



Development and evaluation of a risk-communication campaign on salmonellosis

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ABSTRACT

Risk-communication campaigns are important means of promoting food safety. Although foodborne diseases are a widespread public-health problem, in Italy few communication campaigns have focused on such diseases. In 2007, we launched a public risk-communication campaign on salmonellosis. The initiative, based on communication theory, included a formative research, aimed to outline key aspects for campaign's development, and an impact evaluation survey.

The campaign was found effective in terms of target penetration and measurable learning outcomes. Results confirm that risk-communication campaigns on microbial infections can be successful when based on rigorous methodology, including a systematic evaluation process.

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1. Introduction

Food safety is one of the most widespread public-health problems in both economically developed and developing countries, and it is of great concern to consumers in terms of the potential for foodborne illnesses (Motarjemi & Käferstein, 1997; Redmond & Griffith, 2003; Todd, 1997). Among foodborne pathogens, *Salmonella*, in particular *Salmonella enteritidis*, is recognized as the predominant enteric pathogen in Western countries (World Health Organization [WHO], 2007) and the most widespread cause of foodborne outbreaks in Europe (European Food Safety Authority [EFSA], 2009). The sources of infection include a wide range of domestic and wild animals and foodstuffs of both animal and plant origin, and the most commonly reported locations of exposure to *Salmonella* are private households, restaurants and cafés (Baird-Parker, 1990; Parry, Miles, Tridente, Palmer, & South and East Wales Infectious Disease Group, 2004; Redmond & Griffith, 2003; Scott, 1996; Scott, 2003).

Nonetheless, the general public tends to underestimate microbiological foodborne illnesses, and they consider environmental

contamination as posing a greater risk, specifically, pesticide residues and drugs or hormones used in animal production (Arzenton, Neresini, & Ravarotto, 2005; Powell, 1996). It has also been shown that the perceived risk of food poisoning is related to optimistic bias: individuals believe that they are less likely to suffer from food poisoning than other comparable persons (Arzenton et al., 2005; Parry et al., 2004). However, recent public-health emergencies and food crises, in particular, bovine spongiform encephalopathy (McCluskey, Grimsrud, Ouchi, & Wahl, 2005; Verbeke, Viaene, & Guiot, 1999), avian influenza (de Zwart et al., 2007), wine with methanol (Rosati & Saba, 2004), and dioxin-contaminated poultry (Verbeke et al., 1999) have contributed to increasing risk perception for foodborne illnesses and have given rise to doubts and questions as to the safety of commercially available products.

One of the strategies adopted to address the public's perception of specific health risks is communication campaigns targeting the general public (Aarva, De Haes, & Visser, 1997; Fischhoff, 1995; Freimuth, Linnan, & Potter, 2000; Glik, 2007; McComas, 2006; Scott, 2003; Whittingham & Ruiter, 2008). However, though there is much literature on the public's perception of food-related hazards (Arzenton et al., 2005; Fischer, De Jong, De Jonge, Frewer, & Nauta, 2005; Fischhoff & Downs, 1997; Fischler, 2002; Frewer, Howard, Hedderly, & Shepherd, 1997; Halkier et al., 2007; Kleef et al. 2006; Parry et al., 2004; Powell, 1996; Redmond & Griffith, 2003; Rohr, Lüddecke, Drusch, Müller, & Alvensleben, 2005; Rosati & Saba,

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2004; Shepherd, 2008; Sparks & Shepherd, 1994), studies on the communication of food risks are still sparse (Fischer et al., 2005; Jacob, Mathiasen, & Powell, 2009; Smith, 2006; van Dijk et al., 2008), as are studies on the effectiveness of communication campaigns for improving food safety at home (Nauta et al., 2008). Risk communication is crucial, in that consumers need to know how to safely handle food, and healthier and safer practices in the domestic kitchen can be more easily encouraged by communication than by legislative enforcement (Fischer, Frewer, & Nauta, 2006).

To be effective, a communication campaign needs to be carefully designed, implemented, and evaluated (Alstead et al., 1999; Bauman, Smith, Maibach, & Reger-Nash, 2006; Beaudoin & Thorson, 2007; Covello, 2003; Grier & Bryant, 2005; Wright, McGorry, Harris, Jorm, & Pennell, 2006). Noar (2006) reviewed the 1996–2005 literature concerning mass media health campaigns and suggested a list of principles on which communication initiatives should be based. Specifically, the researchers responsible for designing such initiatives should: (a) conduct formative research, to define the basic knowledge, perceptions, and information needs of the target group; (b) use theoretical frameworks; (c) define the segment audience; (d) design a message targeted to the audience segment; (e) use strategically more significant and accurate media and communication tools to reach the chosen target effectively; (f) conduct a process evaluation, by measuring the campaign efficiency to pursue its aims; and (g) evaluate whether the campaign succeeded in improving knowledge and modeling behaviors (effectiveness). Similar principles, including the campaign evaluation, can be found in social marketing, a discipline in which concepts and techniques of commercial marketing are applied in order to realize initiatives devoted to promote socially beneficial behavioral change (Grier & Bryant, 2005; Lefebvre & Flora, 1988).

Whereas some countries have implemented national communication campaigns to reduce the incidence of foodborne diseases (Scott, 2003), in Italy, focus has instead been placed on evaluating risk perception in specific populations (Arzenton et al., 2005; Centro Interdipartimentale di Ricerca e documentazione sulla Sicurezza Alimentare [Ce.I.R.S.A], 2006) or on communicating to several target audiences yet without assessing *a posteriori* the effectiveness of the communication initiative (Marotta et al., 2008).

The objectives of the present initiative were: (a) to develop a communication campaign, based on the above-mentioned criteria (Noar, 2006), on the risk of salmonellosis related to food handling and storage in the home; and (b) to evaluate the effectiveness of this campaign in terms of increased awareness of the risk and changes in attitudes and behaviors. The campaign was conducted in Veneto Region (northeastern Italy), one of the regions where the Istituto Zooprofilattico Sperimentale delle Venezie acts, where in 2006, 9.6% of the cases of salmonellosis were reported (Ministero del Lavoro, della Salute e delle Politiche Sociali, 2008).

This study consisted of three main phases: (a) formative research, (b) campaign design and implementation, and (c) evaluation of the campaign's implementation process and outcomes. The campaign targeted households in three different towns of the Veneto Region.

2. Formative research

The formative research was conducted to identify the key features of the communication campaign, in particular: the target audience, the most suitable source of information, the most effective medium of communication, and the specific characteristics of the campaign message (Grier & Bryant, 2005; Noar, 2006). Because of the explorative nature of the formative research, we used a qualitative research approach, based on focus groups. This

methodology was chosen because it centers on group interaction and encourages participants to respond to and question one another, under the supervision of a moderator (Greenbaum, 1998; Morgan & Krueger, 1993).

2.1. Methods

2.1.1. Participants and procedures

Four focus groups were conducted, two in the City of Padua (Veneto Region) and two in the City of Milan (Lombardy Region, northern Italy), and they involved a total of 27 participants (13 males and 14 females). In selecting participants, we took into consideration that focus groups should be as homogeneous as possible in terms of the participants' demographics, as this is more likely to result in open discussion (Sim, 1998); however, we also considered that differences in food habits may exist when comparing age groups. In light of these considerations, two focus groups (one in each of the two cities) were carried out with adults (older than 25 years of age) and two with young persons (from 20 to 25 years). The adults were recruited by snowball sampling in other studies and were selected on the basis of specific demographic variables: gender, age, and level of education. The young persons were selected on the basis of gender and on whether or not they were students or workers. Participants selection criteria also included being responsible for purchasing and preparing the food in their household or, for the youngest, being independent in terms of purchasing and/or preparing food. The four focus groups were interdependent, in that the results of the first focus groups influenced the planning of the successive ones; in particular, some of the topics discussed in the earlier focus groups were evaluated and new input was provided for the successive groups. Participants received a voucher to buy books as a reward for their participation. The focus groups were held in the late afternoon and lasted around 2.5 h. They were video-recorded and later transcribed in their entirety.

2.1.2. Focus group protocol

We used a semi-structured moderator's guide, developed based on a review of the literature (Arzenton et al., 2005; Food Standards Agency, 2000; Redmond & Griffith, 2003; Worsfold & Griffith, 1997), which focused on two main themes: (a) perception of the risk of salmonellosis, and (b) communication of the risk. The first set of questions regarded the perception of food-related risks in general and salmonellosis risks in particular (i.e., knowledge of the infection and adoption or avoidance of behaviors to prevent risks, both within and outside of the home). The aim of this set of questions was to reveal existing common knowledge on salmonellosis and to identify underestimated risk behaviors. The second set of questions addressed opinions and suggestions for the communication of food-related risks, with the ultimate goal of contributing to the design of the campaign.

2.2. Data analysis and results

The transcripts of the focus groups were analyzed using thematic content analysis. Two independent researchers identified key themes and coded relevant passages on these themes. The results were then compared to ensure that common themes were identified by both coders. The analysis was aided by the use of the Lexico3 software package (Lamelle, Martinez, Fleury, & Salem, 2003). The main findings of the transcript analysis are reported below.

2.2.1. Risk perception

The results regarding risk perception revealed that the participants were not concerned with the problem of salmonellosis at all.

In fact, it was never mentioned spontaneously when discussing the perception of food-related risks. In general, the participants' knowledge of salmonellosis was unclear and superficial, and both the risks and gravity of the outcomes were underestimated, even by persons who had been affected by salmonellosis in the past. Moreover, the participants reported few personal or family episodes of salmonellosis. These findings led to the conclusion that more detailed information on potentially risky foods and on safe food handling must be conveyed by the communication campaign (Redmond, Griffith, Slader, & Humphrey, 2004). The young persons showed a particular lack of concern over this topic: they perceived salmonellosis to be a disease of little importance which could be resolved quickly and without specific treatment. The finding that young persons are apparently a more difficult audience led to the conclusion that the campaign should try to be particularly appealing for this group.

2.2.2. Target

Regarding the target audience, the focus groups highlighted the importance of informing families, in particular, housewives and all persons involved in food preparation. Healthcare workers and caterers were also mentioned, yet since they usually receive specific information on this disease during training, they were excluded from the list of potential targets.

2.2.3. Source

According to the participants, the source of information on the risks of salmonellosis must be perceived as competent and authoritative. Thus the preferred source would be either the Italy's Ministry of Health, which is perceived as the most authoritative institution on health-related topics, or the local health district, perceived to be competent and, interestingly, closer to citizens. Of interest is the finding that the use of a well-known testimonial, such as a university professor, was not considered to be adequate for this campaign.

2.2.4. Medium and communication characteristics

The participants' opinions on the specific medium for reaching the targeted audience varied. Most participants, especially the

youngest, would prefer television campaigns or television programs focusing on medical or health issues. However, when considering that financial resources could be limited, the participants agreed that the best means of communication would be to send information to households by regular mail. Specifically, both adults and young persons would prefer a formal letter addressed to the head of the household, plus a flyer. The participants agreed that the flyers should be simple, clear and efficient and contain very simple and brief information on salmonellosis (few phrases and exemplificative images depicting prevention and risk behaviors), as well as Internet links. It could take the form of a sort of gadget that could be adhered to the refrigerator or kitchen cabinets.

The tone of communication should be reliable, yet not too serious or inducing excessive anxiety, so as to be appealing; the use of irony is appreciated. Photographs should not be used, and the images should be stylized (e.g., cartoons). Colors should be pleasing and not too bright (e.g., pastels).

3. Communication campaign

Based on the results of the formative research, a pilot communication campaign was launched in June 2007. June was chosen because the risk of salmonellosis is higher in summertime than in other periods of the year.

3.1. Target

The target of the pilot campaign was all of the households (N = 54,291) of three different-sized towns (Treviso, 33,224 households; Bassano del Grappa, 15,717 households; and Cadeneghe, 5,350 households), which are representatives of the demographical and urban structure of the Veneto Region.

3.2. Source

The sources of information were the Istituto Zooprofilattico Sperimentale delle Venezie and the Veneto Regional Government, which are authoritative, well-known, and, in the case of the Istituto Zooprofilattico Sperimentale delle Venezie, quite familiar to the



Fig. 1. The flyer.

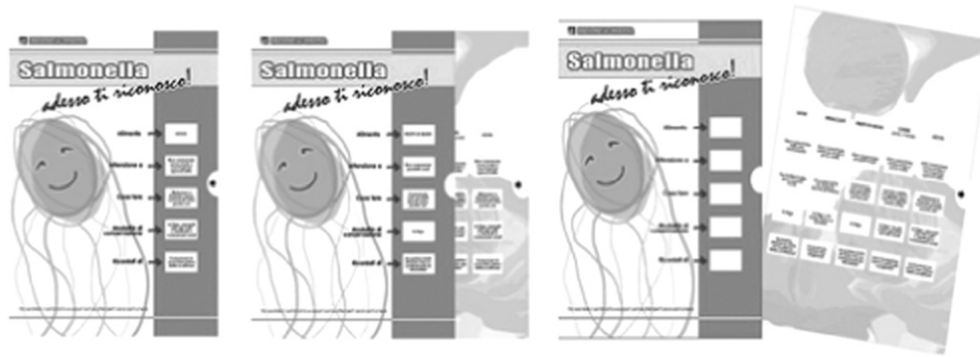


Fig. 2. The sliding insert.

target audience. The logos of these institutions were included on the information material, on which it was also specified that the project was funded by Italy's Ministry of Health, so as to increase the authoritativeness of the message.

3.3. Medium and communication characteristics

The chosen medium was a flyer (Fig. 1) and a sliding insert (Fig. 2). Given that this material was intended to be sent by regular mail (as suggested by focus groups' participants), its design took into account the limits of the postal system. In particular, it measured 15×21 cm, to fit into the postbox. To avoid wrinkling during shipping, the flyer was realized in heavy-weight paper (150 g), and the sliding insert was realized in thin cardboard (250 g); the material was wrapped together in cellophane.

The text and graphic layout were designed so as to prevent the material from being mistaken for advertising and inadvertently thrown away. The material was also designed to be visually pleasing and to stimulate interest among young persons. In particular, friendly pastel-colored illustrations were used, so as to arouse positive emotions and help the target audience remember and adopt adequate behaviors for preventing salmonellosis. Both the flyer and the sliding insert included a stylized and animated illustration of a *Salmonella* bacterium.

With specific regard to the flyer (Fig. 1), this was printed on A5 size paper (front and back), which was folded in half, so that there were four pages of contents. To encourage people to use the flyer and keep it in the kitchen, there was a hole in top so that it could be easily hung; otherwise it could be stuck to the refrigerator. The front page contained the above-described illustration and an explanation that *Salmonella* is a bacteria that lives in the gastrointestinal tract and that it causes salmonellosis, one of the most dangerous foodborne infections in humans. The insides of the flyer contained a list of illustrated recommendations, which focused on: (a) eating and cooking foods such as eggs, pork, poultry, and mollusks; (b) storing foods (e.g., placing cooked food above raw food in the refrigerator, defrosting meat in the refrigerator); and (c) hygiene (e.g., washing hands and cutlery frequently when preparing food) (Altekruse, Street, Fein, & Levy, 1996; Jay, Comar, & Govenlock, 1999; Redmond & Griffith, 2003; Redmond et al., 2004; Scott, 2000). The back page of the flyer provided detailed information on the symptoms of salmonellosis, how the bacteria is transmitted, and what to do in case of infection.

The sliding insert (Fig. 2) was designed to be more playful, so as to allow for dynamic and stimulating learning. The outside pocket included the illustration of the bacteria and cut-out windows labeled "Food", "What to avoid", "What to do", "How to store it", and "Remember to...". When sliding the insert, a specific food (e.g.,

eggs) would appear in the "Food" window, and at the same time the other cut-out windows would display the information regarding the risks and preventive measures for that specific food. The back of the pocket contained general information on salmonellosis.

3.4. Message

The information material included a catchphrase to make the campaign's aim immediately clear: *Salmonella, Adesso Ti Riconosco!* (*Salmonella, Now I Know Who You Are!*). The contents of the message were discussed and validated by the IZSVE's World Organization for Animal Health (OIE) Reference Laboratory for *Salmonella*. They consisted of a minimum of essential information on symptoms, how to prevent infection, and what to do if infected. To make the text simple and direct, short sentences were used, and coordinate (or "compound") sentences were preferred over subordinate sentences. To ensure that the message would be comprehensible, reassuring and not alarming, excessively technical terms were avoided and informal language was used (the negative effect of anxiety-inducing messages is discussed in Pidgeon, Kasperon, & Slovic, 2003; a specific example on salmonellosis risk may be found in Mari & Capozza, 2008). Any scientific terms were clearly explained. The intention was to avoid creating a list of scientific concepts: people should understand easily and not feel bored during reading. Above all, the target audience should be induced to immediately adopt the recommendations on food handling and storage.

4. Campaign evaluation

4.1. Methods

The evaluation focused on three different aspects of the campaign: (a) the ability to reach the target, (b) the performance of the medium and the message in terms of interest generated in the households, and (c) the effectiveness of the campaign in raising awareness of salmonellosis and the means of preventing it.

The evaluation was performed by conducting telephone interviews with the persons responsible for preparing meals in an age-stratified sample of the households that had been sent the campaign material. In particular, Computer Aided Telephone Interviewing (CATI) was performed.

The evaluation was conducted ten days after the campaign material was mailed and consisted of two phases. The first phase was conducted to assess the campaign's penetration in the target population (i.e., whether or not the person being interviewed remembered having received the material). This phase involved 1026 randomly selected households: 509 of the 33,224 households

in Treviso; 308 of the 15,717 households in Bassano del Grappa, and 209 of the 5350 households in Cadoneghe. For the results based on this sample, the margin of error at the 95% confidence level was 3.10%. Of the 1026 persons interviewed, 212 stated that they had received the material (though this did not necessarily mean that they had read it). These households were included in the second phase, that is, the evaluation of the performance of the medium and message and the effectiveness of the campaign.

The second phase involved both the 212 households that reported having received the material and, to have a larger sample, an additional subsample of 243 households that had received it: 113 from Treviso, 79 from Bassano del Grappa, and 51 from Cadoneghe, for a total of 455 households. These additional households were randomly selected after the first sample completion and were not included in the original group of 1026 households.

Data analysis was aided by the use of the SPSS13 software package.

4.2. Evaluation results

4.2.1. Target

The percentage of households that reported having received the information material, which was considered to be indicative of the capacity of the campaign to reach the target, was 20.7% (212 out of 1026 households). The socio-demographic characteristics of the persons interviewed, by whether or not they received the information material and whether or not they read it, are shown in Table 1. Significant differences were found with regard to the town. For example, in Bassano del Grappa, the campaign reached a third of the households, whereas in Treviso, which is the largest of the three towns, the proportion of households reached was much lower than the average.

Table 1

Socio-demographic characteristics of the households that reported having received the campaign material and those that reported having read it ($n = 1026$).

		<i>n</i>	%	Total	Valid
Households that reported having received the material					
Total of households that reported having received the material		212	20.7	1026	1026
Town of residence	Treviso	71	13.9	509	1026
	Bassano del Grappa	102	33.1	308	1026
	Cadoneghe	39	18.7	209	1026
Age (in years)	18–29	38	23.3	143	1022
	30–60	99	22.1	448	1022
	61 and over	75	17.0	411	1022
Level of education	Primary school	48	18.8	255	1021
	Junior high school	66	22.7	299	1021
	High school	66	20.0	330	1021
	University or higher	31	21.2	146	1021
Households that reported having read the material					
Total out of the households to which the material was sent		147	14.3	1026	1026
Total out of the households that reported having received the material		147	69.3	212	212
Town of residence	Treviso	43	60.6	71	212
	Bassano del Grappa	74	72.6	102	212
	Cadoneghe	30	76.9	39	212
Age	18–29	28	73.7	38	212
	30–60	66	66.6	99	212
	61 and over	53	70.6	75	212
Educational level	Primary school	30	62.5	48	211
	Junior high school	47	71.2	66	211
	High school	47	71.2	66	211
	University or more	23	74.2	31	211

Of the persons in the initial subsample who received the material ($n = 212$), 147 (69.3%) had actually read it, constituting 14.3% of the entire sample of 1026 households (this latter percentage indicates the level of success of the campaign and should be considered when making comparisons with similar communication initiatives). Also in this case the percentage of persons who read the material was higher for persons with a higher educational level and those living in the smaller towns.

4.2.2. The medium and the message

The evaluation of the effectiveness of the message focused on: (a) whether or not the persons interviewed were able to remember the message and what the materials were about, (b) whether or not they used and shared the material with the rest of the household members, and (c) the level of satisfaction with the material.

The results presented hereafter refer to the overall subsample of households that declared having received the campaign material ($n = 455$). As shown in Table 2, 89.3% of the persons who reported that they had received the material remembered the topic of the campaign; 6.6% only remembered that the campaign focused on food-related health or good food-handling practices; and 4.1% gave no answer or a completely wrong answer.

Of the persons who had read the material, nearly half (45.0%) had hung it in the kitchen; 19.7% had discussed the information with household members; 12.4% discarded the material after reading; and 14.0% did not remember what they did with the material after reading (Table 2).

To assess the level of satisfaction with the campaign material, the persons who read the material were asked to evaluate the usefulness of the information. Even if 46.3% reported that there was no new information, the remaining 53.7% reported that some of the information was new; in particular, of these people, 35.8% stated that they had already put the recommendations into practice; and 17.0% stated that they intended to do so in the near future (Table 2).

The percentage of persons who agreed with the criticisms of the information material, posed by the interviewers, is shown in Table 3. The two most important criticisms were that the recommended behaviors would be too complicated to put into practice (16.6% of the persons who had read the material) and disappointment that the

Table 2

Answers to the questions for evaluating the effectiveness of the campaign's medium and message (number of households and percentage values).

	<i>n</i> ^a	%
Do you remember the theme of the campaign?		
<i>Salmonella</i> infection	368	89.3
Generic recommendations on food	27	6.6
Other/error	17	4.1
Total valid	412	100
What did you do with the material?		
Hung it up in the kitchen	142	45.0
Gave it to household members	28	8.9
Discussed it with household members	62	19.7
Discarded it	39	12.4
Don't remember/other	44	14.0
Total valid	315	100
Was any of the information/recommendations new to you?		
Yes, already put into practice	109	35.8
Yes, will put into practice in the near future	52	17.0
Yes, but too complicated to put into practice	3	0.9
No	141	46.3
Total valid	305	100

^a Respondents are those who affirmed having received the material ($n = 455$).

Table 3

Extent of agreement with statements for evaluating the campaign message (number of households and percentage values).

	Almost or fully agree, n (%) ^a	Almost or fully disagree, n (%) ^a	Valid n (%) ^a
The information is too complex.	18 (5.7)	296 (94.3)	314 (100)
This kind of campaign could generate useless alarm.	18 (5.8)	293 (95.2)	311 (100)
This kind of campaign is useless.	36 (11.5)	278 (88.5)	314 (100)
The recommendations are too complicated.	52 (16.6)	262 (83.4)	314 (100)
The information/recommendations are too obvious.	68 (21.6)	246 (78.4)	314 (100)

The italic values correspond only to the percentage values.

^a Respondents are those who affirmed having received the material (n = 455).

information was obvious (i.e., no new information was provided) (21.6%). Only 5.7% of the persons who had read the material felt that the information was “too complex”; a similar proportion (5.8%) agreed with the statement “this kind of campaign could generate useless alarm”, whereas 11.5% agreed that “this kind of information campaign is useless”. The remarks on the complexity and obviousness of the message confirm the importance of balancing simplicity, accuracy and usefulness of the information.

4.2.3. Learning effects

A specific part of the evaluation was devoted to the complex issue of the campaign's impact on people's knowledge and behavior. Although the effects of information campaigns can emerge after a prolonged period, we only evaluated the short-term effects (i.e., whether or not the participants remembered the campaign's message early after its delivery). To this end, we compared two subsamples in terms of their answers to questions that explicitly referred to the campaign's contents. One subsample consisted of persons who had read the material and the other consisted of persons who had not received it.

A set of ten questions focused on the ability to identify suitable food practices and behaviors, as illustrated in the information material. The percentages of correct answers for the two subsamples are shown in Table 4.

For all ten questions, the percentage of correct responses was higher for the persons who had read the material than for those who had not received it (chi-square test; see Table 4), suggesting that the information material conveyed its contents. However, it must be considered that we had no information on the level of knowledge of these persons prior to the campaign; for those who read the material, it is possible that the material facilitated recollection of previous knowledge. With regard to the specific questions, the greatest differences between the two subsamples regarded practical recommendations for avoiding salmonellosis, such as boiling raw milk (+27.8%) and defrosting meat (+15.5%), and the specific characteristics of the bacteria and infection, such as the main symptoms (e.g., headache, +19.4%) and the fact that *Salmonella* is not a virus (+15.8%). The high divergence rate suggests that information material can be useful in conveying both pragmatic advice and more conceptual and general information on salmonellosis.

Some of the questions for which the response rate did not greatly differ regarded behaviors not directly related to salmonellosis but which could sound plausible and helpful. For example, the question on whether or not it is necessary to wash eggs before placing them in the refrigerator refers to a practice that has no effect on reducing the risk of salmonellosis but which recalls a hygienic practice. In this case, the difference in the response rate was 3.4%, with a low statistical significance. Such questions

Table 4
Percentage of households that provided correct and incorrect answers to statements regarding salmonellosis (households that reported having received and read the material compared to those that did not receive it).

	Received and read material		Did not receive material		Total valid	Difference in % correct response	χ^2	ρ
	Correct n (%)	Incorrect n (%)	Total n (%)	Total n (%)				
To avoid salmonellosis, raw milk should be boiled (Correct: "True") ^a	262 (88.2)	35 (11.8)	297 (100)	471 (60.4)	709 (100)	+27.8	50.23	<0.01
<i>Salmonella</i> can cause headaches (Correct: "True")	161 (67)	83 (34)	244 (100)	199 (47.6)	418 (100)	+19.4	29.97	<0.01
<i>Salmonella</i> is a virus (Correct: "False")	133 (49.6)	135 (50.4)	268 (100)	230 (33.8)	702 (100)	+15.8	23.55	<0.01
Defrosting meat at room temperature can be a source of salmonellosis (Correct: "True")	140 (50.2)	139 (49.8)	279 (100)	230 (34.7)	633 (100)	+15.5	19.75	<0.01
Raw milk is the fresh milk sold by supermarkets (Correct: "False")	243 (86.2)	39 (13.8)	282 (100)	491 (76.5)	642 (100)	+9.7	11.26	<0.01
<i>Salmonella</i> is present in spittle (Correct: "False")	155 (76.7)	47 (23.3)	202 (100)	296 (68.4)	433 (100)	+8.3	4.69	<0.05
Chicken meat contaminated by <i>Salmonella</i> is yellow (Correct: "False")	105 (61.1)	67 (38.9)	172 (100)	190 (44.8)	424 (100)	+5.9	1.71	NS
Mussels can transmit salmonellosis (Correct: "True")	266 (93)	20 (7)	286 (100)	579 (87.5)	662 (100)	+5.5	6.34	<0.05
Eggs should be washed before being placed in the refrigerator (Correct: "False")	192 (62.3)	116 (37.7)	308 (100)	457 (58.9)	776 (100)	+3.4	1.09	NS
Uncooked food should be placed higher in the refrigerator (Correct: "False")	134 (50.6)	131 (49.4)	265 (100)	339 (48.2)	703 (100)	+2.4	0.42	NS

The italic values correspond only to the percentage values.

^a Questions with the greatest differences in the percentage of participants providing the correct response are listed first. The total includes both the 1026 households to which the information material was originally sent and the additional subsample of 243 households that received the material (n = 1269).

detected the so-called *over-safety effect*, that is, the tendency to remember recommendations that are not useful but which clearly resemble a safe behavior.

Some of the questions with a small difference in the response rate regarded recommendations that could create confusion, for example, the question concerning the placement of uncooked food in the refrigerator. The information material clearly explained that this food should be placed in the lower part of the refrigerator, to avoid, for example, the liquid from food being thawed dripping onto cooked foods erroneously placed in the lower part of the refrigerator and contaminating these foods with bacteria, such as *Salmonella*. They may have remembered that the positioning of raw food in the refrigerator is important but were not able to remember the actual position. For this reason, the result of this question confirms that more complex knowledge needs to be carefully and clearly linked to practical recommendations and not only with rational thinking.

5. Discussion

The pilot communication campaign appears to have achieved positive results in terms of target penetration, the way in which the message was communicated, and the measurable learning effects. In fact, 20.7% of the households remembered having received the information material by mail, and 69.3% of these households had read the material. Moreover, the characteristics of the material (e.g., contents, graphics, and language) were judged positively. The participants' attention was especially drawn by the practical information and recommendations, highlighting the importance of focusing messages on concrete experiences and daily activities.

This initiative represents an important novelty in terms of the topic covered, the methods adopted for its development, and the fact that an evaluation was performed. With regard to the topic, to the best of our knowledge, not only is this the first campaign on communicating the risk of salmonellosis in Italy, it is also one of the very few attempts to carry out a public risk-communication campaign on microbial foodborne diseases. In fact, although there has been increased interest in the public's perception of food-related risks, health communication campaigns in Italy have tended not to focus on foodborne illnesses. With regard to the methods for developing the campaign, their strength lies in the fact that they were based on explicit principles of communication theory (design – implementation – evaluation) and that formative research was performed to define the campaign's characteristics (i.e., target, medium, and tone of the message). This choice of methodology, which has been shown to be effective in other initiatives (Noar, 2006), contributes to ensuring the reliability of the communication process.

With regard to the evaluation, this is perhaps the most important aspect of our initiative. Although public-health communication campaigns are becoming increasingly common, systematic evaluation is generally not included as part of their implementation, particularly in Italy. However, as the present study demonstrates, evaluation is a key feature. If planned and carried out with scientific research methods and techniques (e.g., a sample survey), evaluation contributes to gaining an in-depth understanding of the campaign's impact and allows far-reaching conclusions to be drawn on the entire initiative. Our evaluation had a twofold outcome. First of all, it allowed us to verify that this initiative attained positive results in terms of target penetration, the characteristics of the message, and the measurable learning effects, and that the campaign on the whole was effective. Second of all, it shed light on the effectiveness of the methodology adopted, indicating that adherence to the principles of communication theory is important for the success of initiatives aimed at communicating health risks.

Some limitations of both the campaign itself and how it was evaluated should be mentioned. One limit is related to the channel used to distribute the material. In particular, the postal channel seems to have been less efficient in the larger town, compared to the smaller ones, indicating that alternative and better targeted forms of communication and distribution channels may be needed. A more important limitation regards the evaluation of the learning effects of the campaign. In particular, we did not determine the participants' level of knowledge of salmonellosis before receiving the material. Future public-health communication campaigns should consider the possibility of using a more complex design for evaluation (Valente, 2001), such as a pre/post-comparison design, in which the target population's baseline knowledge would be compared to the knowledge after exposure to the campaign. Despite these limitations, the campaign's results demonstrate that communication strategies on the risk of microbial infections can be successfully developed and can be effective in conveying knowledge on proper food-related practices in the home.

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Appendix A

Translation into English is given of the content of the flyer used for the communication campaign.

Salmonella: Now I know who you are

Name: Salmonella

What is it?: A bacteria.

What does it do?: Salmonella causes one of the most dangerous foodborne infections for human health, salmonellosis.

Where does it live?: In the gastro-intestinal tract of some animals.

What are the symptoms?: In humans, salmonellosis causes abdominal pain, diarrhoea with dehydration, high fever, vomiting, and headache. Symptoms appear from half a day to a few days after having come into contact with Salmonella. If there are no complications, the infection goes away in about one week. The consequences of salmonellosis are often debilitating and annoying: joint pain, fatigue, eye irritation, and joint stiffness, which can last for long periods of time.

How do you get it?: Salmonella is found in contaminated faeces or in material that has come into contact with contaminated faeces. Thus there is a risk of infection if consuming foods of animal origin that can be contaminated, such as eggs and egg products (custards, mayonnaise, etc.), fresh and cured pork sausages/salami, poultry, and raw (non-pasteurised) milk. Uncooked shellfish is also a possible source of infection, especially if raised in contaminated waters.

What do I do if I become infected?: See a physician any time you have gastro-intestinal problems that could lead to salmonellosis' being suspected: neglecting symptoms could increase the risk to your health or that of your family.

Follow rules of hygiene, so that no one close to you also becomes infected.

Simple but effective: our anti-salmonellosis recommendations
Be cautious with foods:

- Do not eat raw or undercooked eggs
- Do not ignore the expiration date: always use eggs that are fresh, especially if preparing uncooked foods with raw eggs,

such as tiramisù, and make sure that egg-based products are always fresh ... even when prepared by someone else

- Do not eat eggs with a dirty or broken shell
- It is not necessary to wash eggs before placing them in the refrigerator
- Do not eat undercooked foods that could pose a risk, in particular, pork and chicken: this is the best way to avoid salmonellosis, since contaminated foods are no different in color, smell, taste, or consistency
- Do not eat undercooked sausage made with fresh meat
- Do not eat raw or undercooked shellfish, especially if you do not know where it came from
- Do not consume raw milk; milk that is not heat-treated can still contain microbes

Be cautious about your habits:

- If preparing tiramisù or mayonnaise, or any uncooked product with raw eggs, eat them while they are still fresh or within several hours; in any case, always store them in the refrigerator
- In the refrigerator, always place cooked foods above raw foods: in this way you avoid the *Salmonella* spreading by gravity to the cooked foods below which, since they have already been cooked, would not be reheated at the temperatures necessary for eliminating the bacteria
- Thaw meat in the refrigerator and not a room temperature

Do not overlook the importance of basic rules of hygiene!

- Clean the refrigerator often, ideally once every 15 days
- When preparing food, wash your hands thoroughly (with soap and water), especially after having handled raw foods
- Wash kitchen utensils between uses, especially if you have used them to cut raw food

Appendix B

Translation into English is given of the content of the gadget with the sliding insert used for the communication campaign.

Salmonella: Now I know who you are

Slide the cardboard insert back and forth and discover how to protect yourself from *Salmonella*

FOOD: egg

WARNING: do not consume raw eggs or eggs with a dirty/broken shell

WHAT TO DO: mayonnaise and tiramisù should be eaten within a few hours

STORAGE: refrigerate, separately from cooked foods or foods that will be eaten raw

REMEMBER TO: eat eggs well before the expiration date

FOOD: meat (chicken, pork)

WARNING: do not eat raw or undercooked meat

WHAT TO DO: wash the knife and cutting board after having cut raw meat

STORAGE: refrigerate; if already cooked, place apart from raw foods

REMEMBER TO: never re-freeze meat that has already been thawed

FOOD: shellfish

WARNING: do not eat raw

WHAT TO DO: eat fresh products within several hours

STORAGE: refrigerate

REMEMBER TO: only purchase shellfish that is packaged and labelled

FOOD: sausage/salami

WARNING: do not eat raw or undercooked sausage

WHAT TO DO: cook sausage well, also on the inside

STORAGE: refrigerate or store in a cool, dry place

REMEMBER TO: consume salami that has been cured well

FOOD: milk

WARNING: do not consume non-pasteurised milk

WHAT TO DO: boil non-pasteurised milk

STORAGE: refrigerate

REMEMBER TO: always look at the expiration date

Salmonella

Salmonella is a bacteria that causes salmonellosis, a foodborne infection that is dangerous for human health. In humans, salmonellosis causes: abdominal pain, diarrhoea with dehydration, high fever, vomiting, headache. See a physician any time you have gastro-intestinal problems that could lead to salmonellosis' being suspected: neglecting symptoms could increase the risk to your health or that of your family.

Always remember to:

- Wash your hands thoroughly when preparing food
- Wash kitchen utensils between uses
- Clean the refrigerator often

Credits: communication campaign produced by Veneto Region, in collaboration with: Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe), Faculty of Psychology – University of Padua. Graphics designed and created by: Training and Communication Unit – IZSVe. Research project 18/2004, funded by the Ministry of Health.

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