CORE
Metadata, citation and similar papers at core.ac.uk
Provided by Research Papers in Economics

Consumer Willingness to Pay for Irradiated Poultry Products*

by

Kent Wolfe, Chung L. Huang, and John McKissick**

Abstract

A probit model for whether or not consumers would buy irradiated poultry products is estimated jointly with an OLS equation for the price premiums that consumers are willing to pay for irradiated chicken breast meat. The results suggest that educating consumers about irradiation would be beneficial to the food industry.

*Selected paper presented at the Southern Agricultural Economics Association annual meetings in Tulsa, Ok, February 14-18, 2004.

**Authors are Public Service Assistant and Professors, respectively, Department of Agricultural and Applied Economics, The University of Georgia, Athens, GA.

Consumer Willingness to Pay for Irradiated Poultry Products

According the Center for Disease Control (CDC), food borne illnesses are responsible for causing 76 million people to become sick, hospitalizing 300,000 people and 5,000 deaths annually. Recent out breaks of food-borne illnesses have raised consumers concerns over food safety. According to Jones, consumers level of concern with food safety is related to their exposure to food safety issues in the media. Over the past decade, public awareness of food safety and risks associated with food-borne illnesses have increased (Mead et al.).

Despite the increase in consumer's concerns with food-borne illness and recent media coverage of outbreaks, America has a very safe food supply. However the CDC statistics on food-borne illness suggest that additional protections are needed to reduce food borne illnesses and address this public health issue. Food processors are interested in increasing the safety of their food products not only to provide a safer product but to reduce losses associated with a food-borne illness problem. Recalling food products can have dire direct and indirect financial consequences for food processors and retailers alike. Irradiating food products provides one means of addressing the food safety issue by significantly reducing the presence of food borne bacteria and diseases.

The USDA's Food and Safety and Inspection Service has approved the use of irradiation to control bacteria in frozen and refrigerated poultry products. However, the poultry industry is hesitant to adopt irradiation technology despite its benefits because of perceived consumer resistance to irradiated products (Misra et al.). The problem is further exacerbated because irradiated food products have to include this information on their label. Irradiated food products have to include the irradiated food symbol as well as a phrase indicated the product has been treated by or with irradiation. Given the poultry industries concern over perceive risk, having to include the irradiation symbol and phrase on their product's label could have dire effects.

Over the past decade, there have been a number of studies focused on consumer acceptability of irradiated food products. In 2000, legislation approved raw poultry products for irradiation processing as a means to control pathogenic microorganisms. Consumer acceptability of irradiated food products ranges from a low of 15% (Gaynor et al.) to as high as 50% (Frenzen et al.). Malone suggested that the success of the food irradiation process is dependant on consumer acceptability. The capital cost of irradiated food processing equipment requires a substantial level of consumer acceptance and willingness to purchase to be economically feasible. The wide range in the level of consumer acceptability for irradiated products relays uncertainty to food processors making them hesitant to invest resources in irradiation technology (Frenzen et al.).

Given the uncertainty associated with consumer acceptability, research in the area of consumers willingness to pay for irradiated poultry food products comes into question. However, a review of existing research into consumer acceptability indicates that the significant variations in acceptability may be more a function of questionnaire design, familiarity with and/or knowledge of the process. Fox and Olson conducted store trials and found that irradiated chicken breasts captured 40% of the market when priced equal to non-irradiated chicken breasts. The study found that irradiated chicken breasts captured 30% of the market when priced 10% above non-irradiated products. In addition, the study found that after reading USDA material on the benefits of irradiation, 77% of the shoppers purchased irradiated chicken breasts. The authors concluded that the percentage would have been higher if more consumers read the USDA material or were knowledgeable about the irradiation process.

Previous research has examined the relationship between attitudes toward various food processing methods and consumer behavior. Research has been undertaken to investigate the relationships between socioeconomic and demographic factors and their impact on consumer behavior. and awareness. The objective of this study is to determine the likelihood that consumers are willing to buy and how much they are willing to pay for irradiated poultry products using sociodemographic and attitudinal factors. In addition, the study evaluate consumers level of knowledge about the food irradiation process and their level of concern with the food irradiation process as well as other food safety procedures.

Empirical Model

The approach taken in this study recognizes explicitly the importance of consumer perceptions and attitudes as they relate to behavioral intention in the decision-making process. Specifically, it is assumed that consumers formulate their perception or attitudes from available information, knowledge, experiences, and given environmental factors, which may include personal characteristics, social and cultural background. Previous studies suggests that information acquisition, and consequently behavior, is affected by various demographic factors such as age and gender, educational attainment, as well as region and urbanization (Hinson et al.; Nayga; Steger and Witte). Thus, these factors are hypothesized to be important determinants that influence consumers' decision to buy irradiated poultry products, if available and the amount of premium that they are willing to pay.

In order to analyze the interdependent relationships of behavioral intentions, i.e., purchase intention and willingness to pay, in the consumer decision-making process, a two-equation structural model is formulated and specified as follows:

(1) $LTB = f(Z_1, SE) + \epsilon_1$,

(2) $WTP = g(LTB, Z_2, SE) + \epsilon_2$,

where LTB represents the likelihood of a consumer's intention to buy irradiated poultry products; WTP denotes a consumer's willingness to pay for irradiated poultry products; Z_is are sets of independent variables measuring consumers' beliefs, knowledge, experiences, and attitudes toward irradiation technology; SE represents socioeconomic and demographic characteristics; and ϵ_is are vectors of random errors.

Specifically, the Z_i variables are assumed to include issues related to food safety, respondents' knowledge about irradiation technology and other technology such as using genetically modified (GM) organisms in food production. Consumers' attitudes toward food irradiation and GMO are also considered relevant variables. In addition, the Z_i variables also include how much confidence that consumers have about the sources of their information acquisition, such as U.S. Food and Drug Administration (FDA) or American Medical Association (AMA). The SE variable is specified to include some of the variables representing primary food shopper, urbanization, age, race and gender, educational attainment, marital status, and household composition and income. Thus, equations (1) and (2) can be rewritten as:

(3) LTB = f(ADCH, BACT, Know Irradiation, Irradiation Necessary, Support Irradiation, Know GM Foods, FDA, USDA, AMA, WHO, Primary Shopper, Urban Household, White, Female, Children < 18 Years, Married, Age, High School Education, Household Income) + ϵ_1,

(4) WTP = g(LTB, Support Irradiation, Consume GM Foods, Urban Household, White, Female, Children < 18 Years, Married, Age, High School Education, Household Income)) + ϵ_2.

The definitions of variables included in equations (3) and (4) are presented in Table 1.

It is hypothesized that the probability of a Georgian consumer purchasing an irradiated poultry product increases if they are concerned about food safety issues such as use of additives and chemical processes in food processing and production. It is believed that the more Georgian's know about irradiation technology, believe that irradiation is necessary and support irradiation are the higher the probability that they will purchase irradiated poultry products and are willing to pay a price premium for them. The reason for this hypothesis is the more educated people are regarding the benefits of irradiation poultry products, the more likely they are to understand the benefit to risk ratio associated with the process and how safe the process is. Similarly, the more people are concerned about bacteria and disease contamination, the more likely they will be supportive of the food irradiation process and willing to buy irradiated products.

The effects of knowing about GM foods cannot be hypothesized prior to the analysis. The reason is it is not clear whether people who have a good understanding of GM foods support the use of technology in the food supply. However, a positive relationship is expected between willingness to pay and people who are willing to consume FM foods. Similarly, the study also hypothesizes that Georgian's who are confident in the endorsements of highly recognized institutions would increase the probability of them purchasing irradiated poultry products.

The effects of being the primary food shopper cannot be hypothesized a priori. It may be hypothesized that Georgian's residing in urban areas (Urban Household) have a greater exposure to information concerning the irradiated food process. In addition, urban residents are introduce to technological changes quicker and more often than are non-urban residents. Therefore, this study hypothesizes the probability of purchasing irradiated poultry products increases if the Georgian resides in an urban area.

The effect of an individual's race on the probability of purchasing and willingness to pay for irradiated food products is discusses in Nayga. He suggests that non-white races have a lower readership of newspapers and magazines which may lead to a lesser understanding of the irradiation process than their white counterparts. Therefore, positive relationships are expected between race (White) and the probability of purchasing irradiated poultry products and willingness to pay a higher price.

Previous research has found that females are typically more concerned about food safety and are more concerned with food safety issues when they shop (Nayga). Steger and Witte offer an explanation in that women often are the primary food shopper as well as being responsible for family health issues, especially when children reside at home. Thus, gender (Female) and having children in the household under 18 years of age are expected to have negative effects on both purchase intention and willingness to pay. The marital status (Married) on the probability of purchasing irradiated poultry and willingness to pay are unclear.

Older people are hypothesized to be less likely to adopt new technology than younger people partially because they may be less inclined to learn about new technologies. The rate at which new technology is adapted is hypothesized to decrease the probability of older Georgian's purchasing irradiated food products as well as their willingness to pay. Education attainment is expected to increase the probability of purchasing and willingness to pay for irradiated poultry products. An individual's level of education may suggest their ability to digest, comprehend and make decisions based on available information. More educated individuals may have more inclination and have a greater likelihood of being exposed to information associated with new technology. Similarly, affluence is hypothesized to increase the probability of purchasing irradiated food products and also the willingness to pay. Assuming that education and affluence are positively related, the more affluent a person is the higher level of education they have achieved.

Survey Design and Methodology

In May 2003, the University of Georgia's Center for Survey Research interviewed 303 primary food shoppers from a randomly generated sample of Georgians using a computer assisted telephone interview (CATI) system. The questions were designed to eliminate leading the respondents or introducing bias. The questionnaire began with measuring respondents level of knowledge with the irradiation process, their attitude toward food irradiation and its effectiveness in increasing food safety.

The respondents were asked a series of questions to measure their perceptions of nine specific possible food safety issues ranging from terrorism to bacterial contamination. Respondents were also queried a series of questions to gauge their level of concern with seven frequently used food safety processes. In addition, the survey contained a number of questions designed to gather information on primary food shopper's willing to purchase and the additional amount they are willing to pay for irradiated foods. Finally, demographic information including gender, age, household income, education, as well as other information was collected from each respondent to complete the survey.

When asked about their intention to purchase irradiated foods, respondents were first told that food irradiation process kills insects, parasites, and bacteria such as Salmonella, E. Coli and Staph and also extends the shelf life of the food by preserving freshness and then were asked if they would be very likely, somewhat likely, not too likely or not at all likely to buy irradiated poultry products. If a respondent answered "very likely" or "somewhat likely," then the respondent is considered likely to buy irradiated foods and the dependent variable of LTB is assigned a value of 1, otherwise 0.

With respect to willingness to pay for irradiated chicken breast meat, the double-bounded bidding procedure was used. It was assumed that each respondent has an unobserved (latent) true value of food safety provided by the irradiation technology. Each respondent was provided with an initial offer price that is $1/lb above the market price and asked if they would be willing to pay the additional amount for chicken breasts with bacteria levels greatly reduced by irradiation. The follow-up offer was made which is either higher or lower than the first price depending on the response to the first bid value. If the first response was "yes," then a randomly assigned higher price (ranging from 5%, 10%, 25%, 75%, to 100% above the first value) would be offered. If the first response was "no," then a lower price would be offered. Unlike the single-bounded procedure, where the latent value could be any value more or less than the given single threshold, the double-bounded method provides a follow-up threshold amount which captures the latent value within a certain boundary (Hanemann).

Due to some refusals and missing information, the sample used for this analysis consists 212 observations with complete information. The variables constructed the survey data and sample characteristics are presented in Table 1. Overall, respondents tended to be demographically upscale, with older, better educated, and higher income consumers slightly over-represented. The average household size was about 3 persons. Female, urban residents, and people of European origin represent 64%, 67%, and 74% of survey respondents, respectively.

The result shows that about 65% of Georgia consumers surveyed were at least somewhat likely to buy irradiated poultry products and they were willing to pay an average of $1.34/lb in addition amount for irradiated chicken breasts. A vast majority of the respondents, or 80%, considered that irradiation process is somewhat necessary for poultry products and more than 55% of the respondents indicated they would support the use of food irradiation. It was somewhat surprising to find that more than 80% of the respondents indicated they were at least somewhat willing to consume GM foods, while only about one half of them considered themselves at least somewhat informed about GM foods or organisms (Table 1).

To implement the empirical model, the typical application is to apply Heckman's two-step sample selection procedure in which equation (3) is to be estimated by the probit procedure and equation (4) is to be estimated by ordinary least squares (OLS) procedure based on a subsample of positive observations with the inclusion of inverse Mills ratio obtained from equation (3) as an additional regressor. In this study, the dependent variables of likely to buy (LTB) and willingness to pay (WTP) are constructed based on the survey data collected. The survey question that related to WTP was not structured sequentially following the question of LTB and the observation of zero amount on WTP is considered a valid answer. Hence, it is necessary to use the entirely sample for WTP instead of a subsample of positive willingness to pay.

The problem of estimating equation (4) with OLS based on the observed data is the correlation between the endogenous binary variable (LTB) and the error term, ϵ_2. A solution to the inconsistent estimates of OLS is to use the two stage least squares procedure (Greene). Huang also used the two stage estimation procedure to investigate interrelationships among consumers' risk perceptions, attitudes, and willingness to pay for residue-free produce. In this case, equation (3), as before, is estimated by probit and the predicted probabilities are used as the instrumental variable for LTB in equation (4) in the second stage of the estimation process.

This econometric procedure is easy to implement and it provides unbiased and consistent estimates for the parameters of equations (3) and (4). Two approaches are used to test the presence of simultaneity and particularly the hypotheses about the interplays between LTB and WTP posited in the model. First, a direct test of the statistical significance of the structural parameters can be made using the *t*-statistic of the estimated coefficients for LTB in equation (4). Alternatively, the overall fit of the equation (4) in the system is compared by excluding the endogenous LTB term from estimation. The appropriate statistical procedures are the χ^2-statistic using the log-likelihood ratio or the *F*-test for testing the hypothesized simultaneity effects. The joint parameter estimation of equations (3) and (4) was carried out by LIMDEP program (Greene).

Results

The estimation results of equation (3) on the likelihood of a Georgia consumer buying irradiated poultry products are presented in Table 2. In probit analysis, the estimated coefficient by itself does not have any economic meanings. The estimated coefficients for the explanatory variables should be interpreted in the sense that they affect the probability of a certain event would occur.

This interpretation can be obtained by computing the marginal probability or marginal effect, which is defined as a product of the estimated parameter and the standard density function evaluated the sample means. Thus, in addition to estimated coefficients and corresponding standard errors, estimates of the marginal effect associated with each independent variable are reported in Table 2. Two goodness-of-fit measures are also reported. One is the log-likelihood ratio. The log-likelihood ratio test statistic indicates that the estimated probit model is statistically significant at less than 1% significance level. The computed Efron's pseudo R^2 of .513 also indicates an excellent fit for the data to model.

The estimated coefficient on ADCH is negative as expected and significantly different from zero at the less than 1% significance level. The result suggests that respondents who are concerned about food safety issues related to additives and chemicals are less likely to buy irradiated poultry products than those who do not have a concern with additives and chemicals. The estimated marginal effect suggests the probability of those concerned respondents buying irradiated poultry products is about 35% smaller than their counterparts, *ceteris paribus*. Respondents who believe that irradiation is necessary to produce safer poultry products and respondents who support the use of irradiation to combat food bourne illnesses and bacteria significantly impacts a respondents likelihood of purchasing irradiated poultry products. The estimated coefficients for Irradiation Necessary and Support Irradiation are both positive and highly significant at the less than 1% significance level. Irradiation likely and Support Irradiation have the largest marginal effects that increase the probability of a respondent purchasing irradiated poultry by 58% and 52%, respectively. The estimated coefficient for primary food shopper and marital status suggest that the probability of purchasing irradiated poultry products is increased by an estimated 27%, if the respondent is married or the primary shopper of the household. The estimated coefficient for WHO is statistically significant but negative which is contrary to expectations. The result indicates that a respondent is likely to buy irradiated poultry products if the process is endorsed by the WHO. The opposite result of a positive effect was found for FDA, USDA, and AMA. This finding appears to suggest that perhaps respondents feel more confident with endorsement made by U.S. government and institutions than by international organization. The presence of children in the household under the age of 18 significantly decreases the probability a respondent will purchase irradiated meat by 21%, consistent with expectations. Age and household income significantly reduce the probability of a respondent purchasing irradiated poultry products but their marginal effects are very small.

The estimation results of equation (4) on the Georgians willingness to pay extra for irradiated poultry products are presented in Table 3. In general, most of the estimated coefficients for the explanatory variables are not statistically significant. However, the overall goodness-of-fit statistics indicate that the model performed satisfactory. The log-likelihood ratio test shows that the estimated model is statistically significant at less than 1% significance level. Furthermore, the adjusted R^2 of .214 is considered a fairly good fit for the model given that the data are cross sectional in nature and collected from the survey.

As to be expected, the most important variable that affects a respondent's willingness to pay is the likelihood of purchasing irradiated poultry product. Thus, if a respondent is willing or likely to buy irradiated products, then those respondents would be willing to pay a higher price for irradiated chicken breast meat for an average of about $1.13/lb. The results show that those respondents who were likely to support irradiation process and willing to consume GM foods would be willingness to pay about $.46/lb and $.44/lb extra for irradiated chicken breasts, respectively.

Among the socioeconomic variables, households with children less than 18 years old was found to have a positive and significant effect on willingness to pay. All the remaining demographic variables were not significant in determining consumers willingness to pay extra for irradiated poultry products. The positive effect of households with young children ran contrary to *a priori* expectation that having children under 18 years of age was hypothesized to negatively related to willingness to pay extra. Perhaps, those respondents who have young children at home believed irradiation enhances food safety attribute of poultry products by reducing the risks of Salmonella contamination and thus would be willing to pay extra for irradiated chicken breasts.

Implications and Conclusions

The results suggest that the probability of a consumer purchasing irradiated poultry products is influenced by their perceptions of the necessity for irradiating these products as well as their support for the products. Consumers concerned with additives and chemicals were significantly less likely to purchase irradiated poultry products. Three demographic variables, Children < 18 Years, Age and Household Income, were found to significantly lower the probability of a consumer purchasing irradiated poultry products. The influence of the demographic variables is important in that for the food irradiation process to gain wide-spread acceptability, the aforementioned demographic groups will have to be convinced that the process is safe and beneficial. This is especially true for households with children as they make up a significant percentage of U.S. households. Convincing the primary food shopper to purchase irradiated products will also send a message to the children that the products are safe.

The second state of the model found that likelihood to purchase irradiated poultry products is the most significant predictor of a consumers willingness to pay extra for these products. Therefore, this emphasizes the need to develop effective marketing and educational material to convince consumers that irradiation is necessary for safer food and to gain their support for the process. If the industry can convince consumers that the process is safe, will provide a safer food product with no to minimal side-effects, they will purchase irradiated poultry products and most likely will be willing to pay extra for the increased level of food safety.

Overall, the results suggest that educating consumers about the benefits of irradiating poultry products has the potential to create a positive perception about the process and increase the probability a consumer will purchase and pay a higher price for these products. Therefore, an effective educational campaign should relay the benefits of irradiating poultry products while addressing common misconceptions associated with food irradiation.

References

Fox, John A. and Dennis G. Olson. "Market Trials of Irradiated Chicken." *Radiation Physics and Chemistry* 52(1998):63-66.

Frenzen, P.D., A. Majchrowicz, J.C. Buzby, and B. Imhoff. "Consumer Acceptance of Irradiated Meat and Poultry Products." *Issues in Food Safety Economics*. U.S. Department of Agriculture, Agricultural Information Bulletin No. 757, August, 2000.

Frenzen, P.D., E.B. DeBess, K.E. Hechemy, H. Kassenborg, M. Kennedy, K. McCombs, A. McNees, and The Foodnet Working Group. "Consumer Acceptance of Irradiated Meat and Poultry in the United States." *Journal of Food Protection* 64, 12(2001):2020-2026.

Gaynor, J., K. Jensen, and E. Jaenicke. "Retail Meat Managers' Profitability Expectations for Irradiated Red Meats." Presented at the American Agricultural Economics Association Annual Meetings, 2002.

Greene, W.H. *LIMDEP Version 7.0 User's Manual*. Plainview, NY: Econometric Software, Inc., 1995.

Hanemann, W.M. "Some Issues in Continuous- and Discrete-Response Contingent Valuation Studies." *Northeastern Journal of Agricultural and Resource Economics* 14, 1(April 1985):5-13.

Heckman, J. "Sample Selection Bias as a Specification Error." *Econometrica* 47(1979):153-161.

Hinson, R.A., R.W. Harrison, and L. Andrews. "Impact of socioeconomic Characteristics on Attitudes Toward Food Irradiation." *Journal of Food Distribution Research* XXIX, 3(November 1998):26-34.

Huang, C.L. "Simultaneous-Equation Model for Estimating Consumer Risk Perceptions, Attitudes, and Willingness to-Pay for Residue-Free Produce." *Journal of Consumer Affairs* 27, 2(Winter 1993):377-396.

Malone, J.W. "Consumer Willingness to Purchase and to Pay More for Potential Benefits of Irradiated Fresh Food Products." *Agribusiness* 6(2):163-178.

Mead, P.S., L. Slutsker, V. Dietz, L.F. McCaig, J.S. Bresee, C. Shapiro, P.M. Griffin, and R.V. Tauxe. "Food-Related Illness and Death in the United States," *Emerging Infectious Diseases* 5, 5(September-October 1999):607-25.

Misra, S.K., Stanley M. Fletcher, and Chung L. Huang. "Irradiation and Food Safety: Consumers Attitudes and Awareness." In J.A. Caswell, ed. *Valuing Food Safety and Nutrition*. Boulder, CO: Westview Press, 1995, pp. 435-455.

Nayga, Rodolfo M.*"* Sociodemographic Influences on the Consumer Concern for Food Safety: The Case of Irradiation, Antibiotics, Hormones and Pesticides." *Review of Agricultural Economics* 18(1996):467-475.

Steger, M.A. and S.L. Witte. "General Differences in Environmental Orientations: A Comparison of Publics and Activists in Canada and the U.S." *The Western Political Quarterly* 42(1989):627-49.

Table 1. Variable Definition and Sample Characteristics

Variable	Definition	Mean (Std. Dev.)
Likely to Buy (LTB) Irradiated Poultry Products	= 1 if respondent indicated at least somewhat likely to buy irradiated poultry products if it was treated with approved doses and properly labeled, 0 otherwise.	.6462 (.4792)
Willingness to Pay (WTP)	Amount of price premium $/lb that respondent is willing to pay for irradiated chicken breasts.	1.3439 (1.3829)
ADCH	= 1 if additive/chemicals are a food safety concern, 0 otherwise.	.1887 (.3922)
BACT	= 1 if bacteria/disease are a food safety concern, 0 otherwise.	.2311 (.4226)
Know Irradiation	= 1 if at least know something about the food irradiation process, 0 otherwise.	.2123 (.4099)
Irradiation Necessary	= 1 if irradiation is considered at least somewhat necessary for poultry products, 0 otherwise.	.8019 (..3995)
Support Irradiation	= 1 if respondent indicated at least somewhat support the use of food irradiateion, 0 otherwise.	.5566 (.4980)
Know GM Foods	= 1 if respondent is at least somewhat informed about genetically modified (GM) foods or organisms, 0 otherwise.	.4057 (.4922)
Consume GM Foods	= 1 if respondent is at least somewhat willing to consume food produced with GM ingredients, 0 otherwise.	.8019 (.3995)
FDA	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the U.S. Food and Drug Administration (FDA), 0 otherwise.	.5236 (.5006)
USDA	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the U.S. Department of Agriculture (USDA), 0 otherwise.	.5187 (.5008)
AMA	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the American Medical Association (AMA), 0 otherwise.	.5802 (.4947)
WHO	= 1 if confidence in the safety of irradiated food increased because it is endorsed by the World Health Organization (WHO), 0 otherwise.	.3962 (.4903)
Primary Shopper	= 1 if the respondent is responsible for the household's grocery shopping, 0 otherwise.	.5613 (.4974)

Urban Household	= 1 if household resides in urban area, 0 otherwise.	.6698 (.4714)
White	= 1 if the race of household is white, 0 otherwise.	.7406 (.4394)
Female	= 1 if respondent is female, 0 otherwise.	.6398 (.4821)
Children < 18 Years	= 1 if there are children under 18 years of age living in the household, 0 otherwise.	.4245 (.4954)
Married	= 1 if married, 0 otherwise.	.6651 (.4731)
Age	Age of the respondent in years.	45.3868 (15.3469)
High School Education	= 1 if respondent attended or graduated from high school, 0 otherwise.	.3066 (.4622)
Household Income	Annual income classes before taxes, ranking from 1 being under $15,000 to 9 being $75,000 and over.	6.3066 (2.6690)

Table 2. Estimated Probit Results of Purchasing Irradiated Poultry Products

Variable	Estimated Coefficient	Standard Error	Marginal Effect[a]
Constant	-.3687	.7325	
ADCH	-.9574***	.3325	-.3466***
BACT	.2251	.3172	.0694
Know Irradiation	-.1624	.3390	-.0538
Irradiation Necessary	1.6338***	.3660	.5799***
Support Irradiation	1.6317***	.3072	.5156***
Know GM Foods	.5244*	.2849	.1621**
FDA	1.0145**	.4330	.3230***
USDA	.3994	.3837	.1286
AMA	.4758	.3835	.1559
WHO	-1.4732***	.4185	-.4847***
Primary Shopper	.8450***	.3282	.2756***
Urban Household	-.4195	.2869	-.1280
White	-.0268	.3055	-.0086
Female	-.4220	.3101	-.1300
Children < 18 Years	-.6396**	.3153	-.2098**
Married	.7986***	.3076	.2724***
Age	-.0247***	.0100	-.0080***
High School Education	-.4603	.2993	-.1554
Household Income	-.0911*	.0539	-.0293*
-2 x Log-likelihood ratio		131.973***	
Efron's pseudo R^2		.513	
Sample size		212	

*, **, and *** indicate the estimated coefficients are statistically significant at the 10%, 5%, and 1% significance level, respectively.

[a] Marginal effect is defined as the change in the probability given a change in the explanatory variable. For binary variables, the marginal effect is calculated as the difference in probability for a discrete change of the value of the binary variable from 0 to 1.

Table 3. Estimated Regression Results of Willingness to Pay for Irradiated Poultry Products

Variable	Estimated Coefficient	Standard Error
Constant	-.1680	.5197
LTB	1.1306***	.3780
Support Irradiation	.4660*	.2583
Consume GM Foods	.4426**	.2144
Urban Household	.1855	.1832
White	.1660	.2095
Female	-.1148	.1779
Children < 18 Years	.5708***	.2056
Married	-.2121	.2001
Age	-.0015	.0064
High School Education	-.0055	.1941
Household Income	-.0062	.0356
-2 x Log-likelihood ratio	74.768***	
Adjusted R^2	.214	
Sample size	212	

*, **, and *** indicate the estimated coefficients are statistically significant at the 10%, 5%, and 1% significance level, respectively.