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Consumers' Attitudes and Perceptions of Food Safety in the United Arab Emirates

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This study analyzes consumers' attitudes and perceptions of food safety in the United Arab Emirates (UAE). The study hypothesized that different ethnic groups perceive food safety differently for a number of reasons. A cross-section sample representing the country's four ethnic groups was analyzed. A probit model was used to analyze factors affecting consumers' perception and attitude toward major food safety concerns and practices. The results show that the most common food safety practice was reading expiration dates, food poisoning was the most frequent food safety concern, the family doctor was the most trusted source of information, and the householder himself was the most responsible entity regarding food safety. The respondents' education levels and their ethnicity were the main determinants of their attitudes toward major food-safety concerns. The results indicated that it would be more effective for food-safety awareness campaigns to be disseminated through different sources of information targeting different ethnic groups.

The United Arab Emirates (UAE) is one of the six states that compose the Gulf region. It is the third largest in terms of size (area of land) after Saudi Arabia and the Sultanate of Oman. Its GDP per capita is estimated at \$55,000 in purchasing power parity, or PPP, and at \$42,664 in nominal terms. It is ranked sixteenth in the world in terms of nominal GDP/capita (IMF 2007). Investment in its people as the "wealth of the nation" has been a primary focus of the UAE government since the inception of the state. The population is now reaping the benefits of a high standard of education and a sophisticated health service. Efforts are directed toward developing human resources, empowering women, and providing social welfare to the more vulnerable in society.

As a result of its progress in social development, the UAE was ranked thirty-first on the Human Development Index (HDI) (Human Development Reports 2008). This progress was reflected in many aspects of development in the country, including rising income per capita, an increase in government expenditure on education and health services, a higher percentage of women participating in the workforce, a low rate of postpartum and infant mortality, and the elimination of dangerous diseases (Ministry of Economy and Planning 2008).

The UAE population was estimated to be 4.32

million at the end of 2004. However, more precise figures were gathered by Census of 2005, the fifth census in the UAE's history, when a major initiative on the part of the government to accumulate accurate information on population structure was taken in order to better target its resources. The census-taking was based on a UN-recognized method known as *de jure* population—i.e., counting people according to their permanent residence in the UAE, regardless of where they were staying during the census period (Ministry of Economy and Planning 2005).

Nationals (Emiratis) constituted approximately 21.9 percent of the total counted population; the total number of non-nationals counted in the census was approximately 78.1 percent of the total counted population. Based on the census data, 38.1 percent of nationals were less than 14 years old, and 51.1 percent were less than 20 years old. However, 48.8 percent of non-nationals belonged to the 25–40 age group. Overall, 52.9 percent of the total population was between 20 and 39 years old. The census also confirmed that the illiteracy rate in the country was 9 percent, approximately the same for nationals and non-nationals (Ministry of Economy and Planning 2005).

The above population introduction is rather important for this study since the study revolves around the human factor of this oil-rich country. The UAE imports more than 95 percent of its food supply from different world sources. Demand for most consumer commodities, and particularly foodstuffs, may be affected by factors that are not considered important in some other countries in the region (El-

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Eraky and Al-Muhairi 2004). Tastes and attitudes, for instance, may be believed to have a significant impact on the quantities demanded and types of some major foodstuff products. This is because food safety and quality is believed to be a major item on the consumers' demand agenda in the relatively affluent Gulf states. The same could be said about the impact of other non-price factors on consumer behavior (Bashir 2005). The study hypothesized that different ethnic groups perceive food safety and quality issues differently for a number of reasons that have to do with ethnicity backgrounds, educational levels, and income, among others. If so, the government needs to take into consideration how different ethnic groups perceive food safety and quality issues in order for it to achieve its main food-importation goal more efficiently; i.e., to satisfy its residents and increase their welfare.

Through the examination of a representative random sample of the four main ethnic household groups residing in Al-Ain, UAE, this study (1) examines the demographic characteristics of the study sample; (2) identifies consumers' attitudes, behavior, and food safety practices; (3) states the most trusted sources of information on food safety/quality issues in the country; (4) clarifies the food safety issues that most concern the residents; (5) ranks the main bodies responsible for food safety in the country; and (6) determines the main factors impacting consumers' attitudes toward major food safety concerns and practices.

Theory

Attitudes are usually viewed as an enduring disposition to consistently respond in a given manner to various aspects of the world, including persons, events, and objects. There are three components of attitude: (1) the affective component, which reflects an individual's general feelings toward an object; (2) the cognitive component, which represents one's awareness of and knowledge about an object; and (3) the behavioral component, which reflects buying intentions and behavioral expectations. Attitudes are considered "hypothetical constructs," which is a term used to describe a variable that is not directly observable but rather is measurable by an indirect means such as verbal expression or overt behavior (Zikmund 2003).

A remarkable variety of techniques have been

devised to measure attitudes. These techniques range from direct to indirect, physiological to verbal etc. Obtaining verbal statements from respondents generally requires that the respondent perform a task such as ranking, rating, sorting, or making a choice or a comparison. Physiological measures of attitudes provide a means of measuring attitudes without verbally questioning the respondent.

In this paper, the most common attitude measurement is used: measuring consumers' attitudes via the technique of obtaining verbal expression through the respondent making a rating. In this technique, the respondent is asked to estimate the magnitude of a characteristic or quality which an object possesses. The respondent indicates the position on a scale(s) where he or she would rate an object. Rating scales are numerous and include the following types: simple attitude scaling, category scales, the Likert scale, semantic differential scales, numerical scales, the Stapel scale, constant sum scales, graphic rating scales, Guttman scaling, and the Thurstone interval scale (Oppenheim 2005).

The Likert scale (the method of summated ratings) is used in this paper due to its popularity in measuring attitudes. With the Likert scale, respondents indicate their own attitudes by checking how strongly they agree or disagree with carefully constructed statements about the attitudinal object. Individuals generally choose from approximately five (although alternatives may range from three to nine) response alternatives: "strongly agree," "agree," "uncertain," "disagree," and "strongly disagree."

To measure the attitude, researchers assign scores or weights, which are not printed on the questionnaire, to the answers. Strong agreement indicates the most favorable attitudes on the statement and the weight of five is assigned to this response. If a negative statement toward the object was given, the weights would be reversed and "strongly disagree" would be assigned the weight of 5. The total score is the summation of the weights assigned to an individual's total responses. A single scale item on a summated rating scale is an ordinal scale.

In the Likert procedure, a large number of statements are generated and then an item analysis is performed. The purpose of the item analysis is to ensure that final items evoke a wide response and discriminate among those with positive and negative attitudes. Items that are poor because they lack

clarity or elicit mixed response patterns are eliminated from the final statement list. This step was followed rigorously in the questionnaire design of this study.

Analysis of Variance (ANOVA), chi-square tests, and a probit regression model were used to achieve the objectives of the study. ANOVA is a collection of statistical models and their associated procedures in which the observed variance is partitioned into components considered to be due to different explanatory (independent) variables. There are three conceptual classes of such models: fixed-effects models, random-effects models, and mixed-effect models. The first models assume that the data came from normal populations which may differ only in their means. The second models assume that the data describe a hierarchy of different populations whose differences are constrained by the hierarchy. The third models describe situations where both fixed and random effects are present. This study implemented the first model, where one-way ANOVA was used to test the differences among two or more independent groups. One-way ANOVA can also be used to test differences among at least three groups, since the two-group case can be covered by a t-test. When there are only two means to compare, the t-test and the F-test are equivalent ($F = t^2$) (Ferguson and Takane 2005).

The chi-square test is applied to contingency tables and allows the researchers to establish how confident he or she is that there is a relationship between two variables in the population. The test works by calculating for each cell in the table an expected frequency or value that would occur on the basis of chance alone. The chi-square value is calculated by calculating the differences between the actual and expected values for each cell in the table and then summing those differences. The chi-square value means nothing on its own and can be meaningfully interpreted only in relation to its associated level of statistical significance. Whether a chi-square value achieves statistical significance depends not just on its magnitude but also on the number of categories of the two variables being analyzed (the degrees of freedom associated with the table). In other words, the chi-square value that is arrived at is affected by the size of the table, and this is taken into consideration when deciding whether the chi-square value is statistically significant or not (Bryman 2008).

The probit model is a specification of a generalized linear model using the probit link function. Because the response is a series of binomial results, the likelihood is often assumed to follow the binomial distribution. The generalized linear model is a flexible generalization of ordinary least squares regression. It relates the random distribution of the measured variable of the experiment (the distribution function) to the systematic (non-random) portion of the experiment (the linear predictor) through a function called the link function (McCullagh and Nelder 1989).

Literature Review

Literature was found on how consumers' attitudes vary toward food safety issues in different countries. Schmitz and Nayga (1991) found that consumer perceptions of fat and cholesterol levels in meats were based on the comparison of the animal sources, not the comparison of the individual cuts or preparation techniques. Schmitz and Nayga used an intercept survey in supermarkets which were randomly selected without replacement for surveying locations. Respondents were asked to select the meat with the highest level of cholesterol and highest level of fat in each of twenty pairs of meat and fish products. Percentages were calculated to determine the number of times that the right-hand choice was circled. Z-tests were conducted to determine if the percentage differed from 0.5. The null hypothesis was that the percentage equals 0.5, which would indicate that respondents guessed, while the alternative was that they did not. The authors also used a logit model to predict the response for each pairing via the usage of demographic variables. The results indicated that consumers distinguish the nutritional and health characteristics of meat based on the animal source and level of processing rather than on individual cuts.

Hoban (1996) reviewed four major studies which dealt with public attitudes and awareness toward biotechnology in the United States. All studies concluded that most people have a positive view on the use of biotechnology in agriculture and food production. Hoban (1999) also compared consumer acceptance of biotechnology in the United States and Japan. He noted that awareness of biotechnology had risen among American consumers, but remained low among Japanese consumers.

Misra, Fletcher, and Huang (1997) analyzed, among other issues, consumers' attitudes toward irradiated foods. Consumers were also asked to express their perception about food safety concerns such as pesticide residues, animal drug residues, growth hormones, food additives, bacteria, irradiation, and naturally occurring toxins, on a scale of "no problem" to "extremely serious problem." The seven-point scale was converted into three groups and the results tabulated in terms of percentages. Chi-square contingency tests were used to determine if consumer awareness differed significantly among demographic subgroups after collapsing the seven-point scale into two groups. Results showed a correlation between awareness of food irradiation and respondents' gender, education, and household income.

Schupp, Gillespie, and Reed (1998) estimated consumer awareness and use of nutrition labels on packaged fresh meats by selected socioeconomic characteristics of households. The survey data were analyzed using logit and tabular analysis. Significant explanatory variables included family income, retirement, and controlling diet to reduce fat and cholesterol intake.

Zhong, Marchant, and Lu (2002) surveyed consumers' awareness and media coverage pertaining to genetically modified (GM) foods in China. The primary purpose of the study was to determine if consumers' potential attitudes toward GM foods were influenced by their existing knowledge and potential information from various types of media as well as by demographic characteristics. Percentages were used to describe the sample from the data collected. The majority of the Chinese consumers were found to have little knowledge about GM foods. About 40 percent of Chinese urban consumers were found to be willing to buy GM foods based on basic and general information on GM foods. Younger, female, and educated consumers tended to be more reluctant to buy GM foods while older, male, and less-educated consumer were less suspicious of the new technology and its outcomes.

Kimenju et al. (2004) used a five-point scale from 1 = "totally disagree" to 5 = "totally agree," with 3 as a neutral mid-point, to gauge consumers' attitudes in Kenya on five types of perceptions of genetic modification: benefits, health risks, environmental risks, ethics, and equity concerns. Descriptive statistics were used to tabulate the results. Almost half

of the respondents were found to be aware of GM crops, and while the majority were appreciative of the positive benefits of the technology, many were worried about potential negative effects.

Badrie et al. (2006) investigated consumer awareness and perception of food safety hazards in Trinidad, West Indies. The objectives of the study were to determine consumer perception and awareness of food safety hazards and food handling and safety practices at home. Analysis of variance was used to investigate the effects of gender on food safety responses and significant differences in means. Gender seemed to have no influence on food safety responses given by consumers. Most of the respondents (83.2 percent) categorized food safety as "very" important while only 6.4 percent felt it was "not."

Data and Methodology

The research method implemented in this study involved conducting a major comprehensive field survey directed to the four ethnic groups residing in the UAE. The city of Al-Ain, where the UAE University is located, was chosen to be the field of the study. This city is located in the Eastern part of Abu Dhabi Emirate, which is the largest in terms of size (land area) of the seven Emirates that compose the UAE. Its population is approximately half a million. The sample was composed of 270 Emiratis, 116 Arab-speaking expatriates, 43 English-speaking expatriates, and 56 of the Urdu/Hindi-speaking population. This made a total sample interviewed of 485 household heads.

In the study sample, the three most dominant nationalities for the Arab-speaking expatriates were Egyptians (24 percent), Lebanese (21 percent), and Sudanese (15 percent). For English-speaking expatriates, the main nationalities were Filipinos (17 percent), Britons (15 percent), and Canadians (12 percent). For Urdu-Hindi speaking expatriates, the nationalities were Pakistanis (82 percent), Indians (11 percent), and seven percent who did not specify their nationalities. This last ethnic population was characterized by having low levels of education and low incomes; performing odd, temporary, and unsecured jobs, the majority of which were unskilled; and some were illegal aliens who lately and under the force of law settled their residency status. Data were collected by conducting interviews with the

household heads who shopped from the different major food-shopping outlets in Al-Ain. Student assistance was used to conduct the interviews of household heads. Descriptive statistics were then used to decipher consumption characteristics of the above four ethnic groups.

The questionnaire was divided into four main sections: The first represented general information about the interviewed householders, the second was confined to data pertinent to foodstuff shopping habits, the third contained questions related to the amounts of the different foodstuffs consumed, and the fourth major section included questions pertaining to food safety and quality issues. The general information section included five questions, the shopping for foodstuff habits section included another five questions, the third section on quantities purchased of foodstuffs per visit included questions on almost all major and non-major food items that a typical household could consume (from meat and cheese to potable water and spices), and the last section on food safety/quality included a total of ten relevant major questions designed to be answered utilizing the Likert scale. A series of "Yes" and "No" questions were also asked to find respondents' attitude toward food safety practices and concerns and used in probit model. Three questionnaire languages were used: Arabic, English, and Urdu/Hindi for the corresponding sample. The data were analyzed using Statistical Package for Social Sciences (SPSS 15.0). Analysis of Variance (ANOVA) and chi-square tests were used to find significant differences in consumers' attitudes toward food safety and quality among the four ethnic groups that made up the study sample. A probit model was developed to analyze several factors affecting consumers' perception and attitude toward major food safety concerns and practices.

Results and Discussion

Demographic Characteristics

The results show that demographic characteristics of the four ethnic groups are significantly different from each other. There are significant variations in the level of income per month of these groups, with the highest level for Emiratis (AED 10,307) and the lowest for Urdu/Hindi-speaking group (AED 1,961). Similarly, the household size also

varies significantly among the ethnic groups. The results show that the largest household size belongs to Emiratis (7.43 individuals) followed by the Urdu/Hindi-speaking group (5.94 individuals), the Arab-speaking group (5.14 individuals), and the English-speaking group (2.49 individuals).

The level of education for the ethnic groups was also found to differ significantly. The results reveal that 97.3 percent of the English-speaking people have a college education, followed by the Arab-speaking group (78 percent), Emiratis (61.3 percent), and the Urdu/Hindi speaking group (11.1 percent). The Urdu/Hindi speaking group is the least educated, with 68.6 percent having less than a high school education. The key demographic characteristics of respondents and comparison by nationality using ANOVA and chi-square analysis are shown in Table 1.

Consumers' Attitudes, Behaviors, and Food Safety Practices

Consumers were asked various statements reflecting their attitudes, behaviors, and food safety practices. The respondents were asked to select their response to these statements from a Likert scale of 1–5, where 1 = "strongly disagree," 2 = "disagree," 3 = "neutral," 4 = "agree," and 5 = "strongly agree." The mean comparison of responses by nationality on various sources of information using ANOVA is given in Table 2.

The results show that reading expiration dates was ranked first, followed by searching for low cholesterol and reading ingredients on the food labels. Reading expiration dates was ranked first for Emirates, English, and Arab consumers, but noticing price came first for Urdu/Hindi-speaking consumers. This probably is because the majority of Urdu/Hindi speaking people surveyed were less educated, unskilled, and working in lower-paying jobs compared to the other groups. The other significant food safety practices for consumers in the UAE were searching for organic food and paying attention to food calories. The results also show that consumers in the UAE give less importance to the existence of artificial flavors/colors in food, the shape of the food packaging, and whether the food items were imported.

Table 1. Mean Demographic Characteristics of Sampled Consumers¹.

Variables	Emiratis	Urdu/Hindi	English	Arab	Total
Mean age (years)	34.27 ^A	36.24 ^A	41.73 ^B	39.77 ^B	36.46
Mean income (UAE dirham) ²	10,307 ^A	1,961 ^B	8,910 ^A	5,057 ^C	7,925
Mean household size	7.43 ^A	5.94 ^B	2.49 ^C	5.14 ^B	6.30
Education ³ (percent)					
None	4.7	16.7	-	-	4.6
Primary	4.3	1.9	-	3.5	3.5
Prep.	7.8	50.0	-	-	10.2
HS	21.9	20.4	2.7	18.4	19.3
BA/BS	46.1	3.7	43.2	64.0	45.3
MS or PH.D.	15.2	7.4	54.1	14.0	17.1

¹Means within a row with different letter are statistically significantly different at the 0.05 level.

²Exchange rate: 1 UAE Dirham (AED) = \$3.678

³ χ^2 (chi-square) value = 196.54 and is significant at the 0.01 level.

Most Trusted Sources of Food-Safety Information

Respondents were asked to identify their most trusted sources of information regarding the food safety issues. A list of various available sources of information was provided, and respondents were asked to select their response from a Likert scale of 1–5, where 1 = “no trust,” 2 = “don’t know,” 3 = “some trust,” 4 = “much trust,” and 5 = “complete trust.” The mean comparison of responses by nationality on various sources of information using ANOVA is given in Table 3.

The results show that there were significant differences in selecting various trusted sources of food safety information by different ethnic groups. The family doctor was the most trusted source of food-safety information for Emiratis and the Arab-speaking group, compared to TV and radio for Urdu/Hindi-speaking people and family/friends/colleagues for English-speaking people. The Urdu/Hindi-speaking group showed the lowest trust for any source of food-safety information. The other major trusted food-safety information sources were the Internet and newspapers. The results further reveal that governmental publications did not have people’s trust for obtaining information about

food safety. Magazines, labels, and pamphlets/flyers were the least trusted sources of information for the sampled consumers. The implication is that it would be more effective if food safety awareness campaigns were disseminated through family doctors, using TV/radio, and through programs and workshops to educate the general public on food safety issues.

Most Concerning Food Safety Issues

The sampled consumers were asked to identify food safety issues that concerned and frightened them most. The respondents were asked to select their response on several issues and fears about food safety from a Likert scale of 1–5 where 1 = “not important,” 2 = “don’t know,” 3 = “somewhat important,” 4 = “important,” and 5 = “very important.” The mean comparison of responses by nationality on various concerns and fears using ANOVA is given in Table 4.

The results show that the three food safety issues that concerned the sampled consumers most were food poisoning, the existence of fats and cholesterol, and sugar content. It was noted that all the listed concerns received high scores on Likert scale

Table 2. Mean Food Safety Practices of Sampled Consumers.

Rank*	Statement	Emiratis	Nationality			Total
			Urdu/ Hindi	English	Arab	
1	I always look at the expiration date of product	4.71 ^{BC}	4.04 ^A	4.56 ^B	4.82 ^C	4.65
2	I always search for cholesterol-free or cholesterol-low food	4.08 ^A	3.79 ^A	3.91 ^A	4.47 ^B	4.12
3	I always look at the ingredients of the product	4.13 ^B	3.45 ^A	4.19 ^B	4.35 ^B	4.11
4	I look first to the price of product	4.13 ^B	4.16 ^B	3.56 ^A	4.16 ^B	4.09
5	I always search for organic food	4.15 ^C	3.32 ^A	3.74 ^B	4.45 ^C	4.09
6	I care about watching calories in different food sources (I am a weight watcher)	4.09 ^B	3.16 ^A	3.74 ^B	4.03 ^B	3.94
7	I know that markets may contain contaminated foods	3.95 ^B	3.14 ^A	4.19 ^B	4.09 ^B	3.91
8	I care about knowing the name of the company producing the food I buy	3.97 ^B	3.02 ^A	4.07 ^B	4.02 ^B	3.88
9	I always investigate the morphological (apparent) food-safety features by touching and smelling food	3.58 ^A	4.00 ^B	3.49 ^A	4.33 ^B	3.80
10	I care about the existence of nutritional additions such as vitamins, etc.	3.71 ^B	3.09 ^A	4.16 ^C	3.92 ^{BC}	3.73
11	I trust the safety of the food I buy	3.71 ^B	3.09 ^A	3.23 ^A	4.16 ^C	3.71
12	Type of container or package (paper, plastic, glass, etc.) affects my choices	3.87 ^C	2.45 ^A	3.40 ^B	3.72 ^{BC}	3.63
13	I have enough information on genetically-modified foods	3.84 ^B	3.18 ^A	3.12 ^A	3.41 ^A	3.60
14	I worry a lot for existence of artificial colors in the product	3.60 ^B	2.30 ^A	4.05 ^C	3.59 ^B	3.49
15	I care about knowing the source (country) of imported food	3.17 ^A	2.98 ^A	4.09 ^B	4.21 ^B	3.48
16	Media (TV, newspapers, etc.) do affect my choices	3.75 ^C	2.32 ^A	3.16 ^B	3.41 ^{BC}	3.45
17	I prefer imported food	3.89 ^C	2.71 ^A	3.44 ^B	2.57 ^A	3.40
18	The shape of the package or container is the thing that attracts me to buy a product	3.39 ^C	2.45 ^A	2.86 ^B	3.11 ^{BC}	3.16
19	I worry a lot about the existence of artificial flavors	-	1.48 ^A	4.00 ^B	3.20 ^C	2.91

* 1 = "strongly disagree" and 5 = "strongly agree."

Means within a row with different letters are statistically significant at the 0.05 level.

Table 3. Mean Uses of Most Trusted Sources of Food Safety Information by Sampled Consumers.

Rank*	Statement	Emiratis	Nationality			Total
			Urdu/ Hindi	English	Arab	
1	The family doctor and/or doctors	4.06 ^B	3.21 ^A	3.93 ^B	4.58 ^C	4.08
2	TV and radio	4.12 ^B	3.86 ^B	3.00 ^A	3.16 ^A	3.76
3	Family, friends, and colleagues	3.56 ^A	3.36 ^A	4.07 ^B	3.92 ^B	3.67
4	Internet	4.06 ^C	1.89 ^A	3.14 ^B	3.06 ^B	3.49
5	Daily newspapers	3.52 ^A	3.23 ^A	3.21 ^A	3.22 ^A	3.39
6	Governmental publications	3.22 ^B	2.41 ^A	3.51 ^{BC}	3.78 ^C	3.29
7	Cooking books	3.49 ^A	1.91 ^B	3.58 ^A	3.25 ^A	3.26
8	Magazines	3.59 ^B	2.59 ^A	2.93 ^A	2.79 ^A	3.23
9	Food labels	3.20 ^A	2.63 ^B	3.40 ^A	3.40 ^A	3.20
10	Pamphlets and flyers	3.37 ^C	1.86 ^A	2.81 ^B	2.79 ^B	3.01
11	Others	2.48 ^A	0.66 ^B	0.21 ^C	1.37 ^D	1.80

* 1 = "no trust" and 5 = "complete trust."

Means within a row with different letters are statistically significant at the 0.05 level.

Table 4. Means of Most Concerning Food Safety Issues for Sampled Consumers.

Rank*	Statement	Emiratis	Nationality			Total
			Urdu/ Hindi	English	Arab	
1	Food poisoning	4.51 ^B	3.79 ^A	4.72 ^B	4.72 ^B	4.49
2	Fats and cholesterol	4.51 ^B	4.07 ^A	4.44 ^B	4.59 ^B	4.47
3	Sugar contents	4.52 ^B	3.88 ^A	4.28 ^B	4.31 ^B	4.38
4	Genetically modified foods	4.50 ^B	3.54 ^A	4.28 ^B	4.37 ^B	4.34
5	Pesticide residues	4.31 ^B	3.04 ^A	4.60 ^{BC}	4.66 ^C	4.27
6	Food handling	4.49 ^B	2.64 ^A	4.56 ^B	4.43 ^B	4.27
7	Hormones	4.42 ^B	2.82 ^A	4.26 ^B	4.41 ^B	4.22
8	Additives and preservatives	4.23 ^B	3.13 ^A	4.49 ^B	4.51 ^B	4.19
9	Existence of foreign bodies in food	4.25 ^B	2.93 ^A	4.47 ^B	4.54 ^B	4.18

* 1 = "not important" and 5 = "very important."

Means within a row with different letters are statistically significant at the 0.05 level.

means, indicating that they were all important. The three most concerning and fear-generating issues for Emiratis were sugar content, food poisoning, and fats and cholesterol content, with the highest score, 4.52, given to the first probably due to fears of diabetes (the most widespread disease threatening families in the UAE). In contrast, the most important issues for the English-speaking consumers were food poisoning, pesticide residuals, and food handling. For the Arab-speaking population, food poisoning, pesticide residues, and fats and cholesterol were the three main fears regarding food safety. The responses for Urdu/Hindi-speaking consumers were significantly different from those of other ethnic groups, with the highest score, 4.07, assigned to the existence of fats and cholesterol. The results also show that the existence of foreign bodies, additives/preservatives, and hormones in food received a low ranking among all groups but still had high mean scores.

Food Safety Responsibilities

Respondents were asked to indicate their opinion of the degree of responsibility of different entities regarding food safety. Respondents were provided with list of different entities and a Likert scale of 1–4, where 1 = “no responsibility,” 2 = “little responsibility,” 3 = “some responsibility,” and 4 = “all responsibility.” The sampled consumers indicated that food safety was mainly their own responsibility, followed by government agencies and consumer protection associations. The responses were found to be statistically significant among different ethnic groups. The results also indicated that farmers, food exporter/importers, and supermarkets were thought to be the least responsible for food safety. This matched the previous result indicating that the family doctor was the most trusted entity when it came to food safety. Each household perceived food-safety responsibility to be mainly their own since information was obtained by them through the family doctor.

For the Urdu/Hindi-speaking group, however, food-safety responsibility was placed on the governmental agencies. Probably this was because most of them do not have family doctors to resort to (health insurance in the UAE is provided mainly by the employer, and most of the Urdu/Hindi-speaking group lack permanent jobs with benefits). The

mean comparison of responses by nationality on the responsibilities of different entities using ANOVA is given in Table 5.

Empirical Model

Few studies have been conducted on factors affecting consumer perception of food safety risks. According to Dosman, Adamowicz, and Hrudehy (2001), gender, age, number of people in the household, and income were the main determinants of awareness of food safety risks. Nayga (1996) studied the socio-demographic factors that affected the perception of safety and found that those with the highest level of concern tended to be females living in non-metro areas and individuals with the highest levels of education and income. Lin (1995) found that those most concerned with food safety tended to be women, older, more educated, full-time homemakers, or to have a member of their household in an at-risk group (older, very young, or pregnant).

The following probit model was developed to analyze several factors affecting consumers' perception and attitude toward major food safety concerns and practices for the sampled consumers in the United Arab Emirates:

$$(1) Y^* = \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{INCOME} + \beta_3 \text{EDUCATION} + \beta_4 \text{HHSIZE} + \beta_5 \text{ARAB} + \beta_6 \text{ENGL} + \beta_7 \text{URDU} + e$$

The descriptions of dependent and independent variables used in the model are given in Table 6.

The regression results show that respondents' educational level and their ethnicity were major determinants of their perception and attitude toward major food safety concerns and practices. The regression results along with coefficients and significance level are given in Table 7.

The education variable is statistically significant (at the one percent significance [alpha] level) in all three models. The result show that the educated respondents were more likely to read information on the food labels regarding expiration dates, to have concerns about genetically modified food, and to have concerns about pesticide residues on the food items. It was also found that respondents with higher incomes were more likely to read information about expiration dates on food labels. The ethnicity of

Table 5. Mean Sampled Consumers' Opinion on Degree of Responsibilities of Different Entities Regarding Food Safety.

Rank*	Statement	Emiratis	Nationality			Total
			Urdu/ Hindi	English	Arab	
1	Myself	3.52 ^B	2.48 ^A	3.91 ^C	3.55 ^B	3.44
2	Governmental agencies	3.26 ^A	3.68 ^B	3.58 ^B	3.67 ^B	3.41
3	Consumer-protection associations	3.47 ^B	2.70 ^A	3.47 ^B	3.47 ^B	3.38
4	Food-processing factories	3.32 ^B	2.98 ^A	3.72 ^C	3.47 ^{BC}	3.35
5	Everybody	3.41 ^B	2.38 ^A	3.42 ^B	3.36 ^B	3.28
6	Supermarkets	3.37 ^{BC}	3.02 ^A	3.44 ^C	3.09 ^{AB}	3.27
7	Food exporter/importer	3.14 ^B	2.63 ^A	3.30 ^B	3.43 ^B	3.17
8	Farmers/fishermen	3.29 ^C	1.91 ^A	3.19 ^{BC}	2.89 ^B	3.02
9	Others	2.62 ^C	.34 ^A	.09 ^A	1.09 ^B	1.76

* 1 = "not responsible" and 4 = "full responsibility."

Means within a row with different letters are statistically significant at the 0.05 level.

Table 6. Description of Variables for Probit Model of Consumers' Perception and Attitude toward Major Food Safety Concerns and Practices.

Variable	Description
Dependent variables (Y*)	
1 EDATE	1 = If consumer read expiration dates 0 = otherwise
2 GMO	1 = If consumer has knowledge about GMO 0 = otherwise
3 PRESID	1 = If consumer has concern about pesticide residues on food 0 = otherwise
Independent variables	
1 AGE	Age of the respondents in years
2 INCOME	Income of the respondents in Dirham
3 EDUCATION	Educational level of respondents
4 HHSIZE	Household size
5 ARAB	1 = If respondent was non-Emirati Arab origin 0 = otherwise
6 ENGL	1 = If respondent was English speaking 0 = otherwise
7 URDU	1 = If respondent was Urdu/Hindi speaking 0 = otherwise
8 EMIRATI (Omitted category)	1 = If respondent was UAE national 0 = otherwise

Table 7. Factors Affecting Consumers' Perception and Attitude toward Major Food Safety Concerns and Practices.

Variables	Dependent Variables		
	EDATE	GMO	PRESI
(Constant)	0.187 (0.757)	-0.279 (0.551)	0.357 (0.445)
AGE	0.007 (0.509)	0.011 (0.194)	-0.001 (0.923)
INCOME	0.0001 (0.090) *	0.000 (0.360)	.00003 (0.199)
EDUCATION	0.286 (0.001) ***	0.193 (0.004) ***	0.136 (0.037) **
HHSIZE	0.024 (0.365)	0.008 (0.694)	-0.027 (0.142)
ARAB	0.146 (0.640)	-0.235 (0.280)	0.419 (0.063) *
ENGL	0.011 (0.982)	-0.518 (0.083) *	0.214 (0.535)
URDU	-0.692 (0.014) **	-0.263 (0.325)	-0.929 (0.000) ***

EDATE= Expiration date, GMO=Genetically Modified Food, PRESI=Pesticide Residues.

t-value in parentheses

***Significant at the 0.01 alpha level.

** Significant at the 0.05 alpha level.

* Significant at the 0.10 alpha level.

Note: The Emirati group was omitted for comparison purpose in order to capture the difference in responses between nationals and non-nationals in the UAE.

the respondents was another major determinant of their perceptions and attitudes toward food safety concerns and practices. The non-Emirati Arab-speaking respondents were more likely to have concerns about pesticide residues on the food items than were Emiratis. In contrast, it was found that Urdu/Hindi-speaking respondents were less likely to read information about expiration dates and to have concerns about pesticide residues on the food items compared to Emiratis. The English-speaking group was less likely to have concerns about GMO food than were Emiratis. There was no statistically significant relationship between the other socio-demographic factors, including age and household size. The results of this study are consistent with

other studies (Nayga 1996; Lin 1995; and Dosman, Adamowicz, and Hrudehy 2001).

Conclusion

The study concludes the following: (1) Demographic characteristics (incomes, household size, and level of education) of the four ethnic groups (Emiratis, Urdu/Hindi-speaking, English-speaking, and Arab-speaking) are significantly different from each other. (2) Examination of food expiration dates, searching for cholesterol in food products, reading the ingredients on food labels, and searching for organic food were the four main food-safety related concerns of the sampled UAE consumers.

The Urdu/Hindi-speaking population cared the most for food prices for reasons that probably had to do with lower education levels and low incomes. (3) Less weight and concern were given to issues related to the existence of artificial colors/flavors, the shape of food packaging, and the source of imported food items. (4) Significant differences in selecting various trusted sources of information were exhibited by the four ethnic groups. For Emiratis and the Arab-speaking population, the family doctor came in first place. For the Urdu/Hindi-speaking populations, TV and radio occupied first place in terms of the major source of trusted information on food safety/quality. For the English-speaking group, family, friends, and colleagues were the most trusted sources of information on food safety. On the other hand, the Urdu/Hindi group exhibited lowest trust in any source of information when compared to the other three ethnic groups. (5) Food poisoning, existence of fats and cholesterol, and sugar in food were the main three food safety concerns in varying degrees depending upon the type of the ethnic groups. For Emiratis and the Arab-speaking and English-speaking groups, food poisoning was first. The Urdu/Hindi population exhibited significant differences from the other three ethnic groups regarding the most concerning food safety issues. (6) Emiratis declared that the householder herself/himself, government agencies concerned, and consumer protection associations were the three main entities responsible for food safety. The responses were found to be statistically different among the different ethnic groups. (7) The respondents' education levels and their ethnicity were the major determinants of their perception and attitude toward major food safety concerns and practices. Finally, (8) in most cases, different ethnic groups had fewer concerns about food safety issues and practices than did Emiratis.

The results suggest that the UAE government needs to place more emphasis on launching consumer-awareness campaigns via different media sources since each ethnic group perceived the trustworthiness of food-safety information differently. The low scores for trust of media exhibited by the Urdu/Hindi-speaking group, which is the main blue-collar group in the nation and the majority of those working with food in terms of its handling or its processing, show the need for more attention from the different entities dealing with food safety issues.

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