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## Accepted Manuscript

Beyond information seeking: Consumers' online deliberation about the risks and benefits of red meat

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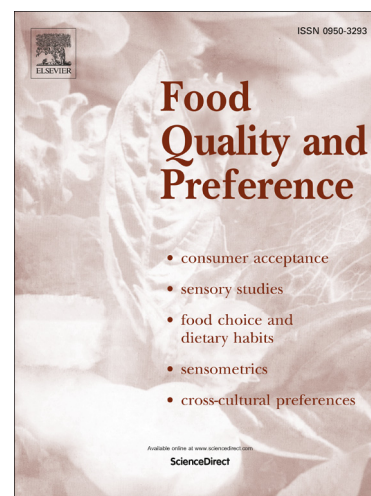
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**Beyond information seeking: Consumers' online deliberation about the risks and benefits of red meat**

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1 **Beyond information seeking: Consumers' online deliberation about the**  
2 **risks and benefits of red meat**

3

4 **Abstract**

5 Successfully engaging consumers in a dialogue may provide opportunities for better tailored and more  
6 effective communication about food-related risks and benefits. Using an online deliberation concept  
7 and software, VIZZATA™, we explored the validity of a behavioral measure of deliberation in an  
8 online environment in the context of consumers' perceptions and information seeking about the risks  
9 and benefits of red meat. Participants from Belgium, Portugal and the United Kingdom (n=150) were  
10 given the opportunity to engage in an asynchronous interaction with the research team about the  
11 information provided. Online deliberation was operationalized as an individual metric based on the  
12 number of questions asked in relation to the information, the number of comments left, the number of  
13 glossary terms accessed, and the time spent on deliberative activity. This operationalization provided a  
14 coherent measure of deliberation which was positively correlated with information recall about the  
15 risks and benefits of red meat. Participants who perceived the information about red meat risks and  
16 benefits as too complex engaged less with the information. The study herewith presents a novel  
17 method of investigating consumers' deliberation about food issues that conceptualizes consumer  
18 engagement as more than just information seeking.

19

20 **Keywords**

21 Consumer; Information seeking; Online deliberation; Red meat; Risk-benefit communication

22

23 **Highlights**

- 24 • A measure of online deliberation about red meat risks and benefits is validated.  
25 • Questions asked, comments given, links clicked, time spent compose the measure.  
26 • Perceiving information about red meat as too complex decreases deliberation.  
27 • Deliberation increases information recall about red meat risks and benefits.

28 **1 Introduction**

29 In the field of food risk and benefit communication, bridging the divide between scientific experts and  
30 the lay audience has traditionally been a difficult task (Gaskell, et al., 2004; Hansen, et al., 2003).  
31 Communicators have the challenging task to assist consumers in making informed decisions (EFSA,  
32 2012) and provide clear information about the balance between risks and benefits, which should build  
33 trust and therefore attenuate unwarranted risk perceptions (Qin & Brown, 2006; van Dijk, et al., 2012).  
34 Over the last decade, communication about food-related risks and benefits has undergone a significant  
35 change as the interest has grown to involve the public in the communication and decision-making  
36 processes (Dijkstra & Gutteling, 2012; Macnaghten, et al., 2005). The focus of this study is on  
37 consumers' deliberation or deliberative activity, which is defined as thoughtful, careful and lengthy  
38 considerations of information by individuals (Davies, 2009). Deliberation may differ from 'debate',  
39 'discussion', or 'argumentation' in that its essence resides in the careful weighing of information and  
40 in making difficult choices and trade-offs among conflicting options (Matthews, 1994), although not  
41 all deliberative encounters require decisions (Burkhalter, et al., 2002). Involving citizens in  
42 deliberation initiatives has mostly been seen as a way to better inform public authorities and provide  
43 input for policy development. Consumers are influenced by deliberative activity as participation in the  
44 communication process can support also individuals to become better informed about an issue  
45 (Demont, et al., 2013; Min, 2007; Ramsey & Wilson, 2009).

46 The rapid growth of internet use and in particular the rise of web 2.0, has created new possibilities and  
47 new mechanisms for consumer engagement in food-related topics and deliberation, making the online  
48 environment a suitable context for the exploration of consumer views on risk and benefit issues. There  
49 are a few organisations using the internet or Twitter as a vehicle for consumer engagement in food  
50 safety or risk communication (e.g. the Food Standards Agency in the U.K. or the Food Safety  
51 Authority of Ireland). Much of this communication is still one-way, not personally tailored and fails to  
52 fully engage consumers in a deliberative process or in a proper dialogue, thus leaving a lot of potential  
53 that remains largely unexploited (Gaspar, et al., 2014; Panagiotopoulos, et al., 2013; Thackeray, et al.,  
54 2012). Besides advantages with respect to the ease and ability to reach out to wide audiences, the use

55 of an online environment offers some new potential for deliberation as in theory it might allow  
56 researchers to better understand which aspects of the communication people pay most attention to and  
57 what their immediate reactions are. Major challenges, however, lie in measuring and monitoring such  
58 online deliberation processes, and assessing differences among individuals in their information  
59 seeking and deliberative activity (Anderson et al., 2012).

60 Furthermore, although risk communication has been extensively addressed over the last 30 years,  
61 much less attention has been paid to developing strategies for communicating balanced information  
62 and to understanding how consumers respond to more complex situations in which both risk and  
63 benefit information are available (Cope, et al., 2010; Fischer & Frewer, 2009; Verbeke, et al., 2008).  
64 Most food products have both positive and negative aspects which consumers often have to weigh up  
65 and trade off. As for the food products that have been characterized by a mixture of positive and  
66 negative effects on health, for example, fatty or oily fish, with the trade-off between omega-3 fatty  
67 acids and fat-soluble environmental contaminants, has received extensive attention (Foran, et al.,  
68 2005; Levenson & Axelrad, 2006; Pieniak, et al., 2008; Verbeke, et al., 2005). Yet less attention has  
69 been paid to red meat (the topic of this study) which is also worthy of attention (see e.g. Regan, et al.,  
70 2014) as it has increasingly been associated with risks (e.g. the presence of hormone or antibiotic  
71 residues, as well as associations with the prevalence of cardiovascular disease and colorectal cancer)  
72 (McAfee, et al., 2010; Smolinska & Paluszkiwicz, 2010) as well as benefits (e.g. as a source of high-  
73 value protein and essential minerals like iron, zinc and vitamin B12) (McAfee, et al., 2010; Wyness, et  
74 al., 2011; Van Wezemaal, et al., 2014). Moreover, red meat risks pertain not only to the arena of  
75 human health and nutrition, but also to the environmental impact of its production which has recently  
76 begun to be acknowledged (Aston, et al., 2011; de Boer, et al., 2013). In a similar vein, benefits  
77 associated with red meat extend beyond its nutritional value alone. These include also hedonic  
78 attributes providing sensory satisfaction (Banovic, et al., 2009; Verbeke, et al., 2010) and socio-  
79 cultural values relating to meat's status, its connection to eating habits, the structural aspects of meals,  
80 and consumers' frames of reference and cooking skills (Parry, 2009; Schösler, et al., 2012; Scholderer,  
81 et al., 2013).

82 Therefore, it is important to investigate how consumers weigh up the various positive and negative  
83 aspects of red meat, and how they engage in seeking clarification about these aspects as they try to  
84 make sense of the risk-benefit information received. Furthermore, given the ubiquitous use of the  
85 online environment for communicating risks and benefits to consumers, it is important to understand  
86 how consumers interact with information materials presented to them, and which aspects of such  
87 information most capture their attention. The objective of this study is to acquire a better  
88 understanding of the nature of consumer deliberation about the risks and benefits of food in an online  
89 environment, taking red meat as the specific case. Hereafter deliberation in an online environment will  
90 be referred to as “online deliberation”.

91 With the aid of a new online deliberation concept and software, VIZZATA<sup>TM</sup>, this study aims to  
92 investigate consumer deliberation about the risks and benefits of red meat while at the same time  
93 testing the validity of a behavioral measure of online deliberation. We aim to evaluate the role of  
94 personal relevance attached to red meat, information (in)sufficiency and perceived complexity of the  
95 information as potential antecedents of online deliberative activity related to information about red  
96 meat. We also explore online deliberation as varying by socio-demographic characteristics, including  
97 gender, age, education and the presence of children. While such characteristics have been shown to  
98 influence food risk and benefit perceptions (e.g. De Vocht et al.; 2013; Bearth et al., 2014) as well as  
99 consumer involvement with meat (Verbeke & Vackier, 2004), associations with food-related  
100 information seeking are less straightforward. For example, Kuttschreuter et al. (2014) document age-  
101 related differences but no gender differences in information seeking about food-related risks. In a  
102 similar vein, Hansen et al. (2010) report that women do not necessarily seek more often product-  
103 specific health-related information compared to men. Also Verbeke and Ward (2006) report that  
104 gender, age, education and presence of children had little impact on consumers’ interest in information  
105 cues on beef labels with a few notable exceptions such as females reporting higher importance and  
106 attention to specific quality indications, and consumers aged below 30 years reporting lower interest in  
107 general. We are not aware of any studies specifically investigating differences in deliberation based on  
108 socio-demographic factors, but insofar as information seeking is one facet of deliberation there are

109 differences which makes it reasonable to explore deliberation as varying by socio-demographic  
110 characteristics.

111 Finally, our study is performed in multiple countries (Belgium, Portugal and the United Kingdom).  
112 Although deliberation can be considered a rather universal process that can be found across cultures,  
113 and while we are not aware of any literature that looked at the cross-cultural aspects of deliberation,  
114 the performance of this work in multiple countries facing the same issues of red meat is believed to  
115 add cross-cultural validity to our study's online method and subsequent findings.

116

## 117 **2 Theoretical background**

### 118 *2.1 Online deliberation*

119 Mechanisms for engaging the public can range from simple public opinion surveys or focus groups to  
120 more complex approaches that involve more participative and deliberative processes such as citizen  
121 juries or conferences. While deliberation has been seen predominantly as face-to-face (F2F)  
122 communication, the development of new communication technologies has opened new avenues of  
123 deliberative possibilities (Boczkowski & Mitchelstein, 2012; Min, 2007; Xenos, 2008), including so-  
124 called online or keyboard-to-keyboard (K2K) deliberation (Powell et al., 2011). The new generation of  
125 interactive online tools that allow users to generate content and interact are increasingly recognized as  
126 an opportunity to involve and empower consumers in the food risk and benefit communication process  
127 (Brossard & Scheufele, 2013; Rutsaert, et al., 2013). Website interactivity can be evaluated on two  
128 levels: social and mechanical. Social interactivity consists of reciprocal communication through  
129 feedback mechanisms (Song & Zinkhan, 2008). The ability to provide feedback in the form of  
130 questions or comments is a form of social interactivity and it facilitates mutual relationships (Jiang, et  
131 al., 2010). Asking questions is an activity that is indicative of thought and consideration about the  
132 presented information; it shows how people are seeking to make sense of new information and  
133 indicates a process of 'wondering' (Marcu, et al., 2014). Asking questions can also be considered as an  
134 indicator of attentiveness (Ripberger, 2011), and analysis of the questions' content is considered a



135 useful way to assess uncertainties and concerns in participants' understanding of the information  
136 provided (Dillon, 1982). Giving comments, on the other hand, is a way of expressing a personal view  
137 on a topic and providing feedback to the communicator. Like the activity of asking questions, giving  
138 comments also requires engagement with and consideration of the material presented. Mechanical  
139 interactivity is seen as active consumer control when looking for information, for example by using  
140 hyperlinks or clicking glossary terms to access other sources and additional information (Sundar, et  
141 al., 2003), whereby active control gives participants the freedom to choose which material they want  
142 to engage with (Boczkowski & Mitchelstein, 2012).

143 In the context of the present study we measured deliberation as the participants' engagement with the  
144 study material presented to them. Based on the aforementioned insights, online deliberation is  
145 operationalized as a behavioral measure in terms of questions asked by consumers about the online  
146 stimulus material, comments left by consumers, glossary terms accessed, together with the total time  
147 spent on deliberative activity. The option to comment gave participants the opportunity to express  
148 personal views and reflect on the given information. The glossary terms in the text provided the  
149 participants the opportunity to access additional information and clarifications they desired. The total  
150 time spent on the exercise indicates a level of interest in and close attention to the presented  
151 information material.

## 152 2.2 *Antecedents of deliberation*

153 The idea that food-related communication should be clear and easy to understand is generally accepted  
154 as best practice (McGloin, et al., 2009). However, scientific results and risk assessments cannot  
155 always easily be translated into simple guidelines and advice that the lay public or the media can  
156 easily understand (Barnett, et al., 2011). The simultaneous communication of food risks and benefits  
157 can result in complex messages and increase confusion and uncertainty. The heuristic-systematic  
158 model proposed by Chaiken (Chaiken, 1980; Eagly & Chaiken, 1993) stipulates that information can  
159 be processed systematically, heuristically or by a combination of these two. While the heuristic mode  
160 involves the use of simple decision rules or rules of thumb to process information, the systematic

161 mode is based on a more detailed processing of all useful information to reach judgement. From this  
162 perspective, deliberation is a cognitive process involving active information seeking and processing,  
163 and is arguably underpinned by systematic rather than heuristic processing as it involves deeper  
164 thought and analysis.

165 A first possible antecedent of deliberation is personal relevance (or importance), as an issue perceived  
166 to be personally relevant is more likely to generate systematic information processing efforts  
167 (Chaiken, 1980; Griffin, et al., 1999). More involved participants may focus more on the content of a  
168 message and look beyond heuristic cues like source characteristics (Chaiken, 1980; Verbeke, et al.,  
169 2008). In relation to everyday risks and benefits, food is commonly perceived as a typical low-  
170 involvement product, therefore one might expect limited interest in information and consequently a  
171 relatively low level of deliberation. Nevertheless, consumer involvement with food may differ  
172 depending on the person, the situation and the product at hand. Therefore, personal relevance attached  
173 to red meat is a relevant construct to consider as a possible antecedent of deliberation about risks and  
174 benefits of red meat.

175 Building on the heuristic-systematic model, the risk information seeking and processing (RISP) model  
176 (Griffin, et al., 1999) assumes that not all individuals need the same amount of information. By  
177 developing the concept of 'information (in)sufficiency', Griffin et al. (1999) stipulate that information  
178 seeking is strongly based on the discrepancy between the actual level of knowledge and the desired  
179 level of knowledge, or information needed to be able to deal adequately with a given risk. The larger  
180 the gap between the actual and desired level of information, the more effortful information seeking  
181 and processing will take place as people think they need to know more about the given risk or the  
182 choice they face. Thus, information (in)sufficiency about red meat risks and benefits can be expected  
183 to impact on deliberation.

184 Finally, in complex situations (or rather, in situations perceived as complex) individuals might fall  
185 back on heuristic strategies by attending to the characteristics of a message such as source credibility  
186 instead of actually engaging with the message content (Kahneman & Tversky, 1979). The RISP model

187 accepts that some people might avoid risk information if it leads to worries they cannot cope with  
188 (Griffin, et al., 1999). Perceived message complexity can thus have a significant effect on information  
189 processing and reduce deliberative activity.

190 Based on the aforementioned theories of risk information seeking and processing and information  
191 avoidance, we examined the role of personal relevance of red meat, risk and benefit information  
192 sufficiency, and perceived information complexity as antecedents of deliberation about the risks and  
193 benefits of red meat. Specifically, we test the following hypotheses:

194 Hypothesis 1: Personal relevance of red meat increases deliberation.

195 Hypothesis 2: Information sufficiency about red meat (a) risks and (b) benefits decreases deliberation.

196 Hypothesis 3: Perceived complexity of the information decreases deliberation.

197

### 198 **3 Materials and methods**

#### 199 *3.1 Participants*

200 A total of 244 participants were invited by a market research agency to take part in a study about the  
201 risks and benefits of red meat (80 from the UK; 80 from Belgium and 84 from Portugal). All  
202 participants were frequent red meat eaters (i.e. non-vegetarians and consuming red meat at least once a  
203 week) who agreed to participate in a deliberation study about red meat, consisting of two stages. Of  
204 the total invited sample, 150 participants (62%) completed both phases of the study in the summer of  
205 2012. Of the 150 participants, 55 came from Belgium, 50 from Portugal and 45 from the UK. The  
206 sample was diverse in terms of a wide range of socio-demographic characteristics (e.g. education  
207 levels, participants with and without children). There was an equal division of men and women in the  
208 sample. 22.7% of the sample was younger than 30 years, 42% were aged between 30 and 40 years and  
209 35.3% were older than 40 years. The majority of the sample had completed a higher education (53.3%)  
210 and 45.3 % of the sample reported they had children.

## 211 3.2 Procedure

212 This study used the online deliberation software VIZZATA™ (<http://www.vizzata.com>) (Barnett, et  
213 al., 2008). This tool allows researchers to present the target audience with information (text, images,  
214 videos, website screenshots, etc.) and to elicit the audience's questions and comments in relation to  
215 these pieces of content. The participants can indicate their preference to receive responses from the  
216 research team, prior to moving to a second phase where their questions and comments are answered  
217 and further questions, comments and answers can be elicited. VIZZATA™ thus offers the opportunity  
218 for on-going asynchronous interaction between the communicator or researcher and the audience. A  
219 further feature of VIZZATA™ is the inclusion of 'glossary terms' – highlighted words in the online  
220 text which can be clicked on to provide further information. One of the core features of VIZZATA™  
221 resides in eliciting questions and comments from the participants and observing their engagement with  
222 the study material, for example by measuring the time spent on each of the content testers (online  
223 pages with pieces of information) or the number of glossary terms that the participants access.

224 The recruited participants were invited by email to the website and presented with a series of seven  
225 content testers where they could ask questions or make comments. Firstly, the participants completed a  
226 short series of closed response questions, which included measures of the antecedents of deliberation  
227 and other control measures. They were then presented with the seven content testers. Five of these  
228 pages contained highlighted glossary terms. At the bottom of each page, participants had the  
229 opportunity to leave questions or comments on the material presented. The first phase of the study  
230 finished with the participants completing a further series of measures pertaining to information  
231 seeking and processing. After the research team conducted the necessary work to provide responses to  
232 the questions and comments participants had submitted, the responses were emailed back to the  
233 participants. Approximately two weeks after completion of the first phase, they were invited to the  
234 second phase of the study and asked to complete a final set of questions. Between both study phases,  
235 no significant incidents regarding the study topic (red meat) were reported in the media in the  
236 participating countries.

237 3.3 *Content of the study*

238 Table 1 presents an overview of the topics covered in the study. All the content tester pages were  
239 about red meat and potential risks and benefits linked to it. The first content tester page gave a general  
240 introduction to red meat. The next two pages dealt with nutritional and environmental risks of red  
241 meat, respectively. Pages four and five provided information about the nutritional benefits and socio-  
242 cultural aspects of red meat, respectively. To avoid bias because of order effects (Verbeke, et al.,  
243 2008), half of the participants were presented with the risk information pages first and half with the  
244 benefit information pages first. As no significant differences were found as a result of presentation  
245 order, the sample was treated as one in further analyses.

246 On page six, a recent article from the BBC News Online was presented (BBC, 2012) (in Belgium and  
247 Portugal, translations of the article were used which appeared in national newspapers). The article  
248 discussed the increased risk of early death in relation to excessive consumption of red meat based on a  
249 recent US study (Pan, et al., 2012). The seventh content tester contained a YouTube video about  
250 synthetic (also referred to as ‘in-vitro’ or ‘cultured’) meat (YouTube, 2011) developed by the Royal  
251 Institution of Australia. Our choice of content testers aimed to reflect the different aspects of red meat  
252 which are currently discussed in society, based not only on information provided by food  
253 communicators but also through other sources and media channels. In addition, synthetic meat (using  
254 beef, thus red meat as a model) was selected as a possible complex topic that had recently emerged  
255 and is expected to develop further in the upcoming years (Hocquette et al., 2013; Verbeke et al.,  
256 2014). The synthetic meat content tester basically informed participants about the fact that animal cells  
257 can be cultured and grown into meat without the necessity of killing an animal. While this content  
258 tester did not explicitly refer to risks or benefits of red meat, it brought to attention the environmental  
259 impact of red meat and it also presented synthetic or cultured meat as a possible future substitute to  
260 traditional meat without the need of harming animals. The red meat news story and the synthetic meat  
261 YouTube video did not contain clickable glossary terms.

262

[Insert Table 1 here]

263 3.4 *Measures*

264 We aimed to measure how consumers engaged in deliberative activity, which we operationalized as a  
265 latent construct based on the standardized scores of four components: (i) the number of questions  
266 participants asked, (ii) the number of comments they left, (iii) the number of glossary terms they  
267 accessed and (iv) the total time they spent on deliberative activity. It is important to note that  
268 standardized scores were calculated, which means that the deliberation measure for each participant is  
269 a relative measure that takes into consideration the comparison to the other study participants.

270 Personal relevance of red meat and information sufficiency about the risks and benefits of red meat  
271 were measured as self-reported variables before participants were exposed to the content testers.  
272 Personal relevance (or personal importance attached to red meat, Van Wezemael et al. (2010)) was  
273 measured on a 7-point Likert scale using four items as presented in Table 4. Griffin et al. (1999: S233)  
274 defined information sufficiency as “the amount of information people say they need in order to deal  
275 adequately with a given risk in their own lives”. Information sufficiency refers to the extent to which  
276 the individual feels his/her need for information on a given topic was satisfied (Eagly & Chaiken,  
277 1993). Information sufficiency regarding both the risks and benefits of red meat was measured on a 7-  
278 point Likert scale ranging from ‘completely disagree’ to ‘completely agree’ (Table 4).

279 Perceived complexity of the presented information and information recall were measured after  
280 participants had been exposed to the content testers. Perceived complexity of the presented  
281 information was measured on a 7-point Likert scale based on the study of Shepherd and Kay (2012).  
282 The participants were asked to name up to three risks and three benefits of eating red meat they could  
283 remember from reading the material presented in the first phase. The measure of recall was calculated  
284 as the sum of risks and benefits correctly recalled and thus ranged from zero to six.

285 Data were analysed using the statistical software SPSS version 20.0 and LISREL 8.72. First,  
286 descriptive statistical analyses were performed using independent sample tests for comparison of mean  
287 scores between groups of participants. Second, a maximum likelihood confirmatory factor analysis  
288 was conducted using the robust maximum likelihood procedure in LISREL 8.72. Third, structural

289 equation model coefficients were estimated and the general fit of the model was assessed. With the use  
290 of structural equation modelling (SEM), the examination of all the relationships between constructs  
291 and items was performed simultaneously. To evaluate how closely the data fit the hypothesized model,  
292 the following goodness of fit indices are reported: the  $\chi^2$ -value together with degrees of freedom (df),  
293 the ratio ( $\chi^2$  /df), the Root Mean Square Error of Approximation (RMSEA), the non-normed fit index  
294 (NNFI), and the Comparative Fit Index (CFI). Values below 0.08 for RMSEA (Browne & Cudeck,  
295 1993) and above 0.90 for NNFI and CFI (Hu & Bentler, 1999); and  $\chi^2$  /df <2 (Tabachnick & Fidell,  
296 2007) indicate an acceptable fit of the model. Due to the fact that  $\chi^2$  is very susceptible to sample size  
297 and the number of items, it is recommended selecting the ratio of the  $\chi^2$  /df as an alternative criterion  
298 (Hair, et al., 2006; Tabachnick & Fidell, 2007).

299

## 300 **4 Results**

### 301 *4.1 Descriptive statistics*

302 Table 2 presents the differences between socio-demographic groups for the number of questions  
303 asked, comments left, clicks on glossary terms and average time spent on deliberative activity about  
304 the risks and benefits of red meat. Of the 150 participants who completed the study, 72% engaged in  
305 deliberative activity by asking questions, giving comments or clicking on glossary terms. In total, the  
306 participants asked 138 questions, left 279 comments and accessed the 20 glossary terms 435 times.  
307 Participants with a higher education level provided significantly more comments and spent on average  
308 a longer time on the stimulus material. Participants with children gave on average more comments. No  
309 significant differences were found for the four hypothesized antecedents of deliberative activity  
310 between countries, gender and age categories.

311 Figure 1 shows the number of questions asked and comments given per content tester. Most comments  
312 were given about CT6 (red meat in the news) and CT7 (synthetic meat). Although content analysis of  
313 the questions and comments is beyond the scope of this paper, examples of questions and comments  
314 are provided in appendix 1, while we provide a detailed analysis of the questions and comments

315 pertaining to synthetic meat in a related paper (Marcu et al., 2014). Briefly, despite recognizing  
316 moderate meat consumption as being indispensable in their personal diets, participants wondered  
317 about the precise role of red meat in a healthy and varied diet and, how much and how frequently red  
318 meat can safely be eaten. They also expressed doubts about a wide diversity of issues relating for  
319 example to red meat's nutritional value, the impact of meat processing and preparation, possible  
320 alternatives to red meat, the possibility of counterbalancing risks by leading healthier lifestyles, and  
321 scientific uncertainties or inconclusiveness about the alleged impacts of meat consumption on human  
322 health and the environment.

323 [Insert Table 2 here]

324 [Insert Figure 1 here]

325 Table 3 presents socio-demographic differences in participants' reported personal relevance of red  
326 meat, information sufficiency about risks and benefits of red meat and perceived complexity of the  
327 given information. Information sufficiency about the risks of red meat was perceived higher in  
328 Portugal than in Belgium and the United Kingdom. Information sufficiency about the benefits of red  
329 meat was perceived higher for participants aged above 35 years compared to younger age. Participants  
330 with a higher education level perceived the information to be significantly less complex compared to  
331 lower educated participants.

332 [Insert Table 3 here]

#### 333 4.2 *Confirmatory factor analysis*

334 Confirmatory factor analysis was performed to determine whether measures of a construct actually  
335 converged towards the intended latent variable of deliberation or shared a high proportion of variance  
336 in common, and whether the constructs were distinct from each other. Latent variables, items, loadings  
337 and reliability estimates are presented in Table 4.

338 [Insert Table 4 here]



339 Due to low factor loadings (<0.40) six items were deleted (Table 4, footnote). Loadings of the  
340 remaining items on the constructs were all significant with values ranging from 0.49 to 0.96. All cross  
341 loadings were below 0.40. One factor loading was relatively low (0.49 for the item *It is valuable to me*  
342 *to include red meat in my diet*). However, due to acceptable values of Cronbach's alpha coefficients  
343 for the personal relevance construct (alpha=0.80) and the consistent meaning of the item within the  
344 construct we decided to retain it in further analyses. All Cronbach's alpha internal reliability  
345 coefficients were above the threshold value of 0.70 for satisfactory scales (Hair et al., 2006).  
346 Descriptive statistics of the five constructs, factor loadings and reliability estimates are presented in  
347 Table 5.

348 [Insert Table 5 here]

#### 349 4.3 *Deliberation and information recall*

350 Information recall was assessed as a check of the validity of our behavioral measure of online  
351 deliberation. Based on the deliberation scores, the participants were divided in three tertiles, i.e. low,  
352 medium and high deliberators. High deliberators (M=4.32; SD=1.72 on a scale from zero to six)  
353 recalled significantly more risks and benefits compared to low (M=2.74; SD=1.85;  $t(98) = -4.42$ ,  $p <$   
354  $.001$ ) and medium deliberators (M=3.22; SD=1.84;  $t(98) = -3.09$ ,  $p < .01$ ).

#### 355 4.4 *Model validation*

356 The hypothesized online deliberation model performed well (Figure 2). The  $\chi^2$  for the model was  
357 202.18 with 125 degrees of freedom ( $p < 0.001$ ), and a ratio of 1.6 thus in accordance with the  
358 recommended threshold level. The RMSEA value was 0.064; the NNFI was 0.95 and the CFI was  
359 0.94, indicating that the goodness-of-fit indices were satisfactory. Direct relationships between  
360 personal relevance, information sufficiency about risks of red meat, information sufficiency about  
361 benefits of red meat and online deliberation had been included in the model but failed to reach  
362 statistical significance (hypotheses 1, 2(a) and 2(b) not supported). Perceived complexity of the  
363 information was negatively moderately (-0.41) and directly associated with our measure of online  
364 deliberation. The higher the perceived complexity of the information in the stimulus material, the

365 lower the online deliberation, supporting hypothesis 3. The SEM results thus support only one of the  
366 four theorized antecedents of online deliberation.

367 [Insert Figure 2 here]

368

## 369 **5 Discussion and conclusion**

370 The present study offers insight in how consumers engage in online deliberation when provided with  
371 information about the risks and benefits of red meat. We conceptualized and operationalized  
372 deliberation as an activity resulting from asking questions, leaving comments, accessing glossary  
373 terms, and spending time on the study stimulus material. While previous research has focused on  
374 deliberation as a method for policy makers to obtain a picture of consumer understandings that are  
375 collectively developed about a specific topic, our approach explored deliberation as manifest in an  
376 individual's activity and even encouraged it further with the provision of individually-tailored  
377 responses to questions and comments. Using the VIZZATA™ online deliberation concept and  
378 software, we identified a number of actions undertaken by individuals that allowed us to construct an  
379 individual measure of deliberation. The results indicate that deliberative activity can be assessed as an  
380 individual and behavioral measure that – at least, for the case of red meat – varies among individuals  
381 and associates with the level of education and having a responsibility as a parent. The results suggest  
382 that the higher educated people are, the more able they are to engage with complex communications,  
383 such as information presenting both the risks and benefits of red meat. This may be the result of being  
384 better 'equipped' and more skilled to deliberate around the complexity of an issue, and/or of being  
385 more familiar with such situations as a result of more frequent exposure to complex information. The  
386 implication is that food communicators should tailor their messages so as to reach those groups of  
387 consumers who are less able to navigate around the complex aspects of food-related risks and benefit.  
388 The presence of children in the household led to leaving more comments. This suggests parents may  
389 attend more to the complex aspects of food, which is possibly driven by their protective role (Eibach

390 & Mock, 2011) and concern about providing adequate nutrition and wholesome food to their children  
391 (Verbeke, 2005).

392 The findings also suggest that, besides content, the presentation format of information influences  
393 deliberative activity. The content testers including a news article and YouTube video, resulted in twice  
394 as much comments compared to standard verbal content testers. This may be due to content, but also  
395 to the higher level of experimental realism as the article and video content testers were visibly copied  
396 from an original and professional source. Material presented in a well-recognized and typical media  
397 format such as a news page or YouTube video may seem more credible, may be more engaging, and  
398 may stimulate more active deliberation from participants.

399 Having constructed a coherent measure of online deliberative activity we corroborated it further using  
400 a measure of information recall which enabled us to observe a systematic relationship between  
401 behavioral indicators of attentiveness to and engagement with the stimulus material and the responses  
402 provided. That is not to say that recall is the primary or necessary outcome of deliberation but as part  
403 of this first attempt to develop online methods that facilitate deliberation, information recall can serve  
404 as a useful cognitive construct against which to locate the deliberation measure. Other possible  
405 validation measures can be attitudinal (e.g. specific beliefs, perceptions, or attitudinal ambivalence) or  
406 behavioral (e.g. intentions to consult more (or less) information about red meat, to pay more (or less)  
407 attention in the future to similar news, information avoidance, or intentions to reconsider one's current  
408 red meat consumption).

409 The development of a measure of online deliberation allowed us to investigate possible antecedents of  
410 online deliberation such as personal relevance, perceived information sufficiency and complexity for  
411 the specific case of red meat. By using structural equation modelling, we were able to estimate the  
412 strength of direct relationships between the different constructs on one hand and deliberation on the  
413 other hand. Our first hypothesis was that personal relevance would have a positive influence on  
414 deliberation as in the case with information seeking (Chaiken, 1980), i.e. the more personally relevant  
415 red meat was, the more the participants were expected to engage in commenting, questioning, and

416 accessing glossary terms. The concept of personal relevance has also been linked previously with  
417 involvement in the context of fresh meat consumption (Verbeke & Vackier, 2004). Despite a positive  
418 correlation between personal relevance (or perceived importance of red meat in the diet) and  
419 deliberation, this construct had no significant impact in the structural equations model (H1 not  
420 supported), which suggests that people may engage in deliberative activity irrespective of their level of  
421 personal involvement with the issue at hand.

422 Information sufficiency about the risks and benefits of red meat was hypothesized to decrease  
423 deliberation. While the RISP model of Griffin et al. (1999) suggests that the perceived gap between  
424 the actual and the desired level of knowledge influences information seeking, information sufficiency  
425 was not found to relate to online deliberation for the case of red meat (H2a and H2b not supported). A  
426 possible explanation is that risks and benefits about red meat have been regularly and quite prominent  
427 in the news during recent years, which may have led to a 'good match' between the actual and  
428 desirable level of knowledge, or even to some degree of 'fatigue' among consumers. For example,  
429 Portuguese participants reported a significantly higher level of information sufficiency about the risks  
430 of red meat, which is an empirical issue as such, though it may also reflect a higher degree of 'fatigue'  
431 among Portuguese meat consumers as compared to consumers in the UK or Belgium concerning the  
432 risks of red meat. In general, our findings suggest that if people feel knowledgeable about the risks and  
433 benefits of red meat, they may either refrain from further deliberation or they may still enjoy engaging  
434 with additional stimulus material by asking questions, leaving comments or clicking glossary terms,  
435 e.g. out of curiosity or to confirm their own knowledge.

436 Perceived information complexity was the only significant antecedent with a negative effect on  
437 deliberation (H3 supported). While one might have assumed that difficulties in understanding the  
438 information may have resulted in people leaving more questions and comments or accessing more the  
439 glossary terms, the opposite was found as the greatest deliberation was observed among people with  
440 low perceived information complexity. This might tie in with previous research on the effect of task  
441 complexity on motivation which has found that when people are able to complete a more complex task  
442 this can in turn lead to satisfaction of a feeling of competence (Sun, et al., 2012). By contrast, if

443 perceived task complexity is negatively related to the probability of completing a task and thus  
444 resulting in unsuccessful fulfilment, this can lead to a sense of incompetence. It could be argued that  
445 the participants who perceived the information about red meat as too complex might have therefore  
446 preferred to avoid this information instead of feeling incompetent to deal with it. Additional  
447 antecedents that might be considered in future studies are, for example, knowledge, need for cognition,  
448 trust in science and society, or interest in information in general as general personal difference  
449 variables. In addition, possible case-specific antecedents such as interest and trust in food-related  
450 information, concern about climate change, openness to innovation in food or interest in any specific  
451 information about issues that are stressed in the content testers provided to the study participants, may  
452 matter.

453 Previous research has indicated that communicating balanced information about food is a difficult task  
454 (Verbeke et al., 2008; Roosen, et al., 2009). The widespread use of the internet and the emergence of  
455 social media are creating a shift in the traditional communication model in which the communicator  
456 had control over the message and how it was spread (Hoffman & Novak, 1996). Although the  
457 integration of social media in public or private communication strategies might worry some food  
458 policy makers and communicators (Rutsaert, et al., 2014), engaging consumers into a dialogue,  
459 whether online or offline, can lead to better informed and more critically thinking consumers. The  
460 present findings are supported by the work of Bjoernes, et al. (2012) who concluded that an online  
461 asynchronous dialogue between healthcare professionals and patients can accommodate the individual  
462 patients' information and communication needs. Neglecting the opportunities for consumers to engage  
463 in a dialogue with food communicators can even result in others taking over the role of communicator  
464 and providing potentially inaccurate information to the public (Agostino, 2013). In order to limit the  
465 influence of unreliable information, there is value in trusted food policy makers and stakeholders  
466 actively engaging with consumers around food-related risks and benefits.

467 Measuring deliberation in the context of public consultation provides food policy makers and  
468 marketers with valuable insights, and enables them to produce communications and interventions that  
469 focus on prevalent knowledge gaps, thus better adopting food-related communication and marketing

470 efforts to people's information needs. While the present study investigated deliberative activity and its  
471 antecedents for the specific case of red meat, it remains to be tested whether the insights obtained (e.g.  
472 significant vs. non-significant antecedents) apply equally to other food product categories. The case of  
473 red meat may be specific because of the large amount of predominantly negative press that has  
474 emerged during the last decade. This may have shaped both consumers' interest in engaging with  
475 additional information about red meat, as well as the perceived personal relevance of red meat in their  
476 diet and information sufficiency about risks and benefits of red meat. Our study is a first step towards  
477 a better understanding of the potential and possible effects of consumer deliberation beyond simple  
478 information seeking in a food context. Whereas this cross-national study demonstrates that  
479 deliberative activity can be meaningfully assessed in different cultural settings, e.g. using the newly  
480 developed VIZZATA<sup>TM</sup> tool, further studies are recommended to investigate the impact of information  
481 presentation formats, the role of people's prior information base when exposed to information that is  
482 consistent or inconsistent with prior knowledge, as well the wider implications of consumer  
483 deliberation, notably in terms of its impact on food-related attitude, preference and behavior change.

484

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- 683

684 **Table 1:** The title and topics of the content testers (information pages)

Content tester	Title	Topics
1	Introducing red meat	Definition of red meat General information about meat consumption Red meat within the food pyramid
2	Possible risks of eating red meat	Cardiovascular disease risk Colon cancer risk Advantages of lean meat
3	Other downsides to red meat	Environmental impact of livestock production Greenhouse Gas Emissions Impact on deforestation
4	Benefits of eating red meat	Nutrients and vitamins Providing satiety Red meat and growth in children
5	Other values to red meat	Taste and hedonic satisfaction Socio-cultural identity Advantages of organically grown meat
6	Red meat in the news	Media online article with title: "Red meat increases death, cancer and heart risk, says study." (BBC, 2012)
7	Synthetic meat	YouTube video about synthetic meat (YouTube, 2011)

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686

687 **Table 2:** Sample characteristics, and differences in number of questions asked, comments left, clicks  
 688 on glossary terms and average time spent on deliberative activity about the risks and benefits of red  
 689 meat across participant groups

	n	Number of questions asked	Number of comments left	Glossary terms clicks	Time spent (seconds)
Total	150	138	279	435	146,902
Mean (S.D.)	150	0.92 (1.92)	1.86 (2.48)	2.90 (4.35)	979 (1004)
Country					
Belgium	55	0.93 (2.53)	1.84 (2.91)	2.75 (4.49)	954 (1037)
Portugal	50	0.78 (1.33)	1.42 (1.97)	2.56 (3.90)	894 (986)
U.K.	45	1.07 (1.63)	2.38 (2.36)	3.47 (4.68)	1,103 (991)
Gender					
Male	75	1.25 (2.47)	2.07 (2.84)	3.04 (4.72)	983 (1029)
Female	75	0.59 (1.05)	1.65 (2.04)	2.76 (3.97)	975 (985)
Age					
≤35 years	66	1.06 (1.74)	1.97 (2.46)	3.42 (4.41)	1,080 (1134)
>35 years	84	0.81 (2.20)	1.77 (2.51)	2.49 (4.28)	900 (887)
Higher Education					
Yes	80	1.15 (2.40)	2.30 <sup>b</sup> (2.71)	3.24 (4.68)	1,110 <sup>b</sup> (1083)
No	70	0.66 (1.13)	1.63 <sup>a</sup> (2.10)	2.51 (3.94)	829 <sup>a</sup> (888)
Having children					
Yes	68	1.26 (2.57)	2.38 <sup>b</sup> (2.81)	3.46 (4.56)	1,130 (1206)
No	82	0.63 (1.08)	1.43 <sup>a</sup> (2.09)	2.44 (4.14)	854 (784)

690 The a-b indicate significantly different mean scores between participant groups using non-parametric

691 Kruskal-Wallis and Mann-Whitney tests.

692

693 **Table 3:** Differences in personal relevance, information sufficiency and perceived complexity of the  
 694 information across participant groups

	n	Personal relevance of red meat	Information sufficiency about red meat risks	Information sufficiency about red meat benefits	Perceived complexity of the information
Total	150	4.64 (1.18)	3.97 (1.04)	4.15 (1.12)	3.16 (1.22)
Country					
Belgium	55	4.70 (1.20)	3.83 <sup>a</sup> (0.85)	4.06 (1.03)	3.06 (1.17)
Portugal	50	4.39 (1.12)	4.27 <sup>b</sup> (1.27)	4.15 (1.35)	3.03 (1.27)
U.K.	45	4.85 (1.17)	3.81 <sup>a</sup> (0.93)	4.26 (0.95)	3.42 (1.22)
Gender					
Male	75	4.62 (1.17)	3.84 (1.06)	4.04 (1.20)	3.07 (1.26)
Female	75	4.69 (1.18)	4.09 (1.01)	4.25 (1.03)	3.25 (1.19)
Age					
≤35 years	66	4.50 (1.23)	3.96 (1.16)	3.91 <sup>a</sup> (1.25)	3.08 (1.31)
>35 years	84	4.75 (1.13)	3.98 (0.95)	4.33 <sup>b</sup> (0.97)	3.23 (1.16)
Higher Education					
Yes	80	4.67 (1.15)	3.96 (1.06)	4.26 (1.14)	2.94 <sup>a</sup> (1.17)
No	70	4.61 (1.21)	3.99 (1.03)	4.02 (1.10)	3.41 <sup>b</sup> (1.25)
Having children					
Yes	68	4.60 (1.22)	4.07 (1.18)	4.27 (1.24)	3.02 (1.28)
No	82	4.67 (1.14)	3.89 (0.91)	4.04 (1.02)	3.27 (1.17)

695 The a-b indicate significantly different mean scores on a seven-point scale (1 totally disagree; 7 totally  
 696 agree) between participant groups using non-parametric Kruskal-Wallis and Mann-Whitney tests.

697

698 **Table 4:** Latent variables, items, factor loadings and reliability estimates

Constructs and items	
<i>Online deliberation</i> (0.73)	
Number of questions asked	0.63
Number of comments given	0.71
Number of glossary terms clicked	0.55
Total time spent (s)	0.79
<i>Personal relevance of red meat</i> (0.80)	
It is important to me to include red meat in what I eat in a typical week	0.79
It is valuable to me to include red meat in my diet	0.96
It is not important to me to eat red meat on a regular basis (R)	0.49
Eating red meat is important to my well-being	0.75
<i>Information sufficiency about red meat risks</i> (0.74)	
I know many of the negative aspects of eating red meat	0.84
I am confident I know enough about the risks of eating red meat	0.88
I am not satisfied with my knowledge about risks of red meat for human health (R)	0.70
<i>Information sufficiency about red meat benefits</i> (0.83)	
I know many of the positive aspects of eating red meat	0.64
I am confident I know enough about the benefits of eating red meat	0.85
I am not satisfied with my knowledge about benefits of red meat for human health (R)	0.64
<i>Perceived complexity of the information</i> (0.78)	
The various benefits and risks of eating red meat were difficult to grasp	0.86
I found myself struggling to understand the information on red meat	0.93
The risks and benefits of red meat consumption seemed incredibly technical and complex	0.63
The sheer number of things to take into consideration when deciding how much red meat I should eat was overwhelming	0.50

699 Note: internal construct composite reliabilities are reported in parentheses. All factor loadings are  
700 significant at  $p < 0.001$ . Fit-statistics:  $\chi^2(120) = 157.53$ ,  $p = 0.012$ ; RMSEA = 0.044; NNFI = 0.97; CFI  
701 = 0.98. Items not included owing to factor loadings  $< 0.40$ : There is no need for me to find out more  
702 information about the benefits of red meat; Understanding the aspects of red meat production and  
703 consumption is quite a challenge; I was able to follow the arguments about the benefits and risks  
704 associated with red meat; It was easy to see why eating red meat has risks and benefits both for human  
705 health and the environment.

706 **Table 5:** Correlation matrix of constructs of interest

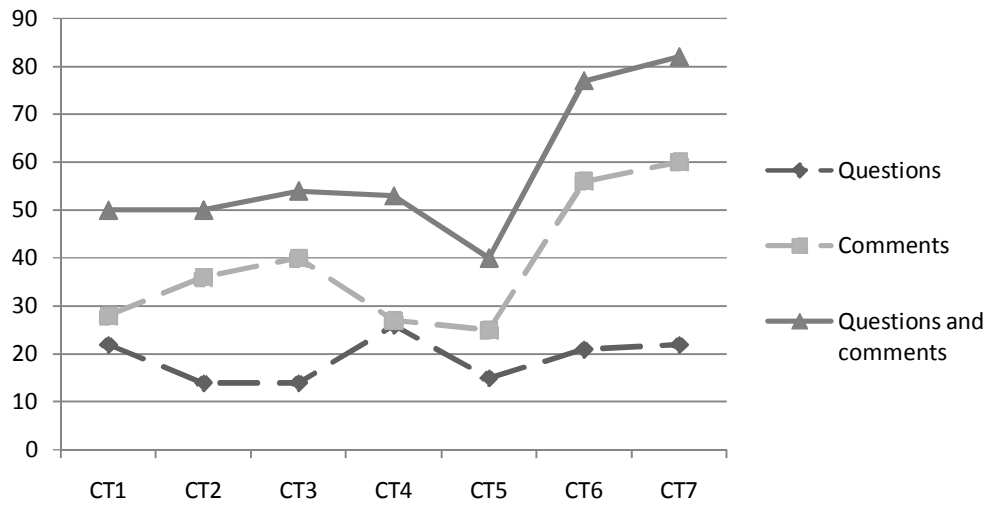
Construct	1	2	3	4	5
1. Online deliberation*	1.00				
2. Personal relevance of red meat	0.19*	1.00			
3. Information sufficiency about red meat risks	-0.06	0.06	1.00		
4. Information sufficiency about red meat benefits	0.01	0.42*	0.72*	1.00	
5. Perceived complexity of the information	-0.41*	-0.14	-0.13	-0.15	1.00

707 Note: \*correlations are statistically significant at  $p < 0.05$  (two-tailed).

708

709



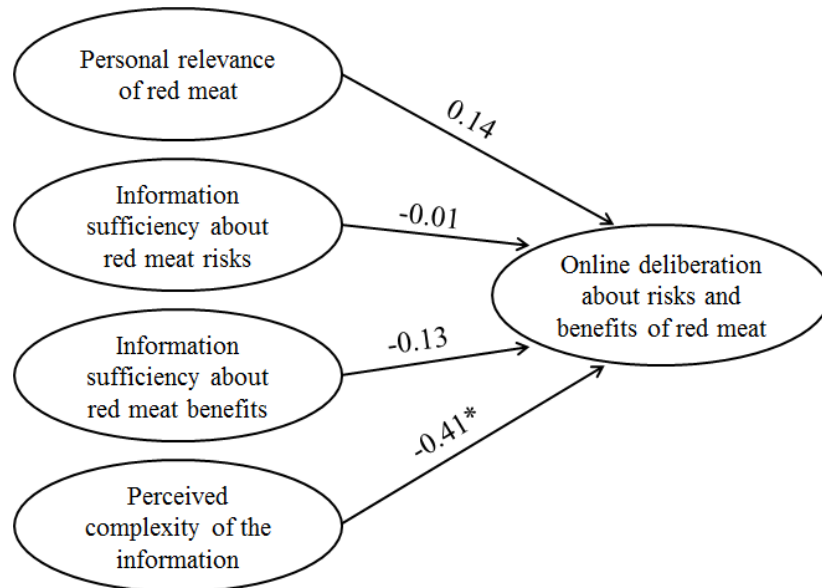


710

711 **Figure 1:** Total number of questions asked and comments given per content tester (CT). See Table 1

712 for the topics included in each content tester.

713



714

715 **Figure 2:** Path modelling (SEM) results of antecedents of online deliberation about risks and benefits716 of red meat. Note: \*:  $p < 0.01$ .

717 **Appendix 1:** Examples of comments and questions asked by the study participants in relation to the different content testers

Content tester	Comments	Questions
CT1: Introducing red meat	<p>One should not analyse food that much, it is a basic need. Red or white meat, why does it matter? It is all good if you eat it with moderation. It is necessary for my children's growth and development.</p> <p>I did not realise that pork was classified as red meat.</p>	<p>Why do men eat more red meat than women? Which nutrients do they need more than women?</p> <p>With which product do you have to replace red meat? Shifting completely to white meat is probably also not healthy?</p>
CT2: Possible risks of eating red meat	<p>I know people who eat only cereals, fruits and vegetables and are indeed healthier.</p> <p>I did not know that red meat increased the chance on bowel cancer and vascular diseases. Somewhere this is quite logical if you link it to the saturated fats/cholesterol.</p> <p>I too had to reduce red meat consumption due to medical advice (high blood pressure and cholesterol).</p>	<p>There is a myth that says that red meat grilled on charcoal may contain carcinogenic substances. Is this true?</p> <p>If the studies are not conclusive, why are people advised to reduce red meat consumption?</p> <p>I am a very active person. I walk five kilometres a day, go to the gym three times a week, and I eat red meat every day. In this scenario, the fact that red meat contains cholesterol, is this not balanced by my active lifestyle?</p>
CT3: Other downsides to red meat	<p>The environmental issue: deforestation due to cattle is doubtful; it is also due to palm oil extraction from palm trees.</p> <p>I always thought that the liberation of fertilizer compounds was good for the environment.</p> <p>I feel sad I cannot find organic meat for an affordable price.</p>	<p>Quorn, does it exist in Portugal?</p> <p>What is organic red meat? Is organic cattle grazing on pasture or fed in another way?</p> <p>Has scientific research been carried out about the reduction of CO<sub>2</sub> and other emissions from the livestock and meat industry?</p>
CT4: Benefits of eating red meat	<p>The way you cook red meat can also influence the quality of your diet.</p> <p>Happy to finally hear about the advantages of red meat. Mostly, you always hear the negative much quicker than the positive.</p> <p>My children cannot become vegetarians before they are</p>	<p>Why do you need zinc and selenium?</p> <p>Is red meat bad for rheumatism?</p> <p>Which are the alternative sources of all these nutrients?</p> <p>How much red meat is healthy to eat in one week?</p>

	physically full grown.	
CT5: Other values to red meat	<p>Cultural identity: I'm from a family with a great tradition when it comes to eating. Big steaks, big meals. And since my grandparents have surpassed the age of 80, I'm eager to know more about the benefits of red meat.</p> <p>This is nice to hear. In general, I find it important to eat a varied diet and for my case also with red meat, around two times per week. Besides that, also chicken, grains, vegetables, fruits, ... When all the animals are well treated, this should not be a problem as long as one varies within the diet.</p>	<p>What are the benefits for the development of children and adults?</p> <p>Why do I need to read statistics?</p> <p>What do you mean with lean red meat? Is it healthier processed or not?</p> <p>From a farmers' point of view, is red meat a good business? I mean, do they make a reasonable income from cattle farming?</p>
CT6: Red meat in the news	<p>I was a little bit scared by this news.</p> <p>It seems a trustworthy study with a large sample.</p> <p>This news is only one study and stands for little.</p> <p>Moderation is the key to healthy eating.</p>	<p>What is the relevance of red meat for health? To what extent is red meat still healthy?</p> <p>Is there a difference between packaged meat (pre-packed or vacuum) and the meat sliced at the point of sales?</p> <p>I am wondering if the consumption of red meat is really the reason for their results? Was there nothing else that matched with their lifestyle that could be the cause of this? Or was this filtered out?</p>
CT7: Synthetic meat	<p>It sounds weird that meat is created in a lab.</p> <p>Everything is possible nowadays. I think they should continue with the study about synthetic meat.</p> <p>I am not pro genetically modified food.</p> <p>This sounds unhealthy and disgusting.</p>	<p>How is the taste of synthetic meat?</p> <p>Is it really the same as traditionally grown meat?</p> <p>How many billions would they put in their pockets if this worked?</p> <p>What will happen to the animals that will not be needed anymore?</p>

718 **Beyond information seeking: Consumers' online deliberation about the risks and benefits of red meat**

719