Snack Peanuts Purchase Pattern: Effects of Nutritional Considerations and Household Characteristics

Arbindra P. Rimal and Stanley M. Fletcher

ABSTRACT

This study examines the effect of a meal planner's nutritional awareness, exercise habits, and household socioeconomic characteristics on market participation and frequency of purchase of snack peanuts. Data are from a household survey of 2880 U.S. households collected by Gallup in 1997. Statistical tests showed that a double-hurdle or Cragg model best represented consumers' participation and purchase level decisions in the snack peanut market. The results indicated that meal planner's nutritional considerations while making food purchase decisions had little effect on the participation level decisions, but did affect purchase frequency of snack peanuts. Those household meal planners who were overly concerned about undesirable nutritional factors tended to decrease their purchase of snack peanuts. Promotion of snack peanuts on the basis of nutritional benefits through health professional and media is a useful tool to increase purchase frequency.

Domestic food use of peanuts is the primary factor determining peanut production under the supply management system of the United States (U.S.). Snack peanuts account for approximately 25 percent of the domestic edible peanut use. Consumption of snack peanuts has varied significantly since 1978 (Figure 1). Consumption increased in the 1980s, hitting a peak in 1989. Health factors, production shortfalls, and economic factors in peanut product manufacturing sectors created downward trends in the early 1990s. As the issues that created declines in consumption were addressed, a reversal in consumption was accomplished in 1995. Snack peanuts were not the only snack product experiencing declines. The market share of snack nuts including snack

peanuts in the U.S. domestic snack food industry has been declining over the past several years. For example, snack nuts had a 14.4 percent share of the snack food market in 1993 which declined to 12.4 percent in 1999 (*Supermarket Business,* 1993–99). There is a growing concern about the sluggish domestic demand for snack peanuts because a continuous decline in consumption implies a shrinking peanut industry. It is important for policy makers and peanut industry leaders to understand the factors affecting domestic consumption of snack peanuts and to cope with the downward trend in consumption faced by the peanut industry.

The demand for farmer stock of peanuts (FSP) is derived from the demand for snack peanuts and other peanut products. According to a national peanut survey by the National Peanut Council (1997). 35 percent of the sample population had not used snack peanuts in the 12 months before the survey date. The sur-

Arbindra P. Rimal is assistant professor, Department of Agriculture-Agribusiness, Southwest Missouri State University, Springfield. Stanley M. Fletcher is professor, Department of Agricultural and Applied Economics, University of Georgia, Griffin.
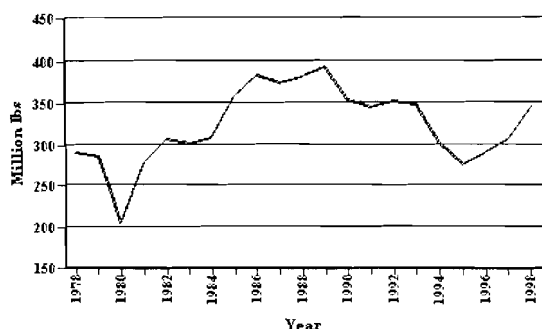
Figure 1. Peanuts used in snack peanuts. Source: Peanuts Stocks and Processing and stock, USDA, 1978–1998

vey defined that population as *nonusers.* Increasing participation by the nonusers of snack peanuts in the domestic market is one way of enhancing total FSP demand. The next method is to increase the intensity of consumption among the user populations. Using the percentage of nonusers and the total U.S. population, an increase in demand for FSP due to increase in participation can be projected. For example, using an average annual per-capita snack peanut consumption of 1.88 pounds (USDA, 1998) and a 1.56 conversion rate (snack to FSP), the total non-use market for FSP is approximately 141,000 tons annually. Although this calculation ignores the fact that some nonusers may never consume peanut products due to peanut allergies or because they simply do not like the product, such a number suggests that the potential market for peanuts is very large. Also, note that the calculation uses the non-use percentage only. If the intensity of use among the users is also increased, then the consumption can be further increased.

Throughout history, nuts have been a staple food providing energy, protein, essential fatty acids, vitamins, and minerals. Today, nuts are classified as part of the USDA Food Guide Pyramid's Meat/Meat Alternate Group. Foods in this group contribute protein as well as important vitamins and minerals to the diet. Nuts are also being studied for their potential health benefits. Research suggests that there may be a connection between frequent nut consumption and a reduced incidence of coronary heart

disease (Sabate, 1999; Dreher, 1996). Thus tradition and promising scientific evidence combine to support the role of nuts in healthful eating.

Peanut products are excellent sources of vitamins and protein. However, peanuts are often associated with high fat and cholesterol. For example, the 1997 peanut survey reported that 41 percent of the respondents felt that peanut products were high in cholesterol, while 23 percent did not know about the cholesterol content in peanuts. This is contrary to the actual situation. Peanuts are normally a cholesterol-free food product. Most of the fat in peanuts is unsaturated which has been shown to lower one's LDL-cholesterol levels. The fat content in peanuts is the least among snack and lunch items such as American cheese slices and beef bologna. Such inaccurate nutritional perceptions are likely to play a critical role in peanut product purchase decisions. Some individuals may decide not to purchase peanut products due to the negative perceived nutritional quality of peanuts, while others may buy them regularly. Do nutritional considerations have a significant impact on the demand for food products, including peanuts? A 1986 survey conducted by the FDA found that more than 60 percent of the respondents changed their eating patterns as a result of health concerns (Mueller, 1989). Studies in the past have related consumer health concern and consumption habit of foods derived from dairy (Jenson, 1995; Heien and Wessells, 1988) and meat sources (Ward and Moon, 1996). Capps and Schmitz (1991) in discussing health and nutritional factors in food analysis and Yen and Chern (1992) in investigating the impact of nutritional information on demand for dairy products, have indicated that consumer health and nutritional concern have a significant effect on food demand.

Previous studies have addressed the relationships between food consumption decisions and socio-demographic characteristics using various demand specifications including the Tobit model, the Cragg Market Participation model, and the Complete Dominance model. Jenson (1995) analyzed consumer health concerns and decisions to participate in the market

for whole-fat milk and found that promotion using nutritional benefits of milk can be a useful tool for the dairy industry to attract market participation. Many studies evaluating meat demand (Brown and Schrader, 1990; Capps and Schmitz, 1991) have concentrated on shifts in demand caused by consumers' views of the health implications of eating meat. However, little is known about the relationship between the U.S. consumers' concern about nutrition and peanut product consumption patterns.

This research examines nutritional considerations of 2880 U.S. households in purchasing snack peanuts. It develops Nutritional Considerations Indices (NCIs) and measures the impacts of NCIs and household socioeconomic characteristics on market participation and purchase level of snack peanuts. It uses three demand models suited for censored observations. When households report zero consumption, Tobit models are often used. This model, however, is very restrictive. It assumes that all consumers, including those who reported zero consumption, will eventually have positive consumption when income and relative prices changed. Such assumption is valid for most agricultural commodities. In the case of peanuts, however, this assumption may not hold. Some consumers who are overly concerned about fat may not buy peanut products at all even when relative prices and income change. In such a situation it is important to evaluate demand for peanut products using alternative models such as Cragg's "double hurdle" or Complete Dominance (CD) models.

Conceptual Model

The relationship between nutritional awareness and the demand for the commodity can be positive or negative depending upon a consumer's knowledge of nutrition vis-a-vis the characteristics of the product (Swartz and Strand, 1981). For example, if a consumer is aware of the importance of vitamins and minerals and one of the product attributes is that the product is a good source of vitamins and minerals, then the awareness is expected to shift the demand for the commodity upwards.

Consumers' attitudes toward nutrition can have two effects. The first effect is on the probability of the participation of those consumers who were previously nonparticipants. The second effect is on the quantity or frequency of purchase. If nutrition considerations are important in making purchase decisions, those who are already in the market tend to buy more or less of products depending on how the attributes of products are associated with the nutritional considerations. Following the two effects of nutritional awareness, a two-step demand model for a peanut product is postulated. The conceptual model is as follows:

$$(1) \qquad \Pr(q_1 > 0) = g(p_i, Y, X_1, N, \epsilon_1)$$

$$(2) \qquad (q_i | q_i > 0) = \zeta(p_i, Y, X_2, N, \epsilon_2)$$

where q_i is the quantity of the commodity consumed, p_i is the price of the commodity i, Y is the income, X_1 and X_2 are the socioeconomic variables related to the consumer, N is the nutrition awareness, and ϵ_1 and ϵ_2 are the disturbance terms. Equation (1) represents a probability of participation in snack peanuts markets, while equation (2) represents the level of consumption given the participation.

The decision framework in (1) and (2) can be represented by the following Marshallian demand function for the commodity q_i:

$$(3) \qquad q_i = f(p_i, Y, X, N)$$

where q_i is the quantity of the commodity consumed, p_i is the price of the commodity i, Y is the household income, X is the vector of socioeconomic variables related to the consumer and N is the nutrition awareness. The consumer has a stock of information about nutrition. The relationship between the nutrition awareness index (N) and the demand for the commodity can be positive or negative depending upon the consumer's knowledge of nutrition vis-a-vis the characteristics of the commodity.

Empirical Models

The above conceptual framework suggests two kinds of decision-making from the buyer's

perspective. The first is whether to participate in the market for peanut products or a participation-level decision. The second is a purchase or consumption-level decision. A buyer may decide to purchase no peanut products, indicating either he or she is a nonparticipant or he or she is a participant at a corner solution due to price or income levels. Three separate empirical specifications of the consumption problems postulated above are found in the literature. The first is the Tobit model which assumes that everyone is a market participant. In this model, zero purchases are simply standard corner solutions. The second is the Heckman type specification, also known as the *Complete Dominance (CD) model* (Blaylock and Blisard, 1993; Jensen, 1995). This specification does not allow for corner solutions. Hence the decision is either to participate or not to participate. Once a household participates in the peanut product market, it will have positive purchase levels. The third and most flexible model is also known as Cragg's "double hurdle" model (Jensen, 1995; Blaylock and Blisard, 1993; Haines, Guilkey, and Popkin, 1988). This model makes a distinction between market participation and zero purchases. According to this model, a zero purchase level may mean either nonparticipation in the market or non purchase due to relative price or income. The double hurdle model is the most general and can accommodate Tobit and CD models (Jensen, 1995). According to this model, a consumer must pass two hurdles before a positive consumption of snack peanuts: be a potential consumer of snack peanuts and actually consume snack peanuts. The log likelihood function of the double hurdle model explaining snack peanut consumption behavior may be written as

$$(4) \quad \ln L = \sum_+ -\frac{1}{2}[\ln 2\Pi + \ln \sigma^2 + \ln \Phi_1(Z_i\delta)$$
$$+ ((y_i - x_i\beta)^2/\sigma^2)]$$
$$+ \sum_0 \ln(1 - \Phi_2(x_i\beta/\sigma)\Phi_1(Z_i\delta))$$

where y_i represents purchase of snack peanuts by household i in the last six months since the date of survey, Φ_1 is the cumulative probabil-

ity of the household i's market participation, Φ_2 is the cumulative probability of non-zero purchase given market participation, σ is the standard error of the purchase, x_i and Z_i are the socioeconomic and nutrition variables affecting the purchase and the participation in the market for snack peanuts.

The Tobit model is a nested version of the double hurdle model. When all households are assumed to be market participants, the probability of market participation is 1, $\Phi_1(Z_i\delta) = 1$. In equation (4), $\Phi_1(Z_i\delta)$ can be set to 1 to represent the log likelihood function for the Tobit model. In the Tobit model all zero purchases are corner solutions. When zero purchases solely represent nonparticipation in the snack peanut market, the probability of non-zero purchases given market participation is 1 or $\Phi_2(x_i\beta) = 1$ in equation (4). The resulting equation represents the log likelihood function for the Complete Dominance (CD) model. In the CD model, a household is a participant or a nonparticipant, thus avoiding the issue of corner solutions. Which of the three models actually explains the behavior of peanut consumers can be tested by using likelihood ratio tests.

In equation (4), Z_i represented the socioeconomic and nutrition variables for the participation decision and X_i represented the socioeconomic and nutrition variables for the consumption decision. While there is a lack of any theory for selecting appropriate socioeconomic variables in the models, results of previous studies provide valuable guidelines in this regard. Putler and Frazao (1994) reported a positive relationship between an individual's awareness of the link between dietary fat and chronic disease and household income. They also postulated a variation in nutritional concern based on race, urbanization, and region due to differences in media exposures among these demographic subgroups.

Household meal planners with different characteristic profiles are likely to have different levels of considerations of dietary components when making food selections. Grossman and Kaestner (1997) reported a positive relationship between education and health. Individuals with more education maintain a

healthy *lifestyle*. Better education enhances the access to nutrition information, thus increasing the likelihood of nutritional considerations while making food selections. Nayga (1997) also found a significant positive relationship between education and a main meal planner's perceived importance of nutrition in food shopping. Among the other characteristics of the household meal planners, a female household meal planner is more likely to consider nutrition while making food selections (Food Marketing Institute, 1990; Nayga, 1997; Putler and Frazao, 1994; Moon et al., 1998); an older household meal planner is more likely to consider nutrition while shopping for food than a younger household meal planner (Frazao and Cleveland, 1994; Grossman, 1972; Ott and Maligaya, 1989). Race may be another individual characteristic associated with the variation in food selection. Flynn et al. (1994) found that nonwhites were more concerned about contamination in food than whites. Nayga (1997) reported that black meal planners perceived nutrition as more important than did white meal planners.

Empirical evidence showing interrelationships between lifestyles and health attitudes are limited. Johnson et al. (1998) reported a statistically significant relationship between indices of physical activity and eating habits of university men and women. The indices measured leisure-time moderate and vigorous activities, flexibility, and strengthening activities. A random cross-sectional study (Woodward et al., 1994) of men and women comparing their health knowledge, behavior, and lifestyles reported that smokers had poorer dietary knowledge, lower intake of vitamins and fiber, and higher intake of dietary cholesterol and alcohol than nonsmokers. The assessment of nutritional habits in population studies has demonstrated that selection of food by a smoker is different from that by a nonsmoker (Midgette et al., 1993; Preston, 1991). Empirical evidence regarding lifestyle and considerations of nutrition when selecting food items is not available. Although lifestyles include many aspects of daily life of individuals, in this study the household meal planner's exercise habits are chosen to represent her or his

lifestyle. It is hypothesized that those household meal planners who exercise regularly are likely to consider nutrition issues more often when selecting food than non-exercisers.

The empirical models in this study posit that household meal planners' participation and consumption decisions in snack peanut markets are influenced by the following factors: household income, presence of young children in the family, households in urban area, geographic location, race, education, age, gender, meal planners' nutritional considerations in food selection, and lifestyle of household meal planners represented by their exercise habits.

Survey Design and Data Collection

In 1997 Gallup conducted a nationwide telephone survey of 2880 households examining their purchases of peanut products. All survey respondents were at least 18 years of age. A multiple call-back method was used for the telephone interview. Up to five call-backs were made to the same telephone number in order to eliminate bias in favor of those easy to reach by telephone. Survey questionnaires included four aspects of consumer behavior: purchase frequency of snack peanuts, nutritional considerations in making purchase decisions, respondents' exercise habits, and demographic background.

Demographic characteristics of respondents included household income, household size, number of children, age of respondents, race, residential status (urban, suburban and rural), etc. Area codes of telephone numbers were used to identify four market regions (West, Midwest, Northeast, and South). Table 1 reports the specific variables used in the models and their description. The number of snack peanuts purchases in the six months before the survey date ranged from 0 to the maximum of 30. Given such large integer values, the purchase frequency is treated as a continuous variable (Anderson and Philips, 1981; Nunnally and Bernstein, 1994). The explanatory variables were grouped into four classes: household characteristics, geographic location of households, household meal planners' char-

Table 1. Names of the Variables and their Descriptions

Variable	Description
PURSNK	Number of times snack peanuts purchased in previous six months
Household Characteristics	
GRINC	Gross household income (in '000 dollars)
HOUSK	= 1 if children in the household; =0 otherwise
FSIZE	Number of family members
URB	= 1 if living in urban area; =0 otherwise
Geographic Location[a]	
NORTHEAST	New England and Mid-Atlantic States
MIDWEST	East North Central and West North Central States
SOUTH	South Atlantic, East South Atlantic, and West South Atlantic
Household Meal planner's Characteristics[b]	
RACE1	1 if household meal planner is white, 0 otherwise
RACE2	1 if household meal planner is black, 0 otherwise
EDUCATION	Education level of household meal planner
AGE	Mid points in the age groups of household meal planners
GENDER	1 if household meal planner is female, 0 otherwise
Nutritional Considerations in making purchase decisions and lifestyle	
NUTRI1	Index of bad nutrition considered in making food purchase decisions (0–1)
NUTRI2	Index of good nutrition considered in making food purchase decisions (0–1)
EXERCISE	Household meal planner's exercise activities per week (0 per week to 7 days per week)

[a] The omitted region is Mid West.
[b] The respondent is assumed to be the household meal planner who makes food purchase decisions including peanut products for the entire household.

acteristics, and nutritional considerations and lifestyle of the household meal planner.

In this paper the frequency of purchase is used to represent the consumption variable. Although frequency of purchase may not necessarily indicate the quantity of product bought, previous studies have shown a positive correlation between these two variables. Ganzach (1993) reported a positive correlation between frequency and number of product bought. Table 2 reports means for overall data and purchasers and non-purchasers of snack peanuts. As the table shows, 55.51 percent of households in the sample purchased snack peanuts in the last six months. For the overall sample the average number of times a household purchased snack peanuts in the last six

months was 2.48. For the subset of the sample with only positive purchase (purchasing households), however, the mean was 4.49. The sample means for the rest of the variables reflect few differences in the compositions of households purchasing and not purchasing snack peanuts. For example, 53.84 percent of the purchasers of snack peanuts were female, while 61.39 percent of non-purchasers were female. In general, purchasing households had higher income and larger family size than non-purchasing households.

Since consumers' attitudes and concerns regarding nutrition and health are observed indirectly, the responses to several nutrition and health-related questions were combined to construct an index measure of the consumers'

Table 2. Sample Means

Variable	All Households	Snack Peanuts	
		Purchasers	Non-Purchasers
PURSNK	2.48	4.49	0.00
Household Characteristics			
GRINC	$50.58	$51.90	$48.22
HOUSK	0.4015	0.4295	0.3515
FSIZE	2.6224	2.7071	2.4712
URB	0.1893	0.1723	0.2106
Geographic Location			
NORTHEAST	0.1893	0.1757	0.2136
MIDWEST	0.2628	0.2598	0.2682
SOUTH	0.3341	0.3557	0.2955
Household Meal planner's Characteristics			
RACE1	0.8613	0.8438	0.8924
RACE2	0.0745	0.0874	0.0545
EDUCATION	3.4336	3.4312	3.4378
AGE	44.1948	43.7576	44.7576
GENDER	0.5827	0.5384	0.6139
Nutritional Considerations in making purchase decisions and *lifestyle*			
NUTRI1	0.5513	0.5463	0.5603
NUTRI2	0.4847	0.4771	0.4982
EXERCISE	3.0707	4.0339	4.1364
Number of Observations	2841	1577 (55.51%)	1264 (44.49%)

considerations of nutrition in making purchase decisions. Respondents were asked the following nutrition-related question: "When you choose the foods you eat, please tell me how frequently you consider the following issues, using a 10-point scale, where 10 means you consider nearly all the time (NAT), and 1 means you almost never (AN) consider it." Two categories of questions formed the basis for developing health considerations indices. The first category is related to the considerations of 'desirable' factors such as vitamins and minerals, contribution of food to the overall recommended daily allowance, amount of fiber, and amount of protein. These nutrients are desirable because, in general, a consumer would desire to have more of them than less. The second category was considerations of 'undesirable' nutritional factors such as cholesterol level, sodium content, fat, additives, calories, and sugar in making purchase decisions.

Nutritional considerations in purchase decision were recorded on a scale of 1 to 10, 1 being almost never (AN) considered while making food purchase decisions and 10 being considered nearly all the time (NAT). Table 3 reports the mean and the coefficient of variance (CV) for the households' responses to nutritional issues. As expected, mean responses were generally neutral. That is, on average, households tended to consider both desirable and undesirable nutrition factors "sometimes" in making food purchase decisions. However, the reported coefficient of variation suggests that there was a considerable variation in the responses.

Nutritional Considerations Indices (NCIs) were designed following Misra et al. (1995) and Jensen and Kesavan (1993). The item scores for each respondent were first summed to get a total score in each of the two nutrition categories. The maximum total scores were 60 and 40 for undesirable and desirable catego-

Table 3. Nutritional Issues Considered by Household Meal Planners while Making Food Purchase Decisions

Nutritional Issues	Mean	Coefficient of Variation
Undesirable Nutritional Factors:		
Cholesterol level in the food	5.56	60.23
Sodium (salt) content in the food	5.21	62.75
Amount of fat in the food	6.70	47.59
Amount of additives in the food	4.61	69.42
Number of calories in the food	5.82	54.67
Amount of sugar in the food	5.07	61.33
Desirable Nutritional Factors:		
Number of vitamins and minerals in the food	5.02	60.58
Overall contribution of the food to the recommended daily allowance	4.68	64.86
Amount of fiber in the food	4.65	65.46
Amount of protein in the food	4.90	62.35

ries respectively, the minimum being 6 and 4. The total scores were then divided by the maximum possible total and expressed as an index ranging from 0.01 to 1.0. An index value of 1.0 corresponded to the highest possible score. The collinearity between 'desirable' and 'undesirable' nutritional indices was not high enough to require a single nutritional index. The correlation coefficient was 0.56. The 'desirable' and 'undesirable' factors were considered separately because of the promotion and advertising strategies that may be applied by peanut snack firms. Since these variables are proxy variables for unobserved tastes and preference measures, they carry with them all the problems associated with using proxy variables (Gao and Shonkwiler, 1993).

Empirical Findings

Table 4 reports the parameter estimates for the double hurdle, Tobit and Complete Dominance models. Maximum likelihood ratio tests rejected the null hypothesis, at the 1-percent level, that double hurdle and standard Tobit models were statistically equivalent ($\chi^2_{df=16}$ = 84). Hence, the null hypothesis that in the case of peanut products all consumers were market participants (Tobit) was rejected in favor of the behavioral explanations specified in the double hurdle model. The likelihood ratio test

comparing the double hurdle against the Complete Dominance model ($\chi^2_{df=16}$ = 571.78) rejected the null hypothesis that all participants had nonzero purchases. This result implies that there are consumers who genuinely dislike snack peanuts either due to perceived negative nutritional attributes or due to other reasons, such as allergies. Also, among the present users of snack peanuts several economic and non-economic factors could influence them to increase their purchase frequency.

Signs of the parameters for purchase frequency were uniform across Tobit, CD, and double hurdle models with the exception of income squared. In general, the absolute values of the coefficients were larger for the double hurdle model than the CD and Tobit models. This implies that the Tobit and CD specifications underestimated the impact of the explanatory variables on the household's decisions of purchasing snack peanuts. The remaining analysis will use parameter estimates from the double hurdle model.

Household income appeared to be an important factor in both decisions of whether to participate (δ) and how many times to purchase (β) snack peanuts in the double hurdle model. The coefficients were positive and statistically significant. Households with higher income tend to have higher probability of participating in the snack peanuts market. Also,

Table 4. Estimated parameters for double hurdle, Tobit models, and Complete Dominance, Snack Peanuts[a]

Variables	Cragg's "double hurdle"	Tobit	Complete Dominance
Market Participation			
Intercept	1.1538*		0.2292
Household Income	0.0426***		0.0178***
Household Income-squared	0.0003***		−0.0001***
Housekids	0.9785***		0.1140
Family Size	−0.9268		0.0223
Residence-Urban	−0.2473		−0.1299*
Northeast	−0.6630***		−0.0875
Midwest	−0.3335		0.0231
South	−0.0891		0.1439*
White	−0.2544		−0.2526**
Black	−0.0132		0.0814
Education	−0.0334		−0.0221
Age	−0.0008		0.0019
Gender	−0.1860		−0.1939***
Nutrition-Undesirable	0.4315		−0.0099
Nutrition-Desirable	−0.3978		−0.1434
Exercise	−0.0665**		−0.0063
Purchase Frequency			
Intercept	2.3197***	1.5975***	3.4967***
Household Income	0.0383**	0.0734***	0.0369***
Household Income-squared	0.0002**	0.0006***	−0.0003***
Housekids	−1.4180***	−0.7495***	−1.1881***
Family Size	0.3754***	0.3085***	0.3120***
Residence-Urban	−0.1803	−0.4239**	−0.1445
Northeast	1.1824***	0.5707**	0.9535***
Midwest	0.6284***	0.3611	0.4012**
South	1.2280***	1.1616***	1.0172***
White	−0.6689**	−0.8430***	−0.3780
Black	0.4906	0.5206	0.4211
Education	−0.0915	−0.1121**	−0.0722
Age	0.0132**	0.0111*	0.0090*
Gender	−0.9997***	−1.1319***	−0.8400***
Nutrition-Undesirable	−3.0449***	−2.5822***	−3.0083***
Nutrition-Desirable	1.4357***	1.0803***	−1.6433***
Exercise	0.1726***	0.1052***	0.1436***
SIGMA	4.9953***	5.2438***	4.5201***
Log Likelihood	−5616.76	−5658.04	5902.65

[a] * indicates significance at $\alpha = 0.10$, ** indicates significance at $\alpha = 0.05$, *** indicates significance at $\alpha = 0.01$.

those who were already in the market were likely to buy snack peanuts more frequently as their income grew. The results indicated that household size had no impact on the decision of whether to participate, but a positive impact on the decision of how many times to purchase snack peanuts. All these results are in line with the expectation that as household income grows and the household size grows consumption of snack peanuts will increase.

Households with children were likely to participate in the snack peanut market, but children had a negative impact on the decision of how many times to purchase snack peanuts.

One possible explanation for such conflicting behavior may be that young children are likely to be provided with snack peanuts by their parents as a snack food item, but are discouraged to eat in excessive quantity. Such ambivalence may have been caused by confusing nutritional information about peanut products. In addition to that, these households must spread their food expenditures over a broader set of food and other goods, resulting in a decline in peanut consumption.

Residence (urban vs. suburban or rural) status had insignificant impact on the decision of whether to participate or on how many times to purchase snack peanuts. The hypothesis that regional location of residence may influence snack peanut consumption behavior because of the differences in lifestyle was tested using dummy variables. It is important to note that the estimated parameters are in relation to the excluded category, the western region. The results in Table 4 indicate that households located in the northeast region were most unlikely to be market participants for snack peanuts. However, those who were already purchasing snack peanuts and were located in the South were likely to purchase most frequently among the four U.S. regions. Respondents who lived in peanut producing southern states are likely to have favorable attitude toward peanuts and are likely to buy more snack peanuts than those who lived in the other parts of the United States.

Gender of a household meal planner did not have any effect on participation decisions in the snack peanut market. However, once a household is a participant, female household meal planners purchased snack peanuts fewer times than their male counterparts. This result is consistent with the other findings that female household meal planners are more likely to consider nutritional components when making food selection decisions than are males (Rimal and Fletcher, 2000; Frazao and Cleveland, 1994).

Although race was not an important factor in making participation decisions for snack peanuts, race had significant effects on purchase frequency. A white household meal planner was likely to buy snack peanuts less frequently than one belonging to other ethnic groups. It is likely that white household meal planners were more concerned about fat content in peanuts than those belonging to other ethnic groups.

As reported in Table 4, NCIs had statistically insignificant impact on the participation decision. However, nutritional considerations were critical in making purchase decisions for the participant households. Such results imply that nutrition may not play a role in participation, but it does influence consumption levels. Perhaps the consumers in the survey adhere to Ben Franklin's recommendation on the need for moderation in everything. Those household meal planners who were concerned about undesirable nutritional factors such as fat and cholesterol made frequent purchases of snack peanuts. Those who considered desirable nutritional factors such as vitamins and minerals in making food purchase decisions bought snack peanuts more frequently. Meal planners' lifestyle, represented by weekly exercise habits, had significant impact on the participation decision for snack peanuts. Those meal planners who exercised regularly were less likely to participate in snack peanut markets. Interestingly, however, those who were the participants in snack peanut markets purchased them more frequently if they exercised regularly. It may reflect a different kind of understanding about nutrition among those consumers who exercised regularly. Perhaps those consumers feel as though they can afford to consume these types of "luxuries" after reducing calories through exercise.

Effects of Nutritional Considerations and Exercise Habits

The effects of nutritional considerations and exercise habits were further examined using the profile of a typical snack peanut consumer. A typical peanut consumer household was located in the rural or suburban south of the U.S. The household had a white female household meal planner in the 40s with some college education. The gross annual income of the household was fifty thousand dollars. The household size was three with one child. The

Table 5. Effects of nutritional considerations in household food purchase decisions on predicted probabilities and amount purchased of snack peanuts[1]

Measure	Almost Never Consider	Almost Always Consider
Undesirable Nutrition Factors		
Probability of Market Participation	0.9838	0.9943
Probability of Nonzero Purchase given market participation	0.7825	0.5918
Overall Probability of Nonzero Purchase	0.7699	0.5884
Conditional Mean Frequency of Purchase (number of times in six months)	8.90	6.16
Unconditional Mean Frequency of Purchase (number of times in six months)	6.35	3.62
Desirable Nutrition Factors		
Probability of Market Participation	0.9933	0.9827
Probability of Nonzero Purchase given market participation	0.6635	0.7519
Overall Probability of Nonzero Purchase	0.6590	0.7389
Conditional Mean Frequency of Purchase (number of times in six months)	7.10	8.39
Unconditional Mean Frequency of Purchase (number of times in six months)	4.68	6.20

[1] The following formula for Cragg model (Jenson, 1995) was used to calculate the above predictions:
(a) Probability of market participation (PMP) $= \Phi(Z_i\delta)$
(b) Probability of Nonzero Purchase Given Market Participation (PNP) $= \Phi(X_i\beta/\sigma)$
(c) Overall Probability of Nonzero Purchase (OPN) $= \Phi(Z_i\delta)\Phi(X_i\beta/\sigma)$
(d) Conditional Mean Frequency of Purchase, $(E(Y|Y_i>0)) = X_i\beta + \sigma \Phi(X_i\beta/\sigma)/\Phi(X_i\beta/\sigma)$
(e) Unconditional Mean Frequency of Purchase, $E(Y_i) = \Phi(Z_i\delta)\Phi(X_i\beta/\sigma) E(Y|Y_i>0)$

household meal planner exercised three times in a week. The effects of nutritional considerations in food purchase decisions on market participation and on purchase of snack peanuts were shown at two levels. First was the effect of undesirable nutritional factors such as fat and cholesterol. The effect was shown when a household meal planner "almost never" and "almost always" considered undesirable nutritional factors while she or he considered desirable nutritional factors "sometimes" (0.5 index value). In the second level, the effects of desirable nutritional factors were calculated keeping the considerations of undesirable nutritional factors at 0.5 index value.

Table 5 shows the effects of two types of nutritional considerations at two levels on the predicted probabilities of participating in snack peanut markets and purchasing them. It reports the conditional and unconditional mean frequency of purchase in six months for the two scenarios. Conditional mean frequency was defined as the number of times a typical household was predicted to purchase snack peanuts in six months provided it was a participant household. Unconditional mean frequency predicted the number of times snack peanuts were purchased irrespective of whether a household was a participant household. If the household meal planner "almost always" considered undesirable nutritional factors such as fat and cholesterol, her likelihood of participating in the snack peanuts market was only slightly higher than when she "almost never" considered. However, the probability of nonzero purchase, once she was a market participant, was clearly higher if she "almost never" considered undesirable nutritional factors while making food selection than if she considered them "almost always". For example, her probability of nonzero purchase given market participation when she "almost never" considered undesirable nutritional factors while making food purchase decision was 0.7699, which decreased to 0.5884 when she "almost always" considered them. Similarly, conditional and unconditional mean frequency of purchase decreased when she "almost always" considered undesirable nutritional factors while making food purchase decisions.

For example, given market participation a typical household was likely to purchase snack peanuts about nine times in six months when the household meal planner "almost never" considered undesirable nutritional factors. The purchase frequency decreased to about six times when she "almost always" considered them. Thus the net effect was a loss of about three purchases in six months. The results suggest that the perceived negative nutritional attributes of peanuts played a significant role in reducing purchase frequency. However, nutritional information had no effect on participation decisions among households.

In the lower portion of Table 5, predictions for the typical snack peanut-consuming household were shown when the household meal planner considered desirable nutritional factors such as vitamins and minerals while making food purchase decisions. Although the differences between "almost never" consider and "almost always" consider for the probability of market participation were negligible, considerations of desirable nutritional factors "almost always" enhanced the probabilities of nonzero purchase of snack peanuts for a participant household. The probability of nonzero purchase given market participation increased from 0.6635 to 0.7519. Consequently, overall probability of nonzero purchase, conditional, and unconditional mean frequency of purchase increased. When a meal manager "almost never" considered desirable nutritional factors she was likely to buy snack peanuts about five times in six months which increased to about six and half times when she "almost always" considered them. Households focusing on desirable nutritional components had favorable attitudes toward snack peanuts that translated into increased frequency of purchase within a specified time.

The calculated effects of the discrete nutrition variables on participation and purchase frequency suggest that emphasis on nutritional attributes by peanut producers while promoting their products will have negligible effects on the participation but positive and numerically meaningful effects on the purchase frequency. It is a bit disconcerting to see that the probabilities of participation are so similar at opposite ends of the scale for both nutrition variables.

Effects of exercise habits of the household meal planner of the profile household on the probability of market participation and purchase of snack peanuts are shown in Figure 2. In calculating the effects it is assumed that the household meal planners considered desirable and undesirable nutritional factors "sometimes." That is, both nutritional indices were set at 0.5. As seen in the figure, the exercise habit of the household meal planner had very little impact on the probabilities of market participation (PMP) for snack peanuts. However, as the number of days of exercise in a week increased, the probabilities of nonzero purchase given market participation (PNP) and overall probability of nonzero purchase (OPN) increased. Once again, positioning peanuts as snack food for people with healthy lifestyles may not bring non-users to the snack peanuts market, but will enhance purchase frequency among those who practice a healthy lifestyle and who are already snack peanuts users.

Conclusions and Implications

This paper has examined factors of influence on consumer decision-making toward snack peanuts consumption. Three types of demand models were specified and estimated to examine participation and purchase level decisions among U.S. households regarding snack peanuts. The decision of whether to participate in the market was separate from the purchase-level decision by participating households for snack peanuts. This result was shown by rejecting the Tobit and CD models in favor of the double hurdle model.

Significant socioeconomic variables influencing the participation decision in the snack peanut market were income, children in the household, geographic location, and household meal planners' exercise habits. Race, education, nutritional considerations in food purchase decisions, exercise habits of household meal planners, age, geographic location, family size, children in the household, residence and gender were the most important variables affecting purchase-level decisions.
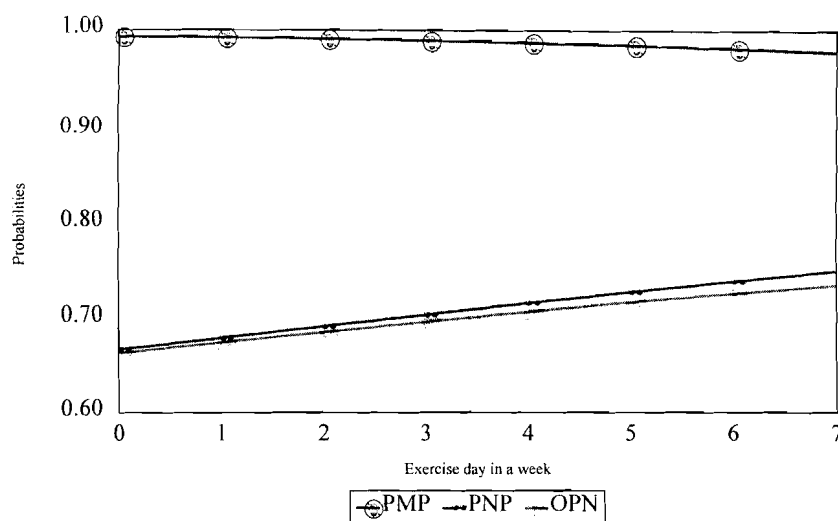
Figure 2. Effects of exercise habits on the probabilities of market participation (PMP), non-zero purchase given market participation (PNP) and overall probability of nonzero purchase (OPN) for snack peanuts

The implications of this research to the peanut industry are twofold. First, producers of peanut products need to separate their products from the general snack category. As households grow more and more concerned about nutrition in food, producers of peanuts must highlight the positive nutritional effects of their products. For example, the presence of children in the household had opposite effects on participation and consumption decisions. Parents are likely to buy snack peanuts for their children but are likely to discourage excessive consumption due to their health concerns regarding excessive consumption of snack foods. Perhaps snack peanut producers need to position their product as a healthy snack food as opposed to being a "junk" food and target specifically families with children.

Although nutritional considerations did not have a significant impact on participation-level decisions, zero purchases of snack peanuts may have reflected the attitude of those consumers who had a healthy lifestyle. The sign and significance of exercise variable (work) in the double hurdle model tended to support this hypothesis. The results suggest that those household meal planners who were overly concerned about undesirable nutritional factors tended to decrease their purchase of snack

peanuts. Those who were more concerned about desirable nutritional factors, however, tended to increase purchase frequency. The implication of this result is that those buyers who already buy snack peanuts are likely to increase their purchase frequency if desirable nutritional factors in peanut products are highlighted through health professionals and media.

Second, given that the decisions regarding snack peanuts purchase differ across region, gender, race, and income groups, strategies have to be clearly targeted in order to be successful. For example, many studies have shown that women are more concerned about health and nutrition than men. In most cases, women make household decisions regarding food selection. Therefore, peanut products targeted for household consumption should be positioned as healthy food. Similarly, peanuts are often considered as a special snack consumed during sports activities which are predominantly participated in by men as players or as spectators. The 'fun' aspects of peanuts may be highlighted when targeting this particular group. The results suggested that household income affected both participation and purchase frequency decisions positively up to a certain income level and larger households

were likely to purchase snack peanuts more frequently than smaller households. Promotion intended to develop markets and encourage both participation and consumption of snack peanuts should focus on large size and medium-income families.

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