

Gáthy, Andrea Bauerné; Soltész, Angéla Kovácsné; Szűcs, István

## Article

# Sustainable consumption – examining the environmental and health awareness of students at the University of Debrecen

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\*Corresponding author: Andrea Bauerné Gáthy, Faculty of Economics and Business, Institute of Economics and World Economy, University of Debrecen, Böszörményi Street 138, Debrecen H-4032, Hungary  
E-mail: [bauernegathy.andrea@econ.unideb.hu](mailto:bauernegathy.andrea@econ.unideb.hu)

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## MANAGEMENT | RESEARCH ARTICLE

# Sustainable consumption – examining the environmental and health awareness of students at the University of Debrecen

Andrea Bauerné Gáthy<sup>1\*</sup>, Angéla Kovácsné Soltész<sup>2</sup> and István Szűcs<sup>3</sup>

**Abstract:** Environmental awareness and health awareness, as part of a sustainable conscious food consumer philosophy, differ in form and extent among societies and countries. The main purpose of this paper was to identify the relationship between the target group's (university students) self-perceived and actual health and environmental awareness, based on their actual consumer behaviour. A questionnaire survey (n = 500) was conducted among the students of the University of Debrecen (UD), Hungary. Several multivariate statistical techniques were applied for the data analysis: principal component analysis, cross-tabulation analysis, exploratory and confirmatory factor analysis, multivariate data reduction techniques and cluster analysis. Following four factors were identified: Organic Food Preference, Price Consciousness, Quality Aspects, Food Information. As a result of the cluster analysis four clusters were formed ("Price-oriented Food Consumers", "Fashionable Organic Food Consumers", "Habitual Food Consumers", "Conscious Food Consumers"). Only the fourth cluster members can be characterised by health and environmental awareness, most of them study health and economics. The obtained findings led to the conclusion that health and environmentally conscious food consumption is at a fairly low level among UD students, i.e. improvement is definitely desirable and higher education can play a significant role in this field.

**Subjects:** European Studies; Education - Social Sciences; Environmental Psychology

**Keywords:** sustainable food consumption; health conscious; eco-conscious; university students; education for sustainable development

### ABOUT THE AUTHORS

Andrea Bauerné Gáthy is an assistant professor at the Faculty of Economics and Business, University of Debrecen, Hungary. She holds the doctorate in Business and Management. Her research interests are sustainability issues, national strategies for sustainable development, sustainable consumption, environmental impact of consumption and production.

Angéla Kovácsné Soltész is an assistant professor at the Faculty of Economics and Business, University of Debrecen, Hungary. She holds the doctorate in Business and Management. Her research interests are research methodology, statistical analyses, multivariate statistical methods, and risk analysis.

István Szűcs an agricultural economist in University of Debrecen, he is a head of Institute of Applied Economics Sciences, and his main research topics are economics of animal production (sector and farm business level); economics of fisheries and aquaculture; marketing aspects of the fisheries sector; economics of the agricultural water management.

## 1. Introduction

Sustainable consumption is characterised by both health awareness and environmental awareness. Sustainable consumption, as a consumer philosophy, is manifested in the consumption of products and services that meet consumer needs while minimising the use of natural resources and environmentally harmful substances, as well as waste and pollutant emissions. Sustainable consumption also means finding solutions to social and environmental imbalances through more responsible consumer behaviour. The concept of sustainable consumption is organically linked to production and distribution, as well as the use of products and services, until they are no longer needed. Consequently, the concept of sustainable development takes into account the entire life cycle of products and services. Sustainable consumption is a key part of sustainable development, i.e., a form of development that ensures that the needs of the present are met without compromising the needs of future generations. All definitions of sustainable consumption emphasise that it is of primary significance to reduce consumption, to satisfy human needs, to provide a good quality of life and an acceptable standard of living; to share the available resources between the rich and poor, to take into account the interests of future generations and to minimise resource use, as well as the generation of waste and pollution. This approach is particularly pronounced for food consumption, as its environmental impact is significant on both the input and output sides (Corsini et al., 2019; Hertwich, 2011; Jones et al., 2016; Olsen & Tuu, 2021; Springmann et al., 2018; Tompa et al., 2020; Tukker et al., 2011; Westhoek et al., 2014).

The current basic principles of sustainable and environmentally conscious food consumption include the preference of plant-based foods and fats over foods of animal origin, and the consumption of less processed and short supply chain foods. The philosophy of health-focused and environmentally conscious nutrition shows many similarities. Numerous studies have found that the production of foods whose consumption should be reduced due to their adverse health effects results in a higher environmental impact (Gazdecki et al., 2021; Ateş, 2020; Watts & Giddens, 2017; Martin & Brandao, 2017; Alsaffar, 2016; Macdiarmid et al., 2016.; Ruini et al., 2015.). The indirect negative environmental impacts associated with food consumption are significant, especially for land use, energy and water demand.

It is assumed that sustainable consumption is characterised by both health awareness and environmental awareness. The central issue of the present study is to examine the relationship between the perceived and actual health and environmental awareness of the young university student age group, with particular reference to food consumption. However, as a first step, it is necessary to provide a brief overview of the conceptual background, as it is important to clarify what is meant by conscious food consumption, as well as health- and environmentally conscious consumer behaviour.

Based on the reviewed Hungarian and international literature, a conscious consumer makes careful choices when making purchases and using services, and is aware of the information that can be used to find out about the product's characteristics, while also taking both his/her own interest and the interest of others into consideration (Hiramatsu et al. 2016; Brochado et al., 2016; Móznér, 2014; Süle, 2012; Zabkar & Hosta, 2012).

Conscious consumption develops as a result of a complex process and can be characterised by several motives (Szakály, 2011). First, consumers must feel the need to be conscious and forward-thinking in their consumption, being aware of their own needs and goals, rather than being passive "shoppers". For this reason, consumers need to know the products and services before making any purchase.

Several authors point out that health is a very good keyword, i.e. consumers can be better motivated to buy environmentally friendly products when they are approached from the side of self-interest (De Boer & Aiking, 2018; Törőcsik, 2014;).

It must be noted that differences were observed between perceived and actual consumer awareness (Pradhan et al., 2020; Szűcs, 2019; Hiramatsu et al., 2016; Chao & Lam, 2011; Milfont, 2009;). In many cases, especially during the conducted questionnaire surveys, respondents show a much more positive image of themselves than what is manifested in their actual consumer behaviour and way of life. However, this behaviour is not necessarily a deliberate misrepresentation. Instead, it can usually be traced back to the fact that consumers' self-created, even "idealised self-image" is no longer transformed into a conscious decision in their consumption choices, i.e. their consumption decisions are unaffected by it. Based on small sample Hungarian surveys, Szűcs states that, depending on the research area, only 10–20% of consumers showed actual consumer awareness supported by actual knowledge and consumer behaviour (Szűcs, 2019). In the authors' opinion, it is common for people to declaring themselves environmentally conscious consumers to be affected by aspects of money-saving, convenience and "occasional hedonism" to such an extent that the issue of the environment becomes "temporarily" less significant.

"Consumer neuroscience" is a relatively new, but very resource and cost-intensive method of marketing research, and it provides an opportunity for a deeper analysis of consumer behaviour and consumer decision-making (Agarwal & Dutta, 2015; Bercík et al., 2016; Javor et al., 2013). It would be useful to apply the method of "consumer neuroscience" to examine the above issues; however, this was not an option for the authors in the present circumstances.

The authors of this paper sought to separate perceived and actual consumer awareness, both in terms of health awareness and environmental awareness. The performed analysis aimed to determine which factors appear more strongly and which have a greater impact on consumer decisions in the area of food consumption.

It is a fact that environmental awareness and health awareness, as parts of a conscious food consumer philosophy, are not present in the same form and extent in different societies. In addition, there are significant differences depending on people's age, place of residence, education and income situation, which is also supported by literature sources. In the authors' experience, people in their twenties are greatly misinformed on the subject, and they do not tend to act in an environmentally and health conscious way in their daily lives.

The aim of the study was to answer the following questions:

- Which factors influence the food consumption of Debrecen University students the most?
- How can the environmental and health awareness of the target group be characterised?
- What are the most common beliefs and misconceptions that influence the food consumption decisions of the target group?

## 2. Materials and methods

### 2.1. Sampling procedure

Secondary and primary information was collected and evaluated. As a first step, the related Hungarian and international literature was reviewed as the background of the topic in order to clarify the related concepts and to get an overview of the findings of previous research.

In the next step, between May and July 2019, as a part of the quantitative research, students of the University of Debrecen were involved in a questionnaire survey, as one of the most common consumer information acquisition techniques. An online questionnaire survey and an offline sampling method (personal, paper-based inquiry) were used simultaneously, particularly emphasising the differences in levels of knowledge students have on the topic of health conscious nutrition and environmentally conscious food consumption. This study was aimed at assessing the food consumption habits of a young generation of intellectuals. This 18–25-year-old age group can be considered as the middle and upper class consumers of the near future. Higher education

students in the examined age group can already be considered independent decision-makers in their consumption habits, especially in the field of food consumption. During this period, the developed consumption patterns are also influenced by education and they will continue to play a significant role. The survey was voluntary and anonymous.

## **2.2. Participants**

After data cleansing and making the sample gender representative, the sample size was 500 people ( $n = 500$ ). The distribution of the interviewed university students by faculty and the gender distribution within faculties are representative of the students of the University of Debrecen, calculated with the help of the headcount data provided by the University Education Office. Participation in the survey was voluntary; however, quota sampling was used to ensure representativeness with regard to faculty student numbers and gender. As of 15 March 2019, the university had 24,480 students, which includes the total number of full-time, part-time, Ph.D., and postgraduate students in the 14 faculties. Due to the exploratory nature of this research, the conclusions drawn from the obtained results when examining the homogeneous group of students of the University of Debrecen shall only be applied to the food consumption habits and attitudes of the students of the University of Debrecen; however, these findings can also be relevant for other higher education students.

## **2.3. Measurements and data analysis**

Both closed and open questions were used in compiling the questionnaire. Some of the questions focused on how respondents see their own consumer awareness, while other questions focused on respondents' food consumption habits and attitudes. Eating habits and daily physical activities were also covered. In addition, a set of statements were incorporated in the questionnaire in order for respondents to express their agreement or disagreement with food consumption statements using a five-point Likert scale (1 = strongly disagrees, 5 = strongly agrees; Likert, 1931). Following the independent examination of this set of statements, a principal component analysis was performed in order to transform the obtained responses into variables with a smaller sample number, while preserving the largest possible information content (Rummel, 1970). During the factor analysis, only the consumer awareness-related statements about food consumption habits were examined. Principal component analysis was performed using Varimax rotation with Kaiser normalisation (Yong & Pearce, 2013). Cronbach's Alpha was used to test the reliability of factors (Gliem & Gliem, 2003). Bartlett's test was used to examine whether there was a correlation between the initial variables, while the Kaiser-Meyer-Olkin (KMO) criterion was used to examine the suitability of data (Williams et al., 2010). To identify and understand different types of students, the K-means Clustering Method was applied to the extracted factors. The difference between average factor scores of different types of students was checked with one-way ANOVA (Guojun et al., 2007).

Background variables in the questionnaire included gender, age, education, subjective income perception, form and level of higher education, as well as body weight and height to determine Body Mass Index (BMI).

The data obtained during the questionnaire research were processed with SPSS 23.0. Data logging was performed immediately after the data cleansing process. Basic descriptive statistical methods (minimum, maximum, mean, standard deviation, distribution, skew) were used to filter out errors and outliers during the questionnaire survey and data entry, as well as to process data. Cross-tabulation analysis was also used in the analysis to explore the relationship between each variable (Bryman & Cramer, 2002). Pearson's Chi-squared test was used to confirm (or reject) the significant correlation between the examined variables, and the non-parametric Kruskal-Wallis test of variance was also used to explore differences between groups. According to the recommendations, the interpretation of the obtained results was performed at a significance level of  $p = 5\%$  (Kruskal & Wallis, 1952).

### 2.4. Sample description

In the survey, a questionnaire filled out by 500 people (n = 500) was evaluated after data cleansing and making the sample gender representative (Table 1). All respondents have active student status at the University of Debrecen, 82.4% of them are full-time students and 17.6% are part-time students. The gender distribution of respondents reflects the proportions of the base population, with 223 male students (44.6%) and 277 female students (55.4%). In terms of place of residence, living in a county seat was the most frequent response (45.2%). As regards food consumption, this age group can already be considered to be independent decision-makers. However, the authors believe that those who still live in a family environment and students living in a dormitory or rented apartment are different in this respect. As for the place of residence during the academic year, 44.2% of the sample still spend their daily lives at home, in a family environment, while the remaining 64.8% already spend their daily lives in a dormitory or a rented flat instead of their childhood home.

Figure 1 shows the distribution of respondents by faculty, according to which the sample corresponds to the proportions of the base population. The five faculties of the University of

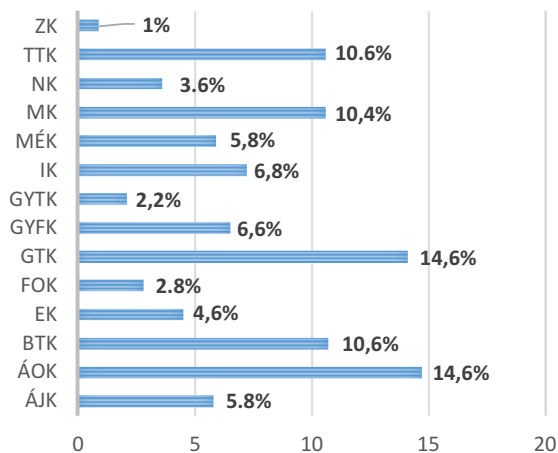
**Table 1. Distribution of the sample population along the background variables**

Description		Sample distribution	
		N	%
<b>Gender</b>	Female	277	55.4
	Male	223	44.6
<b>Form of training</b>	Full-time	412	82.4
	Part-time	88	17.6
<b>Place of residence</b>	Capital	8	1.6
	City of county rank	226	45.2
	City	131	26.2
	Settlement with a population between 2000–10,000 people	38	7.6
	Settlement with a population less than 2000 people	97	19.4
<b>Subjective income situation</b>	We have daily financial problems	6	1,2
	Sometimes we have financial problems	17	3.4
	We can make ends meet, but we cannot save up any money	144	28.8
	We can make a great living and we can also save up some money	188	37.6
	We can make an outstanding living and we can also save up money	145	29.0
<b>Place of residence during the school year</b>	At home (with the family)	221	44.2
	Dormitory	112	22.4
	Rented flat	117	23.4
	Own flat	45	9.0
	No answer	5	1.0

Source: Own calculation

**Figure 1. Distribution of the sample by the faculties\* of the University of Debrecen (N = 500).**

**Note:** ZK = Faculty of Music; TTK = Faculty of Science and Technology; NK = Faculty of Public Health; MK = Faculty of Engineering; MÉK = Faculty of Agricultural and Food Sciences and Environmental Management; IK = Faculty of Informatics; GYTK = Faculty of Pharmacy; GYFK = Faculty of Child and Special Needs Education; GTK = Faculty of Economics and Business; FOK = Faculty of Dentistry; EK = Faculty of Health; BTK = Faculty of Humanities; ÁOK = Faculty of Medicine; ÁJK = Faculty of Law.



Debrecen with the largest number of students are the Faculty of Medicine (3,467 students), the Faculty of Economics and Business (3,334 students), the Faculty of Humanities (2,524 students), the Faculty of Engineering (2,495 students) and the Faculty of Science and Technology (2,487 students).

### 3. Empirical results

#### 3.1. Evaluation of the obtained results based on the background variables

The first question was about consumer awareness. Respondents used a 5-point scale to express how much they consider themselves to be a conscious consumer according to the criteria raised (Table 2).<sup>1</sup>

Based on the obtained answers, price had the highest average value (4.002, i.e. the examined age group can be considered as price-sensitive food consumers), while standard deviation was also the lowest with this criterion, closely followed by quality as a criterion for food purchase and consumption. Local products had the lowest average value (3.092) and the median is also lower (3). It can also be concluded that a higher proportion of respondents consider themselves to be conscious food consumers in terms of health awareness than in terms of environmental awareness.

18.2% of respondents declared themselves to be health conscious food consumers.<sup>2</sup> Based on the performed cross-tabulation analysis, it can be concluded that most of these respondents are female, they study at the Faculty of Medicine, the Faculty of Child and Special Needs Education and the Faculty of Humanities, they live in a county seat, at home, in a rented apartment or dormitory, either with parents, with non-relatives or in a relationship, and they belong to the high and medium income categories. 9.2% of respondents clearly indicated that they do not consider themselves health conscious food consumers. These students are mostly male, they study at the Faculty of Engineering, the Faculty of Informatics and the Faculty of Humanities, live in a county seat, at home or in the dormitory, and they belong to the medium and highest subjective income category. 0.9% of respondents indicated that they do not know what this concept means. Most of



**Table 2. Assessing the factors influencing food consumption among students (N = 500)**

Description	Price	Quality	Local products	Brand	Environmental awareness	Health awareness
Mean	4.002	3.916	3.092	3.112	3.296	3.644
Std. deviation	0.892	1.039	1.234	1.141	1.046	1.019
Median	4	4	3	3	3	4

Source: Own calculation

these respondents are male students who study at the Faculty of Law and the Faculty of Informatics, live in a county seat or in a settlement with less than 2000 inhabitants and belong to the medium or high income category (this group of respondents is merged with the non-health conscious group in further analyses.) For this question, it was also possible to indicate “in part”. 72.2% of the respondents marked this answer. These respondents are mostly female students of the Faculty of Economics and Business, the Faculty of Medicine and the Faculty of Science and Technology, they live in a county seat, at home with their parents, and belong to the medium and higher income categories.

10.0% of respondents declared themselves to be environmentally conscious food consumers.<sup>3</sup> Based on the performed cross-tabulation analysis, it can be concluded that most of these respondents are female students of the Faculty of Economics and Business, the Faculty of Medicine and the Faculty of Humanities, they live in a county seat, at home, i.e. in a family environment with their parents, and belong to the medium income category in terms of the family’s subjective income situation. 17.8% of respondents clearly stated that they do not consider themselves to be environmentally conscious food consumers. Most of these respondents are male students of the Faculty of Science and Technology, the Faculty of Engineering and the Faculty of Economics and Business, they live in a county seat, at home or in a dormitory, and belong to the middle and highest income category. 2.4% of respondents indicated that they do not know what this concept means, i.e. they are unaware of the criteria of environmental awareness. Most of these respondents are male students of the Faculty of Informatics and the Faculty of Engineering, they live in settlements with less than 2,000 inhabitants with their parents and they belong to the high subjective income category (in further analyses, the latter group of respondents will be treated together with the group that does not consider themselves to be environmentally conscious). It was also possible to mark the answer “in part” for this question. 69.8% of respondents indicated this answer. Most of these respondents are female students of the Faculty of Medicine, the Faculty of Humanities and the Faculty of Economics and Business, they live in a county seat, at home with their parents, and belong to the middle and high income categories.

Based on the above results, it can be concluded that the students of the University of Debrecen are less familiar with the criteria of environmental awareness than with the characteristics of health awareness. They see themselves as health conscious rather than environmentally-conscious food consumers, and they tend to reject environmental aspects of food consumption to a greater extent. In addition, their food consumption decisions are dominated by self-interest over socially responsible behaviour.

In the course of examining health awareness, respondents were categorised into 3 groups based on “perceived awareness,” i.e. their own opinion of themselves in this respect: “yes” (health conscious), “partially” (partially health conscious), and “no” (rejecting health awareness or not knowing what is covered by this concept). As a next step, cross-tabulations were made and the relationships between “perceived” and “real” awareness were evaluated using the  $\chi^2$  test.

18.2% of respondents declared themselves to be health conscious food consumers. In a healthy lifestyle, regular exercise and regular sports play a decisive role in addition to healthy eating. A significant correlation was found between “perceived” health awareness and physical activity (Chi-square value:  $\chi^2 = 44.752$ ;  $p < 0.001$ ). Regular physical activity is common among those who declare themselves health conscious food consumers<sup>4</sup> (29.7% of them do physical activity and play sports once a week and 38.5% several times a week). Those who do not consider themselves to be health conscious do not do regular exercises, i.e. almost half (46.8%) of the group exercise only a few times in a month.

With regard to regular meals in accordance with the recommendations, a cross-tabulation analysis revealed that the group of those who consider themselves health conscious tend to eat 4–5 times a day more frequently (52.7%) than those who do not consider themselves health conscious (37.5%). Health conscious respondents tend to eat 4–5 times a day, while non-health conscious respondents eat irregularly and snack more often.<sup>5</sup> The Chi-squared test clearly revealed that there is a significant correlation between health awareness and regular eating (Chi-square value:  $\chi^2 = 34.893$ ;  $p < 0.001$ ). However, “snacking between main meals” does not show a clearly significant relationship with whether respondents declare themselves health conscious or not, i.e. no clear correlation was found (Chi-square value:  $\chi^2 = 5.686$ ;  $p = 0.058$ ).

Proper fluid intake is a prerequisite for a healthy diet.<sup>6</sup> Based on the related recommendations, the average fluid requirement of an adult is between 2 and 3 litres per a day. This amount of fluid intake consists of consuming different types of liquids, including morning coffee or cocoa, soup or vegetable dish for lunch, as well as fluids consumed during the day, and consumers were properly informed about this fact in the same question. Those who declare themselves to be health conscious tend to consume fluids in accordance with the recommendations, i.e. perceived and actual health consciousness are in harmony (Chi-square value:  $\chi^2 = 21,470$ ;  $p = 0.005$ ).

Health awareness is related to environmental awareness in terms of food consumption. However, it should be emphasised that only actual actions, i.e. actual decisions related to food consumption, can have an impact. 10.0% of respondents claim to be environmentally conscious food consumers.

During the analysis of environmental awareness, respondents were classified into three groups based on their opinions about themselves: “yes” (environmentally conscious), “partially” (partly environmentally conscious) and “no” (rejecting environmental awareness or not knowing what this concept means). As a next step, correlations and differences between these groups were analysed.

As regards factors influencing food purchase decisions, respondents were asked to use a five-point Likert scale to indicate how important each criterion was in their decisions. A Kruskal-Wallis test was performed to verify whether perceived environmental awareness has any effect in the case of each criterion (Table 3).

It can be concluded that there is a significant difference between those who declare themselves as environmentally conscious consumers and those who do not in the following cases: (1) product price, (2) information content and reusability of packaging, (3) country of origin, (4) trademark, (5) availability of the product in the market/specialised store and (6) opinions in the social media. Consequently, it can be stated that perceived and actual environmental awareness show correlation in the case of the criteria influencing food consumption decisions.

When examining environmental awareness, respondents were asked about the form of transport they use. For this question, respondents could mark multiple answers.<sup>7</sup> Bicycle use is twice as common for those who declared themselves to be environmentally conscious as for those who claim not to be or only partially environmentally conscious. Car and public transport were

**Table 3. Correlations between criteria influencing food consumption decisions and perceived environmentally conscious behaviour**

Description	Level of significance
Unit price (HUF per product or HUF per kg)	0.263
Product price	0.013
Packaging, appearance	0.850
Information content of the packaging	<0.001
Reusability of the packaging	<0.001
Country of origin	<0.001
Shelf life	0.061
Popularity of the brand	0.114
Trademark (Hungarian product, Outstanding product)	<0.001
Buying kitchen-free products	0.572
Availability of the product in the market/specialist shop	0.004
Availability of the product in a hypermarket	0.287
Opinions in the social media (e.g., blogs and vlogs)	<0.001

Source: Own calculation, (Kruskal-Wallis test, significance level:  $p = 5\%$ )

mentioned most often by those who declare themselves non-environmentally conscious. Walking as a form of transport was also mostly indicated by non-environmentally conscious respondents.

The results of a set of statements in the questionnaire is presented below (Table 4). Respondents could express their agreement or disagreement with food-related statements on a five-point Likert scale (1 = strongly disagrees; 5 = strongly agrees).

It is more characteristic of students who consider themselves only partially or not health conscious at all to find taste to be the most important thing during cooking ( $p = 0.005$ ) and they like to eat with their family and/or friends in a restaurant ( $p = 0.01$ ), while health conscious students tend to regularly go through promotional magazines as opposed to respondents who claim not to be health conscious ( $p = 0.047$ ).

Those who consider themselves environmentally conscious prefer fresh over frozen products ( $p = 0.047$ ); it gives them a sense of safety if they eat familiar food ( $p = 0.003$ ), they insist on consuming only familiar food ( $p = 0.001$ ), and the information in ads helps them in their decisions ( $p = 0.02$ ).

### 3.2. Results of the principal component and factor analysis

A principal component analysis was performed after the independent examination of the set of statements. The statements about food consumption habits in the questionnaire, more specifically the ones related to consumer awareness, were examined during the factor analysis. After adjusting the factor weights and rotations, 23 statements were suitable for analysis, leaving 84.2% (421 people) of the responding students in the sample. The remaining 79 students were excluded either because they did not give any answer or they indicated the answer “I do not know”. For this reason, their answers could not be analysed. The number of missing answers was not higher than 4% for any of the probed statements (the highest rate was 3.6%).

Four factors were formed on the basis of the obtained answers. In absolute terms, factor weights exceed 0.325 in all cases, however, negative factor weights were obtained for 3 statements. In these cases, the opposite of the given statement is included in the evaluation (Table 5). Principal component analysis was performed using Varimax rotation with Kaiser normalisation (Yong & Pearce, 2013). The Cronbach’s Alpha score was examined in order to examine factor

**Table 4. Evaluating the set of statements related to food consumption among UD students (N = 500)**

Statements	Statistical indexes					
	Mean	Mode	Group median	Skewness	Interquartile range of grouped data	
					Q1	Q3
I prefer fresh products over canned goods.#	4.38	5	4.51	-1.40	3.82	-
I prefer fresh products over frozen products.	4.26	5	4.39	-1.15	3.59	-
I buy fresh meat and vegetables rather than pre-packaged ones.*	4.14	5	4.36	-1.24	3.44	5.00
I always try to get the best quality at the best price.*	4.09	5	4.23	-1.15	3.41	4.87
I compare prices between the foods to buy to get the best value.#	4.01	5	4.20	-1.11	3.3	4.87
I consider the taste the first and most important thing during cooking.	3.89	4	3.95	-0.46	3.14	4.72
I always check prices, even for small items.#	3.62	5	3.75	-0.41	2.59	4.71
I love going to restaurants with my family and friends.	3.59	4	3.75	-0.57	2.65	4.63
I make a shopping list when I buy food.#	3.52	4	3.67	-0.49	2.53	4.59
For me, product information is very important. I need to know what the product contains.*	3.41	4	3.49	-0.40	2.53	4.37
A familiar food gives me a sense of security.	3.39	4	3.47	-0.32	2.42	4.42
I prefer food made in Hungary.*	3.38	3	3.40	-0.17	2.41	4.40
I regularly check out the promotional magazines and take the opportunity when I go shopping.	3.31	5	3.45	-0.32	2.16	4.51
I only buy and eat foods I know.	3.24	3	3.28	-0.20	2.36	4.13

(Continued)

Statements	Statistical indexes					
	Mean	Mode	Group median	Skewness	Interquartile range of grouped data	
					Q1	Q3
I like to buy groceries in specialist shops where I can get expert advice.* (e.g., butcher's, greengrocery)	3.08	3	3.15	-0.16	2.09	4.10
I don't like spending too much time cooking.*	3.05	4	3.06	-0.04	1.88	4.23
I try to avoid food additives.*	2.87	3	2.83	0.11	1.86	3.85
I always plan a few days in advance what we will eat.*	2.86	3	2.80	0.16	1.81	3.86
It is more important to choose food for their nutritional value than their taste.*	2.80	3	2.81	0.03	1.89	3.71
I make sure that the product is preservative free.*	2.80	3	2.76	0.17	1.79	3.76
I do not mind paying a higher price for organic products.*	2.64	2	2.55	0.32	1.55	3.66
I consume natural or organic food.*	2.62	2	2.56	0.24	1.61	3.60
I like to know what I buy, so often ask questions where I buy the food.*	2.58	3	2.55	0.20	1.52	3.60
I prefer canned goods over frozen ones.*	2.40	1	2.29	0.43	1.36	3.37
I usually don't decide what to buy until I'm in the store.#	2.38	2	2.29	0.44	1.44	3.25
Ads information can help me make a better purchasing decision.	2.38	1	2.30	0.36	1.32	3.39
We eat a lot of previously prepared meals at home.#	2.37	1	2.24	0.55	1.35	3.28

Source: Own calculation; Note: The amount of missing data for each statement is less than 4%.

**Table 5. Factors and factor weights obtained during the principal component analysis**

Statements	Factors			
	1	2	3	4
I make sure that the product is preservative free.	0.816			
I try to avoid food additives.*	0.797			
I consume natural or organic food. *	0.736			
I do not mind paying a higher price for organic products.*	0.700			
It is more important to choose food for their nutritional value than their taste.*	0.683			
For me, product information is very important. I need to know what the product contains.*	0.602			
I always check prices, even for small items.*		0.787		
I compare the prices of the food items I want to buy so that I can get the best prices.*		0.733		
I regularly check out the promotional magazines and take the opportunity when I go shopping.*		0.669		
I always try to get the best quality at the best price.*		0.503		
I make a shopping list when I buy food.*		0.478		
I prefer fresh products over canned goods.			0.807	
I prefer fresh products over frozen products.			0.760	
I buy fresh meat and vegetables rather than pre-packaged ones.*			0.638	
We eat a lot of previously prepared meals at home. *			-0.507	
I prefer canned goods over frozen ones.			-0.329	

(Continued)

Statements	Factors			
	1	2	3	4
I usually don't decide what to buy until I'm in the store.*			-0.325	
A familiar food gives me a sense of security.*				0.649
I only buy and eat foods I know.*				0.642
I trust the food products I see in ads more than the ones that are not in the ads.*				0.638
I like to know what I buy, so often ask questions where I buy the food.*				0.533
I like to buy groceries in specialist shops where I can get expert advice.* (e.g., butcher's, greengrocery)				0.510
I prefer food made in Hungary.				0.430

Source: Own calculation

Method: Principal component analysis, Varimax rotation with Kaiser normalisation; Cronbach's Alpha: 0.815; KMO = 0.780; Bartlett's test ( $\text{Chi}^2 = 3614.406$ ;  $\text{df} = 253$ ;  $p < 0.001$ ); MSA scores > 0.669; Mean of communality: 50.8%; Total variance: 50.752%

reliability (Gliem & Gliem, 2003); its value was 0.815 for the 23 statements, and it exceeded 0.6 for each factor. Hair et al. (2010) note that the Cronbach's alpha should be higher than 0.70; however, in the case of exploratory research, values from 0.60 to 0.70 may be accepted. Bartlett's test was used to reveal whether there is a correlation between the initial variables, the level of which is  $p < 0.001$  in this case. Consequently, these variables are suitable for analysis. The Kaiser-Meyer-Olkin (KMO) criterion was used to test the suitability of data, as this method aims at determining the suitability of the variables for analysis. In this case, the KMO value is 0.780, which can be considered appropriate, almost very good (MSA value > 0.669), i.e. the variables are suitable for factor analysis (Williams et al., 2010). The total variance is 50,752%, therefore, the principal component retains more than half of the original information content.

Four factors were identified based on the principal component analysis. The first factor (F1) is characterised by the preference for organic products in terms of food consumption and purchase. Statements in favour of organic products were included here, hence this factor was named "Organic Food Preference Factor" (explanatory variance: 17.61%). Factor F1 includes six statements from the set of statements based on which (1) quality characteristics are the main factors in making food consumption decisions; (2) it is important that the food is preservative-free; (3) the food should be free of additives; (4) nutritional value is more important than taste; (5) willingness to pay even higher price for organic products; and there is a strong demand for (6) information about what consumers eat. Based on the high factor weights, it appears that these conditions largely determine food consumption decisions.

**Table 6. Factor analysis based on socio-demographic background variables (N = 421)**

Socio-demographic variables	Factors			
	F1 Preference of organic foods	F2 Price awareness	F3 Quality aspects	F4 Food information
<b>Gender</b>	no effect	***less frequent among men	***less frequent among men	no effect
<b>Faculty</b>	no effect	no effect	*very frequent among students of the Faculty of Pharmacy	no effect
<b>Training</b>	no effect	no effect	no effect	no effect
<b>Place of residence in the school year</b>	no effect	***more frequent in rented flats and dormitories	*less frequent in dormitories	*frequent among those living at home
<b>Income</b>	no effect	no effect	no effect	no effect
<b>Health awareness</b>	***very frequent among those giving “yes” as an answer	no effect	* less frequent among those giving “no/I don’t know” as an answer	* less frequent among those giving “yes” as an answer
<b>Environmental awareness</b>	*** very frequent among those giving “yes” as an answer	* frequent among those giving “yes” as an answer	** less frequent among those giving “no/I don’t know” as an answer	* frequent among those giving “yes” as an answer

Source: Own calculation

Method: Analysis of variance—ANOVA, Levels of significant difference: \*: $p < 0.05$ ; \*\*: $p < 0.01$ ; \*\*\*: $p < 0.001$

The second factor (F2) involves the statements related to price. Since this factor is characterised by consciousness, it is called “*Price Consciousness Factor*” (explanatory variance: 11.75%). Factor F2 includes five statements, according to which (1) price plays a central role in food purchase habits: even in the case of small quantities, price is taken into account, (2) consumers strive to find the best price/value ratio; for this reason, (3) they follow discounts; (4) they consciously prepare for shopping, and (5) they write a shopping list in advance. Awareness can also be clearly observed based on factor weights, as respondents plan in advance, always look for where they can buy foods at a good price, and price is a significant factor for them even when buying smaller quantities.

The six statements in the third factor (F3) focus on the “freshness” of foods. The name “*Quality Aspects Factor*” was found to be appropriate in this case (explanatory variance: 11.48%). According to these statements, consumers prefer fresh foods and food ingredients to canned, frozen and pre-packaged products; they consume little pre-prepared food and they consciously plan their food purchases in advance.

The fourth factor (F4) also involves six statements that focus on information about food consumption, therefore, this factor was named “*Food Information Factor*” (explanatory variance: 9.91%). According to the statements in F4, (1) information plays a central role in both the purchase and consumption of food; (2) they prefer to consume traditional, well-known foods, (3) they trust the product information in advertisements; (4) when shopping for food, they are happy to visit “specialised stores” (5) where they ask questions about the product; and (6) they prefer Hungarian/ domestic (i.e. non-foreign) foods.

As a next step, the factors were examined on the basis of socio-demographic background variables using analysis of variance (ANOVA; Table 6). The analysis showed that a significant effect could be observed for all background variables except income. Traditional socio-demographic background variables were supplemented with questions on health and environmental awareness, and the resulting groups were also compared with the factors.



In the *Organic Food Preference Factor* (F1), a significant effect can be observed in the case of those who consider themselves environmentally and/or health conscious, and no other significant correlation with other socio-demographic background variables was found, i.e. it can be concluded that awareness strongly influences decisions related to food consumption.

The statements in the *Price Consciousness Factor* (F2) are less characteristic of male students and those living in the capital, but more typical of those who live in a rented flat or dormitory during the school year and claim to be environmentally conscious. Those who consider themselves environmentally conscious thoroughly plan their food purchases and consider it important to keep track of the price changes of food, as well as the various discounts to be able to buy food at a better price.

The *Quality Aspects Factor* (F3) is less common among male students, those living in small towns and students who live in dormitories during the school year, but is very common for students of the Faculty of Pharmacy. The statements in factor F3 do not refer to those who claim not to be environmentally and health conscious. Students in factor F3 tend to be influenced by their perceived/manifested health and/or environmental awareness in their food consumption decisions.

The *Food Information Factor* (F4) is more characteristic of students participating in part-time training, and the effect of perceived/declared awareness appears in terms of both health and environmental awareness, which is rather characteristic in the case of the latter.

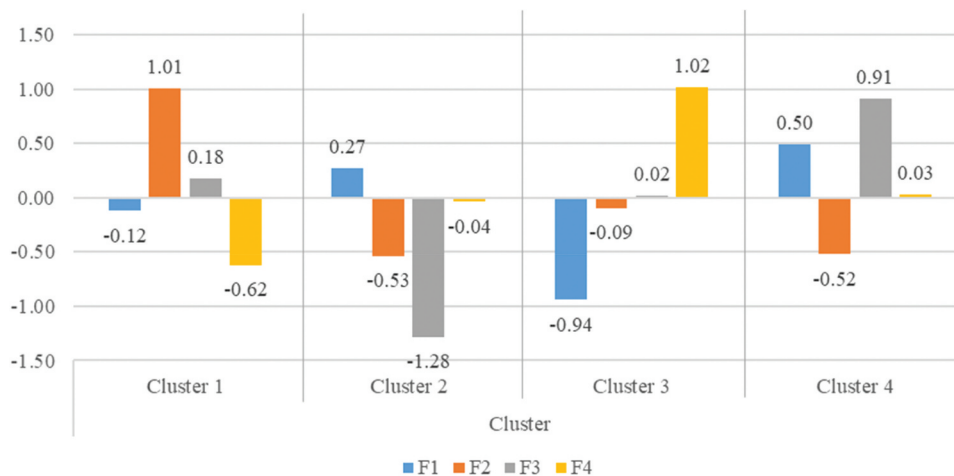
### 3.3. Results of the cluster analysis

Among the various clustering procedures, the hierarchical Ward method and the non-hierarchical K-means method were both used to classify the statements into homogeneous categories. The factors underlying the clusters have been examined previously (Cronbach's 'Alpha > 0.6), and all factors were found to be suitable for cluster analysis (Guojun et al., 2007). The results of the non-hierarchical clustering were chosen for the analysis, during which four clusters (C1; C2; C3; C4) were formed by entering three, four and five cluster numbers and then running them in the analysis of variance (Figure 2), i.e. the number of respondents belonging to the final segments was at least 15% of all respondents.

ANOVA was performed to evaluate the distribution of the cluster within the sample and its relationship with the different factors. When analysing the developed clusters, a cross-tabulation analysis involving the background variables revealed significant correlations with all characteristics except the place of residence and the form of training. Altogether, the four cluster solution yielded segments which can be well separated and delineated (Table 7).

**Figure 2. Clusters shown by factor.**

**Note 1:** The Y axis shows the deviations from the mean value.  
**Note 2:** F1 = Organic Food Preference Factor; F2 = Price Consciousness Factor; F3 = Quality Aspects Factor; F4 = Food Information Factor  
 Source: Own calculation



**Table 7. The formed clusters in view of socio-demographic variables**

Variables		Socio-demographic characteristics (%)				Sig
Number of clusters		Cluster1	Cluster2	Cluster3	Cluster4	
Cluster size		<b>29.22</b>	<b>24.47</b>	<b>18.05</b>	<b>28.27</b>	
Gender	Male	19.59	32.99	20.62	26.80	<0.001
	Female	37.44	17.18	15.86	29.52	
Faculty	ÁJK	15.38	46.15	19.23	19.23	0.044
	ÁOK	25.86	18.97	13.79	41.38	
	BTK	40.91	34.09	9.09	15.91	
	EK	27.78	16.67	11.11	44.44	
	FOK	25.00	25.00	16.67	33.33	
	GTK	27.42	16.13	19.35	37.10	
	GYFK	32.00	20.00	20.00	28.00	
	GYTK	22.22	0.00	22.22	55.56	
	IK	31.03	24.14	27.59	17.24	
	MÉK	22.22	25.93	22.22	29.63	
	MK	26.09	28.26	19.57	26.09	
	NK	28.57	35.71	0.00	35.71	
	TTK	39.58	20.83	27.08	12.50	
ZK	33.33	66.67	0.00	0.00		
Form of training	full-time	30.46	24.71	17.82	27.01	0.514
	part-time	23.29	23.29	19.18	34.25	
Place of residence	capital	16.67	16.67	—	66.67	0.308
	county seat	29.89	22.28	17.93	29.89	
	city	27.43	23.89	18.58	30.09	
	small town	30.56	36.11	25.00	8.33	
	village	30.49	25.61	18.85	28.20	
Place of residence during the school year	rented flat	38.46	19.23	19.23	23.08	<0.001
	dormitory	38.24	29.41	17.65	14.71	
	at home	17.24	25.86	18.39	38.51	
	own flat	36.84	18.42	15.79	28.95	
Income	low	39.13	47.83	8.70	4.35	0.007
	medium	31.15	23.77	22.95	22.13	
	high	27.64	22.91	16.73	32.73	
Health awareness	yes	33.82	19.12	2.94	44.12	<0.001
	no/I don't know	25.64	33.33	35.9	5.13	
	partly	28.66	24.52	19.11	27.71	
Environmental awareness	yes	28.21	25.64	5.13	41.03	<0.001
	no/I don't know	20.22	24.72	35.96	19.1	
	partly	32.08	24.23	14.33	29.35	

Note 1.:there are more respondents in the given category than expected

there are less respondents in the given category than expected

for the Faculty of Dentistry, the Faculty of Music and the Faculty of Public Health, the sample number of several cells were lower than 5, i.e. they were excluded from the evaluation

Note 2.: ZK = Faculty of Music; TTK = Faculty of Science and Technology; NK = Faculty of Public Health; MK = Faculty of Engineering; MÉK = Faculty of Agricultural and Food Sciences and Environmental Management; IK = Faculty of Informatics; GYTK = Faculty of Pharmacy; GYFK = Faculty of Child and Special Needs Education; GTK = Faculty of Economics and Business; FOK = Faculty of Dentistry; EK = Faculty of Health; BTK = Faculty of Humanities; ÁOK = Faculty of Medicine; ÁJK = Faculty of Law.

The first cluster (C1) includes predominantly price-conscious food consumers, who also take food quality into consideration, but do not invest energy in gathering information about food, nor do they pay attention to the origin of food. Respondents in this cluster are mostly female students of the Faculty of Humanities, who live in a rented flat or dormitory during the school year. This is the largest cluster, which includes 29% of respondents. The C1 cluster was named “Price-oriented Food Consumers” based on the characteristics of its members.

As regards those belonging to the second cluster (C2) (24.5% of respondents), only the demand for organic food appears, but they are not interested in the price and quality of food, nor do they look for other information about food. Most of the members of this cluster are male students of the Faculty of Humanities and the Faculty of Law, and the majority belong to the lower income category. The C2 cluster was named “Fashionable organic food consumers” based on its main characteristics.

Members of the third and smallest cluster (C3) (comprising 18% of respondents) are only willing to consume what they know, they look for food information, but do not deal with food prices or their quality. This cluster includes mostly students of the Faculty of Medicine, the Faculty of Science and Technology and the Faculty of Informatics, they belong to the middle income category and do not claim to be either health- or environmentally conscious. The name “Habitual food consumers” was found appropriate for this cluster.

The C4 is the second largest cluster (involving 28.3% of respondents) and it is characterised by the demand for organic food and the importance of quality aspects. Members of this cluster spend only little energy on gathering food information, but do not consider food prices important. A large proportion of students in this cluster study at the Faculty of Health, the Faculty of Economics and Business and the Faculty of Pharmacy, a large proportion of them live at home with their families, they classify themselves into the higher income category, and claim to be health- and environmentally conscious. The C4 cluster is the only cluster that can be characterised by health and environmental awareness, which also influences food consumption decisions, hence the name “Conscious food consumers”.

#### 4. Discussion of results

A limited number of researches have examined the relationship between environmental awareness and health awareness as part of a sustainable, conscious food consumption philosophy among university students. However, several studies have confirmed that diets based on nutritional guidelines significantly reduce the negative environmental impacts of nutrition, such as Ateş (2020), Ghvanidze et al. (2019), Martin and Brandao (2017), Dooren and Bosschaert (2013), and McDonald et al. (2012), and Tukker et al. (2011).

This study investigated and tested the relationship between the target group’s (university students) self-perceived and actual health and environmental awareness, based on their actual consumer behaviour. Our findings are similar to the study findings include Pradhan et al. (2020), Szűcs (2019), and Chao and Lam (2011) who found significant differences between self-perceived and actual consumer awareness.

The results show that regular exercise and regular and conscious eating are common among those who profess to be health-conscious food-consuming students. This results consistent with the findings of many researches, such as Frezza et al. (2019), Fenyves et al. (2019), Ghvanidze et al. (2019), and Martin and Brandao (2017).

Four factors were distinguished on the basis of the performed principal component analysis (F1) Organic Food Preference Factor, (F2) Price awareness factor; (F3) Quality Aspects Factor; and (F4) Food Information Factor. This is consistent with the findings of several studies, such as Nie et al. (2017), Annunziata and Mariani (2018), Van Huy et al. (2019), and Verain et al. (2017), Móznér (2014), La Lama et al. (2018), Ghvanidze et al. (2019), and Hrubá (2019).

Based on the results, these are the determinants of food consumption decisions among university students.

The contribution of the study to the results so far is to draw attention to the importance that it is still possible to influence consumption patterns for the age group studied (young adults), but this can only be effective if aligned with the higher education program.

## 5. Conclusions

Based on the obtained findings of this research, it can be concluded that the students of the University of Debrecen are less familiar with the criteria of environmental awareness than the characteristics of health awareness, they consider themselves health conscious rather than environmentally conscious food consumers, and reject environmental aspects in a higher proportion. In addition, self-interest dominates over socially responsible behaviour in their food consumption decisions. Health and environmentally conscious food consumption is at a fairly low level among students, i.e. improvement is definitely desirable. University education can play a role in this field, as information on conscious consumer behaviour and criteria for health and environment-conscious behaviour can be included in the topics of many subjects in various fields of study.

Differences and correlations were examined in relation to perceived and actual food consumption habits. The obtained results show that there is a significant difference in several respects on behalf of those who claim to be environmentally conscious in comparison with those who do not. Those who consider themselves to be environmentally conscious consumers tend to refrain from novelties and prefer the usual flavours and fresh ingredients. As regards the different modes of transport, this group prefers walking and public transport, and they like to ride the bicycle.

Again, a significant difference was found in the case of health conscious food consumers between those who claim to be conscious and those who do not. Health conscious students (1) exercise regularly; (2) eat as often as recommended; (3) also pay attention to adequate daily fluid intake; (4) consider taste to be a priority when eating; (5) combine the community experience with meals; (6) keep track of special discounts, which also affects their food consumption, while the above criteria do not necessarily apply to those who do not consider themselves health conscious.

Four factors were distinguished on the basis of the performed principal component analysis: (F1) Organic Food Preference Factor; (F2) Price awareness factor; (F3) Quality Aspects Factor; and (F4) Food Information Factor. Four clusters were formed as a result of the cluster analysis. The results of cluster analysis can be useful in creating education methods which should be a differentiate in the way of the transfer of information that promotes conscious consumption according to and developing the level of health and environmental awareness of university students. The first cluster (C1—"Price-oriented Food Consumers") involves 29.22% of the respondents, who are predominantly price-conscious food consumers and their decisions are not influenced by anything other than price. These respondents tend not to be health or environmentally conscious. Based on the obtained results, this cluster involves mostly students from the Faculty of Humanities, i.e. it would be extremely important to provide them with more information in the field of health and environmental awareness during their education, especially with regard to food consumption. Those belonging to the second cluster (C2—"Fashionable Organic Food Consumers") are characterised by the demand for organic food, representing 24.47% of respondents. Again, health and environmental awareness is not characteristic of this cluster. Since only the F1 factor (Organic Food Preference Factor) appears prominently, and quality and information are not important to these respondents at all, their decisions are not necessarily considered conscious. In the educational programmes of the Faculty of Law, the Faculty of Music and the Faculty of Public Health, information that strengthens health and environmental awareness should be emphasised. The members of the third, i.e. the smallest cluster (C3—"Habitual Food Consumers") make up 18.05% of the respondents, who stick to their well-known flavours and foods. Students of the Faculty of Medicine, the Faculty of Science and Technology and the Faculty of Informatics belong to this

cluster. These students tend to reject health and environmental awareness. Consequently, it would be necessary to give information to these students about conscious food consumption in a special form. In addition, it should be the first step to arouse their interest in the topic. C4 (“Conscious Food Consumers”) is the second largest cluster (28.27% of respondents). This is the only cluster whose members can be characterised by health and environmental awareness. In addition, they prefer organic food, find food quality characteristics to be important and invest energy in obtaining food information, while price is a less significant aspect during their food purchases and consumption decisions. Most of the members of this cluster study health and economics.

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#### Author details

Andrea Bauerné Gáthy<sup>1</sup>

E-mail: [bauerne.gathy.andrea@econ.unideb.hu](mailto:bauerne.gathy.andrea@econ.unideb.hu)

ORCID ID: <http://orcid.org/0000-0002-9515-3290>

Angéla Kovácsné Soltész<sup>2</sup>

István Szűcs<sup>3</sup>

<sup>1</sup> Faculty of Economics and Business, Institute of Economics and World Economy, University of Debrecen, Debrecen, Hungary.

<sup>2</sup> Faculty of Economics and Business, Institute of Sectoral Economics and Methodology, University of Debrecen, Debrecen, Hungary.

<sup>3</sup> Faculty of Economics and Business, Institute of Applied Economics Sciences, University of Debrecen, Debrecen, Hungary.

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#### Notes

1. Question: Do you consider yourself a conscious consumer? (1) in terms of price; (2) in terms of quality; (3) in terms of preferring Hungarian products; (4) in terms of brand; (5) in terms of environmental awareness; (6) in terms of health awareness. Please rate from 1 to 5! (1—I do not consider myself a conscious consumer at all, 5—I fully consider myself a conscious customer, 0—I cannot decide).
2. Question: In your opinion, do you usually eat health-consciously? (1) yes; (2) in part; (3) no; (4) I do not know what this concept means.
3. Question: Do you consider yourself an environmentally conscious food consumer? (1) yes; (2) in part; (3) no; (4) I do not know what this concept means.
4. Question: Please describe your physical activity (sports or physical work)? (1) I exercise for at least 30–60 minutes per day; (2) I exercise 30–60 minutes several times a week; (3) I do exercises for 30–60 minutes once a week; (4) I do exercises only a few times a month; (5) I usually avoid physical activity
5. Question: How many times do you eat on an average weekday? (1) 4–5 times a day (breakfast, lunch, dinner, and a small meal between main meals); (2) I only eat 3 times a day (breakfast, lunch, dinner); (3) I eat twice a day (I skip either the breakfast or dinner); (4) I snack almost all day and I do not stick

to main meals; (5) I don't know because I eat very irregularly.

6. Question: Please estimate how much fluid you consume on an average weekday (including soup)? (1) half a litre / day; (2) 1 litre / day; (3) 2 liters / day; (4) 3 liters / day; (5) More than 3 liters / day
7. Question: How do you usually travel? (Please give estimates) (A) Daily average distance travelled (meters); (b) Average daily duration of travel (minutes): (1) by car; (2) by bicycle; (3) by public transport; (4) on foot; (5) other: ...

#### Disclosure statement

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