

DOCTORAL (PhD) THESES

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AUTHORITY RISK COMMUNICATION IN THE FOOD CHAIN

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1. BACKGROUND OF RESEARCH

Food safety has always been a serious concern for human society. In every world religion, it can be observed how leaders have been trying to communicate, pass on, and enforce food hygiene and safety and public health rules in early societies. Accordingly, food chain supervision has existed even in ancient times. In Hungary, a well-organised and specifically trained central authority have been in charge of this task since the second half of the 1800s.

From the end of the 20th century, the need for new foundations of food safety communication and the working method and structure of food chain supervision was clear once again. The breakthrough in Europe was the widespread social tension caused by a prion disease in the second half of the 1990s, the bovine spongiform encephalopathy (BSE). As a result, the issue of food chain safety appeared in the headlines of newspapers, and was popularised, which required communication with consumers, the wide strata of society. The foundations of the new European food safety system were formulated in the European Commission's Regulation No 178/2002, which included the general principles and requirements of food law, the founding of the European Food Safety Authority, and the establishing of procedures concerning food safety. It was based on chain approach and the principles of traceability and precaution, and it has also introduced a risk assessment as supervising method approved by Codex Alimentarius. The key concept of which is the risk that is the multiplication of the severity and probability based on the characteristics of the health effects determined by qualitative and quantitative analyses of a given hazard and the exposure of consumers defined with measurement and estimation.

In accordance with the methodological requirements of the risk analysis, public tasks are divided into three groups:

- Risk management
- Risk assessment
- Risk communication

Traditional activities of the authorities (regulation, control, sanctioning) have been considered as risk management. These procedures are based on the results of risk assessment, which includes scientific activities within the risk analysis. Risk assessment involved the identification and qualitative and quantitative analysis of the hazard, the characterisation of possible health effects (harms) and the determination of the exposure. Risk communication complements the last two activities. The task of risk communication is to create a common language to contribute to the two-way (between society and authority) flow of information about risks. The latter is especially important if some of the actors in the food chain are not fully in possession of the information necessary to avoid risks, and when the available information is critically undervalued or overstated by the actors of the chain.

Some of the principles of European food law and the “food scandals” in Hungary in the 2000s prompted Hungarian decision-makers to create a new basis for the domestic food chain supervising service as well. With Act XLVI of 2008 on food chain and official supervision and the establishment of an integrated authority supervising the whole food chain, we introduced new elements in domestic food law that could greatly facilitate the implementation of principles of risk analysis and considered the connections between agri-food verticals and public health as a coherent and complex system.

The aim of my research was to segment the Hungarian population in a satisfactory but scientifically well-grounded way based on food safety risk perception, in order to enable the food chain supervising authority to communicate food chain safety events in a targeted manner and – as a consequence – more effectively in the future.

2. RESEARCH METHODOLOGY AND SAMPLE

Prior to the research, I set up 3 hypotheses:

H1: The Hungarian society can easily be divided with cluster analysis on the basis of the perception of food-borne risks and risk-avoidance behaviour into manageable number (3-6) of robust-sized (each group covering at least 15% of the sample) groups, where each group can be considered homogeneous.

Explanation: By justifying this hypothesis, the path towards consumer segmentation opens. If the hypothesis cannot be verified, then there is no need to set up target groups in risk communication, or targeted communication is only feasible in a very stratified manner.

H2: Different consumer perceptions of food safety are largely influenced by age, gender and educational attainment in Hungary, which can be justified as a result of classification based on risk perception and risk avoidance behaviour (H1 hypothesis).

Explanation: Based on the international literature, it can be assumed that these demographic variables determine risk perception in food safety in the domestic society to some degree as well. The justification of the hypothesis alone enables a simple consumer segmentation, and at the same time, it raises the possibility of more complex segmentation.

H3: Knowledge of food safety does not necessarily determine food safety awareness.

Explanation: Using a multivariate analysis, we can gain deeper knowledge of the driving forces of domestic society's food safety risk avoidance behaviour. If we fail to substantiate this hypothesis, the most important objective of risk communication for prevention purposes can be the

development of education and the dissemination of knowledge. However, in case of justifying the hypothesis, at least some of the consumer segments require communication methods that attract the attention and change the behaviour of those who are knowledgeable but not conscious consumers.

As research methodology, quantitative questionnaire survey was chosen. Face-to-face interviews were conducted with the monitoring of quotas. The goal was to achieve a sample that is representative regarding sex, age, and place of residence. In order to determine representativity, we considered the dataset for 2014 adjusted from the census of 2011 conducted by the Hungarian Central Statistical Office as a basis.

Sampling was extended to several major cities in the country. The survey was carried out in public areas at traffic junctions with the assistance of the employees of the National Food Chain Safety Office.

During the face-to-face survey, 1003 evaluable interviews were conducted. Considering the subject, this large sample size provided an appropriate basis for carrying out statistical analyses.

The chosen form of interviews opened up the opportunity for more curious respondents to express their opinion and views orally as well. Such non-quantifiable information greatly assisted the analysis and provide important experiences for later research.

In the first phase of the analysis, I proved that the sample could be well segmented along a number of demographic parameters by applying descriptive statistical methods and contingency tables, so I could justify that creating target groups facilitate risk communication.

For statistical analysis, we used version 22 of IBM SPSS (Statistical Package for Social Sciences), which was specifically designed for statistical

surveys in the field of social sciences. With the aid of this software, analysis was performed firstly with descriptive statistical tools (mean, standard deviation, median, mode, minimum, maximum, frequency). These tools enabled the general characterisation of the sample and the understanding of simple connections.

In the second phase of the analysis, we compared the demographic variables with variables that are relevant based on descriptive statistics. Their connections were analysed with a chi-squared test using contingency table, which was conducted with Pearson's method. During the analysis, the aim was to detect significant relationships. To achieve this, the confidence interval was set at 95%. Cluster analysis was carried out in order to segment the Hungarian population on the basis of risk communication, which resulted in more homogenous groups that can be addressed effectively by risk communication with the application targeted tools. For the cluster analysis, I determined firstly with factor analysis 2 types (basic and advanced) of knowledge and 2 types of awareness (of home and of shopping) variables. After specifying the variables relevant to the research hypotheses, we formed consumer clusters with the hierarchical, agglomerative Ward's clustering method (variances method). During the analysis, we identified four significantly different groups to design effective communication activities.

3. RESULTS AND EVALUATION

The issue of food chain safety is a priority area for consumers. The respondents considered health care (4.80) and food chain safety (4.64) as the two most important issues among the stat-supervised areas listed in the questionnaire.

Contingency tables show that there is a significant connection between the assessment of the importance of food chain safety and the increase in age, and significant differences are observed arise in relation to sex. Nearly 78% of women characterised the importance of food chain safety by “5”, while this ratio barely reached 70% in the case of men.

Thirty-seven and thirty-nine hundredths percent of the respondents felt an improvement in the domestic situation of food safety between 2012 and 2014, while less than 5% perceived deterioration. Those who believed the situation had not change were divided into other groups: 13.70% said that the food safety situation of our country was good before, which had been preserved; and only 4.94% felt that the circumstances were bad in the past regarding this issue, and there had not been a change compared to this. Overall, more than half (51.06%) of the respondents think that food chain safety has evolved or has been good in our country, the level of which has been maintained.

The research also covered the functions of each food chain safety actors, including the state, to maintain food chain safety. According to the respondents, food processing companies (4.57), food service and public sector catering (4.25), and farmers (4.24) have the largest share. Smaller, but still significant importance was attributed to public authorities (4.19). Food retailers are considered to be moderately important (4.01), while their own

(i.e. consumers) responsibilities are characterised by a mere average of 3.72. The line ends with the institutions of the European Union (3.66), scientific bodies (3.53), and civil organisations (3.20).

Contingency tables revealed significant connections between the judgement of the public authorities and the age group and financial status of the respondent. Accordingly, members of the age group of over the age of 40 and those with low or average income attach more importance to public authorities in maintaining food chain safety.

The responsibility of the public supervision of food chain safety was considered as the task of the National Food Chain Safety Office (NFCSO) by the majority of consumers. NFCSO is followed by ÁNTSZ (25.54%) and KÖJÁL (9.57%) that has not existed since the 1990s, which can be justified probably by strong imprinting. Respondents with college or university degrees chose NFCSO more than the average, while those with lower qualifications voted more than the average for ÁNTSZ and KÖJÁL. This result suggests that changes in the authority's organisation system are only slowly or not integrated into the public consciousness.

However, the increase in the recognition of National Food Chain Safety Office was confirmed by the answers to the direct question. While in autumn 2013, only 36.88% of the respondents reported that they had heard of NFCSO, this rate rose to 77.74% in autumn 2015.

Respondents considered NFCSO's primary task to control food products (86.82%) and food businesses (72.27%). In addition to this, they consider it important to supervise food offered in restaurants and public sector catering (64.64%).

It is an important result that the respondents attributed great importance to NFCSO's information of the population on food chain security issues (56.00%). Participation in the extension of elementary school students' knowledge on foodstuffs (38.16%) and in the training programs of food businesses (32.30%) is also an important and expected task according to consumer feedback.

When examining the direct communication channels used by NFCSO, it was discovered that the Facebook page of the authority was known by 9.79% of the respondents and 22.04% knew about the toll-free telephone number for reports regarding food stuffs. Only 4.44% of the respondents had heard about NFCSO's self-developed application. However, it can be considered a good result that Konyhasziget magazine is known by 17.40% of the respondents, and this rate is even higher among women: it exceeds 21%.

Based on the analysis of the role of the communication channels in providing information, it can be stated that most information in connection to food chain safety reaches consumers through internet and television (in both cases, an average score of 3.69 was measured on the applied 1 to 5 scale). The role of personal information exchange (3.14) – family, relatives, and acquaintances – and traditional media (3.06) can be considered moderate in this area. The role of social media (2.96) and radio (2.93) is similarly low. The webpage of the authorities and institutions for this purpose is rarely visited (2.54). Although, the role of authorities' websites is primarily to provide information for professionals and journalists. Campaign sites (Supermint, *Ételt csak okosan*, Wasteless) appearing in recent years wish to break with this tradition, but at the time of the survey, our research could not be expanded for these in 2015.

After contingency table analysis, it is clear that through television, primarily people over the age of 60 or individuals without high school degree can best be reached. The role of online news sites and social network sites is important in all demographic groups, while younger respondents can only be reached through this communication channel effectively.

Examining the consumers' knowledge of food safety issues showed no significant change compared to the experiences from previous years. As an example, most respondents (56%) still identify the characteristic taste of long-life milk with preservatives. If we examine each issue along the demographic parameters, the knowledge of people over the age of 60s is much lower than that of younger generations.

Contingency table analyses justified that the domestic society is segmented primarily on the basis of age, gender, and level of education regarding the perception of food-borne risks and risk-avoidance behaviour.

Awareness and knowledge of consumers were characterised by 2 indicators per ("basic" knowledge, "advanced" knowledge, shopping awareness, household awareness) per each set up with the help of factor analysis. Consequently, it was found that the level of knowledge of food safety in the Hungarian society does not clearly define the risk avoidance behaviour related to food safety, in other words, knowledge does not determine awareness. For a more detailed examination of this phenomenon, we approached the subject with cluster analysis, which determined four significantly distinct groups. The relationship between knowledge and awareness is presented in Table 1 for each cluster.

Table 1. Comparison of clusters regarding the focus areas examined (Source: own result).

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
„basic” knowledge	–	–	+	++
„advanced” knowledge	+	--	++	--
shopping awareness	--	+	–	++
household awareness	–	+	–	++

4. CONCLUSIONS AND SUGGESTIONS

Risk communication is an extremely important area of the methodology of risk analysis and risk management, linking the actors of the food chain, and its success is a key issue in reducing the risk level of the entire food chain. However, it is also a difficult task, since a great amount of information surrounds the consumers every day, so awareness raising is the first challenge the authority has to deal with.

For the successful transfer of information, the target group, the message, the communicator, the form of delivery, the channel, and – at the end of the process – the receiving of the information must be carefully monitored. It should also be borne in mind that consumers do not necessarily act consciously, even if they are in possession of the necessary knowledge, but the opposite of this might occur as well; that adequately conscious behaviour regarding food safety is not accompanied by knowledge. To overcome these problems, neither the simple communication of authorities based on dissemination of knowledge nor the reflective risk communication is no longer suitable.

The research results of the last few years might mean a solution that beyond the partnership model – in addition to getting to know consumers' attitudes and behaviours – the entire system should be created from the point of view of consumers. It is recommended to make food chain events as straightforward as possible, personal, even exciting and interesting. With the tools of behavioural science, the success of food chain safety's risk communication can be enhanced.

According to the aforementioned factors, we modelled the behaviour of Hungarian food consumers with a survey conducted, and on the basis of this, it was possible to isolate segments of consumer groups with similar characteristics. The results of the segmentation, such as the typical characteristics of the four consumer groups that have been set up, and the proposals for communication strategy based on their attitude are presented below.

Cluster 1: “sparrow”

Cluster 1 expressly underperformed in terms of basic knowledge, but at the same time it achieved better results on issues with a higher level of knowledge. It is also interesting to note that this group – regarding conscious behaviour – is far below the average, which is most pronounced in its somewhat "ad hoc" behaviour in shopping.

Regarding the ratio of sex, male respondents dominate in the cluster (59.7%). The group is particularly youthful considering the high proportion of respondents under the age of 29 and between 30 and 39 years (27.73% and 23.52%). The group shows no extremities for income level: 58.0% of the group has average income. A significant proportion of respondents (41.02%) completed secondary education (skilled workers, graduates). Most of the members of the cluster share the task of food shopping with other family members (60.68%), but at the same time, the proportion of those who does not take part in such activities is higher than the average (12.82%). It is a decisive feature of the cluster that maintaining food chain safety, compared to other clusters, is considered to be a not that important task and they do not consider the role of consumers important in this regard. Their consumer awareness is low: they are not regularly informed about food safety issues, they are not consciously aware of their diet, the proportion of those that use a

separate cutting board for vegetables and meat is lower than the average, and they do not pay attention to the temperature of the refrigerator. Their level of superficiality is also confirmed by the fact that they place their products in the shopping basket according to the design of the shop during shopping, and thus ignore that some chilled/frozen foods are affected by storage temperature fluctuations.

Based on the results of the research, it can be stated that the members of the group do not consider organic foods to be safer than conventional foods, nor do they show intense interest in new food products on the market, nor are they specifically open to trying new things in the kitchen. The lack of this kind of interest is also confirmed by the fact that product preference tests conducted in the frame of NFCSO's program Supermint were much less known than the average.

A quarter of the members of the cluster do not watch television, but the majority of the group claimed to be a regular internet user.

Only 75.65% of the respondents reported to have heard about the current food chain safety authority (NFCSO), which is lower than the average.

Suggested communication strategy: raising awareness, but in parallel with deepening of basic knowledge. As a challenge, disinterest related to food and, above all, food safety is displayed. Therefore, young people who make up most of the cluster should be approached by short, easy-to-understand, attention-grabbing messages, and the most appropriate channel for the transfer of information in their case is the social media sites. Messages are useful in the form of infographics, animation, and games; making information more interesting to the consumers of Cluster 1.

Cluster 2: “thrush”

Cluster 2’s knowledge on food safety issues is the lowest: the basic and higher level knowledge of group members are below average. In contrast, their behaviour is rather positive in both shopping and home-cooking.

In Cluster 2, female consumers are predominant (58.69%). The group consists mostly of older respondents: almost one third (30.07%) are over the age of 60, which is confirmed by the high proportion of pensioners (29.52%). The number of inhabitants in the villages is very high (22.10%). An important feature is that there are more respondents (15.32%) with low levels of educational attainment in the group compared to the average. Nearly one third (31.73%) of the cluster has an income lower than the average. Most of the members of the cluster go food shopping on their own (40.29%).

The group attributes an increasing role to farmers in maintaining food chain safety compared to the average.

Awareness is clearly reflected in their consumer behaviour: they deliberately choose a grocery store or a brand, typically read the label information (use-by date, country of origin) before purchasing, and also pay attention to kitchen hygiene. It is an interesting contradiction that although they reported that they pay attention to the temperature of their refrigerator, knowledge-based questions have revealed that they are not aware of the optimal temperature range. The members of the group have a positive attitude towards small farmers and organic food. Their interest in food is also apparent in other test factors: members of the group regularly cook, are open to try out new foods and report to be gourmets. Consumer awareness also manifests itself in a strong preference for Hungarian food.

The members of the group regularly watch television and also use social network sites as a source of information.

Only 75.00% of the respondents had heard of the currently supervising food chain safety authority (NFCSO), which proved to be the lowest among the identified clusters.

Suggested communication strategy: presentation of good practices needs to hand over to the necessary knowledge elements, higher level theoretical knowledge should be communicated in the form of interesting news.

Cluster 2 is positive about food preparation, so it is advantageous for them to send messages in "hidden" form; for example, to show good practice in cooking programs. Supplementing recipe descriptions with food safety information in printed press can be an effective way of reshaping routine activities.

Cluster 3: “falcon”

Cluster 3's food safety knowledge is outstanding, with particular regard to higher level knowledge. However, based on the results, it can be said that their behaviour in the kitchen or during shopping is not characterised by awareness.

The cluster is mostly made up of men (57.51%), the ratio of people in their thirties (30.05%) is significantly higher. More than a quarter (25.90%) of the group is a resident of Budapest. The income of the cluster members (30.05%) is high, with almost two thirds (62.16%) having university degree. The proportion of active employees (60.10%) and entrepreneurs (8.51%) is outstanding. Most of the members of the cluster, goes food shopping for their household along with other family members (57.81%).

In terms of their food-related attitudes, they show a varied picture: they look at shopping as a pleasant experience and are also open to trying out new foods. At the same time, they do not favour domestic food products and have no explicit preference for bio- and small-scale products either. Classical home food preservation methods (jam, compote) are not used. Their main source of information was reported to be television and online news sites, and they strongly denied the classic communication channels (radio, newspaper). Of the members of the group, significantly more people than the average are familiar with NFCSO's online Supermint program (8.90%).

Most respondents who regularly buy food on the internet are among the members of this group (14.50%).

Concerning the specific knowledge of food safety, the group performed outstandingly, confidence which appeared in their expertise in the supervisory system: for 81.48% of respondents, NFCSO was not an unknown concept.

Suggested communication strategy: it is necessary to convey traditional, colourful or even astonishing, humorous but sophisticated messages that show the consequences of inappropriate cooking practices. It is important to make tangible, visible the risk to Cluster 3 as a personal problem affecting them.

In terms of communication channels, short materials and advertisements on video sharing sites can be effective intermediaries, and it is worth considering the role of festivals and grocery stores, online web-shops in selecting a communication channel.

Cluster 4: “stork”

The members of the group have a very high level of knowledge on basic food safety, but they have been quite poorly performing on issues with more complex knowledge. These shortcomings in knowledge no longer appeared in their behaviour: they reflected expressively conscious behaviour in both shopping and home cooking.

Cluster 4's largest proportion (61.94%) consists of women. Most of the members of the group are in their forties and fifties (27.43%), but a significant percentage of respondents is over the age of 60 (26.54%). Accordingly, almost one quarter of the members of the group (24.52%) are already retired. Another important descriptive parameter is that almost a quarter of the members (24.77%) are residents of Budapest. The determinative part of the cluster (30.90%) has a modest income. Regarding educational attainment, the group can be considered heterogeneous. Among the members of the 4th cluster, there is the lowest proportion of those who trust others with the shopping (8.92%). A remarkable difference compared to other clusters is that the group believes that food distributors are largely responsible for the maintenance of food chain safety, while they attribute less importance than the average to public authorities.

Consumer awareness, in addition to kitchen and food purchasing habits, is manifested in many areas of life for the members of this cluster: they are attentive to the preservation of their health, they are trying to have a proper diet, and environmental aspects are also considered during their daily lives.

Their attitude to food is particularly positive: they love to bake and cook, are open to new flavours and foods, have learned a lot about food in childhood, and are now especially open to learn new pieces of information regarding this.

Their characteristic feature is that more than 60% of them pay attention to the Hungarian origin of foods when purchasing products that can be produced in Hungary. Accordingly, it can be said that the quality and safety of domestic products are also judged to favourably. Of the National Food Chain Safety Office, 80.0% of the members of the group have heard, which can be considered a very good result compared to other clusters.

Suggested communication strategy: similar to the strategy used in Cluster 2 (“thrush”), but the focus should be on incorporating a higher level of theoretical knowledge. Food safety information should be used as a curiosity about the field of foods.

In the first stage of the analysis, by using descriptive statistical methods and contingency tables, I proved that the sample could be well-segmented along a number of demographic parameters, so I could confirm the first and second hypotheses, so I highlighted that the formation of target groups enables more efficient risk communication.

In the second stage of the analysis, I conducted a cluster analysis. As a result, we can get homogeneous groups that can be addressed effectively by using targeted tools for risk communication. For the cluster analysis, I first determined by factor analysis 2 types (basic and advanced) of knowledge and 2 types of (home and shopping) awareness variables. After determining the variables relevant to the research questions, I formed consumer clusters using a hierarchical, agglomerative Ward’s clustering method (variances method). During the analysis, four significantly different groups were isolated. Through this, I confirmed Hypothesis 3 that knowledge and awareness of food safety are not closely related.

5. NEW AND NOVEL SCIENTIFIC RESULTS

1. Presentation of consumer risk perception on the basis of domestic and international literature and own research.
2. Justification of the impact of age, sex, and educational attainment on consumers' differing risk perception.
3. The demonstration that a higher level of knowledge does not necessarily lead to a higher level of awareness in risk avoidance in the field of food safety.
4. Segmentation of Hungarian consumers based on risk perception and demographic parameters, which enable the use of targeted risk communication.

6. PUBLICATIONS IN THE FIELD OF THE DISSERTATION

Peer-reviewed journal articles

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2. **Süth Miklós:** Élelmiszer-biztonság, hatósági élelmiszer-ellenőrzés. In: A Magyar Zoonózis Társaság 2006. évi előadásai, 124-138. Magyar Zoonózis Társaság, Budapest.

7. PUBLICATIONS OUTSIDE THE FIELD OF THE DISSERTATION

Peer-reviewed journal articles

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