Influence of Product Attributes and Household Characteristics on Consumers' Attitude Toward and Purchase Pattern of In-shell Peanuts

Arbindra P. Rimal and Stanley M. Fletcher

A nationwide household survey was used to examine U.S. consumers' attitude and purchase behavior toward in-shell peanuts. Fishbein's multiattribute model was the basis for evaluating the effects of perceived product attributes on attitudes toward in-shell peanuts. Consumer purchase behavior was analyzed using a count data model. The results suggest that attitudes toward in-shell peanuts were influenced by attributes such as fat, taste, and healthiness, and that taste was the only attribute influencing consumers' purchase decisions. Consumers who perceived that in-shell peanuts contained undesirable nutritional ingredients, such as fat and cholesterol, developed unfavorable attitudes toward in-shell peanuts. These perceptions translated into reduced purchase frequency for in-shell peanuts.

One of the most important factors influencing the U.S. peanut supply management program and the volume of domestic peanut production is the domestic edible food use of peanuts (Carley and Fletcher, 1997). Peanuts are usually consumed as food in one of four forms: peanut butter, snack peanuts, candy, and in-shell. The consumption of in-shell peanuts as food has been volatile in the U.S. domestic market for the past several years (Figure 1). According to a national peanut survey conducted by the Gallup Organization for the National Peanut Council (1997), 58 percent of the population did not consume in-shell peanuts in the 12 months prior to the survey date. The survey defined those participants as non-users. One way in which peanut demand could be enhanced is through increased consumption of in-shell peanuts by non-users in the domestic market. Another approach is to increase the intensity of consumption among the user population.

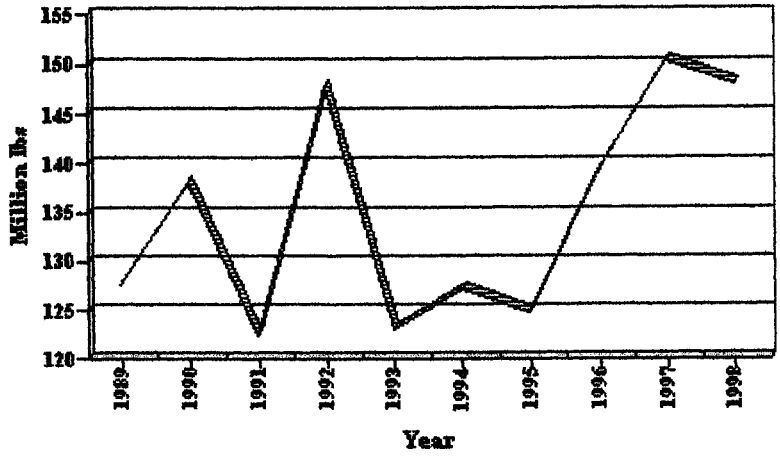

Figure 1. In-shell Peanut Consumption.

Source: USDA (1989–98).

Arbindra P. Rimal is assistant professor, Agribusiness, Southwest Missouri State University, Springfield, MO. Stanley M. Fletcher is professor, Department of Agricultural and Applied Economics, College of Agricultural and Environmental Sciences, Griffin Campus, University of Georgia, Griffin, GA.

Peanut products are an excellent source of vitamins and protein; however, peanuts are often associated with being high in fat and cholesterol. For example, the 1997 peanut survey reported that 41 percent of the respondents thought that peanut products were high in cholesterol while 23 percent did not know about the cholesterol content of peanuts. In fact, peanuts are normally a cholesterol-free food product. Most of the fat in peanuts is unsaturated fat, which has been shown to lower LDL-cholesterol levels. The fat content in peanuts is the lowest among snack and lunch items, such as American cheese slices and beef bologna. Such inaccurate nutrition perception likely plays a critical role in peanut-product purchase decisions. Some individuals may decide not to purchase peanut products because of their negative perceptions about peanuts' nutritional attributes. Others may buy them regularly due to the perceived positive attributes of peanuts. Similarly, in-shell peanuts are often considered as a special snack consumed during sports activities. For example, vendors at ballparks around the United States sell roasted nuts to fans eager to crack shells and enjoy the game. Does their image play any role in shaping consumers' attitudes toward in-shell peanuts and consumption levels?

This study assesses U.S. consumers' preferences for in-shell peanuts using consumer survey data collected by the Gallup Organization in December 1997. The study is divided into two parts. First, factors affecting consumers' attitudes toward in-shell peanuts are analyzed. The influence of perceived attributes of in-shell peanuts and socioeconomic variables on consumers' attitudes toward in-shell peanuts are investigated using Fishbein's multiattribute model. Next, a count data model is used to analyze sampled households' purchase patterns of in-shell peanuts. The identification and comparison of factors influencing attitudes toward and purchase of in-shell peanuts provide valuable information in formulating short- and long-term marketing programs.

Conceptual and Empirical Models

Attitude Toward In-shell Peanuts

Peanut marketers need to know whether consumers hold favorable or unfavorable attitudes toward peanuts, and they must understand the reasons behind these attitudes. Fishbein's (1963) multiattribute model represents a valuable approach in examining the relationship between consumers' product knowledge in terms of products' perceived attributes and consumers' attitudes toward these products. Symbolically, Fishbein's multiattribute model can be written as

$$(1) \qquad A_0 = \sum_{i=1}^{n} \beta_i X_i ,$$

where A_o is the attitude toward a product; X_i is the strength of the belief that the product has attribute i; β_i is the evaluation of attribute i; and n is the number of salient attributes. The model, therefore, proposes that attitudes toward a given product are based on the summed set of beliefs about the product's attributes weighted by the evaluation of these attributes. The evaluations (β_i) and the belief (X_i) are obtained from survey responses and used for the calculation of the overall attitude toward a product. The X_i component—which represents the strength of a consumer's belief that the product possesses a particular attribute—is typically measured using a scale variable, for example, a variable between "agree strongly" and "disagree strongly." Ideally, the information on the evaluation of the attributes is also collected using a similar type of scale variable; however, studies have found that respondents often have difficulty in distinguishing between the existence of the attribute and the evaluation of the attribute for low-involvement products like food (Wadel and Steenkamp, 1991; Steenkamp, 1997). The situation can be handled by treating equation (1) as a stochastic regression equation and statistically measuring the evaluation of attributes (β_i). The following is the modified equation that represents the stochastic multiattribute model as proposed by Fishbein, using four attributes.

$$(2) \quad A_0 = \sum_{i=1}^{n} \beta_i X_{it} + \varepsilon_t , \quad i = 1,\ldots,4; t = 1,\ldots,T$$

where X_{it} is the i^{th} attribute of in-shell peanuts reported by the t^{th} respondent; β is the vector of unknown parameters representing the evaluation of the attributes; and ϵ_t is the independently and identically normally distributed error term. The

survey data used in this study provide information on consumers' attitudes toward in-shell peanuts and their statements regarding four types of attributes of in-shell peanuts—namely fat, taste, healthiness, and consumption occasions. Respondents expressed the existence of the four attributes using a five-point scale ranging from agree strongly to disagree strongly.

An ordered probit model is selected as the appropriate empirical model, given that the attitude variable is measured using a scale that allows for the ranking of outcomes. The empirical model is defined as:

$$Y^*_t = \beta' X_t + \epsilon_t, \tag{3}$$

where Y^*_t is an unobserved attitude toward in-shell peanuts; X_t is a vector of four perceived attributes of in-shell peanuts and sociodemographic variables hypothesized to affect the overall attitude toward in-shell peanuts; β is the vector of unknown parameters; and ϵ_t is the independently and identically normally distributed error term. The role of sociodemographic variables in the formation of attitude toward products has been addressed in previous research (Steenkamp, 1997; Alvenslaben, 1997). While Y^*_t is unobserved, respondents actually report the attitude by selecting one of the five categories (Y_t) that represent consumers' like or dislike of in-shell peanuts:

$$\begin{aligned}
&Y_t = 1 \quad \text{if} \quad Y^*_i \le 0;\\
&Y_t = 2 \quad \text{if} \quad 0 < Y^*_i \le \mu_1;\\
&Y_t = 3 \quad \text{if} \quad \mu_1 < Y^*_i \le \mu_2;\\
&Y_t = 4 \quad \text{if} \quad \mu_2 < Y^*_i \le \mu_3; \text{ and}\\
&Y_t = 5 \quad \text{if} \quad \mu_3 < Y^*_i \le \mu_4.
\end{aligned} \tag{4}$$

$\mu_1 \ldots \mu_4$ are unknown thresholds. The probability that a respondent chooses category j for like or dislike of in-shell peanuts is

$$\text{Prob}(Y_t = j) = \Phi(\mu_j - \beta' X_t) - \Phi(\mu_{j-1} - \beta' X_t). \quad j = 1,2,3,4,5 \tag{5}$$

Φ is the normal cumulative distribution function. The log likelihood function for equation (5) is

$$\ln L = \sum_{j=1}^{5}\sum_{i=1}^{t} \ln\{\Phi(\mu_j - \beta' X_t) - \Phi(\mu_{j-1} - \beta' X_t)\}. \tag{6}$$

In limited dependent variable models, heteroskedastic error causes inconsistency of the parameter estimates (Arabmazar and Schmidt, 1981). To correct for the potential inconsistency caused by heteroskedasticity, the standard deviations, σ_i, can be specified as

$$\sigma_i = \exp(\gamma' z_t), \tag{7}$$

where z_t is a vector of exogenous variables causing heteroskedasticity, and γ is a conformable parameter vector. The unknown parameters, including β (equation (6)) and γ (equation (7)), for the model were estimated using maximum likelihood estimation via *LIMDEP* (Greene, 1995).

In-shell Peanut Purchase Behaviors

The frequency of in-shell peanut purchase is reported as integer values. It is, therefore, appropriate to analyze the purchase behavior using empirical models based on count data, such as the Poisson or the negative binomial models (Cameron and Trivedi, 1997; Greene, 1997). The Poisson regression model assumes that the conditional mean of the outcome is equal to the conditional variance. In the presence of overdispersion, the conditional variance of the outcome is higher than the conditional mean. The Poisson model will yield consistent estimates of the parameters, but the standard errors are biased downward (Gourieroux, Monfort, and Trogon, 1984). While this problem may be common in practice, alternative models—such as geometric distribution or negative binomial models—can remedy the situation.

A negative binomial count data model, suggested by Long (1997), was used to represent the purchase frequency of in-shell peanuts. The negative binomial distribution of both zero and positive count was selected to account for the overdispersion in the data. The log likelihood function for the single-decision negative binomial model of in-shell peanut purchase can be written as:

(8) $L(\beta \mid y, X) =$

$$\prod_{t=1}^{T} \frac{\Gamma(y_t + \alpha^{-1})}{y_t! \Gamma(\alpha^{-1})} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu_t} \right)^{\alpha^{-1}} \left(\frac{\mu_t}{\alpha^{-1} - \mu_t} \right)^{y_t},$$

where $\mu = X\beta$, with X representing the vector of explanatory variables, including sociodemographic and product attributes; y_t = in-shell peanut purchase frequency; and α = overdispersion parameters.

Survey Designs and Data Collection

A nationwide household survey of 507 households was used to examine purchases of in-shell peanuts. All survey respondents were at least 18 years of age. A multiple call-back method was used for the telephone interviews. Up to five call-backs were made to the same telephone number to eliminate bias in favor of those who were easily reached by telephone. Survey questionnaires included several aspects of consumer behavior: purchase level of peanut products, including in-shell peanuts; attitudes toward in-shell peanuts; perceived attributes of in-shell peanuts; nutritional consideration in making purchase decisions; respondents' exercise habits; and demographic backgrounds. Detailed data regarding attitudes toward in-shell peanuts and purchase patterns were obtained.

The specific variables used in the models and their descriptions are presented in Table 1. Attitudes toward in-shell peanuts were measured using a five-point scale variable ranging from "dislike in-shell peanuts very much" to "like in-shell peanuts very much." Statements were associated with consumption intensity to obtain a more precise ordinal measure of attitude. Approximately 24 percent of the respondents expressed moderate to extreme liking of in-shell peanuts while 42 percent expressed indifference.

A list of four statements was used to measure the perceived product attributes:

(1) In-shell peanuts are low in saturated fat.

(2) In-shell peanuts are a good-tasting snack.

(3) In-shell peanuts are a healthier snack.

(4) In-shell peanuts are for special occasions.

For each statement, respondents were asked to select one of the five options ranging from disagree strongly to agree strongly. More than 80 percent of the respondents either agreed or agreed strongly that in-shell peanuts taste good. Only 32 percent agreed or agreed strongly that in-shell peanuts are for special occasions only. (As previously mentioned, a common perception regarding in-shell peanuts is that they are consumed during sporting events only.)

Selection of variables and their research hypotheses were determined on the basis of similar empirical studies relating to other types of food. Socioeconomic variables influence various stages of consumers' decision-making. Food consumption, particularly that of snack food, varies across socioeconomic characteristics. For example, men consume more snacks than women, and older people are more likely to snack than younger people (Mcbean, 1988). Change in household income influences purchase of food by restricting or relaxing budget constraints; however, the exact nature of the relationship depends on the nature of the good. Households are likely to switch to more expensive snacks as their income levels increase. It was hypothesized that respondents in peanut-producing regions are likely to have better attitudes toward in-shell peanuts and are likely to more frequently purchase peanuts than those respondents in other U.S. regions.

Respondents' nutrition consideration in purchasing in-shell peanuts and their lifestyles were also included in the models. Since a consumer's attitude and concern regarding nutrition and health were observed indirectly, the responses to several nutrition and health-related questions were combined to construct two index measures of the consumer's consideration of nutrition in making purchase decisions. Two categories of questions formed the basis for developing health consideration indices.

Table 1. Names of the Variables and Their Descriptions.

Variable	Description
Peanut Product Purchases	
LIKE	Ordered categorical variable representing the attitude toward in-shell peanuts—1=dislike in-shell peanuts such that I barely eat them once a month; 5=like in-shell peanuts so much that I tend to eat them every day
PURINS	Number of times in-shell peanuts were purchased in previous six months
Household Characteristics	
GRINC	Gross household income (in '000 dollars)
FSIZE	Number of family members
Geographic Location	
PNTSTATES	=1 for peanut-producing states—Virginia, North Carolina, South Carolina, Alabama, Georgia, Florida, Oklahoma, Texas, and New Mexico; =0 otherwise
Household Meal Planner's Characteristics	
RACE	=1 if household meal planner is white; =0 otherwise
EDUCATION	Education level of household meal planner—1=less than high school; 2=high school graduate; 3=some college; 4=trade/technical; 5=college; 6=postgraduate
AGE	Midpoints in the age groups of household meal planners
GENDER	=1 if household meal planner is female; =0 otherwise
Nutrition Consideration in Making Purchase Decisions and in Lifestyle	
NUTRI1	Index of undesirable nutrition considered in making food purchase decisions (0-1)
NUTRI2	Index of desirable nutrition considered in making food purchase decisions (0-1)
EXERCISE	Household meal planner's sports activities per week (0 per week to 7 days per week)
Meal Planner's Perception of In-shell Peanuts	
FAT	In-shell peanuts are low in saturated fat—1=disagree strongly; 5=agree strongly
TASTE	In-shell peanuts are a good-tasting snack—1=disagree strongly; 5=agree strongly
HEALTHY	In-shell peanuts are a healthier snack—1=disagree strongly; 5=agree strongly
OCCASION	In-shell peanuts are for special occasions—1=disagree strongly; 5=agree strongly

The first category is related to the consideration of desirable nutritional factors, such as vitamins and minerals, contribution of food to overall recommended daily allowance, amount of fiber, and amount of protein. In general, consumers were expected to want more of those nutritional factors than less. The second category was consideration of undesirable nutritional factors—such as cholesterol level, sodium content, fat, additive, calories, and sugar—in making the purchase decision. Nutrition consideration in the purchase decision was recorded on a scale of 1 to 10, with 1 being "almost never considered" in the food purchase decision and 10 being "nearly always considered." The mean and the coefficient of variation for households' responses to nutritional issues is reported in Table 2. As expected, mean responses were generally neutral. That is, on average, households tended to consider desirable and undesirable nutrition factors "sometimes" in making food purchase decisions; however, the reported coefficient of variation suggested that there was considerable variation in the responses.

Table 2. Nutritional Issues Considered by Household Meal Planners While Making Food Purchase Decisions.

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

Nutrition consideration indices were designed following Misra, Fletcher, and Huang (1995). 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 categories, respectively. The minimum scores were 6 and 4. The total scores were then divided by the maximum possible total and expressed as an index ranging from 0 to 1. An index value of 1 corresponded to the highest possible score. The descriptive statistics of the variables used in the analyses are reported in Table 3.

Table 3. Descriptive Statistics of the Variables Used in the Analyses.

Variable	Mean	Standard Deviation
LIKE	2.02	1.12
PURINS	3.03	4.88
GRINC	43.07	20.19
FSIZE	2.75	1.56
PNTSTATES	0.19	0.37
RACE	0.85	0.35
EDUCATION	3.55	1.54
AGE	43.62	14.35
GENDER	0.49	0.50
NUTRI1	0.49	0.27
NUTRI2	0.41	0.28
EXERCISE	3.33	2.40
FAT	2.94	1.26
TASTE	4.43	0.97
HEALTHY	3.39	1.32
OCCASION	2.67	1.60

Discussion of Results

Results from the ordered probit model for consumer attitude and the negative binomial count data model for consumer purchase behavior are reported in Tables 4 and 5, respectively. The marginal effects of explanatory variables on number of times in-shell peanuts are purchased in six months are presented in Table 6. Marginal effects are calculated for each explanatory variable while keeping the others at their mean values.

Table 4. Consumer Attitude Toward In-shell Peanuts: Ordered Probit Model Results.

Variable	Coefficient	Std. Error
Constant	-0.7493***	0.2535
GRINC	-0.0017	0.0018
FSIZE	0.0195	0.0226
RACE	-0.0734	0.0956
PNTSTATES	0.1815***	0.0756
AGE	0.0029	0.0027
GENDER	-0.2576***	0.0782
FAT	0.0515**	0.0255
TASTE	0.1111***	0.0402
HEALTHY	0.0707***	0.0282
OCCASION	-0.0068	0.0207
NUTRI1	-0.3074*	0.1863
NUTRI2	0.0983	0.1734
EXERCISE	0.0387***	0.0144
μ_1	0.3806***	0.0661
μ_2	0.8285***	0.1336
μ_3	1.6380***	0.2193
Log Likelihood Function Value	-557.99	
Log Likelihood Function Value (Restricted; β=0)	-594.90	
χ^2	73.81***	
Madalla's Pseudo R^2	0.15	

* indicates significance at α=0.10; ** indicates significance at α=0.05; *** indicates significance at α=0.01.

Table 5. In-shell Peanut Purchase Pattern: Negative Binomial Model Results.

Variable	Coefficient	Std. Error
Constant	-0.1740	0.5106
GRINC	-0.0051*	0.0031
FSIZE	0.0766**	0.0365
RACE	-0.2320	0.1619
PNTSTATES	0.0805	0.1446
AGE	0.0034	0.0043
GENDER	-0.4277***	0.1081
FAT	0.0159	0.0441
TASTE	0.3723***	0.0850
HEALTHY	-0.0003	0.0468
OCCASION	-0.0279	0.0293
NUTRI1	-0.5891**	0.2920
NUTRI2	0.2298	0.2962
EXERCISE	-0.0013	0.0219
α (overdispersion parameter)	1.0668***	0.1062
Log Likelihood Function Value	-977.53	
Log Likelihood Function Value (Restricted; β=0)	-1456.83	
χ^2	958.61***	
Madalla's Pseudo R^2	0.88	

* indicates significance at α=0.10; ** indicates significance at α=0.05; *** indicates significance at α=0.01.

Table 6. In-shell Peanut Purchase Pattern: Marginal Effects for Negative Binomial Model.

Variable	Marginal Effect (Purchase in Six Months)
GRINC	-0.0157*
FSIZE	0.2340**
RACE	-0.7087
PNTSTATES	0.2460
AGE	0.0103
GENDER	-1.3062***
FAT	0.0486
TASTE	1.1373***
HEALTH	0.0010
OCCASION	-0.0850
NUTRI1	-1.7993*
NUTRI2	0.7020
EXERCISE	-0.0039

* indicates significance at α=0.10; ** indicates significance at α=0.05; *** indicates significance at α=0.01.

The chi-square statistics for both models indicate that the null hypothesis that all parameters were jointly zero is rejected at 0.01 level. The null hypothesis of no overdispersion (α=0) is rejected at the 0.01 level in favor of the negative binomial model; hence, the choice of negative binomial over the Poisson distribution is appropriate. Maddala's pseudo R^2 was used to evaluate the fitness of the models (Long, 1997). The values of the pseudo R^2 were 0.15 for the ordered probit model and 0.88 for the negative binomial model. For cross-sectional data with categorical dependent variable the pseudo R^2 is often small (Gujarati, 1995). The pseudo R^2 of the negative binomial model suggests that the fit, when measuring purchase behavior among the sampled households, was as good or better than comparable applications of the model.

Consumer attitudes toward in-shell peanuts were influenced by product attributes and the respondents' characteristics and lifestyle. Those respondents who agreed that in-shell peanuts were low in saturated fat, good-tasting, and healthy had a more favorable attitude than those who disagreed about the existence of those attributes. Not all product attributes affecting attitudes toward in-shell peanuts influenced purchase behavior. For example, the "fat" and "healthy" attributes influenced attitudes but not purchase behavior. The results suggest that the single, important product attribute that can create sales volume is taste. Those respondents who agreed that in-shell peanuts were a good-tasting snack were more likely to buy in-shell peanuts than those who disagreed. Those respondents were likely to purchase in-shell peanuts one time more in six months than those who disagreed, which is a 33 percent increase in purchase frequency as compared to the mean purchase frequency of 3.03 in six months.

Various sociodemographic and lifestyle variables affected consumers' attitudes toward in-shell peanuts and their purchase patterns. Female household meal planners had a negative attitude toward in-shell peanuts that was reflected in their purchase decisions. A male meal planner was likely to buy in-shell peanuts 1.31 additional times in six months as compared to his female counterpart; this is about a 35 percent increase relative to the mean purchase of 3.65 times in six months among male household meal planners. Respondents who lived in a peanut-producing state had a favorable attitude toward in-shell peanuts but did not necessarily buy more in-shell peanuts than those who lived in the other parts of the United States. Socioeconomic factors—such as household income, race, and family size—did not affect the way in which respondents formed their opinion about in-shell peanuts; however, households with higher incomes were likely to buy in-shell peanuts less frequently than those households with lower incomes. A $1,000 increase in household income reduced the purchase frequency for a six-month period by 0.02 times. Households with larger family size were likely to buy more in-shell peanuts than those with smaller family size. Each additional family member constituted 0.23 additional purchases of in-shell peanuts over a six-month period.

Respondents' nutrition concerns in making food purchase decisions were reflected in their attitudes and purchase behavior. Household meal planners who were concerned about undesirable nutrition in food, such as fat and cholesterol, had a negative attitude toward in-shell peanuts and were likely to buy them fewer times than those who were not concerned. Such concern translated into 1.80 times fewer purchases of in-shell peanuts over a six-month period. In contrast, desirable nutrition factors did not influence either the attitude or the frequency of the purchase of in-shell peanuts. Although respondents who exercised more frequently were likely to form a favorable attitude toward in-shell peanuts, this did not translate into additional purchases.

Conclusions and Implications

This study illustrates the difference between attitude and purchase behavior with regard to in-shell peanuts. A number of factors influenced attitudes toward in-shell peanuts, but not all caused any significant effect on the purchase patterns. The attitude toward in-shell peanuts was influenced by attributes—such as fat, taste, and healthiness; however, taste was the only attribute that influenced consumers' purchase decision. Although consumer lifestyle, represented by exercise habits, factored into the formation of opinions about in-shell peanuts, it did not influence in-shell peanut purchases among the sampled respondents. Those respondents are likely to be potential in-shell consumers if sports and health images are highlighted in the promotion campaigns for in-shell peanuts. Thus, growers, shellers, and marketers of in-shell peanuts should target consumers with "healthy" lifestyles as potential buyers.

This study further highlights consumers' growing concern regarding the nutrition content of food items. Those consumers who perceived that in-shell peanuts contained undesirable nutritional ingredients, such as fat and cholesterol, developed an unfavorable attitude toward in-shell peanuts. Such perceptions translated into reduced purchase frequency. It is, therefore, important to address such unfavorable health perceptions among consumers.

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