statistical significance between gender and perception that genetically modified foods are unhealthy. Twenty-six females and 20 males answered no to the statement that genetically modified foods are unhealthy, while 20 males and 39 females answered yes that genetically modified foods are unhealthy (Table 21).

Table 21

Gender and Perception that Genetically Modified Foods Are Unhealthy

Genetically modified foods are unhealthy	Gender		Total
	Male	Female	
No	20 (43%)	26 (57%)	46
Yes	20 (34%)	39 (66%)	59
Total	40	65	105

There was no statistical significance by chi-square analysis between gender and perception that supermarkets sell genetically modified foods. Five males and seven females

stated no to the statement that supermarkets sell genetically modified foods. While 35 males and 58 females stated that supermarkets do sell genetically modified foods (Table 22).

Table 22

Perception that Supermarkets Sell Genetically Modified Foods Based on Gender

Supermarkets sell genetically modified foods	Gender		Total
	Male	Female	
No	5 (42%)	7 (58%)	12
Yes	35 (38%)	58 (62%)	93
Total	40	65	105

There was statistical significance by chi-square analysis between gender and perception that genetically modified foods have more nutrients than organic or conventional foods ($p=0.001$). Twenty five of the males did not think genetically modified foods have more nutrients than organic or conventional foods, but 13 of the males did believe the genetically modified foods did have more nutrients. Fifty nine of the females did not believe that genetically modified foods have more nutrients, but only five females believed that more nutrients were available (Table 23). So there were fewer females compared to males who believed genetically modified foods have more nutrients than organic or conventional foods.

Table 23

Gender and Perception that Genetically Modified Foods Have More Nutrients than Organic or Conventional Foods

Genetically modified foods have more nutrients than organic or conventional foods	Gender		Total
	Male	Female	
No	25 (30%)	59 (70%)	84
Yes	13 (72%)	5 (28%)	18
Total	38	64	102

There was no statistical significance between gender and perception that all soy and soy products are genetically modified ($p=.298$). Forty two females and 29 males do not believe all soy and soy products are genetically modified. But 22 females and 11 males do believe all soy products are genetically modified (Table 24).

Table 24

Perception that All Soy and Soy Products Are Genetically Modified Based on Gender

All soy and soy products are genetically modified	Gender		Total
	Male	Female	
No	29 (41%)	42 (59%)	71
Yes	11 (33%)	22 (67%)	33
Total	40	64	104

This concludes the data results. The significance of the results and comparisons of the findings to other research will be discussed in Chapter 5.

Chapter V: Discussion

Previous studies have shown that consumers appear to have a more positive attitude towards organic foods, are more negative about genetically modified foods, and appear to lack knowledge about both organic and genetically modified food. Hallman, Hebden, Aquino, Cuite and Lang (2003) conducted a study to determine public perceptions of genetically modified foods and found that less than half of the participants had heard about genetically modified products. In this present study conducted with university students, it was evident that the participants knew very little about organic and genetically modified products. The lack of knowledge became quite noticeable during the survey as evidenced by comments indicating some participants of the present study guessed some of the answers while other participants were comfortable not answering some questions. One reason that university students were chosen was the belief that they would be more educated than the general population on organic food and the use of biotechnology in agriculture (Finke & Kim, 2003). However, the anticipated knowledge level was not evident.

Seventy nine of the 106 subjects knew organic foods are grown without pesticides and chemical fertilizers, and 97 of the 106 agreed that organic foods are environmentally friendly. However, only 28 of the 106 subjects knew that organic food needs to be certified to be sold as organic. This indicates many consumers have heard of the term organic and are aware of its central features, namely, that it is chemical-free and has positive environmental impacts; however, most are unfamiliar with organic farming standards (Davies, Titterington, & Cochrane, 1995). Some 77 of the 105 responses to the question perceived that organic foods have more nutrients than conventional or genetically modified foods although the literature rarely indicates any nutritional advantage.

Ninety three of the participants stated that supermarkets sell genetically modified foods. Several investigators have concluded that Americans are generally uninformed about genetically modified food and unaware of its presence in the food system (Hallman, Adelaja, Schilling, & Lang, 2002; Hallman, Hebden, Aquinao, Cuite, & Lang, 2003). The college students in this study tended to be more aware of the presence in their food supply. Seventy nine disagreed that genetically modified foods are safe for the environment. Anderson, Wachenheim, and Lesch (2006) found that half of the participants in their research were concerned about the effects that genetically modified products have on the environment. Similarly, Ayaz et al. (2011) in a university study population found that more than half thought that genetically modified products presented risks to the environment. This present study found even more concern for the environment than reported by Anderson, Wachenheim, and Lesch (2006), Hallman et al. (2003) and Ayaz et al. (2011). More than 75% of the participants in the present study perceived that genetically modified products were harmful for the environment.

The question as to whether social environment affected consumption of organic food did not appear to be supported by chi-square analyses of responses of the study population. Family influences on food choices, local movements, consuming home cooked meals, and growing up with a homegrown garden did not affect consumption of organic food. Consumption of genetically modified food and social behavior showed similar results to those of organic food consumption. None of the analyses showed an effect of past social environment on consumption of organic or genetically modified food.

According to Ayaz (2011), women are more knowledgeable regarding organic foods than men. Chi-square analyses did not reveal any knowledge advantage about organic food by women over men in the present study. There were no differences in gender regarding pesticides and

chemical fertilizer use, need for certification to be sold, nutritional value, or environmental impact. Although, there were no significant differences in knowledge of organic food by gender, the knowledge level by both sexes was lacking.

Gender differences in perceptions of genetically modified food were found in the college students. Chi-square analysis indicated a significant gender difference favoring female students with the knowledge that genetically modified foods are not safe for the environment as well as a statistically significant difference favoring female students' knowledge that genetically modified foods did not have more nutrients than organic or conventional foods. Ayaz et al. (2011) found that that the male students in Turkey were more knowledgeable about genetically modified products. Therefore, this present study was contradictory to the results found by Ayaz et al. (2011), in that for at least two of the parameters, female students were more knowledgeable.

Limitations

The subjects' knowledge was a limitation to this study. It was unclear if subjects understood the meaning of organic or genetically modified food, which would impact the accuracy by which the survey questions were answered. This study was conducted in two colleges in Atlanta, Georgia. Therefore, the sample does not represent the whole country and results cannot be generalized broadly.

Conclusions

There is limited research and very little information relayed to consumers on the effects that genetically modified foods have on our health and the environment; therefore, it is hard for consumers to have an educated opinion on the safety of genetically modified products. Participants were unsure if organic foods needed to be certified organic to be sold as an organic product. In this college population, the social environment was found to have little detectable effects on

knowledge and perceptions of organic and genetically modified food. Family influences, growing up with a homegrown garden, media, and local movements were not related to the use or knowledge of organic and genetically modified foods.

Many members of the food industry-marketing channel have an interest in the perceptions of consumers with regard to genetically modified and organic foods. This sample of college students helps provide a look into the future education needs. More in depth research needs to be done on the topic to determine consumer's perceptions and buying practices. Appropriate educational materials that could broaden the genetically modified and organic food and consumer knowledge base need to be developed. By not engaging in proactive, strategic marketing, the industry has left consumers to figure it out on their own.

Recommendations

This study shows the need for further research to better understand the potential consumers of organic and genetically modified foods as there appears to be confusion on many fronts. Further research needs to be done to determine long-term benefits and/or risks of consumption of genetically modified foods. In addition, a study should be conducted to determine why there is a current knowledge gap about organic and genetically modified foods. Research could also assist the industry on what marketing strategies would be useful in educating and informing the public.

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Appendix A:

Memo of Study Approval by University of Wisconsin Institutional Review Board

August 1, 2012

Juliana Galvao

RE: Consumer perception, knowledge and purchase motivators for organic and genetically modified foods.

Dear Juliana,

The IRB has determined your project, "**Consumer perception, knowledge and purchase motivators for organic and genetically modified foods**" is **Exempt** from review by the Institutional Review Board for the Protection of Human Subjects. The project is exempt under **Category #2/3** of the Federal Exempt Guidelines and holds for 5 years. Your project is approved from **8/1/2012**, through **8/1/ 2017**. Should you need to make modifications to your protocol or informed consent forms that do not fall within the exemption categories, you will need to reapply to the IRB for review of your modified study.

If your project involved administration of a survey, please copy and paste the following message to the top of your survey form before dissemination:

This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46

If you are conducting an **online** survey/interview, please copy and paste the following message to the top of the form:

"This research has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46."

Informed Consent: All UW-Stout faculty, staff, and students conducting human subjects research under an approved "exempt" category are still ethically bound to follow the basic ethical principles of the Belmont Report: 1) respect for persons; 2) beneficence; and 3) justice. These three principles are best reflected in the practice of obtaining informed consent from participants.

If you have questions, please contact Research Services at 715-232-1126, or foxwells@uwstout.edu, and your question will be directed to the appropriate person. I wish you well in completing your study.

Sincerely,



Susan Foxwell
 Research Administrator and Human Protections Administrator,
 UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB)

Appendix B: Interview Survey

This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46

Gender

- Male
- Female

Age:

Social behavior (Y/N)

- 1) My family has a huge influence in how I eat.
- 2) Local movements influence how I eat.
- 3) Media has an impact in my eating habits.
- 4) I grew up eating home cooked meals.
- 5) I grew up eating fast food and processed foods.
- 6) I grew up with home grown vegetables and fruits.

Perception and knowledge of organic foods (Y/N)

- 1) Organic foods are grown without any pesticide or chemical fertilizers.
- 2) Organic foods do not need to be certified organic to be sold as an organic product.
- 3) Organic food has more nutrients than conventional or genetically modified foods.
- 4) Organic foods are environmentally friendly.
- 5) All local foods are grown organically.

Perception and knowledge of genetically modified foods (Y/N)

- 1) Genetically modified foods are safe for the environment.
- 2) Genetically modified foods are unhealthy.
- 3) Do supermarkets sell genetically modified foods?
- 4) Genetically modified foods have more nutrients than organic foods or conventional foods.
- 5) All soy and soy products are genetically modified.

Purchase Motivators

- 1) Do you consume organic foods? (Y/N)
- 2) Do you consume organic food to improve your health? (Y/N)
- 3) What aspect of consuming organic foods do you think improves your health?
- 4) Do you consume genetically modified foods? (Y/N)
- 5) Do you consider genetically modified foods to be harmful? (Y/N)
 - a. Why do you think that genetically modified foods are harmful for your health?
 - b. Combination of plant gene with bacterial gene.
 - c. Not enough research to prove that they are not unhealthy.

6) What is the most important criteria in choosing between organic and genetically modified foods?

- a. Environmentally friendly
- b. Taste
- c. Quality
- d. Price

Income

- < \$40,000
- \$40,000 – \$60,000
- > \$60,000

Education

- High School
- Some college or Tech School
- College
- Graduate School

Appendix C:

Consent to Participate In UW-Stout Approved Research

Title: *Consumer perception, knowledge and purchase motivators for organic and genetically modified foods.*

Research Sponsor:
Carol Seaborn, PhD, RD, CD, CFCS
University of Wisconsin-Stout
715-232-2216

Investigator:
Juliana Galvao
952-465-2718

Description:

Participants will be interviewed to answer questions on a survey consisting of 27 questions that will determine perceptions and purchase intent of organic and genetically modified foods.

Risks and Benefits:

There is minimal risk to answering questions. Subjects might be embarrassed to answer certain questions, such as their income and their age. This research is beneficial to learn peoples' perception and knowledge of organic and genetically modified foods.

Time Commitment:

Interview will last five minutes.

Confidentiality:

Your name will not be included on any documents. We do not believe that you can be identified from any of this information.

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. You have the right to stop the survey at any time. However, should you choose to participate and later wish to withdraw from the study, there is no way to identify your anonymous responses.

IRB Approval:

This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator: *Juliana Galvao, 952-465-2718*
juliana.galvao@gmail.com.

Advisor: *Carol Seaborn, PhD, RD, CD, CFCS*
University of Wisconsin-Stout
715-232-2216,
seabornc@uwstout.

IRB Administrator
 Sue Foxwell, Research Services
 152 Vocational Rehabilitation Bldg.
 UW-Stout
 Menomonie, WI 54751
 715.232.2477
foxwells@uwstout.edu

Statement of Consent:

By completing the survey questions by interview, you agree to participate in the project entitled,
“Consumer perception, knowledge and purchase motivators for organic and genetically modified foods.”