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## Consumer Food Safety Knowledge, Practices and Differences in Behaviors in Thrace Region of Turkey

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### ABSTRACT

In this study, the expectations of individuals living in urban and rural regions of Thrace Region of Turkey were investigated by considering the level of knowledge and behaviour of those individuals about parameters, consumptive habits and food safety while they are buying food products. This study has been conducted in Thrace Region by face to face survey with 770 individuals who have an effective say in the decision of food consumption within the family. The factors affecting the consumers in being knowledgeable about food safety were analyzed with Logit model. Based on analyses results, the variables of gender, town-city and education were determined as statistically significant and coherent with the expectations of coefficients of slope. F<sub>1</sub> group (consciousness of food content, appropriate preparation and buying consciously) and F<sub>3</sub> group (quality and cost) have been determined as statistically significant.

Keywords: Factor analysis; Logit analysis; Food safety; Consumer behavior

## Trakya Bölgesindeki Tüketicilerin Gıda Güvenliği Konusunda Bilgi, Uygulama ve Davranışlarındaki Farklılıklar

### ESER BİLGİSİ

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### ÖZET

Bu çalışmada Trakya Bölgesinde kentsel ve kırsal kesimde yaşayan bireylerin gıda ürünleri satın alırken dikkat ettikleri parametreler, tüketim alışkanlıkları ve gıda güvenliği ile ilgili sağlık riskleri karşısında bilgi düzeyleri ve tutumları incelenerek beklentilerinin neler olduğu ortaya konulmaya çalışılmıştır. Çalışma, Trakya Bölgesinde, ailede gıda tüketim kararında etkili olan 770 birey ile yüz yüze görüşülerek yapılmıştır. Tüketicilerin gıda güvenliği hakkında bilgi sahibi olmalarında etkili olan faktörler Logit model ile analiz edilmiştir. Analiz sonucuna göre cinsiyet, köy-şehir ve eğitim değişkenleri istatistikî olarak anlamlı ve eğitim katsayılarının beklentilere uyumlu oldukları tespit edilmiştir. F<sub>1</sub> grubu (gıda içeriği bilinci, uygun hazırlama ve bilinçli satın alma) ve F<sub>3</sub> (kalite ve fiyat) grubu istatistikî olarak anlamlı bulunmuştur.

Anahtar Kelimeler: Faktör analizi; Logit analizi, Gıda güvenesi; Tüketici davranışları

## 1. Introduction

Production of ready-made food has risen depending on the increase in consumption of ready-made food parallel to the developing economy. There is not always an increase in the quality as a result of rising production. Parallel to the increase in food consumption, even a slightest problem in hygienic conditions might affect the majority of the population. Therefore diseases originated from foods are growing public health problems in all over the world (Etiler 2001). Consumers have many concerns about the influence of the foods they eat on their health. These range from concerns about the dangers posed by food borne illness and other food safety issues, “chemical additives,” high fat foods and chronic disease threats, through to ecological and regulatory concerns (Worsley & Lea 2008).

Food safety refers to whether chronic or acute hazards may cause food to harm humans (FAO/WHO 2009). Potentially undesired compounds in foods range broadly from natural and environmental contaminants to agrochemicals.

Food safety has become one of the nation’s hottest topics in the recent years. It’s little wonder, with recent *Salmonella* spp. and *E.coli* outbreaks affecting everything from peanuts and pistachios, to common vegetables like tomatoes, peppers and spinach—and even cookie dough.

Henson & Traill (1993) define food safety as “the inverse of food risk—the probability of not suffering some hazard from consuming specific food” absence of food safety causes national and global problems. Food health safety as a whole is a topic which comes first in terms of public authority and procedures when indispensability and economic importance of food products in daily life are considered. At the same time the demand for the food products that have quality warranties has increased. Quality of food products can be defined as acceptable characteristic set by consumers. The product can be considered to have good quality if it meets the need of consumer and has the acceptable objective (energy, vitamin, mineral, toxic material content of the product and freshness) and subjective values (color, shape, taste and smell etc. of the

product). The use of methods that receive direct opinion of consumer in the correct measurement of quality and relatedness of the quality in food products to the conception of the consumer has increased the importance of the concept of conscious consumer (Dölekoğlu 2002).

Although it is well known that the Turkish consumer’s tendency towards food safety has been increasing steadily, research relating to food safety is very limited within Turkey, particularly when considering the inadequate state of forecasts for the future (Oraman et al 2009). In recent years, it has become also apparent that consumer concerns about health have led to significant changes in consumer preferences, which have yet to be fully investigated. Food safety is immediately top-of-mind for consumers as they have low levels of confidence in the safety of food produced in Turkey. In this respect, food safety appears to be assumed. Consumers typically get their information about food safety from the media, so this source appears to play a major role in consumer confidence in food safety (Oraman et al 2009). Consumers feel that they lack food safety information but it is evident that they do not actively seek it. The media is the primary and typically passive source of information for the large majority. Those who look for information tend to rely on the Internet, brochures, and discussions with family, friends and people involved in health and the food industry, like doctors, dieticians and retailers.

Previous studies in adults have indicated that food safety knowledge tends to increase with age and practice: females have higher scores than males, and younger respondents have shown the greatest need for additional food safety education (Bruhn and Schutz, 1999; Rimal et al 2001). According to Albert (1995), respondents from urban areas tend to have lower scores than those from rural areas. However, Morrone & Rathburn, (2003) and Unklesbay et al (1998) found that only a few studies have been conducted to explore the food safety knowledge, and behaviours among college students in developed country. Unusan (2007) and Garayoa et al (2005) found significant difference among education levels concerning attitude towards food safety and knowledge.

According to Shepherd (1989) numerous variables influence consumer's knowledge and behaviours processes. Individual socio-demographic characteristics are commonly included as determinants of attitudes. Today's consumers are characterized by an increasing health consciousness and growing interest in the role of food for maintaining and improving human well-being and consumer health (Gilbert 2000; IFIC 2000).

Most previous investigations of consumers' food concerns have focused on single themes such as "food safety" (Wandel 1994; Topuzoğlu et al 2007; Dölekoğlu 2002). In recent years, it has also become apparent that consumer concerns about health have led to significant changes in consumer preferences, which have yet to be fully investigated. The main objective of this study is to gain a better understanding of examining their consciousness levels in food safety of consumers.

In this study, we used a binary logistic regression analysis that can be used to determine the degree of influence of the factors which provides food safety consciousness for the individuals living in rural and urban areas of Thrace region (Edirne, Tekirdağ, Kırklareli) by examining their consciousness levels in food safety.

We believe that the results can provide important information for the producers, retailers and food authorities to help them to understand the main factors affecting consumers' decisions and therefore improve their strategies.

The remainder of the paper is organized as follows. First, previous work analyzing consumer concern with food safety and factors affecting consumers' knowledge is reviewed. Next, the data and the statistical methods used to analyze the data are described. Then, the results and accompanying discussion is presented. The final section provides conclusions and outlines avenues for future research.

## 2. Material and Methods

### 2.1. Data collection

The primary material of the research consists of the data collected from survey studies with

selected dwellings in Thrace region (Tekirdağ, Edirne, Kırklareli). Sample volume is distributed according to the density of the population living in the Tekirdağ, Edirne, Kırklareli provinces. Of the total 770 consumers, 88 in urban, 99 in rural areas in Kırklareli province; 109 in urban, 121 in rural areas in Edirne province, 188 in urban, 165 in rural areas in Tekirdağ province were interviewed.

Maintaining the original data about the research is based on the method of face-to-face interview. In survey forms, the questions related to demographic information of consumers were asked as closed end whereas the questions for determining the standard of knowledge of the consumers about food safety were prepared in quintet Likert scale. Original data was collected in a single step. Coincidental sampling method was used in determining the consumers who are the data sources. Since there hasn't been any study about consumption of these products in research region, the ratio was accepted as 50% in order to reach the maximum sample that will represent the population (Newbold 2007).

$$n = \left( \frac{1.96}{0.05} \right)^2 \times (0.5) \times (0.5) \cong 385$$

The formula above has been used to determine the number of samples and the sample volume has been determined as 770 (385 individuals in urban region and 385 individuals in rural region).

Where; n, sample volume; z  $\alpha/2$ , confidence level (the coefficient for 95% confidence is accepted as 1.96); p, the proportion of conscious consumers about food safety; q, 1-p (the proportion of the unconscious consumers about food safety); d, the proportion of accepted sampling error (5%).

### 2.2. Data analysis

#### 2.2.1. Factor analysis

Answers of the questions determining the attitudes of consumers, who take place in this study, towards food safety in buying food products were obtained with quintet likert scale. Because of the number of criteria that shows the behaviour and attitude of consumers varying with the level of their knowledge about scaled food safety are too much, it is not

possible to use this criteria as explicative variables. Therefore, the variables need to be illustrated synoptically. In this study, the summarizing of the variables has been done with factor analysis by courtesy of PASW 18.0 pack program.

Initially, the aptness of the data for the factor analysis has been analysed with the KMO (Kaiser-Meyer-Olkin) test. Kaiser-Meyer-Olkin: Measure of sampling adequacy is used to compare the magnitudes of the observed correlation coefficients in relation to the magnitudes of the partial correlation coefficients. Large KMO values are good because correlations between pairs of variables (i.e., potential factors) can be explained by the other variables. If the KMO is below 0.50, don't do a factor analysis. The KMO value was 0.79 and the fact that the KMO value is higher than 0.50 shows that the variants

are suitable for factor analysis and the number is sufficient. In addition to that, a global test has been made, according to the result; it has been shown that the samples drawn are at a level that can represent the population.

According to the results of Factor Analysis, five factors were chosen because they explained a high proportion of original variance and had Eigen value higher than one. Globally explained 54.4% of variance respectively. The contribution of the variables to the main factors obtained in the PCA regarding effect to be information about food safety and variance explained are shown in Table 1.

### 2.2.2. Logit analysis

Logit model, which is generated as an alternative to probit model in order to solve the problems

**Table 1- Factor analysis rotation solution**

*Çizelge 1- Faktör analizi rotasyon sonuçları*

Factor		1	2	3	4	5
Consciousness of food content, suitable preparation of food and buying it with consciousness	Read label information of food products	0.785				
	I research the content of food which I have bought	0.780				
	Cooking and preserving according to the instructions	0.657				
	Preferring foods that the certificated of HACCP, ISO and TSE	0.632				
	Being careful with the cleaning of the store	0.587				
	Not using products that have expiration date	0.351				
Willingness for paying extra money for safety food	Ignoring the costs of some foods		0.870			
	Agreeing to pay much money for foods products that have no hormone		0.422			
Quality and price	Believing that costly foods are more quality			0.856		
	Brands food are more quality			0.806		
	Being affected by advertisements while buying foods			0.570		
Natural foods and use of food additives	It is necessary to use additives to the foods for its taste and quality				-0.645	
	Consuming products that don't include additives				0.634	
	Food additives affect health badly				0.520	
	Caring for buying organic and natural foods				0.520	
	Eating three meals regularly				0.477	
Environmental knowledge	Check whether the product harms the environment or not					0.846

encountered in linear probability model, is more desirable in application and being used more commonly. Although, it is the same as the probit model in respect of formation process, it is distinguished from probit model in respect of cumulative dispersal function (CDF) which it is based on (Özer 2004). The probability of an individual having knowledge about food safety is indicated with;

$$P_i = E(Y = 1|X) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_2 + \dots + \beta_k X_k)}} \quad (1)$$

or

$$P_i = \frac{1}{1 + e^{-Z}} \quad (2)$$

Here,

$$Z_i = \beta_1 + \beta_2 X_2 + \dots + \beta_k X_k \quad (3)$$

and equation (2) is known as (cumulative) logistic dispersal function. It is known that while  $Z_i$  varies from  $-\infty$  to  $+\infty$ ,  $P_i$  takes values between 0 and 1, and  $P_i$  has non-linear relation with  $Z_i$ .

If the probability of having knowledge about food safety is  $P_i$ , probability of buying is in  $(1-P_i)$  form

$$1 - P_i = \frac{1}{1 + e^{Z_i}} \quad (4)$$

Therefore this can be written;

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \quad (5)$$

In this case, the odds of having knowledge are  $P_i / (1-P_i)$ . The following result is obtained if the natural logarithm of this equation is taken;

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = Z_i \quad (6)$$

$$= \beta_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

Logarithm of odds,  $L$ , is not only linear to the  $X$  but also to linear the coefficients of main body.  $L$  is called logit and the logit model comes from the equation (6) (Gujarati 1999). The variables used in the model and their values are given in the equation shown below and in Table 2, respectively.

Ratio of probability of  $\ln [P_i/(1-P_i)]$  shows the probability of consumers having knowledge about food safety.

**Table 2- Definition of the variables**

*Çizelge 2- Değişkenlerin tanımlanması*

Dependent variable	10	Knowledge about food safety
Safety		Non-knowledge about food safety
Independent variables		
Gender	1	Female
	0	Male
Rural area	1	Urban
	0	Rural
Education	1	Non-education
	2	Primary school
	3	Secondary School
	4	High school
	5	University
Factor 1		Consciousness of food contents, suitable preparation of food and buying it with consciousness
Factor 2		Willingness for paying extra money for healthy food
Factor 3		Quality and price
Factor 4		Natural foods and use of food additives
Factor 5		Environmental knowledge

$$\ln [P_i/(1-P_i)] = Y_i = \beta_0 + \beta_1 F1 + \beta_2 F2 + \beta_3 F3 + \beta_4 F4 + \beta_5 F5 + \beta_6 W + \beta_7 GENDER + \beta_8 EDU1 + \beta_9 EDU2 + \beta_{10} EDU3 + \beta_{11} EDU4 \quad (7)$$

This method has many statistical properties. All of the estimators are coherent and asymptotically active. In the logit model estimated with maximum likelihood method, likelihood ratio (LR) test can be applied when significance of all or part of the coefficients is tested (Pindyck & Rubinfeld 1991). In addition to this, in regards of suitability of concord, R<sup>2</sup> value is not being accepted as a correct scale for logit models (Thomas 2000). Alongside suggesting many alternatives as suitability of concord, Nagelkerke R<sup>2</sup> value was used. When the independent variables in the model are examined for whether they have a significant effect or not, the hypothesis is created as follows (Greene 1997).

$$H_0: \beta_1 = \beta_2 = \dots = \beta_k = 0$$

$$H_1: \beta_1 \neq \beta_2 \neq \dots \neq \beta_k \neq 0$$

Odds ratio represents how many folds the possibility of realization is affected by the dependant variable if the related independent variable takes 1 (one) or

zero (0) value when the other variables are constant. In addition to this, if the coefficients of regression take a negative value, the odds ratios of these coefficients must be corrected as OO= 1/OO, in principle (Özdamar 2004).

### 3. Results and Discussion

In this study, some demographic and socio-economic indicators of individuals taking the survey were investigated (Table 3). In this study, 770 individuals (385 from urban, 385 from rural), who are living in Thrace region (Edirne, Tekirdağ, Kırklareli) and effective in the decision of the food, were interviewed face-to-face. Of the individuals interviewed, there are 557 females (72.3%) and 213 males (27.7%). Survey was conducted with 353 individuals (45.9%) in Tekirdag city, 230 individuals in Edirne city (29.9%) and 187 individuals in Kırklareli city (24.2%).

Answers of the questions determining the tendency of consumers towards food safety and consumption, when they are buying food products,

**Table 3- Demographic characteristics of the individuals research area**

*Çizelge 3- Araştırma alanına ait demografik kriterler*

Gender	Urban	%	Rural	%	Number	%
Female	283	36.8	274	35.6	557	72.3
Male	102	13.2	111	14.4	213	27.7
<b>Education level</b>						
Non-education	-	-	6	0.8	6	0.8
Primary school	143	18.6	298	38.7	441	57.3
Secondary School	47	6.1	51	6.6	98	12.7
High school	113	14.7	31	4.0	144	18.7
University	79	10.3	2	0.3	81	10.5
<b>Number of family</b>						
1-2	36	4.7	26	3.4	62	8.1
3-5	313	40.7	299	38.9	612	79.4
6-8	36	4.7	58	7.5	94	12.2
9- +	-	-	2	0.3	2	0.3
<b>Income (monthly)(YTL)</b>						
< 350	1	0.1	13	1.7	14	1.8
351-500	21	2.7	72	9.4	93	12.1
501-1000	117	15.2	171	22.2	288	37.4
1001-1500	115	14.9	89	11.6	204	26.5
1501-2000	62	8.1	30	3.9	92	11.9
2000 <	69	9.0	10	1.3	79	10.2
Total	385	100.0	385	100.0	770	100.0

were obtained with quintet likert scale. Because of the number of criteria that shows the behaviour and attitude of consumers varying with the level of their knowledge about scaled food safety are too much, it is not possible to use this criteria as explicative variables. Therefore, the variables need to be illustrated synoptically. In this study, the summarizing of the variables has been done with factor analysis and these factors were used as explicative variables in Logit analysis. The factors can be estimated as the linear components of the observed variables when they are subtracted from the observed variables. General estimate equation of the  $F_j$ , which is the  $j^{\text{th}}$  factor, can be expressed as follows:

$$F_j = \sum_{j=1}^p [W_{j1}X_1 + W_{j2}X_2 + \dots + W_{jp}X_p] \quad (8)$$

Where;  $W_j$  is the coefficients of factor;  $P$  is the number of variables

Eigen value is taken as 1 in factor analysis. Kaiser-Meyer-Olkin measure of sampling adequacy is calculated as 0.791. According to Kaiser's measure this is a mid-grade size equation. Barlett's sphericity test is significant ( $P < 0.01$ ). Therefore data is suitable to apply factor analysis (Pett et al 2003).

The factors, which were examined to explain the attitudes of consumers when they are buying food products, were gathered in five main groups. The factor namings were done based on attitude groupings formed underlying this factor. First factor is the biggest factor and explains 17.5% of the variance. This factor was named as "the factor of consciousness of food content, appropriate preparation and conscious shopping". It contains the variables showing the buying behaviour of individuals who do the shopping in the family. The factor of the demand for paying more for healthy food accounts for 10.6%, the factor of quality and price accounts for 10.2%, the factor of use of natural product and additives accounts for 9.9%, factor of environmental conscious accounts for 6.2% of the variance. These factors accounts for 54.4% of preference variation for the total group. These results indicate which factors are considered when consumers are making a decision.

An inverse relationship was observed between opinions for negative influence of using food additives on health, taking pains to buy organic and natural products, eating regularly three meals, consuming products which do not contain any additives and opinions for necessity of using additives for taste.

After summarizing the variables by the help of factor analysis, the factor groups, which are effective in individuals being knowledgeable about food safety, used as explicative variables in logit analysis. In this model, the variable of individuals being knowledgeable about food safety is used as dependant variable whereas the variables of gender, living in town or city, level of education and factor groups ( $F_1, F_2, F_3, F_4, F_5$ ) are used as explicative variables.

According to the results of the estimate, it was determined that variables of town-city and education are statistically significant and coefficients of slope are concordant with the expectations. [ $H_0: \beta_k = 0; H_1: \beta_k \neq 0; t_{\beta k} = \beta_k / s(\beta_k)$ ]. Among the variables of factor groups, only variables of the first (food content conscious, appropriate preparation and conscious buying) and the third (quality and price) factor groups were determined as statistically significant. Coefficients of the model and statistical values are illustrated in Table 4.

The table value for  $\chi^2$  is 20.09 with 8 degrees of freedom, at 1% significance level.  $H_0$  is rejected because of the LR statistics of the model ( $891.399 > \chi^2_{0.01,8}$ ). The model was determined as statistically significant (Table 4).

In the event of explaining some Odds ratio, Odds ratio of FACTOR 1 variable was calculated as 1.648. This coefficient indicates that the individual, who gives importance to this factor group, is being 1.648 fold more knowledgeable about food safety. The odds ratio of Urban variable was calculated as 0.435 and the Odds ratio calculated after the correction is  $OO = 1/0.435 = 2.297$ . This ratio indicates a city-origin individual is being 2.297 fold more knowledgeable about food safety. Also, odds ratio of GENDER variable was calculated as 1.9. This ratio indicates women are being 1.9 fold more knowledgeable about food safety than men. Table 4 represents the odds ratios calculated for every one of the estimators.

**Table 4- Results of logit model***Çizelge 4- Logit model sonuçları*

<i>Variable</i>	<i>Coefficient</i>	<i>Standard error</i>	<i>Wald</i>	<i>P</i>	<i>Odds ratio</i>
Invariable	0.320	0.806	0.157	0.692	1.377
Factor 1	0.500	0.162	9.458	0.002*	1.648
Factor 2	-0.035	0.095	0.139	0.710	0.965
Factor 3	-0.176	0.090	3.851	0.050**	0.839
Factor 4	-0.002	0.175	0.000	0.990	0.998
Factor 5	-0.005	0.070	0.006	0.938	0.995
Urban	-0.832	0.180	21.386	0.000*	0.435
Gender	0.645	0.185	12.086	0.001*	1.905
Education 1	-1.130	0.984	1.319	0.251	0.323
Education 2	-1.811	0.375	23.326	0.000*	0.163
Education 3	-1.347	0.414	10.602	0.001*	0.260
Education 4	-0.680	0.398	2.917	0.088***	0.507
-2 Log likelihood			891.399		
Possibility ratio (%)			70.8		
Nagelkerke R <sup>2</sup>			0.27		

\*, significant for 99% confidence interval; \*\*, significant for 95% confidence interval; \*\*\*, significant for 90% confidence interval

Education is a variable that affects an individual to behave consciously and correctly in behaviour of buying. The education of mother is important in buying and preparing food products. Level of education is an effective factor in those individuals buying quality and healthy products, too.

#### 4. Conclusions

The factors, which were examined to explain the attitudes of consumers when they are buying food products, were gathered in five main groups. First factor is the biggest factor and explains 17.5% of the variance. This factor was named as “the factor of consciousness of food content, appropriate preparation and conscious shopping”. It contains the variables showing the buying behaviour of individuals who do the shopping in the family. The factor of the demand for paying more for healthy food accounts for 10.6%, the factor of quality and price accounts for 10.2%, the factor of use of natural product and additives accounts for 9.9%, factor of environmental conscious accounts for 6.2% of the variance.

The factors affecting the individuals in being knowledgeable about food safety were analyzed with Logit model. According to the results of the estimate, it was determined that variables of

urban and education are statistically significant and coefficients of slope are concordant with the expectations. Among the variables of factor groups, only variables of the first (*food content conscious, appropriate preparation and conscious buying*) and the third (*quality and price*) factor groups were determined as statistically significant.

Special days and campaigns should be organized in order to inform the consumer and create a public opinion so as to develop the habit of healthy diet. Mass communication tools should be benefitted for this purpose. Educating consumers by broadcasting effective programs on various media organs, especially on TV, will be extremely beneficial in order to make consumers eat consciously and use their income reasonably in this way.

In Turkish society, it is required to create consumer conscious in every topic. In order to form conscious consumers, importance must be paid in educating every consumer beginning from when they were young.

In future, research priority must be given to study more in details opinion about consumer expectation and behaviour for food safety in Turkey.

Future research is needed to explore whether the factors that influence the perception of food

safety risk differ from the factors that influence the actual response to food safety. Given the rationale for offsetting behaviour in food safety, consumers' food expenditure decisions can be affected by the availability of food safety information, the nature of the supply chain to produce a final product, and consumers' timing of decision making. The motivation behind implementing food safety policies in the food sector is to guarantee the well-being of consumers.

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