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Consumer Food Choices as a Reflection of Concerns about Nutritional Attributes

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Abstract

Economic growth changed household food consumption patterns in the Republic of Korea. Consumer survey data were used to identify concerns about fat, saturated fat, sodium, sugar, calories and protein consumption. Results showed income, age, household size and the geographic location significantly influenced consumer concerns with regard to these nutritional attributes.

Introduction

The policy focus in the 1970's was the production of the sufficient volume of agricultural products to meet the domestic food demand. In traditional Korean society, prior to the establishment of the Republic of Korea in 1945, animal fat was one of the most preferred food attributes. Limited household budgets prevented many from purchasing, for example, the desired amount of meat containing also animal fat. With the rapid economic growth in the late 20th century and increasing household incomes, the annual per capita meat consumption increased from 24.9 lbs in 1980 to 73.9 lbs in 2002 (Ministry of Agriculture and Forestry, 2004). The dietary behavior of Korean consumers is currently characterized by a high animal fat intake resembling the food intake patterns of many industrialized nations. Consequently, nutritional and health considerations affecting consumers' purchase decisions became an important factor shaping the Korean food policy today.

The emerging policy issues include the supply of food with attributes necessary to maintain health and sustain the quality of life. Policy makers need to know about consumers' knowledge and preferences for nutritional attributes, and how such knowledge varies across socio-demographic profiles of consumers. Improved understanding of consumer food choices with regard to selected attributes directs scientists' to develop and test agricultural technology. Ultimately, farmers benefit from new technology and are able to supply commodities preferred

by consumers assuring the sustainability of the domestic farm sector. Knowledge of consumer food purchasing decisions helps food distributors and retailers to respond to consumer preferences by sourcing products with the demanded attributes. The whole sector of food production and distribution together with the agricultural technology development responds to signals originating with consumers.

The objective of this study is to examine the relationship between socio-demographic variables and concerns about six nutritional attributes in Korea: fat, saturated fat, salt, sugar, calories, and protein. Until now, a limited number of studies reported by home economists and food scientists addressed this issue among Korean consumers. To agricultural economist, the topic of concerns about nutritional attributes is of interest in terms of the prediction of food purchasing behavior. Anticipated changes in the demand of agricultural products guide the needed adjustments in agricultural production. After identifying factors relevant to food choices with regard to specific nutritional attributes, results are verified by comparing the lifestyle trends. The comparison includes a review of empirical data related to each nutritional attribute and the leading causes of death such as the diseases of the circulatory system. Moreover, results contribute to the formulation of the emerging food policy by identifying particular needs of various consumer subgroups of Korean society. Farmers and agribusiness will find research results useful for their production and marketing decisions.

Nutrition and Consumer Food Choices

A number of studies have considered the role of health and nutrition in food demand analysis. Capps and Schmitz (1991) measured the effects of health information on beef, pork, poultry, and fish demand using a cholesterol information index. Health information positively affected demands for poultry and fish, but had a negative affect on the demand for beef and pork. Jensen et al. (1992) created a consumer attitude and health information index and applied it to dairy product consumption. Consumers with a positive attitude towards calcium in dairy products tended to demand more dairy products than consumers with negative attitudes. A study by Frazao and Cleveland (1994) identified the nutrition and health awareness effects on the actual consumer dietary behavior. They explained the relationship between health awareness and fat and cholesterol intake. Meal planner in household appeared to underestimate fat and overestimate cholesterol in diets, but sufficient knowledge of fat and cholesterol roles could have improved diets.

Socio-demographic factors affected consumer attitudes for specific nutritional attributes determined by health awareness. Nayga (1997) identified socio-demographic variables affecting use of nutritional information about ingredients, health benefits, calories, sodium, vitamins/minerals, fiber, fat, cholesterol, and sugar content listed on food product labels. The well educated were more likely to use nutritional information than the less educated and females

were more likely than males. Rimal et al. (2001) examined the effects of socio-demographic characteristics on household meal planner's consideration of four dietary components in food selection. According to that study the household income, the number of children in the household, the geographic location, gender, age, and education significantly effected food selection. In a study focused on European consumers, Moon et al. (1999) identified concerns of consumers in Bulgaria toward five nutritional attributes. In a society experiencing a major economic transition to a market economy, household income was found to, generally, have a significant effect on consumer concerns regarding fat, sugar, protein, and energy in food. A unique aspect of this work was their use of a simulation method to illustrate the change in probabilities of being concerned about nutritional attributes with regard to changes in selected consumer characteristics.

Previous studies suggested effective modeling approaches and proper variables to explain consumers' behavior, but the investigations were focused on the United States or European countries. This study expands the existing literature by examining consumer's concerns about important food attributes to industrialized countries of Asia.

Conceptual Framework

Nutritional attributes are assumed to influence the consumer's decision to select a particular food. Consumers derive satisfaction from eating food products knowing they are rich in a specific ingredient (e.g., vitamin C), but low in some other ingredient (e.g., in saturated fats).

The degree of satisfaction derived from food consumption is difficult to measure and largely unobservable. The concept of satisfaction is defined in economic theory as utility. The abstract nature of utility has been measured indirectly in empirical consumption studies. Although the utility associated with food choices remains unobservable, it is possible to record food choices and, therefore, implicitly (indirectly) learn about the utility consumers derive from selecting foods with specific nutritional attributes.

Socio-demographic and economic characteristics of a consumer are assumed to influence the food choices reflecting concerns about nutritional attributes. Suppose that U represents the utility associated with a choice of food with a specific attribute and Z is a vector of socio-demographic characteristics influencing the degree of utility associated with the observed consumer behavior.

$$U_i = \gamma_i Z + \varepsilon_i$$

Consumer is assumed to be able to distinguish between two alternatives and select the one, which leads to a higher degree of utility (or satisfaction). Frequently, consumer choice has been modeled as a binary event, i.e., an event where only two outcomes are possible: either a consumer chooses a product or she does not choose a product. Suppose that U^c and U^n represent utilities associated with two choices of ‘being concerned’ and ‘not being concerned’ with a

specific nutritional food attribute. Therefore if Y , an indicator of consumer choice, is 1 then $U^c > U^n$ and Y equals 0 if $U^c < U^n$. For Y equal 1, the choice of an alternative is

$$\begin{aligned} \text{Prob}[Y_{ij} = 1/Z] &= \text{Prob}[U^c - U^n > 0] = \text{Prob}[\varepsilon > -\gamma Z] \\ &= F[\gamma Z] \end{aligned}$$

where $\varepsilon = \varepsilon_c - \varepsilon_n$ and $\gamma = \gamma_c - \gamma_n$ respectively;

$i = 1, 2, 3, \dots, n$, and denotes a consumer;

$j = 1, 2, 3, 4, 5$, or 6 denotes a food attribute, i.e., fat, saturated fat, salt, sugar, calories or protein.

The question format used in the survey instrument led to the specification of dependent variables indicating the degree of concern regarding a specific attribute. Respondents indicated their concerns on a five-step scale ranging from being ‘almost never concerned’ to ‘very often concerned.’ Given the nature of responses the model was estimated using the ordered logit method.

Data

The data used in this study are survey data collected in December 2003 by the Rural Development Administration in the Republic of Korea. The objective of the survey was to obtain information about consumer nutritional awareness. All respondents were women who were responsible for meal planning in their household. Because females usually are the meal preparer

in Korea, males were excluded in this survey. A total of 1,000 women in the Seoul metropolitan area were selected by multi-stage stratified quota sampling. The Seoul metropolitan area was divided into five areas. A sample of 200 respondents was selected from each area. Each subsample drew equally from five age groups (30 years to 34 years old, 35 years to 39 years old, 40 years to 44 years old, 45 years to 49 years old, and 50 years to 54 years old). Interviewers visited every individual household and conducted face-to-face interviews using a structured questionnaire.

Korean consumers showed a high level of concern about all nutritional attributes. The share of respondents indicating that they were 'often' or 'very often' concerned about selecting food products with regard to the six attributes consistently exceed 60 percent. Such a level of concern compared favorably with similar reports from other countries. For example, 22 percent and 13 percent of U.S households responded that they were never concerned about sugar or fat consumption, respectively (Rimal et al., 2001). Among Bulgarian consumers 19 percent and 22 percent, respectively, displayed a relatively low concern about the intake of calories and protein (Moon et al., 1999).

The distribution of responses suggested a comparatively low level of concern about the saturated fat consumption. Saturated fat consumed in excess can cause health problems bigger than other types of fat. The observed high level of concerns about salt (69.8%) and sugar

(65.0%) in food products was similar to concerns expressed by the Bulgarian consumers about salt (52.9%) and sugar (50.5%) content in food products they chose. However, a relatively large number of respondents was not concerned about the saturated fat or sugar content in foods (8% and 9%, respectively). The concerns about the saturated fat content were the lowest among those who indicated they were ‘very concerned’ about a listed ingredient. Moreover, the summation of those ‘concerned’ and ‘very concerned’ was also the lowest with regard to the saturated fat content. This pattern of responses is consistent with the prevalence of circulatory diseases in Korea. The share of respondents not concerned about sugar content in foods was also relatively high. Sugar consumption contributes to possible weight gain and may exacerbate effects of unbalanced diet on consumer health. The tabulated frequencies suggest the need for consumer education with regard to these two food ingredients although the profile of either group must yet be developed.

Table 1 shows the descriptive statistics of independent variables used in the study. The average household monthly income was above 3 mln won per month. Monthly earnings are determined by the official pay scale in case of government employees or employees of agencies and institutions funded from the central budget, for example research institutes, public schools and universities. One third of respondents graduated from a university (Table 1). Education is highly respected in Korea and among young Koreans having a high school degree is almost

universal. The average age of forty suggests that a number of respondents was advanced in years.

Personal interviews at home applied to data collection may have contributed to this result

because young women are more likely to work outside home, especially university graduates.

The average surveyed household consisted of four persons, a substantially higher number than

that in the United States. Respondents resided in even numbers across the five areas. The area of

East Gangnam is considered fairly fashionable with a large number of Korean 'yuppies' moving

there in recent years.

The Empirical Model

Six equations were specified to establish the influence of socio-demographic variables on the consumer concern about food nutritional attributes. A number of previous studies statistically confirmed the influence of listed variables (Table 1) on food product choices.

Household income was an important factor in explaining the relationship between the concern about nutritional attributes and food consumption. Consumers from households reporting a high income level tended to be more concerned than consumers from households with less income (Nayga, 1996; Moon et al., 1999; Rimal et al., 2001). In this study, household income is hypothesized to have a positive effect on the degree of consumer concerns about nutritional attributes.

Education level and age are hypothesized to have a significant influence on food choices with regard to the six attributes. Consumer awareness about nutritional issues has positive effect on food purchase decisions (Putler and Frazao, 1994; Nayga, 1997; Moon et al., 1999; Rimal et al., 2001), but in the current study the direction of the effect is expected to vary with regard to a particular attribute; for example, the higher the educational attainment level or the more advanced age, the higher the degree of concern about the saturated fat in foods. Meal preparers 50 years old and older were found to be more likely to follow the dietary recommendation for fat, saturated fat, and cholesterol than younger meal preparers (Frazao and Cleveland, 1994).

Education level is an indicator of ability to recognize the relevance of new information and, therefore, as information on detrimental effects of fat consumption reaches consumers, those with more education are expected to make different food choices than those with less education.

The presence of children in a household is hypothesized to have a positive effect on concerns about desirable nutritional attributes for children, i.e., fat, protein, and calories, but a negative effect on undesirable attributes of saturated fat, sugar, and salt. Rimal et al. (2001) reported that children had a positive effect on consideration of vitamin and mineral content in food selection. This study measures the effects of the household size on concerns about the six food attributes assuming that the size reflects the presence of children. Although many Korean households may include three generations, in urban setting the household consists of parents and

children. The expected influence on concerns about food attributes is similar to that obtained for the presence of children in previous studies, i.e., the larger the household size, the higher degree of concern about saturated fat, sugar and salt, and less concern about protein, calories or total fat.

Location of residence was hypothesized to affect concerns about nutritional attributes.

Han et al. (1998) found that elderly men and women in urban area showed higher percentage of abnormal level of cholesterol, triglycerides, LDL, and HDL than those in rural areas. Because sources of cholesterol include foods of animal origin, in many European countries the rural population has had easier access to meat and dairy products and suffered from the related circulatory diseases. Therefore, no a priori expectations with regard to the directional effect of the residence variable are made in the current study. All consumers in the sample reside in urban areas and the effects are differentiated across space. East Gangnam area was selected as the benchmark area because of its perception as the area where the major consumption trends originate in the Seoul metropolitan area.

Results

A comparison of demographic and socio-economic characteristics of survey respondents and the whole population of Korea provided additional insights. By design, the survey respondents were restricted to female and sorted by age groups. A slightly larger portion of survey respondents received a university degree than in total population. Although the share of

respondents from the highest income category is about the same as in the total population, consumers from households with the lowest income are under-represented. The share of respondents from the fourth and fifth income category (shown in Table 1) was more than twice the corresponding share in the total population. Income discrepancies between sample and population profiles are common in consumer studies. Results from the current study apply mostly to households with above average incomes. Furthermore, household income differences result from the actual survey location and geographical income distribution. The Seoul metropolitan area receives 48.1% of the whole gross domestic product of Korea (Korea National Statistical Office, 2004a). The average household income of this area is higher the national average (Korea National Statistical Office, 2004b). Regarding household size, especially the smallest size category, there is a difference between shares reported in the survey and the total population. In the smallest household size category the difference is in part explained by the omission of one-person households in the survey, which focused on families. The survey design may have also contributed to the large share of household reporting four members. However, given the focus on food selection and concerns about nutritional attributes, the distribution of households across size categories provides useful insights into consumer behavior.

Household income positively affected concerns regarding fat, saturated fat, and calories (Table 2). Respondents from households with higher incomes were more concerned about intake

of these food attributes than respondents from households with less income. Although the animal product consumption has been increasing recently, nutritional differences among income classes still exists (Yoon, 1997). The diet of people with low incomes is high in carbohydrates and low in fat. Therefore, respondents from the low-income bracket showed little concern about the fat consumption, especially when compared to concerns of those from the high-income bracket. Household income, however, was not statistically significant with regard to salt, sugar, and protein consumption. It is possible that across all income groups, respondents were well informed about the detrimental effects of excessive salt and sugar consumption to their health. The result is supported by the progress made in managing hypertension in the general population. The death rate caused by hypertensive diseases declined from 45.6 in 1983 to 10.7 per 100,000 in 2003 (Korea National Statistical Office, 2004c).

Older respondents were more concerned about salt and protein in food products than younger respondents (Table 2). The elderly have comparatively more opportunities to learn about the recommended dietary behavior for health than the young. Health education programs stress the link between nutrition and causes of high blood pressure or diabetes, which are common degenerative diseases related to aging.

The number of household members negatively influenced concerns about the total fat intake. Respondents from households with many family members were less concerned about fat

consumption than respondents from households with few family members. Shopping habits, meal preparation and eating patterns are likely to be more diversified in larger household causing nutritional concerns about the total fat intake to be unimportant.

Residential location significantly affected concerns with regard to all six attributes (Table 2). Regarding fat, saturated fat, salt, sugar, and protein content of foods, respondents from all showed less concern than respondents from East Gangnam. In case of the concerns about caloric content of food products, the majority of areas did not differ from the level of concern expressed by East Gangnam residents. Only residents of West Gangnam appeared to pay less attention to the calories contained in foods in comparison to East Gangnam residents.

Educational attainment level positively influenced concerns with regard to sugar content (Table 2). More educated household meal planners were more likely to be informed about nutrition and familiar with the diet-disease connection than less educated meal planners (Rimal et al., 2001). The general absence of statistically confirmed differences in the level of concern between respondents with a university degree and those with high school education or less implies that Korean consumers obtained the necessary information to make healthy food consumption decisions. Either the respondents learned about the affects of food attributes from sources such as mass media or the high school teaching programs already conveyed the necessary information before respondents received university education.

Implications

Agricultural and food manufacturing technology development and application depends on changes in food consumption patterns. Recently, the observed food preferences with regard to concerns about the nutritional attributes changed the traditional dietary behavior. For example, animal fat was a commonly preferred food attribute by many Koreans, but it has become less preferred in recent times. The decreasing preference for fat in foods is likely related to increased efforts in the area of public health education. Furthermore, raising incomes allowed for different food choices.

In order to remain competitive, farmers and food manufacturers must take into account, among others, the changing preferences and apply production or processing technologies, which reduce fat content. To meet consumer expectations with regard to fat content, scientists from breeders to food technologists working on new product formulations must focus on the selection of ingredients that lower the saturated fat content. From breeding leaner pigs or cows that produce milk with less fat to changes in formulations of traditional products containing saturated fat, or selecting soybeans with the preferred fatty acid composition, scientists may become responsive to consumer demands and public health priorities.

Though Korean consumers are highly concerned about nutritional attributes in food, the level of concern does not guarantee desirable dietary behavior. The survey results indicated that

respondents were more concerned about fat consumption than saturated fat consumption. Despite the high level of concern about food fat content, the death rate from diseases of the circulatory system remains high.

There likely is a gap between knowledge of what is the preferred dietary pattern and the actual food choices. As shown in this study, food choices with regard to specific attributes depend on a number of factors. Consumers often make food choices guided not only by nutritional attributes, but attributes consistent with lifestyle preferences including the ease of preparation or convenient handling of a food product. Specific eating habits of Korean people can induce health related problems (Yoon, 1997). For example, the preference for salty foods is undesirable from the public health standpoint, but salt may help to enhance taste or preserve food for an extended time period.

Future research needs to specifically focus on the consumer demand for food and food products and the implications of changing demand for agricultural technology research. A system that monitors changing nutritional concerns may be put in place to signal the actual changes in perceptions and the persistence of these changes. Constant efforts in communication between research institutions, food manufacturers and distributors, and consumers will improve the understanding of the important role of scientists and their responsiveness to evolving consumer preferences by the public and private sector.

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Table 1. Names and definitions of the variables used in empirical models.

Variable name	Units	Mean	Standard deviation
Household income (in 10,000 won)	1 = less than 199 won	4.029	1.906
	2 = 200 - 249		
	3 = 250 - 299		
	4 = 300 - 349		
	5 = 350 - 399		
	6 = 400 - 449		
	7 = 450 - 499		
	8 = 500 or more		
Education	1 = University graduate	0.335	0.472
	0 = At most high school graduate		
Old	1 = 40 years old or older	0.600	0.490
	0 = less than 40 years old		
Members	Actual number of household members	3.948	0.771
West Gangnam	1 = West Gangnam; 0 = otherwise	0.200	0.400
East Gangbuk	1 = East Gangbuk; 0 = otherwise	0.200	0.400
West Gangbuk	1 = West Gangbuk; 0 = otherwise	0.200	0.400
New Town	1 = New Town; 0 = otherwise	0.200	0.400

Table 2. Estimation results of six equations modeling concerns about food attributes.

Variables	Saturated					
	Fat	fat	Salt	Sugar	Calories	Protein
Intercept 5	0.1626 (0.21)	-1.4054 (15.86)	-0.6583* (3.47)	-0.6010* (2.96)	-1.2268* (11.93)	-0.8246* (5.36)
Intercept 4	1.8506 (27.02)	0.5420 (2.40)	1.4212* (15.94)	1.2816* (13.29)	0.8791* (6.17)	1.3906* (15.06)
Intercept 3	3.4429 (85.69)	2.4981 (47.42)	3.1457* (71.90)	3.0026* (67.96)	2.5779* (49.10)	3.3777* (79.66)
Intercept 2	6.4143 (109.85)	5.6362 (85.97)	7.5314* (50.51)	7.6143* (51.66)	5.5615* (83.19)	
Household income	0.1432* (18.22)	0.1365* (16.80)	0.0160 (0.23)	0.0293 (0.79)	0.0822* (6.04)	0.0327 (0.95)
Educational attainment level	-0.0635 (0.22)	0.0631 (0.22)	0.2167 (2.57)	0.2150* (2.59)	-0.1406 (1.08)	0.0220 (0.03)
Age	0.1034 (0.68)	0.1631 (1.69)	0.3836* (9.14)	0.1285 (1.06)	0.1475 (1.36)	0.2138* (2.81)
Household size	-0.2007* (6.80)	-0.0720 (0.88)	-0.0842 (1.18)	-0.0781 (1.04)	-0.0343 (0.20)	-0.1081 (1.92)
West Gangnam	-0.9533* (25.31)	-0.9533* (14.43)	-0.4194* (4.95)	-0.4049* (4.72)	-0.5688* (9.17)	-0.7286* (14.72)
East Gangbuk	-0.9795* (26.55)	-0.5540* (8.77)	-1.0453* (30.10)	-1.0147* (29.03)	-0.1617 (0.74)	-0.5154* (7.34)
West Gangbuk	-0.6176* (10.60)	-0.5248* (7.86)	-0.5209* (7.57)	-0.8184* (18.99)	-0.2094 (1.23)	-0.4150* (4.76)
New Town	-0.5587* (8.75)	-0.3828* (4.26)	-0.8749* (21.51)	-0.7257* (15.20)	-0.2975 (2.53)	-0.3465* (3.37)
χ^2 -Statistics**	63.09	44.87	52.75	46.54	19.22	22.64

* Statistically significant at $\alpha = 0.10$ or less.

**Critical χ^2 value is 20.09 with 8 degrees of freedom at $\alpha = 0.01$.

Note: Numbers in parentheses are Wald statistics.