

*Acta Alimentaria*, Vol. 47 (3), pp. 307–314 (2018)

DOI: 10.1556/066.2018.47.3.6

## POSSIBILITIES OF TARGETING IN FOOD CHAIN SAFETY RISK COMMUNICATION

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(Received: 25 September 2017; accepted: 22 December 2017)

In recent years, there have been many changes in the food market, which have greatly transformed our approach to food chain supervision. The increasing complexity of the food chain (e.g. globalization of food trade, expansion of raw materials and additives, technical advancement), the frequent changes in food consumption trends and the phenomenon of food crime belong to the most challenging issues for food chain control institutions. These factors require the re-evaluation of the role of consumers in the food chain. The overall aim of this research was to explore consumers' risk perception and risk avoidance for a more efficient, targeted risk communication. In the survey 1003, face-to-face interviews were made using questionnaire. The statistical analysis of data was followed by the identification and characterization of 4 relevant target groups with cluster analysis method: disinterested youngsters (17.0%), conscious elders (39.4%), food adepts (27.5%), and soul of the family (16.1%). Results indicated, that the Hungarian society can be segmented regarding to food associated risk perception and avoidance. It has been also proven, that risk perception is influenced by demographic factors. Furthermore, we have also managed to conclude that efficient risk communication would require a well-aimed and focused communication strategy.

**Keywords:** food chain safety, risk communication, communication strategy, consumer survey, risk perception, risk analysis

The foundations of the current European food safety system were laid down in the White Paper on Food Safety (EC, 2000) and in Regulation (EC) No 178/2002, based on risk analysis, the integrated and coherent food chain approach, traceability, and precautionary principle, which required the reformulation of former processes (LACZAY, 2012). In Hungary, the incorporation of risk communication – as a part of the risk analysis – to the legal system was finalized by the Act XLVI of 2008 on food chain and its control and belongs to the duties of the National Food Chain Safety Office (NFCISO).

Even though risk communication research dates back to the 1960s (STARR, 1969), in the field of food safety risk communication the first breakthrough appeared at the end of the 1990s (FREWER et al., 1996; HANSEN et al., 2003), and the systemic appearance was promoted by the European BSE crisis (VOS, 2000; KELEMAN, 2002). The principles of effective risk communication have been studied by many researchers at international (for instance KLINKE & RENN, 2002; FREWER, 2004; VERBEKE et al., 2007) and national levels (BÁNÁTI & LAKNER, 2002; LAKNER & KASZA, 2009). In regard of the message, concise, well-defined statements and understandable language are important (MILES & FREWER, 2001). In case of information channels, the wide variety of media is available, and the mixing and overlapping of communication tools are becoming increasingly common. Concerning the communicator, credibility, expertise, recognition, and trust play the key roles (PRADES et al., 2014). For

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communication practice, versatility and creativity are the most important factors (HANSEN et al., 2003). But all of these factors should be fitted to the target group of the communication. While some demographic features, such as gender and age, seem to have a deterministic role, the effects of other generally studied factors (e.g. education, social status, income level) are not so clear. These issues are studied most often by quantitative methods covering consumer attitudes, awareness, risk perception, and also the prediction of responses (REDMOND & GRIFFITH, 2003; BÁNÁTI et al., 2004; LAKNER et al., 2006; VERBEKE, 2008; KASZA, 2010).

This paper aims the investigation of three hypotheses to get a realistic picture about the possibilities of targeting in food chain safety risk communication in Hungary:

1. The Hungarian society is segmented regarding to food associated risk perception and risk avoidance.
2. The risk perception of consumers is greatly influenced by age, gender, and education.
3. The meaning of authority is different for consumers, therefore not all consumers can be reached with centralized risk communication.

## 1. Materials and methods

### 1.1. Research methodology

The research methodology was a questionnaire based quantitative consumer survey. The sample was taken through voluntary personal interviews. Data was recorded to paper based questionnaires. Most of the applied questions were close ended, measured on 1–5 Likert scale (1: strongly disagree; 5: strongly agree). Participants were recruited from November to December of 2015 at 11 separate locations of Hungary: Budapest, Debrecen, Győr, Miskolc, Székesfehérvár, Szolnok, Szeged, Szombathely, Pécs, Tatabánya, Veszprém. At the beginning, all pedestrians were approached at the selected public locations (usually crowded central places of cities). In the later phases, we have filtered the potential participants according to gender, age and habitation quotas to assure representativity.

### 1.2. Sample characteristics

During the survey, 1003 interviews were made that provided an adequate basis for carrying out robust statistical analyses. The sample was representative for gender (female: 53.94%, male: 46.06%), age (under 29: 18.54%, 30–39: 20.04%, 40–59: 31.51%, over 60: 29.91%), and geographical regions (pro rata in regard of the country's seven planning-statistical NUTS 2 regions). Representativity was assured by fitting the sample composition to the 2011 census data of the Hungarian Central Statistical Office that has been adjusted by a micro-census in 2014 (HCSO, 2014).

### 1.3. Statistical analysis

The data was analysed with the IBM SPSS Statistics 22.0 software package, which was specifically designed for social science statistics. The analysis started with descriptive statistical tools (mean, standard deviation, median, mode, minimum, maximum, frequency), which allowed the general overview of the results and the understanding of simple relationships between variables. Significant differences were investigated with cross tables and Chi<sup>2</sup>-test, using the Pearson method. The confidence interval was 95%, as it is commonly used in social sciences.

We have used a cluster analysis to differentiate the consumer groups based on two computed variables (its elements are detailed below) and two consumer awareness factors (derived from 7 variables summarized in Table 1). These two factors explain 57 percent of the variance within the original data set (Table 2). In the next part, we have summarized elements of the computed variables applied.

1. Basic knowledge, including three variables:

V1: The thin mould layer on the top of the jam does not pose a risk.

V2: Meat and salad require separate cutting board.

V3: The temperature of the refrigerator should be between 8 and 12 °C, if it is adjustable.

Type of variables: True or false. Correct answers received 1 point, false was 0 value.

2. Advanced knowledge, including seven variables:

V4: The characteristic taste of UHT milk is caused by preservatives.

V5: Safe food is free of E-numbers.

V6: Mycotoxin is a toxin produced by bacteria.

V7: Traditional foods are free of genes.

V8: If a product contains bacteria, it is unsafe.

V9: Freezing destroys all microbes, therefore frozen food is safe.

V10: Naturally based/bio foods are free of risks.

Type of variables: True or false. Correct answers received 1 point, false was 0 value.

Table 1. The assignment of consumer awareness variables to factors in the component matrix

Variables	Factors	
	Shopping awareness	Household awareness
V11: I choose brand and producer on purpose.	.063	<b>.704</b>
V12: I read the product label carefully.	.005	<b>.807</b>
V13: I always have a look on the products use by date.	.213	<b>.690</b>
V14: I wash my hands before cooking.	<b>.826</b>	.064
V15: I wash my hands before eating.	<b>.842</b>	.061
V16: I use separate cutting board for vegetables and meat.	<b>.524</b>	.319
V17: I wash the fruit before consumption.	<b>.671</b>	.141

Table 2. Total variance explained by two identified factors

Component	Initial eigenvalues		
	Total	% of variance	Cumulative %
1	2.594	37.059	37.059
2	1.399	19.991	57.050
3	.759	10.841	67.891
4	.705	10.077	77.968
5	.650	9.281	87.249
6	.529	7.557	94.806
7	.364	5.194	100.000

After selecting the clustering factors relevant to the research questions, the consumer clusters were formed by Ward's method, according to the Euclidean distance. In this case, the combination of clusters is based on the smallest increase in internal variance (MACQUEEN, 1967).

## 2. Results and discussion

Results of the Pearson's chi-squared test indicated that there is a significant relationship ( $P=0.000$ ) between assessing the importance of food chain safety and the age of the respondents. Analysis of the same question in the light of genders and education levels resulted also in significant differences (e.g. nearly 78% of women characterized the importance of food chain safety by '5' on Likert-scale, while this percent is less than 70% in case of men). There is a significant correlation ( $P<0.05$ ) between the assessment of the changes in the general food safety situation in the country and the income level of respondents; people with higher income level perceive a more favourable tendency. Furthermore, significant correlations were obtained between the perception of public authorities and age groups ( $P<0.05$ ), and also the respondent's financial position ( $P<0.05$ ). Accordingly, respondents of the age group of over 40 and with low to average income attach more importance to public authorities in maintaining food chain safety. However, based on the research of AJZEN (2015), beside the sociodemographic characteristics of consumers, other background factors, such as social environment, have a significant influence on consumer attitude.

In order to distinguish the clusters, the bases of the segmentation process were level of knowledge (basic knowledge, advanced knowledge) and awareness (shopping awareness, household awareness). According to our findings, four significantly different groups were identified (Table 3).

Table 3. The distribution of identified clusters within the sample

Identified clusters	Presence (%)
Cluster 1: Disinterested youngsters	17.0
Cluster 2: Conscious elders	39.4
Cluster 3: Food adepts	27.5
Cluster 4: Soul of the family	16.1
Total	100.0

"Disinterested youngsters" were particularly underperformed in terms of basic knowledge, although achieved better results on issues, which required advanced knowledge. Concerning conscious behaviour, this group was far behind the average (e.g. they were not regularly informed about food safety issues, and did not paid attention to conscious nutrition). The "ad hoc" behaviour in shopping was also a characteristic feature. Regarding the gender ratio, male respondents were dominant (59.7%). Considering the high proportion of respondents aged under 29 (27.73%) and between 30 and 39 (23.52%), the group was the youngest of all. The income status was not particularly heterogeneous: 58.0% of the group had an average income. A significant percentage of respondents (41.02%) had secondary education (professional workers, graduates). It is noteworthy that for this group food chain

safety was considered to be a moderately important issue, furthermore the role of consumers in risk prevention was also underestimated. The majority of the group claimed to be a regular internet user. Television was not a very important source of information for them, one quarter of this group does not even watch TV at all. Therefore, as SCHULTZ and co-workers (2011) have previously mentioned in their study, it could be advisable to pay more attention to social networking sites, when targeting younger generations. Only 75.65% of the respondents have heard about NFCSO, which was lower than the average. According to the above, the proposed communication strategy for the first cluster is described in Table 4. Considering the young age of this group, it is supposed that the members of the cluster would migrate to other clusters at a later stage in their course of life.

Table 4. Proposed communication strategy for Cluster 1

Appropriate message:	eye-catching, brief information
Communication channel:	internet, social networks
Solution to reach:	mobile applications and games
Expected result:	basic knowledge and awareness development

“Conscious elders” is a cluster that can be described by an intensive activity in fields of gathering information on food safety and awareness in shopping situations and household practices. On the contrary, this group had the lowest level of knowledge regarding food safety issues. This information supports the earlier findings of RAAB and WOODBURN (1997), which proved that there can be a significant difference between food safety knowledge and the applied household and shopping practices. Ratio of female consumers were dominant (58.69%), and the most significant share of this cluster was over the age of 60 (30.07%). In case of this cluster, the proportion of residents living in villages can be considered moderately high (22.10%). Another important feature is that the number of respondents with low education level (15.32%) was also relatively high compared to other groups, and nearly one third of the cluster (31.73%) had a low income level. Consciousness was clearly reflected in the clusters’ behaviour: they chose grocery store or brand with a purpose, typically read the label information before purchasing, and pay attention to kitchen hygiene. Members of this cluster are typically fond of cooking, happy about new recipes, and consider activities related to meal provision as a creative part of their self-expression. Members of the group regularly watch television and consider it as the most important source of information. Only 75.00% of the respondents heard about NFCSO, which proved to be the lowest among the identified clusters. This could be a challenge in both preventive risk communication and crisis communication, because these activities are building on the already gathered recognition of the authority by the consumers. In case of this target group, Table 5 contains the proposed communication strategy.

Table 5. Proposed communication strategy for Cluster 2

Appropriate message:	eye-catching, food quality connected
Communication channel:	television, social networks, printed media
Solution to reach:	informative articles, crosswords and television
Expected result:	knowledge development, NFCSO recognition

“Food adepts” cluster’s food safety knowledge was outstanding in both knowledge fields, especially their advanced knowledge level was high compared to other groups. However, their shopping and household awareness were low, which supports the results of other researchers claiming that knowledge does not affect directly consciousness (McINTOSH et al., 1994). This cluster is mostly composed of men (57.51%), and the proportion of members aged between 30 and 39 was significantly high (30.05%). More than a quarter (25.90%) of the group members was resident of Budapest. A dominant part of the cluster members had outstanding income (30.05%), and nearly two thirds (62.16%) had university degree. Additionally, active employees (60.10%) and entrepreneurs (8.51%) were also overrepresented. The group’s approach to media was unique in the sample: they neglected some of the classical communication channels (radio and especially printed newspapers), used television only at rare cases, and the main source of information was the internet by far. In terms of food safety specific knowledge, the group performed extremely well, and this confidence was also apparent in case of their knowledge regarding food chain supervision system: for 81.48% of the respondents NFCSO was a familiar institution. On the basis of these findings, we have developed the following recommendation for risk communication strategy (Table 6), in order to target Cluster 3 in an appropriate way.

Table 6. Proposed communication strategy for Cluster 3

Appropriate message:	brief, colourful, eye-catching, comical
Communication channel:	in store, video sharing sites, events (such as fairs, cultural and music festivals)
Solution to reach:	advertisements, posters, on-site games
Expected result:	consciousness, feedbacks to NFCSO

“Soul of the family” cluster members had a high level of basic knowledge in the field of food safety, but performed rather poorly at questions requiring more complex knowledge. In contrast, their responses reflected conscious behaviour both in shopping and household. According to McINTOSH and co-workers (1994), this kind of consciousness is largely shaped by individual observations and beliefs. Females were overrepresented in the cluster (61.94%), and most of the members were 40–50 years old. Although the decisive part of the cluster (30.90%) had low income level, regarding education the group can be considered heterogeneous. Nearly 80.00% of the members had already heard about NFCSO, which can be regarded as a very good result compared to other clusters. Table 7 contains the targeted risk communication strategy for the last cluster.

Table 7. Proposed communication strategy for Cluster 4

Appropriate message:	interesting and/or emotional, aiming at the development of advanced knowledge
Communication channel:	television, printed media, blogs
Solution to reach:	cooking programs, articles, quizzes
Expected result:	knowledge extension, dissemination of information to others

### 3. Conclusions

According to the survey results, the Hungarian society is heterogeneous regarding perception and avoidance of food-borne risks, therefore H1 has been proven. Based on the data gathered from primary research, consumers can be segmented on the basis of their attitudes, behaviour, and knowledge, which should be taken into account by planning the risk communication of the authority. It has also been proven, that there is a relationship between assessing the importance of food safety and age, gender, and education. These parameters influence the behaviour of consumers in a significant way in the Hungarian population, thus H2 has been also proven. The awareness level, the usage of the information source, and the recognition of the Hungarian food chain safety authority have also indicated heterogeneous results, which require specific strategy for each target group. Therefore H3 has been also proven.

Beside classical authority measures, such as risk assessment, developing the legislation framework, keeping registration, providing certifications, conducting inspections, issuing sanctions, and organizing monitoring, risk communication has also emerged as a profoundly important tool in the field of food chain safety control. The increasing complexity of the food chain requires partnerships not just between the authority and the food business organizations and the scientific community, but with non-governmental organizations and consumers as well. This can be built upon the recognition of the food chain safety control service, the proficiency and preparedness of the official personnel in risk communication, and the efficient segmentation of the population.

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The authors thank the generous support of the National Food Chain Safety Office, Hungary, for allowing the use of research data for scientific purposes.

The study has been also supported by the project under the European Union's Horizon 2020 research and innovation programme, grant agreement No 727580, project title: SafeConsumE – Safer food through changed consumer behaviour – Effective tools and products, communication strategies, education and a food safety policy reducing health burden from foodborne illness.

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