# Applying Multinomial Logit Model for Determining Socio-Economic Factors Affecting Major Choice of Consumers in Food Purchasing: The Case of Mashhad

M. R. Kohansal[1], and A. Firoozzare[1*]

## ABSTRACT

The aim of this study was investigation of the factors affecting the primary choice of consumers in food purchasing in Mashhad city by applying cross section data of 201 households in 2012. In this study, 56, 30, and 14% of the consumers chose healthiness of food, price of food, and taste of food, respectively, as the primary preference in food purchase. Results of applying multinomial logit model illustrated that older respondents and females were more careful for health than young respondents and males. Also, results indicated that the households with high income and high educational levels were more likely to choose healthy foods. Moreover, respondents who had knowledge of food health were more likely to select healthiness of foods. In addition, comparison of the findings of this study with similar studies indicates that results are analogous. Based on the results of this study, some recommendations are provided for policy makers and food producers.

Keywords: Choice Process, Food Consumption, Primary preference, Multinomial logit model, Primary choice.

## INTRODUCTION

Unbalanced food consumption patterns and poor eating habits are considered as effective factors of many diseases. High-fat diets and consumption of large amounts of high-energy foods are some examples of these kinds of diets. Today, in most countries, health policies encourage people to follow a healthier diet: making a reduction in fatty, sugary and salty foods; eating more fibre-rich, fresh fruits, and vegetables. However, it is difficult to change individual food manners since it is based on habits that have been developed over a lifespan (Phu Tu *et al.*, 2012). Also, consumers worry about the quality and safety of their food. Consumers´ concerns about food are based on worries not only about health, but also about agriculture, ecology, and food culture.

Technological and environmental changes associated with modern food production, such as genetic engineering and the use of pesticides, are also of vital weight for society and for increasing interest to consumers (Holm and Kildevang, 1996).

There are many substances in the world that are detrimental to human health. Henson and Traill (1993) describe food safety as ''the inverse of food risk-the probability of not suffering some hazard from consuming a specific food''.

In recent years, many food companies have developed and marketed foods in response to increasing consumer concern about diet and healthiness. When making purchase decisions, not only consumers are interested in the particular health benefits offered by the product, but also the taste and price. Understanding how individuals perceive characteristics of foods and the factors affecting consumer decision can

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[1] Department of Agricultural Economics, Ferdowsi University of Mashhad, Mashhad, Islamic Republic of Iran.
[*] Corresponding author; email: alifiroozzarea@gmail.com

assist policymakers and producers of food. Knowledge of the factors affecting consumers' decision can supply advantages for producer. Surveys show that, in recent years, producers also pay attention to the scope of food security (Cobanoglu *et al.*, 2013; Rahimi *et al.*, 2011) and, therefore, it is necessary for them to understand the factors affecting the major choice of consumers in food purchasing.

In addition, the policymakers can develop new strategies according to this study. Thus, when priority is given for population dietary change, the need for a greater understanding of the factors that affect food choice and their interactions is greater than ever.

This research attempted to discover the features influencing consumer preferences for food products and analysis of the factors affecting choices of consumers in food purchasing. It is necessary to mention that, in this article, the word "food" applies to all conventional materials that consumers purchase in order to eat or drink, except drugs.

Purchasing decisions of consumer are influenced by demographic and socio-economic factors. Literature review indicates that consumers' attitudes towards food safety, in general, differ according to demographic and socio-economic factors such as sex, age, educational level, and economic status.

Difference between individuals in their choice(s) of food(s) is apparent and the question ''what and why we eat?'' has been addressed by many studies during the last years (Ajzen, 1991; Ajzen and Fishbein, 1980; Köster and Mojet, 2007; Murcott, 1989; Shepherd, 1999; Steiner, 1979). Food choice has been reported as a very complex human behavior that is determined by many factors, not exclusively by physiological and nutritional needs, and their interactions (Phu Tu *et al.*, 2012).

Also, a lot of researches have analyzed factors affecting consumer reaction to food safety. Dosman *et al.* (2001) found that women, older respondents, and households having higher income level tended to perceive food safety of higher risk than individuals in other categories. Shepherd (1999) believe that individual's food choice is determined by the individual's characteristics (including psychological factors such as mood, stress, guilt, etc.); by the ''interactions'' between this individual and the food in question (including biological factors such as hunger and satiety, appetite, perceptive sensory characteristics, etc.) and by the ''interactions'' between this individual and his/her economic conditions (such as cost, income, accessibility, education, skills, time, etc.) and social environment (such as culture, religion, demography, etc.). These factors vary according to stage of life, and the relative weight of one factor will vary from one individual or group of people to the next. Flynn *et al.* (1994) found that women perceive risks to be higher than do men. Krewski *et al.* (1994) found that older individuals were more likely to rate risks higher than younger individuals. Baker (2003) found that women, older respondents, households having higher education level and members of households with young children were the most likely to have an extreme risk avoidance response. The present study was conducted in Mashhad to determine the factors affecting consumers' food preference such as income level, educational level, gender, age, household size, and knowledge of food health.

## MATERIALS AND METHODS

Methodologically, the aim of this study was to show a useful application of the multinomial regression approaches to food consumers in marketing and food sciences research. Discrete choice analysis deals with the modeling of choice from a limited set of discrete alternatives. Most frequently, these are binary choice models using either a probit or logit specification (Riddington *et al.*, 2000). Multinomial logit model is used for analysis of consumers' primary choices. The multinomial logit model represents an

appropriate framework to explore and explain choice process where the choice set consists of more than two alternatives (Greene, 1998; Ben-Akiva and Lerman, 1985). For the sake of this model to be appropriately applied, those alternatives must not be ranked. This model describes the behaviour of consumers when they are faced with a variety of goods with a common consumption objective. However, the goods and choices must be highly distinguished by their individual attributes. Multinomial logit estimation has been used in many empirical studies such as Goktolga *et al.*, 2005; Schupp *et al.*, 1998; Luzar *et al.*, 1998; Ferto and Szabo, 2002; Da´ vila *et al.*, 2002; Seddighi and Theocharous, 2002; Haartsen *et al*, 2003; Baker, 2003; Pundo and Fraser, 2003; Hatirli *et al*, 2004.

The original formulation of the logit model stems from Luce (1959) and the theoretical expression of its choice probabilities can be derived from the random utility maximization theory (Ben-Akiva and Lerman, 1985). The utility $U_{ij}$ derived by the *i*th individual from the *j*th alternative can be written as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \beta_j^t X_i + \varepsilon_{ij} \quad (1)$$

Where, $V_{ij}$ is the average utility, $\varepsilon_{ij}$ is the random part, $X_i$ is the matrix of the characteristics of the individual *i*, and $\beta_j$ is the parameter vector for each alternative. Following the development of random utility theory, the probability, $P_{ij}$ that an individual i selects alternative j equals the probability that $U_{ij}$ is larger than the utilities $U_{ik}$ of all other alternatives in the individual's choice set, *C*.

$$P_{ij} = P(U_{ij} \geq U_{ij}) \qquad \forall k \in C \qquad k \neq j)$$

$$P_{ij} = P(V_{ij} + \varepsilon_{ij} \geq V_{ik} + \varepsilon_{ij}) \qquad \forall k \in C \qquad k \neq j)$$

$$(2)$$

It is assumed that the random components of the utility, $\varepsilon_{ij}$, are independent and identically distributed with a Gumbel distribution, the expression of the probability of an individual *i* choosing an alternative j is given by(Pina and Dı´az Delfa, 2005):

$$P_{ij} = \frac{e^{\beta_j^t X_i}}{\sum_{k \in C} e^{\beta_k^t X_i}} \qquad \forall j \in C \qquad (3)$$

In the context of our study, the logit analysis determines the likelihoods of a consumer selecting one of the different characteristics of food (healthiness, price, and taste), given his/her socio-demographic characteristics.

In other words, multinomial logit models are generalization of logit models for binary responses and fitting the generalized logit model requires simultaneously satisfying the $J–1$ equations that specify the model. Multinomial logit model is defined as follows:

$$\log\left(\frac{p_{ij}}{p_{i1}}\right) = x_i \beta_j \qquad for \qquad j = 1,...,J,$$

$$i = 1,...,N$$

$$(4)$$

Where, $p_{ij}$ is Prob(Y= j|x), which is obtained as follows:

$$P_{ij} = \frac{\exp(x_i \beta_j)}{\sum_{j=1}^{J} \exp(x_i \beta_j)} \qquad (5)$$

Equation (5) can be estimated by the method of maximum likelihood. In this model, the probability is obtained as follows:

$$P_i(Y = 1) = \frac{1}{1 + \sum_{j=1}^{J} \exp\{x_i \beta_j\}}$$

$$P_i(Y = j) = \frac{\exp\{x_i \beta_j\}}{1 + \sum_{j=1}^{J} \exp\{x_i \beta_j\}}$$

$$where \qquad j = 1,2,...J - 1, \qquad i = 1,2,...,N$$

$$P_i(Y = J) = \frac{\exp\{x_i \beta_j\}}{1 + \sum_{j=1}^{J} \exp\{x_i \beta_j\}} \qquad (6)$$

Multinomial logit models assume response counts at each level of covariate combination as multinomial and multinomial counts at different covariate combinations are independent. The benefit of using multinomial logit model is that it models the odds of each category relative to a baseline category as a function of covariates, and it can test the equality of coefficients even if confounders are

different, unlike the case of pair-wise logistics, where testing equality of coefficients requires assumptions about confounder effects (Fujimoto, 2005).

The parameter estimates for the $\beta_j$ vectors that maximize the log likelihood function can be obtained using the Newton method (Greene, 1995). Marginal probabilities of choice (marginal effects) can be calculated from Equation (7) below:

$$\frac{\partial P_{iy}}{\partial x_i} = P_{ij}\left[\beta_j - \sum_{k=1}^{J} P_{ik}\beta_{k0}\right] \quad for J - 1,2,...,J.$$

(7)

Using Equation (7), we can find changes in probabilities for primary choice in food purchase due to a slight change in one of the consumers' characteristics, while holding all other explanatory variables fixed (Goktolga *et al.*, 2005). In the case of qualitative variables included in the model like sex and knowledge of food health, the difference between the probability of each alternative when the variable is equal to one and when it is equal to zero is calculated. In this study, Limdep 8.0 was used to estimate the multinomial logit model.

## The Data

Incorrect dietary habits due to lack of awareness and also some social and economic issues is considered as one of the most important problems all over the world. Some statistics indicate that this situation is poorer in Iran (Table 1).

From Table 1, it is clear that wrong dietary habits is a major problem in Iran. Mashhad, which is considered as one of the most important metropolises of Iran, has similar situation. This city is located in Khorasan Razavi Province, in the northeastern corner of Iran. It is Iran's second largest city, second in size only to Tehran, Iran's capital. Also, these days we observe increasing rate of inauguration of fast-food centers as a result of public interest in these kinds of foods, so that, today, 1,400 fast-food centers work under the control of Deli and Pizzeria union of Mashhad. All around the city, these centers are too crowded and sometimes operators cannot provide the desired service. This trend is worrying.

Moreover, investigation shows that average price of fast foods are much less than traditional foods in this city. These factors besides lack of diversity of traditional foods, delectability of fast foods, attractiveness of fast food centers, and other reasons like lack of food knowledge in the population, tend to change the recommended consumption patterns in this city.

Using a pilot study, which covered 30 cases, we calculated the variance of the intended survey variables. Based on this variance and employing Equation (8), we determined sample size; afterward, by applying simple random sampling method, data of 201 households of Mashhad city were gathered in March 2012 through filling a questionnaire via face to face method.

$$n = \frac{Z^2\delta^2}{d^2}$$

(8)

The questionnaire included three parts. One part was dedicated to behavioral characteristics of the consumers while buying food, the other part was designed to evaluate the economic information of the citizens, and the last part aimed at some social features of the respondents.

**Table 1**. Comparison of pattern of food consumption in the world and Iran.

| Food | The ratio of Iranian consumption to world consumption |
|---|---|
| Fish | 0.33 |
| Vegetables | 0.25 |
| Soybean | 0.05 |
| Egg | 0.33 |
| Milk | 0.33 |
| Sugar | 6 |
| Salt | 2 |
| Bread | 6 |
| Soda | 4 |

Source: Forutan Entrepreneurship Foundation (2012).

# RESULTS

Investigation of the consumers in this study sample shows that 56 percent of them choose healthiness of food as the primary preference in food purchase. Moreover, based on these results, about 30 percent of consumers select taste of food as the primary preference in food purchase and the rest choose price as their major preference. Computing *Chi*-Square test statistic (53.920) depicts that these results is not random, but at the significance level of 1 percent, can be extended to all residents of Mashhad (Figure1). The definitions of variables are represented in Table 2. In this study, the variables considered affecting choices of consumers among primary preference alternatives (PP) were: sex (SE), age (AG), income (INC), education (EDU), household size (HS) and knowledge of food health (KFH).

It is hypothesized that sex, age, income level, education level and household size are the key factors affecting choice of households for consuming food. It is hypothesized that household income level is an important variable that influences household consuming behavior. Consequently, households who have high-income level are more likely to choose healthiness of food than households having low-income level, due to food price being one of the major factors for households with low-income. It is also assumed that consumers who have high educational level are more likely to give preference to healthiness of food than those who have lower level of education. Moreover,
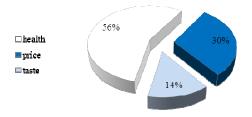


**Figure 1**. Frequency distribution of consumers' priorities of food characteristics, 2012 (n= 201).

household size variable influences respondents purchase behavior. It is assumed that large-size households are less likely to choose healthiness of food as primary preference because crowded households are more interested in price of foods than other households. In addition, we assume that consumers who have knowledge of food health are more likely to give preference to healthiness of food than to other alternatives (price and taste of foods),

From Table 3, it is obvious that 41 percent of the respondents were male and 59 percent female. Also, it is clear that the range of respondents' age was 17-60 years and the average of age was about 30 yr. Based on this table, the average educational level of the respondents was about 15 years. It ranged from 6 to 22 years. The average number of household members was 4.76 persons, with the minimum of 2 and the maximum of 9 persons. This table also indicates that 46 percent of respondents had partial knowledge about food health. Based on this table, the respondents' monthly income ranged from 1,000 to 16,000 thousand Rials and the average income was

**Table 2**. Definition of the variables of the multinomial logit model.

| Variables (Xi) | Unit of account: modalities of variables |
| --- | --- |
| PP (primary preference) | 0= Healthiness of food; 1= Price of food, 2= Taste of food |
| SE (Sex) | 1= Male, 0= Female |
| AG (Age) | Number of living years (continuous) |
| INC (Income) | 10,000 Rial (continuous) |
| EDU (Education) | Number of education years (continuous) |
| HS (Household size) | number of household members (continuous) |
| KFH (Knowledge of food health) | Yes= 1, No= 0 |

**Table 3**. Descriptive statistics of independent variables of the multinomial logit model.

| Variable | Minimum | Maximum | Mean |
|---|---|---|---|
| SE (Sex) | 0 | 1 | 0.41 |
| AG (Age) | 17 | 60 | 30.16 |
| INC (Monthly income) | 1000 | 16000 | 6300.91 |
| EDU (Education) | 6 | 22 | 15 |
| HS (Household size) | 2 | 9 | 4.76 |
| KFH (Knowledge of food Health) | 0 | 1 | 0.46 |

Source: Research Findings.

6,301 thousand Rials.

The estimated results from the multinomial logit model are represented in Table 4. Based on $R^2$ pseudo statistics, it can be clearly seen that estimated multinomial logit model is a suitable regression and, therefore, independent variables of the model explain variation of dependent variable in three groups (i.e. including household in different groups)

well Moreover, the model is statistically significant at 0.01% level. It also is statistically significant based on the Chi-Square test.

It is clear from Table 4 that sex, age, income level, and educational level variables affected households' primary choice of price of food over the food's healthiness in the first equation. In other words, age, income level, educational level, and being female increase the probability of embedding a

**Table 4**. Estimation of multinomial logit model for consumers' preferences: Three categories.

| Variable | Coefficient | Standard Error | *b/St. Er.* | *P[\|Z\|>z]* | Odds ratio |
|---|---|---|---|---|---|
| Characteristics in numerator of Prob[Y= 1] (Price of food vs. Healthiness of food) | | | | | |
| Constant | 6.996*** | 2.947 | 2.374 | 0.017 | - |
| SE | 0.860** | 0.454 | 1.896 | 0.058 | 2.363 |
| AG | -0.541*** | 0.207 | -2.615 | 0.008 | 0.582 |
| INC | -0.004*** | 0.001 | -3.383 | 0.001 | 0.996 |
| EDU | -0.175* | 0.107 | -1.637 | 0.101 | 0.839 |
| HS | 0.092 | 0.180 | 0.508 | 0.611 | 1.096 |
| KFH | -0.746 | 0.871 | -0.856 | 0.392 | 0.474 |
| Characteristics in numerator of Prob[Y= 2] (Taste of food *vs.* Healthiness of food) | | | | | |
| Constant | 12.137*** | 3.958 | 3.067 | 0.002 | - |
| SE | 1.524** | 0.676 | 2.255 | 0.024 | 4.589 |
| AG | -1.552*** | 0.308 | -5.045 | 0.001 | 0.212 |
| INC | -0.008*** | 0.002 | -4.220 | 0.001 | 0.992 |
| EDU | -.105 | 0.151 | -0.694 | 0.487 | 0.900 |
| HS | 0.247 | 0.235 | 1.049 | 0.294 | 1.280 |
| KFH | -4.214*** | 1.349 | -3.125 | 0.002 | 0.015 |
| Pseudo *R*-square | | | | | |
| Cox and Snell | | | 0.246 | | |
| Nagelkerke | | | 0.288 | | |
| McFadden | | | 0.146 | | |
| Model fitting information | | | | | |
| Likelihood ratio tests | *Chi*-square= 55.463 | | *DF*= 12 | | *Sig*< 0.0001 |

Notes: ***, ** and * indicate the significance level of 1, 5 and 10%, respectively.
Source: Multinomial logit model output.

household in a group with more relative preference for food's healthiness compared to price of food. Household size and knowledge of food health were found statistically not significant in explaining households' choice between price of food and healthiness of food alternatives. Concerning the household's choice of taste of food over the healthiness of food alternative, sex, age, income level and knowledge of food health variables were statistically significant.

From Table 4, it is obvious that the sign of sex variable is positive and statistically significant in both equations. These show that female respondents are more likely to choose healthiness of food over price and taste of food. In other words, it depicted that female respondents were more sensitive about their health than male respondents.

Based on results of this study, there would be a positive relationship between age and purchasing behavior of healthiness of foods. The sign of age variable is negative and statistically significant in both equations. The results suggest that older respondents are less likely to choose price and taste of food over health of food. As a result, it is concluded that older respondents are more sensitive about their health than young respondents. We see a similar situation for income level variable. It is hypothesized that there would be a positive relationship between income level and purchasing behavior toward healthiness of foods. On the basis of these results, wealthier respondents were more likely to prefer healthiness of food over taste and price of food, because naturally they don't worry about cost of living and try to consume foods suitable for their health.

As shown in Table 4, it is obvious that the sign of education level variable is negative in both equations, and statistically significant in the first one. The results support the hypothesis and indicate that households with higher educational level are less likely to choose price of food over its healthiness. In addition, these households are less likely to choose taste of food over its healthiness.

Therefore, households who have high income and high educational level are more conscious about their health than households with low income and low educational level. Thus, the hypothesis is confirmed that households having high income and educational levels are more likely to choose healthiness of food over its price, compared to other income groups.

Moreover, based on these results, knowledge of food health variable is significant in equation two and its sign is negative. Therefore, respondents having more knowledge of food health are more sensitive about their health and less likely to choose taste of food over healthiness of food.

As Greene (2002) noticed, the meaning of coefficients is not straightforward; therefore, it is necessary to compute marginal effects to provide a better understanding of the model. In this model, marginal effect measures the change in the probability of the household's primary preference outcome with respect to a change in each explanatory variable (Goktolga *et al.*, 2005). Results of calculating variables marginal effects are presented in Table 5.

Marginal effect of sex variable indicates that female respondents chose healthiness of food alternative as the primary preference in food purchase more than male respondents. Consequently, marginal coefficient of healthiness of food alternative is 0.204. However, male respondents chose taste of food and price of food as the primary preference in food purchase more than female respondents, with their marginal coefficients being 0.098 and 0.106, respectively. This finding indicates that male respondents are concerned with features such as taste and price, while female respondents worry about healthiness.

**Table 5**. Marginal effects averaged over individuals.

| Variables | Consumers' primary preference | | |
|---|---|---|---|
| | Taste of food | Price of food | Health of food |
| SE (Sex) | 0.0981 | 0.1061 | -0.2042 |
| AG (Age) | -0.0342 | -0.1237 | 0.1579 |
| INC (Monthly income) | -0.0005 | -0.0005 | 0.0010 |
| EDU (Education) | -0.0296 | -0.0019 | 0.0315 |
| HS (Household size) | 0.0065 | 0.0194 | -0.0259 |
| KFH (Knowledge of food health) | -0.0552 | -0.0038 | 0.0591 |

Source: Results from the multinomial logit regression.

Also, marginal effect of age variable indicates that older respondents chose healthiness of food alternative as the primary preference in food purchase, more than younger respondents. Based on the results of this study, as the respondent's age increases by one year, the probability of selecting the price and taste of food as the primary preference in food purchase decrease by 0.124 and 0.034, respectively. However, the probability of choosing healthiness of food increases by 0.158.

Furthermore, marginal effect of income level variable depicts that each 10,000 Rials increase in household income decreases the probability of selecting price and taste of food as the primary preference in food purchase by 0.0005 and 0.0005, respectively. Simultaneously, the probability of choosing healthiness of food increases by 0.001.

In Table 5, it is obvious that educated respondents chose healthiness of food alternative as the primary preference in food purchase more than the uneducated ones. On this basis, one year increase in the number of education years decreases the probability of selecting price and taste of food as the primary preference in food purchase by 0.0019 and 0.0296, respectively. However, the probability of choosing healthiness of food increases by 0.0315.

The variable of household size shows that adding one family member to the household will increase the probability of selecting taste and price of food as the preference in food purchase by 0.007 and 0.019, respectively. On the other hand, the probability of choosing healthiness of food as the primary preference in food purchase decreases by 0.026.

At last, respondents who had knowledge of food health chose healthiness of food alternative as the primary preference in food purchase more than respondents who did not have this knowledge. Consequently, marginal coefficient of healthiness of food alternative is 0.059. Simultaneously, respondents who did not have this knowledge chose taste and price of food as the primary preference in food purchase more than female respondents, with their marginal coefficients being 0.055 and 0.004, respectively.

Also, instead of calculation of marginal effect for each variable, we can calculate and interpret odds ratios. The interpretation of the results of marginal effects and odds ratio leads to the same direction. As an example, the ratio of probability of choosing food price to choosing food health for the male is equal to 2.363. It means that male respondents pay more attention to price rather than health of food. Also, based on results of Table 4, it is obvious that the ratio of probability of choosing taste of food to choosing health of food is equal to 4.589. In other words, taste and price have the dominant roles as the primary preference in food purchase for the male. As another example, results in the same table indicate that one year older respondents had the ratio of probability of choosing price of food to choosing health of food equal to 0.582. This means that older respondents paid more

attention to health of food rather than its price.

In order to investigate the predictive power of the multinomial logit model (out of sample) we filled this questionnaire for about 25% of the first sample size. It means that we asked the same questions from 50 residents of Mashhad and, based on their answers and results of the estimated model, we calculated the predictive power of the model (Table 6).

According to Table 6, it is clear that the overall predictive power of the estimated multinomial logit model is 68 percent. It means that this model and its coefficients could appropriately predict the consumers' behavior in choosing these criteria while purchasing food with reasonable reliability. Results of predictive power are represented in Table 6 individually for each group. Based on this table, statistics of prediction power for consumers who chose healthiness of food was more than those who chose price or taste of food.

## DISCUSSION

Results of this study, which was conducted in Mashhad and aimed at determining the factors affecting consumer preference (i.e. income level, education level, gender, age, household size, and knowledge of food health), are compatible with findings of Goktolga *et al.* (2005), Baker (2003), Dosman *et al.* (2001), Flynn *et al.* (1994), and Krewski *et al.* (1994) studies. They also found that women, older respondents, households having higher income level, households having higher educational level, and members of households with young children tended to perceive health of food as having greater priority than other criteria.

These results can offer important information for firms to produce healthy foods and for policy makers who care about citizens' health.

Food producers should produce for households who have high income and high education. Target groups of firms producing food should be older consumers and women. They should increase knowledge of the society through their advertisements in order to attract more customers. If firms have some data about factors that affect food preference of consumers, they can improve some marketing strategies.

Policy makers should develop some cost oriented regulations in order to decrease price effect for low income households. These regulations include subsidizing healthy foods, providing financial credit at low interest rate, reducing tax, and encouraging investment in firms producing healthy food. By reducing cost of healthy foods, probability of preferring healthiness of food over price of food in households with low income will increase.

Regarding the results of this study, government can organize some educational programs about food health for all citizens in order to increase knowledge of food health. In addition, media has a very significant responsibility in enhancing this knowledge in the society.

**Table 6.** Classification of customers for testing data based on estimated multinomial logit model.

| criterion | Number of cases | Predictive power of MNL model | | |
|---|---|---|---|---|
| | | Health of food | Taste of food | Price of food |
| Health of food | 35 | 26<br>74.3% | 5<br>14.3% | 4<br>11.4% |
| Taste of food | 7 | 3<br>42.9% | 4<br>57.1% | 0<br>0.0% |
| Price of food | 8 | 4<br>50.0% | 0<br>0.0% | 4<br>50.0% |
| Percentage of right prediction | | 68.0% | | |

Source: Results from the multinomial logit (MNL) regression.

## ACKNOWLEDGEMENTS

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# کاربرد الگوی مالتی‌نومیال‌لاجیت در تعیین عوامل اقتصادی- اجتماعی مؤثر بر انتخاب اصلی مصرف‌کنندگان در خرید مواد غذایی: مطالعه موردی مشهد

م. ر. کهنسال و ع. فیروززارع

## چکیده

هدف این مقاله بررسی عوامل مؤثر بر انتخاب اول مصرف‌کنندگان در خرید مواد غذایی در شهر مشهد با استفاده از داده‌های مقطع‌زمانی ۲۰۱ خانوار در سال ۱۳۹۱ است. در این مطالعه به ترتیب ۵۶، ۳۰ و ۱۴ درصد مصرف‌کنندگان معیارهای سلامت، قیمت و طعم‌ومزه مواد غذایی را به عنوان ترجیح اول خود در خرید مواد غذایی عنوان نمودند. نتایج بکارگیری الگوی لاجیت‌چندجمله‌ای (مالتی‌نومیال‌لاجیت) حاکی از این است که زنان و پاسخ‌دهندگان با سن بالاتر نسبت به مردان و پاسخ‌دهندگان جوان‌تر به سلامت غذا توجه بیشتری نشان می‌دهند. همچنین نتایج حاکی از این است که خانوارهای با سطوح بالاتر درآمد و تحصیلات نیز با احتمال بیشتری سلامت غذا را به عنوان معیار اول خود انتخاب می‌کنند. علاوه براین، پاسخ‌دهندگانی که دانش بیشتری نسبت به سلامت مواد غذایی دارند، با احتمال بیشتر سلامت مواد غذایی را انتخاب خواهند کرد. همچنین ما نتایج این مطالعه را با مطالعات مشابهی که در این حوزه انجام شده است مقایسه نمودیم. این مقایسه نشان می‌دهد که نتایج و یافته‌های این مطالعات مشابه یکدیگر است. در نهایت نیز بر اساس نتایج این مطالعه برخی پیشنهادات برای سیاست‌گذاران و تولیدکنندگان مواد غذایی ارائه شده است.