

1 **Does consumer health-orientation affect the use of nutrition facts panel and claims? An**
2 **empirical analysis in Italy.**

3 **1. Introduction**

4 Overweight, obesity and obesity-related diseases are constantly increasing worldwide and,
5 currently, according to the World Health Organization ‘Most of the world's population lives in
6 countries where overweight and obesity kill more people than underweight’ (WHO, 2015). Over the
7 last 10 years, many economists investigated the main factors guiding consumers’ food choices and
8 found that the use of food labels can play a crucial role in leading toward healthier food
9 consumption (Banterle & Cavaliere, 2014; Barreiro-Hurlè, Gracia & De Magistris, 2010;
10 Mazzocchi, Traill, & Shogren 2009; Varyam, 2008). Previous studies showed that food label¹ usage
11 can increase consumers’ food-related consciousness, thereby improving the healthiness of their food
12 choices (Barreiro-Hurlè et al., 2010; Drichoutis, Lazaridis & Nayga, 2005; Drichoutis, Lazaridis &
13 Nayga, 2006; Varyam, 2008). Accordingly, the use of labelled information has been considered in
14 some papers as a preventive health behavior (Drichoutis et al., 2006; Moorman & Matulich, 1993).
15 Previous findings showed that labelled information can also affect consumers’ beliefs about the
16 product characteristics. High expectations likely increase consumers’ acceptance for the product
17 ultimately having an impact on food behaviors (Torres-Moreno, Tarrega, Torrescasana, & Blanch,
18 2012; Sabbe, Verbeke, & Van Damme, 2009) and this could represent a critical point in the
19 promotion of healthy food consumption. However, the effectiveness of food labelling is strongly
20 dependent on whether consumers are actually willing to use it.
21 Most of the studies on food labels typically refer to the use of the nutrition facts panel, which
22 reports the detailed nutrient content of food products (calorie amount, serving size, macro- and

¹ The terms ‘food labels’ and ‘labelled information’ are used in this paper to refer in general terms to different kind of nutrition-related indications that is, nutrition facts panel, nutrition claims and health claims. Thereby the terms ‘food labels’ and ‘labelled information’ are used in this paper to comprise both nutrition facts panel and claims. Specific terms (that is, nutrition facts panel, nutrition claims, and health claims) and their related acronyms (respectively NFP, NC and HC), are used to differentiate the type of information considered and to explain the analysis, the results and the related discussion.

23 micro-nutrient contents, and reference daily intake). Other kind of labels used to convey to
24 consumers nutrition- and health-related information are represented by nutrition and health claims.
25 The former consist in very concise messages regarding the reduced or extra amount of a specific
26 macro- or micro-nutrient in a food (e.g., fiber, fat, calorie, sodium), whereas the latter refer to
27 scientifically proven health benefits associated with the consumption of a particular food. At the
28 European level the nutrition facts panel became mandatory since 2011 (EU Regulation N.
29 1169/2011), whilst nutrition and health claims still remain voluntary indications (respectively
30 regulated by the EU Regulations N. 1924/2006 and N. 432/2012).

31 Previous research on food labels mainly focused on the differences in consumers' liking for and
32 understanding of nutrition facts panel and claims, on the effect of their joint presence on a single
33 label (Cavaliere, Ricci, & Banterle, 2015; Gravel, Doucet, Herman, Pomerleau, Bourlaud, &
34 Provencher, 2012; Grunert, Fernandez Celemin, Wills, Storcksdieck Genannt Bonsmann, &
35 Nureeva, et al., 2010; Gracia, Loureiro, & Nayga, 2009; Drichoutis, Lazaridis, Nayga,
36 Kapsokefalou, & Chryssochoidis, 2008; Gracia, Loureiro, & Nayga, 2007), and also on the different
37 effect of these two types of labels on consumers' healthy food choices. Some of these latter studies
38 found evidence that nutrition facts panel usage is associated with healthier food patterns, meaning
39 lower intake of fat and sugar, and higher intake of Vitamin C, iron, and fiber (Post, Mainous, Diaz,
40 Matheson, & Everett, 2010; Varyam, 2008; Guthrie, Fox, Cleveland, & Welsh, 1995). On the other
41 hand, the results concerning consumers' use of claims are diverse. Indeed, some literature suggested
42 that claims may facilitate consumers in making well-informed food choices (Verbeke, 2005),
43 whereas other studies indicate that they might be misled by consumers (Gravel et al., 2012; Nocella
44 & Kennedy, 2012; Svedberg, 2002). For instance, as shown by Wansink & Chandon (2006) low fat
45 claims may lead consumers allowing themselves to eat bigger portions, which overall results in
46 increased calorie intake.

47 Although these aspects of consumers' use of labelled information were already extensively
48 investigated, still relatively little is known about the role of motivational factors. Since the

49 effectiveness of food labels in leading consumers' toward healthier food choices is strongly
50 dependent on their willingness to use it, motivational factors can play a crucial role.
51 This paper contributes to the literature exploring the role of consumers' health-orientation. Despite
52 the effect of this variable on food behaviors was examined in previous studies, until now only a few
53 have specifically considered its effects on consumers' use of food labels (Hess et al., 2012;
54 Visschers et al., 2010; Blitstein and Evans, 2006). Thereby, this paper aims at investigating whether
55 different levels of orientation to health are related to an increase (decrease) of food label usage. The
56 present research expands previous literature by separately analyzing nutrition facts panel, nutrition
57 claims, and health claims in order to investigate if health-orientation is associated with diverse
58 patterns in the use of labelled information. Moreover, we propose an alternative measure of
59 consumers' orientation to health. The rationale is to develop an index able to comprise the three
60 main components of health-orientation (attitudes, beliefs and behaviors) mentioned in the definition
61 of this concept, and which can be concise enough to be more easily used in face-to-face or on-line
62 consumer surveys compared to previous scales.

63 Health-orientation is defined in the literature as the individual motivation to engage in healthy
64 attitudes, beliefs and behaviors (Dutta, Bodie, & Basu, 2008; Moorman & Matulich, 1993). It can
65 be seen as the extent to which individuals are concerned about health-related issues and gives a
66 measure of their willingness to take responsibility for their health (Dutta et al., 2008; Moorman &
67 Matulich, 1993). In other words, it represents the individual motivation for pursuing the goal of
68 being healthy.

69 Previous studies showed that health-orientation is able to influence the extent to which people
70 engage in health-enhancing behaviors and decision making related to food consumption (Geeroms
71 Verbeke, & Kenhove, 2008), including the use of labelled information (Visschers et al., 2010).
72 Thereby, in this paper we expect to find differences in consumers' use of nutrition facts panel and
73 claims according to their health-orientation.

74 Indeed, the information cost related to the use of nutrition facts panel is higher relative to the cost of
75 claims. This is attributable to the amount of information reported and their degree of complexity.
76 Moreover, the nutrition facts panel is typically placed on the back side of food packaging and
77 requires consumers to actively look for it (Gracia et al., 2009). Thus, consumers are expected to use
78 the nutrition facts panel when their health motivation is strong enough to overcome such costs.
79 Accordingly, we hypothesize that (i) the more individuals are oriented to health, the more
80 frequently they use nutrition facts panel label.

81 On the opposite, the information cost of claims is lower due to the conciseness of the information
82 reported and their front-of-pack positioning. When health-orientation is low claims are likely
83 preferred to a more complex and complete information source. Therefore, we hypothesize that (ii)
84 the fewer individuals are oriented to health, the more they are likely to refer to nutrition and health
85 claims.

86 This paper is structured as follows: section two explains the empirical analysis applied and explains
87 the procedure used to build the health-orientation index; section three reports the analysis of the
88 results of the model estimates; section four discusses the results in the context of extant literature;
89 finally, section five reports the main conclusions of the study.

90 **2. Methods**

91 *2.1 Data collection*

92 Data for the analysis were collected in Milan (Italy) through face-to-face interviews on a sample of
93 consumers in charge of their household grocery shopping. A geographically stratified systematic
94 sampling was used for the selection of the retailers. Specifically, starting from the postal code, we
95 listed all the super- and hypermarket of Milan area. The first store was selected by means of a
96 randomly extracted number between 1 and the sampling fraction. The remaining stores were chosen
97 adding to this number the sampling fraction. The different size of the selected retailers was used as

98 criterion to establish the number of consumers to be recruited in each store: 10 consumers were
99 interviewed in each supermarket (totally 14) and 20 in each hypermarket (totally 8). Consumers
100 were randomly approached outside the grocery stores covering different time bands in order to
101 reach different shoppers categories.

102 We totally collected 300 interviews. The sample size was decided following the criterion explained
103 by Mazzocchi (2008) for the determination of the relative accuracy of a mean estimator according
104 to both sample and population sizes. 300 respondents allow to commit a relative error lower than
105 6.27%. In other words, this sample size on a population exceeding 1.2 million as that of Milan city
106 (according Istat population Census 2011 - most recent available data) is enough to guarantee a an
107 excess or deficiency of the mean estimator around 6%. Data were gathered using a questionnaire
108 previously validated on a small sample of 40 consumers.

109 *2.2 Variable description*

110 According to the purpose of the paper, the first part of the analysis was meant to investigate
111 consumers' use of different food label formats, namely nutrition facts panel (mandatory) and
112 nutrition and health claims (voluntary).

113 Nutrition facts panel (NFP) usage was estimated through a frequency question commonly employed
114 in a number of previous studies (Cooke & Papadaki, 2014; Visschers, Hartmann, Leins-Hess, Dohle
115 & Siegrist, 2013; Nayga, 2000). Specifically, consumers were asked to state how frequently they
116 use NFP on a continuous rating scale representing the interval between 'Never' and 'Always' (from
117 0 to 10)². Although the frequency of use is typically measured on a 5-point Likert scale, we used a
118 continuous rating scale to obtain more accurate responses and to reduce the bias due to consumers'
119 convergence on the central value.

120 The same scale was used to assess consumers' interest in nutrition claims (NC). Consumers were
121 asked to state their interest in different claims, namely those referring to fat, energy, sugar, light,

² Respondents were asked to make a sign on a bar.

122 and salt, permitted by the Reg. n. 1924/2006. Answers to such questions ranged from ‘Not at all
123 interested’ to ‘Very interested’ (0 to 10). Similarly, consumers were asked about their interest in the
124 presence of health claims (HC) on food products³.

125 We referred to ‘use’ in the question about nutrition facts panel since such label, being generally
126 placed on the back side of the food packaging, requires consumers to make an active process of
127 information searching. On the other hand, claims represent very short and concise messages
128 displayed on the front of the food pack. This implies that consumers might be exposed to such
129 information even though they do not actively look for it, thus the use of claims might be involuntary
130 and the term ‘interest’ is more appropriate.

131 The second part of the survey aimed at measuring consumers’ orientation to health. The detailed
132 description of the variables used to construct the health-orientation index is provided in paragraph
133 2.3.

134 Another section included several questions necessary to estimate consumers’ level of nutrition
135 knowledge. Typically, nutrition knowledge is estimated through the nutrition knowledge
136 questionnaire developed and validated by Parmenter and Wardle (1999). The questionnaire aims at
137 measuring multiple aspects of nutrition knowledge by means of different subscales. Due to its
138 completeness the questionnaire is long and hardly applicable in a face-to-face surveys. Accordingly,
139 and in line with previous studies (Barreiro-Hurlé et al., 2008 and 2010; Drichoutis et al., 2005), we
140 used a simplified measure made of 5 items extrapolated from some of the subscales in Parmenter
141 and Wardle questionnaire. Specifically, two items aimed at assessing consumers’ knowledge
142 concerning nutritional recommendations, respectively regarding fruit and vegetable consumption,
143 and the type of fats that must be reduced. The other three items regarded specific knowledge on
144 energy, carbohydrate, and protein content of food products.

³ Contrary to what we did for nutrition claims, we did not ask consumers about their interest in specific health-related claims, because at the time of the survey (January-February 2012) the EU had not yet enacted the Regulation N. 432/2012 providing the list of all permitted health claims. However, the question was formulated giving concrete examples.

145 Moreover, in line with previous literature which highlighted a positive association between the diet
146 healthiness and the use of food labels (Guthrie et al., 1995; Graham & Laska, 2012; Post et al.,
147 2010; Varyam, 2008; Ollberding, Wolf, & Contento, 2010), we decided to include one question
148 assessing consumers' self-perceived healthiness of their dietary patterns. We chose a self-reported
149 measure of healthiness because we were interested in estimating how consumers actually perceive
150 their diet, instead of having an evidence-based information. Answers to such question ranged from
151 'Unhealthy' to 'Very healthy' (0 to 10) on a continuous rating scale.

152 As shown in Table 1, the questionnaire also comprised items about socio-demographic and
153 economic characteristics. Indeed, a great body of literature highlighted that these variables are
154 important predictors of consumers' use of labelled information. In detail we considered gender, age,
155 education level (secondary school, high school, and university degree) and income (<800€, 800-
156 1500€, 1500-3000€, 3000-5000€, >5000).

157 *[PLEASE INSERT TABLE 1 HERE - Variable description, with concerning mean, frequency,*
158 *standard deviation, and alpha coefficient]*

159 *2.3 Health-orientation index*

160 In this paper consumers' health-orientation is measured through an index constructed by means of 7
161 items. As mentioned previously, the objective of this index is to capture individuals' health-related
162 attitudes, beliefs, and behaviors, that is, the main dimensions of health-orientation provided in its
163 definition. The 7 items used to build the final index were developed basing on those included in the
164 scale proposed by Dutta-Bergaman (2004).

165 In detail, health-related attitude can be explained as the way an individual views health, or tends to
166 behave toward it. To capture this aspect consumers were asked to state which is the driving factor of
167 their food choices, indicating which one they rank as the most important among health, taste, and
168 price.

169 Healthy beliefs can be described as health-related ideas that individuals accept as true. Dutta-
170 Bergman (2004) defined healthy beliefs as ‘specific cognitions held by individuals about health
171 behaviors [...]’ and included in their subscale several items related to eating habits, including fruit
172 and vegetable consumption. Accordingly, beliefs were elicited by means of two questions,
173 respectively meant at revealing if consumers’ choice to limit their consumption of junk food⁴
174 (snacks, sugary beverages, and fried food) and to increase fruit and vegetable intake is due to
175 specific health-related cognitions. Junk food were chosen for the former question as they are
176 generally considered less healthy than other food categories. On the contrary, fruit and vegetable
177 consumption is well acknowledged to be associated with positive effects on health (Anderson,
178 Smith, & Washnock, 1999; Liu, 2003; Radnitz, Beezhold, & DiMatteo, 2015).
179 Last, healthy behaviors, which represent a manner of behaving that is clearly oriented to health.
180 Following the approach of Dutta-Bergman (2004) we considered both food- and non food-related
181 behaviors. The former were measured by means of two questions about fruit and vegetable
182 consumption. Such questions, differently from those used to elicit beliefs, were aimed at assessing
183 respondents’ real consumption of these food categories (i.e., consumption frequency). Non food-
184 related behaviors, instead, referred to smoking and practicing physical activity.

185 *2.4 Data analysis*

186 To analyze the relationship between consumers’ health-orientation and the use of/interest in
187 different label formats, we performed a set of three equations differing only with regard to the
188 dependent variables used: *i*) use of nutrition facts panel (NFP); *ii*) interest in nutrition claims (NC);
189 *iii*) interest in health claims (HC). Regression analyses have been performed using STATA version
190 12.1 and considering 90% minimum confidence level. The first dependent variable, namely NFP,
191 represents consumers’ stated frequency of use of the nutrition facts panel. NC is the dependent

⁴ There is no clear definition on what junk food is exactly, but studies consistently refer to food items that are high in fat, sugar and salt (HFSS) such as soft drinks, confectionaries, crisps/savory snacks, fast food, pre-sugared breakfast cereals, and pre-prepared convenience foods (Capacci, Mazzocchi, & Shankar, 2012).

192 variable referred to consumers' interest in nutrition claims. Such variable is the result of a factor
193 analysis performed using the five questions on nutrition claims mentioned in the previous section.
194 Such analysis allowed simplifying the final interpretation of the results. Factor loadings are reported
195 in table 2.

196 *[PLEASE INSERT TABLE 2 HERE - Factor loadings related to the nutrition claims items]*

197 Finally, the dependent variable of the third equation is related to consumers' level of interest in
198 health claims (HC).

199 As for the regressors, which are equal in the three equations, HOI constitutes our measure of health-
200 orientation. Four of the seven questions used to create the index were binary, the other three were in
201 a multiple choice format always including a health-related response among the possible alternatives.
202 In this latter case, the questions were transformed into dummy variables following this criterion:
203 when health was chosen as the answer, the dummy assumed value 1, otherwise value 0. Responses
204 were then summed to constitute the index. A health-orientation score was assigned to each
205 respondent based on the summation of the single scores obtained for such questions. The final index
206 values ranged from '0' meaning 'Not at all health-oriented' to 7, 'Very health-oriented'. The index
207 was then normalized⁵.

208 In line with previous literature on nutritional label use, we included in the analysis consumers'
209 nutrition knowledge. We constructed a normalized index using the summation of the scores
210 obtained by each respondent in the related five questions. Correct answers to such questions were
211 assigned value 1, otherwise value 0. This way, the knowledge index assumed value 5 when the
212 respondent gave correct answer to all questions.

213 Other regressors in the equations are self-perceived healthiness of the diet, gender, age, education
214 level and income.

⁵The normalization is based on the following formula: $x_i = \frac{x_i - x_{min}}{x_{max} - x_{min}}$

215 To verify the absence of multi-collinearity among the independent variables included we computed
216 the variance inflation factor (VIF) test.
217 Moreover, to better characterize the sample, we analyzed consumers' body mass index (BMI).
218 Indeed, a number of previous studies showed that BMI is strictly related to food behaviors,
219 including food label usage (Blitstein & Evans, 2006; Liu, Hoefkens, & Verbeke, 2015). However,
220 BMI was not included as a regressor in our models due to multicollinearity problems with the
221 variables of the HOI and with nutrition knowledge. Moreover, someone might also argue that BMI
222 could represent a source of endogeneity with the three dependent variables of our equations.
223 However, given the health-orientation definition and the variables used in this paper to construct the
224 HOI index, it is reasonable to expect the existence of a link between consumers' orientation to
225 health and their BMI levels. Thereby, we conducted an exploratory analysis dividing the sample
226 into two sub-groups, respectively normal weight versus overweight and obese consumers, and
227 explored the distribution of the HOI index in these two population sub-samples.

228 **3. Results**

229 *3.1 Sample characteristics*

230 Sample characteristics are illustrated in table 3. With regard to gender, women are slightly more
231 represented (54%) compared to men and the average age is around 47 years old, with a majority of
232 consumers (39.7%) aged between 41 and 65 years old. The education level of the sample population
233 is distributed as follows: 30.7% has bachelor or master degree, 43.7% has high school diploma,
234 while 25.7% has lower levels of education. 39.3% of the sample state to have a household monthly
235 income between 1500-3000€.

236 *[PLEASE INSERT TABLE 3 HERE - Sample characteristics: socio-demographic, economic*
237 *variables, and BMI]*

238 The exploratory analysis of the distribution of the HOI index in the normal weight versus
239 overweight and obese consumers shows a remarkable difference (Figure 1).

240 *[PLEASE INSERT FIGURE 1 HERE - Distribution of the health-orientation index across BMI*
241 *categories]*

242 The distribution of the HOI in the normal weight category is much more shifted toward right
243 relative to the distribution of the HOI in consumers with higher BMI. The different distribution of
244 HOI between the two sub-samples considered (obese and overweight vs normal weight) is
245 statistically different at 0.01 level. In other words, overweight and obese consumers have lower
246 probability to have high HOI scores.

247 *3.2 OLS results*

248 The results of our analysis are displayed in table 4. Looking at the results of the first model having
249 NFP as dependent variable, we observe a positive and significant relationship with HOI (0.575). On
250 the contrary, when moving to the results concerning consumers' interest in nutrition and health
251 claims, the relationship with HOI becomes negative (-0.170 and -0.700 respectively).

252

253 *[PLEASE INSERT TABLE 4 HERE – Results of the OLS model estimates, respectively having*
254 *nutrition facts panel use frequency, interest in nutrition claims and interest in health claims as*
255 *dependent variables]*

256 As for nutrition knowledge, the coefficient estimates show that high levels of knowledge are
257 positively associated with a high frequency of use of the NFP (0.304). Instead, when moving to
258 consumers' interest in NC and HC, the relationship becomes negative (-0.087, -0.282 respectively).
259 Looking at the results of models 2 and 3 we observe a positive relationship between consumers'
260 self-perceived healthiness of the diet and interest in claims. The coefficient magnitude is lower in

261 the NC model and higher in the HC model (respectively 0.113 and 0.250). Contrary to our
262 expectations, no significance was found in model 1.

263 As for the socio demographics elderly consumers are more likely to use nutrition and health claims
264 compared to young people (respectively 0.008 and 0.037) and women show higher interest in such
265 labels than men (0.687 and 0.761 respectively for nutrition and health claims). Education is
266 significant in the first model and is positively related to the use of NFP (0.450). Although the
267 income variable is not significant in the models having NC and HC as dependent variables, it is
268 possible to notice a shift in the coefficient sign.

269 **4. Discussion**

270 The results of the analysis stress the idea that health-orientation is related to consumers' use of
271 different labelled information. In detail, high HOI scores seem to increase the probability that
272 consumers use complex and detailed labelled information, that is the nutrition facts panel. This
273 finding is in line with that of Moorman and Matulich (1993), who found that health can be an
274 important motivator for consumers to increase the amount of nutritional information that can be
275 obtained through the use of food labelling. Moreover, in line with previous studies (Geeroms et al,
276 2008; Visschers et al., 2010), this result can be explained by the fact that when consumers' are more
277 health-motivated, they are more likely to undertake actions and behaviors that can (directly or
278 indirectly) contribute to improve their health status (Cavliere, De Marchi, & Banterle, 2014).
279 Accordingly, nutritional information conveyed through the NFP can be seen by these consumers as
280 a means that can enable them to make more healthful food choices, ultimately having a positive
281 impact on their diets.

282 Low health-orientation scores, instead, are associated with a high interest in nutrition- and health-
283 related claims. These results can be interpreted in different ways. In line with previous literature we
284 can argue that low health-orientation leads consumers to be less information seeker (Moorman &
285 Matulich, 1993). For this reason, claims can be appealing for this consumer category as they

286 typically have a frontal positioning on the food pack, which lowers the cost of information
287 searching (Grunert and Wills, 2007). Moreover, being only little oriented to health, these
288 individuals are likely little interested in having detailed information. Thereby, their interest is
289 oriented to the synthetic contents of both nutrition and health claims.

290 The results of our analysis also strengthen the key role played by nutrition knowledge in affecting
291 the use of labelled information. These results are in line with previous findings showing a positive
292 relationship between high levels of knowledge and the use of nutritional information (Drichoutis et
293 al., 2005; Hess et al., 2012). Miller and Cassady (2015) reported that high knowledge supports and
294 facilitates consumers in the use of the complex information reported on nutrition facts labels, thus
295 contributing to increase their frequency of use of such information source. Nutrition knowledge,
296 indeed, seems to be related to consumers' increased ability to select labelled information and
297 facilitates the memorization and reuse of such notions during the food choice process (Miller &
298 Cassady, 2015). In other words, it can be seen as an instrument that allows consumers processing
299 the information contents.

300 Different results have emerged with regard to nutrition and health claims. In this case, indeed, the
301 analysis reveals a negative relationship between nutrition knowledge and consumers' interest in
302 both claim categories. This could be attributable to the limited, not detailed and very concise
303 amount of information conveyed by claims, which enables less knowledgeable consumers to access
304 such contents. These results are in line with previous evidence suggesting that consumers referring
305 to claims are generally less knowledgeable compared to those using the nutrition facts panel
306 (Barreiro-Hurlé et al., 2010; Barreiro-Hurlé, Colombo, & Cantos, 2008).

307 With regard to the socio demographic and economic variables, the results highlight that both
308 education level and income are positively related with a frequent use of the nutrition facts panel.
309 Such evidence is in accordance with previous studies that reported that consumers with high socio-
310 economic status are generally more likely to seek health information (Drochoutis et al., 2006;
311 Cowburn & Stockley, 2005; Hesse et al., 2005). Accordingly, they are more likely to make use of

312 the information reported on the NFP. Moreover, these results need to be discussed in the context of
313 extant literature providing evidence of the existence of a strong relationship between consumers'
314 socio-economic status and nutrition knowledge (Grunert et al., 2012). Indeed, consumers with
315 higher education and income are more likely to know more about nutrition and food, thus they have
316 higher capabilities to use the information reported on the nutrition facts panel.

317 The analysis also highlights that female and older seem to be more interested in nutrition and health
318 claims relative to men and the younger segments of the population. However, gender and age seem
319 to affect only consumers' interest in claims, while no significant effects were found with regard to
320 the use of NFP.

321 Interestingly, results show that high interest in nutrition and health claims is associated to
322 consumers positive evaluation of the degree of healthiness of their diet. Previous research suggested
323 that claims are perceived as guarantee of the healthiness of food products and that such idea of
324 healthiness is then easily and generally extended to the diet itself (Wansink & Chandon, 2006).
325 Therefore, this finding seem to strengthen the idea that the information conveyed by claims might
326 be misled by consumers. This assumes particular importance considering that consumers that are
327 mostly interested in claims seem to have only scarce nutrition knowledge.

328 Even though we did not include BMI among the regressors, the significant difference between the
329 distribution of HOI among the BMI categories considered suggests the existence of a strong link
330 between these variables. BMI can be considered as the outcome of one's food consumption, which
331 is ultimately affected by a number of factors. Although we did not specifically tested this issue in
332 our analysis, it is reasonable to argue that among these factors, health orientation could have a
333 crucial role as it may determine healthy or unhealthy food choices.

334 The analysis has some caveats, which concern the data collection and the methodology applied.
335 First, the analysis is based on stated preferences, therefore, the results might suffer from a bias due
336 to over- or under-estimation of the responses. Moreover, one of the main disadvantages of using
337 face-to-face survey is represented by the social-desirability bias that could come into play during

338 the interview and ultimately affect the results. A second limitation of the study is that we used two
339 different measures for our dependent variables. Indeed, we elicited the frequency of use in the case
340 of the nutrition facts panel, but we referred to the level of interest when dealing with claims. Such
341 distinction might have led consumers to attach different meanings to the terms ‘use’ and ‘interest’,
342 and this might have affected the interpretation of the results. Indeed, on the one hand, as suggested
343 by previous studies (Grunert and Wills, 2007) self-reported use is closely related to self-reported
344 reading, thereby it is reasonable to expect that responses to such question actually reflect
345 consumers’ behavior. On the other hand, the meaning of the term interest is less univocal, and being
346 interested in claims does not necessarily imply that consumers actually refer to such information.
347 Moreover, a specific comment has to be made with regard to the HOI. We believe that the proposed
348 measure, very concise and meanwhile able to comprise the main aspects of orientation to health,
349 offers an interesting starting point to develop a standard measure of consumers’ orientation to
350 health. This would be of remarkable importance for two main reasons. First, the literature still lacks
351 of a standard measure of orientation to health; second, the existing scales, when comprehensive of
352 the different dimensions of health orientation, are way too long to be easily employed in consumer
353 surveys. However, the reliability of the HOI developed in this paper needs to be further tested and
354 confirmed with other studies. Future studies should test other variables to capture each component
355 of health-orientation to verify if different items could give better results and to overall improve the
356 index. Moreover, it would be valuable to use bigger samples and consider the effects of HOI with
357 specific product categories.

358 **5. Conclusions**

359 This paper highlights the crucial role played by health-orientation in motivating consumers to use
360 labelled information.

361 The results remark that the detailed information reported on the nutrition facts panel is more likely
362 used by consumers that already tend to engage in health-enhancing behaviors such as practicing

363 physical activity. Whereas, claims are of interest for a weaker category of the population made of
364 consumers little oriented to health, with scarce nutrition knowledge and low socio-economic status.
365 As addressing people toward healthful food consumption is no trivial matter, a better understanding
366 of the relationship between labelled information usage and orientation to health as a motivational
367 factor is valuable to design food policy strategies that could be always more targeted on the
368 characteristics of diverse consumer categories. Policy interventions should not be only focused on
369 improving labelling design or contents, but should also aim at making consumers more oriented to
370 health and more knowledgeable about nutritional characteristics of food. In this context,
371 information campaigns aimed at making consumers more aware about the health risks related to
372 unhealthy food consumption might lead them to become more health concerned.

373

374 **References**

- 375 Anderson, J. W., Smith, B. M., & Washnock, C. S. (1999). Cardiovascular and renal benefits of dry
376 bean and soybean intake. *The American Journal of Clinical Nutrition*, 70(3), 464-474.
- 377 Banterle, A., & Cavaliere, A. (2014). Is there a relationship between product attributes, nutrition
378 labels and excess weight? Evidence from an Italian region. *Food Policy*, 49, 241-249.
- 379 Barreiro-Hurlè, J., Gracia, A., & De Magistris, T. (2010). Does nutrition information on food
380 products lead to healthier food choices? *Food Policy*, 35, 221-229.
- 381 Barreiro-Hurlè, J., Colombo, S., & Cantos, E. (2008). Is there a market for functional wines?
382 Consumer preferences and willingness-to-pay for resveratrol-enriched quality red-wine. *Food*
383 *Quality and Preference*, 19(4), 360-371.
- 384 Blitstein, J. L., & Evans W. D. (2006). Use of Nutrition Facts Panels among Adults Who Make
385 Household Food Purchasing Decisions. *Journal of Nutrition Education and Behaviour*, 38(6), 360-
386 364.

387 Capacci, S., Mazzocchi, M., & Shankar, B. (2012). The regional price of junk foods relative to
388 healthy foods in the UK: Indirect estimation of a time series, 1997–2009. In Proceedings of the 86th
389 Annual Conference of the Agricultural Economics Society, Warwick University, Coventry, UK, 16-
390 18 April 2012.

391 Cavaliere, A., De Marchi E., & Banterle, A. (2014). Healthy–unhealthy weight and time preference.
392 Is there an association? An analysis through a consumer survey. *Appetite*, 83, 135-143.

393 Cavaliere, A., Ricci, E. C, & Banterle, A. (2015). Nutrition and health claims: who is interested? An
394 analysis of consumer preferences in Italy. *Food Quality and Preference*, 41, 44-51.

395 Cooke, R., & Papadaki, A. (2014). Nutrition label use mediates the positive relationship between
396 nutrition knowledge and attitudes towards healthy eating with dietary quality among university
397 students in the UK. *Appetite*, 83, 297-303.

398 Cowburn, G., & Stockley, L., (2005). Consumer understanding and use of nutrition labelling: a
399 systematic review. *Public Health Nutrition*, 8, 21-28.

400 Drichoutis, A. C, Lazaridis, P., & Nayga, R. M. Jr. (2006). Consumers’ use of nutritional labels: a
401 review of research studies and issues. *Academy of Marketing Science Review*, 9, 1-22.

402 Drichoutis, A. C., Lazaridis, P., & Nayga, R. M.. Jr. (2005). Nutrition knowledge and consumer use
403 of nutritional food labels. *European Review of Agricultural Economics*, 32(1), 93-118.

404 Drichoutis, A. C., Lazaridis, P., Nayga, R. M. Jr., Kapsokefalou, M., & Chryssochoidis, G., (2008).
405 A theoretical and empirical investigation of nutritional labels use. *European Journal of Health*
406 *Economics*, 9(3), 293-304.

407 Dutta-Bergman, M. (2004). Primary sources of health information: Comparison in the domain of
408 health attitudes, health cognitions, and health behaviors. *Health Communication*, 16, 273-288.

409 Dutta, M. J, Bodie, G. D., & Basu, A. (2008). Health disparity and the racial divide among the
410 nation's youth: Internet as a site for change? In: Everett A. (Eds.), *Learning race and ethnicity:
411 Youth and digital media. The John D. and Catherine T. MacArthur Foundation Series on Digital
412 Media and Learning* (pp. 175-198). The MIT Press, Cambridge,.

413 Geeroms, N., Verbeke, W., & van Kenhove, P. (2008). Consumers' health-related motive
414 orientations and ready meal consumption behaviour. *Appetite*, 51, 704-712.

415 Gracia, A., Loureiro, M. L., & Nayga, R. M. Jr., (2009). Consumers' valuation of nutritional
416 information: A choice experiment study. *Food Quality and Preference*, 20, 463-471.

417 Gracia, A., Loureiro, M. L., & Nayga, R. M. Jr., (2007). Do consumers perceive benefits from the
418 implementation of a EU mandatory nutritional labelling program? *Food Policy*, 32(2), 160–174.

419 Graham, D. J., & Laska, M. N. (2012). Nutrition label use partially mediates the relationship
420 between attitude toward healthy eating and overall dietary quality among college students. *Journal
421 of Academy of Nutrition and Dietetics*, 112, 414-418.

422 Gravel, K., Doucet, E., Herman, C. P., Pomerleau, S., Bourlaud, A., & Provencher, V. (2012).
423 “Healthy”, “diet” or “hedonic”. How nutrition claims affect food-related perceptions and intake?
424 *Appetite*, 59, 877-884.

425 Grunert, K. G., Fernandez Celemin, L., Wills, J., Storcksdieck Genannt Bonsmann, S., & Nureeva,
426 L. (2010). Use and understanding of nutrition information on food labels in six European countries.
427 *Journal of Public Health*, 18, 261-277.

428 Grunert K. G., Wills, J., Fernandez Celemin, L., Lahtheenmaki, L., Scholderer, J., Storcksdieck
429 genannt Bonsmann, S. (2012) Socio-demographic and attitudinal determinants of nutrition
430 knowledge of food shoppers in six European countries. *Food Quality and Preference*, 26, 166-177.

431 Grunert K. G., Wills, J. (2007). A review of European research on consumer response to nutrition
432 information on food labels. *Journal of Public Health*, 15, 385-399.

433 Guthrie, J. F., Fox, J. J., Cleveland, L. E., & Welsh, S. (1995). Who uses nutritional labelling and
434 what effect does label use have on diet quality? *Journal of Nutrition Education*, 27(4), 173-192.

435 Hess, R., Visschers, V. H., & Siegrista, M. (2012). The role of health-related, motivational and
436 sociodemographic aspects in predicting food label use: a comprehensive study. *Public Health
437 Nutrition*, 15(3), 407-414.

438 Hesse, B. W., Nelson, D. E., Kreps, G. L., Croyle, R. T., Arora, N. K., Rimer, B. K., & Viswanath,
439 K. (2005). Trust and sources of health information: The impact of the Internet and its implications
440 for health care providers: Findings from the first Health Information National Trends Survey.
441 *Archives of Internal Medicine*, 165, 2618–2624.

442 Istat, (2011). Census of Italian Industry and services. <http://www.istat.it/it/>. Accessed on April 14th
443 2016.

444 Liu, R. H. (2003). Health benefits of fruit and vegetables are from additive and synergistic
445 combinations of phytochemicals. *The American Journal of Clinical Nutrition*, 78(3), 517-520.

446 Liu, R., Hoefkens, C., & Verbeke, W. (2015). Chinese consumers' understanding and use of a food
447 nutrition label and their determinants, *Food Quality and Preference*, 41, 103-111.

448 Mazzocchi, M., Traill, B. W., & Shogren, J. F. (2009). *Fat economics. Nutrition, health, and
449 economic policy*. Oxford University Press.

450 Mazzocchi, M., (2008). *Statistics for Marketing and Consumer Research*, SAGE Press.

451 Miller, L.M.S., & Cassady, D.L. (2015) The effects of nutrition knowledge on food label use. A
452 review of the literature. *Appetite*, 92, 207-216.

453 Moorman, C., & Matulich, E. (1993). A model of consumers' preventive health behaviours: The
454 role of health motivation and health ability. *Journal of Consumer Research*, 20, 208-228.

455 Nayga, R. M. Jr. (2000). Nutrition Knowledge, Gender, and Food Label Use. *Journal of Consumer*
456 *Affairs*, 34, 97-112.

457 Nocella, G., & Kennedy, O. (2012). Food health claims – What consumers understand. *Food policy*,
458 37, 571-580.

459 Ollberding, N. J., Wolf, R. L., & Contento, I. (2010). Food label use and its relation to dietary
460 intake among US adults. *Journal of the American Dietetic Association*, 110, 1233-1237.

461 Parmenter, K., & Wardle, J. (1999). Development of a general nutrition knowledge questionnaire
462 for adults. *European Journal of Clinical Nutrition*, 53, 298-308.

463 Post, R. E, Mainous, A. G., Diaz, V. A., Matheson, E. M., & Everett, C. J. (2010). Use of the
464 Nutrition Facts Label in Chronic Disease Management: Results from the National Health and
465 Nutrition Examination Survey. *Journal of the American Dietetic Association*, 110(4), 628-632.

466 Radnitz, C., Beezhold, B., & DiMatteo J. (2015). Investigation of lifestyle choices of individuals
467 following a vegan diet for health and ethical reasons. *Appetite*, 90, 31-36.

468 Sabbe, S., Verbeke, W., & Van Damme, P. (2009). Confirmation/disconfirmation of consumers'
469 expectations of fresh and processed tropical fruit products. *International Journal of Food Science*
470 *and Technology*, 44, 539–551.

471 Svedberg, E. (2002). *Consumers' views regarding health claims on two food packages*. Lund:
472 Department of Education, Lund University.

473 Torres-Moreno, M., Tarrega, A., Torrecasana, E., & Blanch, C. (2012). Influence of label
474 information on dark chocolate acceptability. *Appetite*, 58, 665-671.

475 Variyam, J. N. (2008). Do nutrition labels improve dietary outcomes? *Health Economics*, 17, 695-
476 708.

477 Verbeke, W. (2005). Agriculture and the food industry in the information age. *European Review of*
478 *Agricultural Economics*, 32(3), 347–368.

479 Visschers, V. H. M., Hartmann, C., Leins-Hess, R., Dohle, S., & Siegrist, M. (2013). A consumer
480 segmentation of nutrition information use and its relation to food consumption behaviour. *Food*
481 *Policy*, 43, 71-80.

482 Visschers, V. H. M., Hess, R., & Siegrist, M. (2010). Health motivation and product design
483 determine consumers' visual attention to nutrition information on food products. *Public Health*
484 *Nutrition*, 138(7), 1099-1106.

485 Wansink, B., & Chandon, P. (2006). Nutrition labels and obesity. NBER working paper No.
486 W11956.

487 World Health Organization (WHO) 2015. Obesity and Overweight Fact Sheet n. 311.
488 www.who.int/mediacentre/factsheets/fs311/en/

Table 1. Variable description, with concerning mean, frequency, standard deviation, and coefficient alpha

Variable name	Description	Obs	SD	Freq	α	Min	Max
DEPENDENT VARIABLES							
<i>Nutrition facts panel</i>	Frequency of use of nutrition facts panel (never=0, always=10)	300	2.6			0	10
<i>Nutrition claims</i>					0.92		
Energy	Level of interest in energy-related claims (Not at all interested=0, Very interested=10)	300	3.24			0	10
Fats	Level of interest in fat-related claims (Not at all interested=0, Very interested=10)	300	3.18			0	10
Sugar	Level of interest in sugar-related claims (Not at all interested=0, Very interested=10)	300	3.28			0	10
Sodium	Level of interest in sodium-related claims (Not at all interested=0, Very interested=10)	300	3.15			0	10
Light	Level of interest in the claim 'light' (Not at all interested=0, Very interested=10)	300	2.86			0	10
<i>Health claims</i>	Level of interest in health claims (Not at all interested=0, Very interested=10)	300	2.88			0	10
INDEPENDENT VARIABLES							
<i>Health-orientation index</i>					0.67		
Health attitude	Which is the most important factor that you consider while choosing a food product? Health=1, otherwise=0	300	0.41	66		0	1
Health beliefs - junk food	Do you limit junk food consumption? Yes I limit junk food consumption because I believe that excessive intake is unhealthy =1, otherwise =0	300	0.5	168		0	1
Health beliefs - fruit and vegetable	Do you eat fruit and vegetable? Yes I eat a lot of fruit and vegetable because I believe that this is beneficial for my health =1, otherwise=0	300	0.46	207		0	1
Healthy behaviors - fruit	Consumption frequency: more than once a day=1, otherwise=0	300	0.5	143		0	1
Healthy behaviors - vegetable	Consumption frequency: more than once a day=1, otherwise=0	300	0.5	135		0	1
Healthy behaviors - physical activity	Respondents practice physical activity regularly=1, otherwise=0	300	0.5	144		0	1
Healthy behaviors - smoking	Respondents do not smoke=1, otherwise=0	300	0.5	157		0	1
<i>Nutrition Knowledge</i>							
Knowledge - fruit and vegetable	Respondents' Knowledge about F&V recommended consumption frequency (knowledgeable=1, not knowledgeable=0)	300	0.49	113		0	1
Knowledge - fats	Respondents' Knowledge about the type of fat that must be reduced among monounsaturated, polyunsaturated and saturated (knowledgeable=1, not knowledgeable=0)	300	0.46	206		0	1
Knowledge - energy	Respondents' Knowledge about energy content of fats, proteins, and carbohydrates (knowledgeable=1, not knowledgeable=0)	300	0.47	200		0	1
Knowledge - carbohydrates	Respondents' Knowledge about carbohydrate content of among pasta, fish and eggs (knowledgeable=1, not knowledgeable=0)	300	0.35	256		0	1
Knowledge - proteins	Respondents' Knowledge about protein content of different dairy products (knowledgeable=1, not knowledgeable=0)	300	0.43	227		0	1
<i>Self-perceived healthiness of the diet</i>	Self-perceived healthiness of the diet (very unhealthy=0, very healthy=10)	300	1.81			0	10
<i>Body mass index (BMI)</i>	Respondents' Body Mass Index (kg/m ²)	300	3.46			16	33
<i>Gender</i>	1 female, 0 male	300	0.5	162		0	1
<i>Age</i>	Respondents' age	300	18.18			19	91
<i>Education level</i>	Respondents' education level (secondary school, higher education, degree and post degree)	300	0.75			1	3
<i>Household income</i>	Respondents' household Income (<800€, 800-1500€, 1500-3000€, 3000-5000€, >5000€)	300	1.06			0	4

Table 2. Factor loadings related to the nutrition claims items

Interest in Nutrition Claims (NC)	
Fats	0.916
Energy	0.930
Sugar	0.922
Sodium	0.808
Light	0.807
Total Variance explained	77.14%
Kaiser-Meyer-Olkin	0.822
Bartlett Test	1414.02 ***
Cronbach α	0.925

Significance *** $p < 0.01$

Table 3. Sample characteristics: socio-demographic, economic variables, and BMI.

Gender	% of total (<i>n</i> =300)	Household income	% of total (<i>n</i> =300)
Male	46.00	<800€	6.67
Female	54.00	800-1500€	26.33
Age		1500-3000€	39.33
18-25	17.33	3000-5000€	17.33
26-40	24.67	>5000€	10.33
41-65	39.67	Education level	
>65	18.33	Secondary school	25.67
BMI		High school	43.67
Normal weight	55.33	Bachelor or Master degree	30.67
Overweight and obese	44.67		

Figure 1. Distribution of the health-orientation index across BMI categories

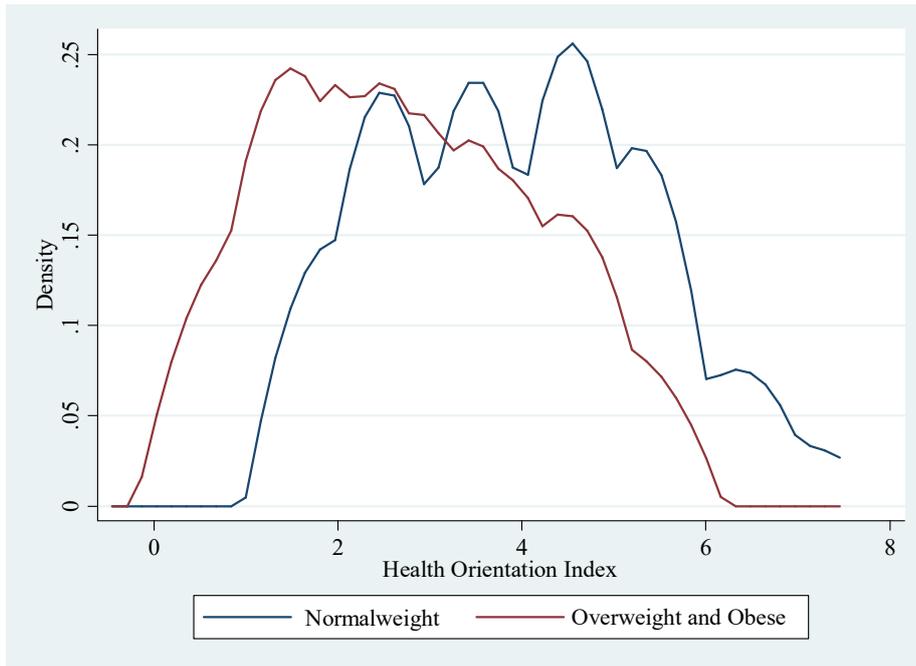


Table 4. Results of the OLS model estimates, respectively having nutrition facts panel use frequency, interest in nutrition claims and interest in health claims as dependent variables.

	Nutrition facts panel	Nutrition claims	Health claims
Health-orientation index	0.575 *** (0.144)	-0.170 *** (0.049)	-0.700 *** (0.158)
Nutrition knowledge	0.304 * (0.145)	-0.087 ** (0.050)	-0.282 * (0.158)
Self-perceived healthiness of the diet	0.080 (0.081)	0.113 *** (0.027)	0.250 ** (0.088)
Gender - Female	0.267 (0.289)	0.687 *** (0.100)	0.761 ** (0.317)
Age	0.007 (0.009)	0.008 ** (0.004)	0.037 *** (0.012)
Education level	0.450 * (0.247)	0.060 (0.085)	0.329 (0.271)
Household income	0.297 * (0.148)	-0.050 (0.051)	-0.233 (0.162)
N	300	300	300
R ²	0.140	0.225	0.150
F	6.770 ***	14.080 ***	7.860 ***
VIF	1.010	1.010	1.010

Significance: *** p < 0.01; ** p < 0.05; * p < 0.10