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## 1. Introduction

Fruit and vegetables (F&Vs) are important elements for a healthy, balanced daily diet, preventing a number of chronic diseases, including hypertension, cardiovascular disease, type 2 diabetes, certain cancers and musculoskeletal disorders (FAO/WHO, 2004; European Food Information Council, 2012; OECD, 2014). The World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) recommended the intake of a minimum of 400 g of F&Vs per day (FAO/WHO, 2004). Several countries have translated this target into the 'Eat 5 servings of fruit or vegetables each day' message (in short: "5 A Day"). However, several EU member states fail to meet this F&Vs intake. Household data show that total F&Vs consumption ranged from 577 g/day in Poland to 196 g/day in Iceland, and vegetable consumption varied from a minimum of 109 g/day in Norway to a maximum 284 g/day in Cyprus (European Food Information Council, 2012). Given these large discrepancies among European countries, the European Commission is monitoring the consumption of F&Vs as one of a number of ways to offset a worsening trend of poor diets in Europe (OECD, 2014).

In Italy, which reported in 2008 the second F&Vs intake in Europe (452 g/day) and the highest consumption of processed vegetables (56 g/day) (European Food Information Council, 2012), the picture changed rapidly in recent years. In 2014 the estimated annual F&Vs intake was lower than 360 g/day, and the drop in per capita consumption affected both fruit and vegetables. Moreover, older people more commonly eat vegetables daily, whilst consumption is lowest among young people aged 15-24 years: only 45% of the Italian population between 20-24 years consumes at least one portion of vegetables per day (Zucconi, 2015). This is in accordance with observations of a general moving away from the Mediterranean diet of many countries in the Mediterranean area (Dernini et al., 2013; Mistretta et al., 2016). Traditionally, dietary patterns of young population from Italian Northern regions are less adherent to the Mediterranean diet, therefore characterized by

a lower consumption of vegetables, compared to the Southern regions (Noale et al., 2014; Santomauro et al., 2014; Donati, Menozzi, Zighetti, Rosi, Zinetti, & Scazzina, 2016). It has also been observed in several Mediterranean countries that inhabitants of urban areas are less likely to be adherent to traditional dietary patterns than those living in rural areas (Dernini et al., 2013; Mistretta et al., 2016). An improved adherence to the Mediterranean diet of young people, associated with a higher vegetable consumption, is related to several factors including having lunch at school, breakfast with family, availability and liking of vegetables, living in rural environment, higher cultural level and socio-economic status of parents. Moreover, lifestyle habits and parental modelling have been reported to influence adolescents' vegetable consumption (Grosso et al., 2013a, 2013b; Roccaldo et al., 2014). Hence, understanding young adults' drivers regarding vegetable eating, in a context of declining consumption, could facilitate the design of interventions to increase vegetable intake in the young population.

## 2. Theoretical framework and research hypothesis

The present study uses the theory of planned behaviour (TPB) (Ajzen, 1991) to explain and test the main determinants of vegetables consumption among young adults in Italy. The TPB postulates that attitude toward the behaviour (favourable or unfavourable evaluation of the behaviour), subjective norm (perceived social pressure), and perception of behavioural control (PBC, perceived ability to perform the behaviour) lead to the formation of a behavioural intention, and that intention is the immediate antecedent of behaviour (Ajzen, 1991). Intention captures the motivational factors that influence behaviour: given a sufficient degree of actual control over the behaviour, people should carry out their intentions when the opportunity arises. According to the TPB, human social behaviour is guided by considerations regarding a behaviour's likely consequences (behavioural beliefs), by perceived opinions of the social environment (normative beliefs), and by one's perceptions of barriers and facilitators when attempting to perform a behaviour (control beliefs)

(Fishbein & Ajzen, 2010). Interventions to changing intention and behaviour should target the relevant behavioural, normative and control beliefs.

Prior applications of the TPB in predicting vegetable consumption suggest that attitude, subjective norms and PBC explain 31% of the variance in intention and 10% of the variance in vegetable intake (Guillaumie, Godin, & Vézina-Im, 2010). Individual's beliefs about consequences, capabilities and social influences were significant predictors of intention, whilst intentions and beliefs about capability (PBC) significantly affected vegetables intake. Therefore, this study suggests that:

**H1**: A favourable attitude would significantly predict intention to consume vegetables.

**H2**: Subjective norms would significantly predict intention to consume vegetables.

**H3**: PBC would significantly predict intention to consume vegetables.

**H4**: Behavioural intentions would significantly predict the behaviour, i.e. vegetables consumption.

**H5**: PBC would significantly predict the behaviour.

Although the TPB has been satisfactorily applied in predicting intentions and behaviour in many fields (Armitage & Conner, 2001; Conner & Sparks, 2005), including health-related behaviour (McEachan, Conner, Taylor, & Lawton, 2011), it may not necessarily capture all of the predictors of more complex behaviour such as food choices (Kothe & Mullan, 2014). For food purchases, behaviour may not only be the resultant of planned intentions, but it may also become habitual. Habit is a psychological construct involving repetition, automaticity and expression of one's identity (Verplanken & Orbell, 2003). Several studies have shown its relevance in F&Vs consumption (Guillaumie et al., 2010; De Bruijn et al., 2007; De Bruijn, 2010; Godin et al., 2010; Menozzi & Mora, 2012; Allom & Mullan, 2012), and in other food-related behaviours (e.g., Honkanen, Olsen, & Verplanken, 2005; Menozzi, Halawany-Darson, Mora, & Giraud, 2015). Habits were modelled as moderator between intention and behaviour, as emerged in other studies

77 considering fruit consumption (De Bruijn et al., 2007; De Bruijn, 2010) and other healthy activities
78 such as physical activity (van Bree et al., 2013). Moderator effect implies that the casual relation
79 between two variables changes as a function of the moderator variable (Baron & Kenny, 1986, p.
80 1174). Therefore, a measure of habits was added to the model suggesting the following hypothesis:
81 **H6**: Habits would have a role in moderating the intention-behaviour relations.
82
83 Therefore, this paper aims to confirm (1) the TPB model predictors for vegetable consumption
84 among young adults in Italy, and (2) the role of habits as moderating the intention-behaviour
85 relations. The relevant beliefs are also analysed to help in defining targeted interventions.
86
87
88 **3. Material and Methods**
89 *3.1 Data collection and sample*
90 The sample consisted of 823 undergraduate students. Students were recruited from the University of
91 Parma (Northern Italy) in order to meet the University of Parma quota of areas of study (social,
92 scientific and sanitary) and gender. Data were collected during June and July 2013 with face-to-face
93 interviews performed by three trained and experienced interviewers who submitted the TPB
94 questionnaire to those who consented. All respondents participated in a lottery; five of them won a
95 prize of 50 Euros. Excluding the incomplete questionnaires, the final sample consisted of 751
96 students, 55% of which are females. The mean age is 22.1 ± 2.6 years. Approximately two third of
97 the respondents hail from Northern Italy, 5% from Central Italy, 27% from Southern Italian regions,
98 and only three students from foreign countries. The areas of study are social (45%), scientific (31%)
99 and sanitary (24%) (Table 1).
100
101 [Table 1 about here]
102

103 *3.2 Measures and statistical analysis*

104 The questionnaire items were defined following Ajzen's conceptual and methodological
105 considerations (Fishbein & Ajzen, 2010). The targeted behaviour was "Eating at least 2 servings of
106 vegetables per day next week". Potatoes and other starchy roots were excluded following the WHO
107 definition of vegetables. A preliminary qualitative study was conducted with one focus group and
108 in-depth personal interviews with undergraduate university students to elicit salient beliefs
109 connected to vegetable consumption.

110 The TPB items were scored on a 7-point Likert scale. *Attitude* toward the behaviour was assessed
111 with four semantic differentials (e.g., "Eating at least 2 servings of vegetables per day next week is
112 bad/good"). *Behavioural beliefs* regarding the outcomes of the behaviour were "Feeling better",
113 "Having more energy", "Having higher control over weight", and "Being healthier in the future".
114 Two measures of *subjective norms* were used (e.g., "Most people who are important to me think
115 that I should/I should not eat at least 2 servings of vegetables per day next week"). *Normative*
116 *beliefs* that a particular referent individual of group thinks respondents should or should not perform
117 the behaviour were included, with reference to "Friends", "My family", "Family doctor" and "Food
118 industries and retailers". *PBC* was measured with two items (e.g., "I think that eating at least 2
119 servings of vegetables per day next week is possible"). *Control beliefs* about factors that would
120 enable or impede the behaviour performance were assessed considering "High cost", "Low cooking
121 skills", "Conservation difficulty", "Pesticide residuals" and "Not promoted by companies". Two
122 items were used to assess *behavioural intention* (e.g., "I intend to eat at least 2 servings of
123 vegetables per day next week"). Two items were employed to measure the *behaviour*: first by
124 asking respondents to indicate from a list the number of servings of different vegetables consumed
125 during the last 24 hours, and then by asking how many servings of vegetables respondents have
126 eaten last week (frequency of consumption). Finally, six items were introduced representing the
127 different facets of the *habit* based on the short version of the Self-Report Habit Index (Verplanken
128 & Orbell, 2003; van Bree et al., 2013): "Consuming at least 2 portions of vegetables a day is

129 something that: I do automatically/that makes me feel weird if I do not do it/I do without
130 thinking/that belongs to my weekly routine/that's typically "me"/that makes me feel well if I do it"
131 (mean 4.05 ±1.63). Three habit groups were defined based on tertiles of the mean index score,
132 resulting in nearly similar group sizes (see also De Bruijn et al., 2007; van Bree et al., 2013). Thus,
133 low habit was defined as lower than or equal to 3.27 (n = 250), medium habit as between 3.28 and
134 4.83 (n = 258) and high habit strength as equal or higher than 4.84 (n = 243). The high habit group
135 is mostly composed by females than the other groups, whilst other socio-demographics do not differ
136 across groups (Table 1). The internal consistency of the scales (Cronbach's alpha) suggests that the
137 scales are reasonably homogenous (Table 2). Further details on the questionnaire can be found in
138 Menozzi, Sogari, and Mora (2015).
139 The data were initially analysed to evaluate major differences of relevant TPB variables across habit
140 groups, and to confirm correlational relationships between the attitude, subjective norm and PBC
141 with, respectively, their behavioural, normative and control beliefs, and between the predictors and
142 both intention and behaviour (Fishbein & Ajzen, 2010). A structural equation modelling (SEM)
143 approach was used to test the research hypothesis (Byrne, 2010). The model fit was assessed with
144 chi-square ($\chi^2$), comparative fix index (CFI), the Tucker-Lewis Index (TLI), and root mean square
145 error of approximation (RMSEA), and the coefficient of determination ($R^2$) was used to measure
146 the explained variance of the endogenous variables (intention and behaviour). The models were
147 estimated using Bayesian estimation procedure, suggested to analyse categorical data (Byrne,
148 2010). The role of habit as moderating the effect of PBC and intentions over the behaviour was
149 evaluated using multi-group SEM to test for significant differences across the three habit groups
150 (Baron & Kenny, 1986; Lippke, Nigg, & Maddock, 2007; Byrne, 2010). In testing for invariance
151 across groups, it is necessary first to test the validity of the baseline model (configural model),
152 separately for each group and then simultaneously for purposes of testing cross-group equivalence
153 (configural equivalence). Then, it is necessary to test for the invariance of factor loadings
154 (measurement model) evaluating the equivalence of each item across the groups. Finally, providing

evidence of group metric equivalence, the invariance of the structural model (factor covariances and structural paths) has to be tested. The $\chi^2$ difference ($\Delta\chi^2$) test and the CFI difference ($\Delta$CFI) can be used for models comparison, where evidence of noninvariance is claimed if the $\Delta\chi^2$ is statistically significant and the $\Delta$CFI is greater than 0.01 (Byrne, 2010).

## 4. Results

### *4.1 Descriptive analysis*

Mean vegetable consumption was three servings of vegetables per day (2.98 ± 1.86); individuals who reported higher habits consumed a larger number of servings the previous day (3.61 ± 1.73), compared to medium (3.10 ± 1.83) and low habit participants (2.24 ± 1.79) (Table 2). When considering the frequency of consumption over the last week, on average the respondents reported a daily vegetable consumption of two servings (median class = 4), with higher frequency by respondents who reported higher habits (three per day), than medium (two per day) and low habit participants (one per day).

[Table 2 about here]

Respondents reported a general positive attitude toward the behaviour (mean score 5.35 ± 1.14), a moderately positive social pressure (4.19 ± 1.39), a general positive perceived control (5.17 ± 1.61), and a moderately positive intention (4.83 ± 1.70) over eating at least 2 servings of vegetables per day next week (Table 2). The high habits group has shown significant higher scores for each construct compared to both medium and low habit groups ($p<0.001$, Table 2).

### *4.2 Predicting vegetable consumption with the TPB*

The hypothesized TPB model fits the data very well ($\chi^2$ (56) = 109.727, CFI = 0.986, TLI = 0.981, RMSEA = 0.036). Attitude, subjective norms and PBC are all significantly correlated with

intentions (respectively, r = 0.57, 0.52 and 0.70), and are all significant predictors of intention (beta = 0.33, 0.20 and 0.50, $p<0.001$)[1]. The behaviour is significantly correlated with intention and PBC (r = 0.58 and 0.51); however only intention is a significant predictor of the behaviour (beta = 0.65, $p<0.000$). From the perspective of the TPB, the effect of PBC on the behaviour must be attributed to the effect of PBC on the behavioural intention: PBC only marginally influences the behaviour (beta = 0.19, p=0.059), whilst it is the main predictor of intention, suggesting that intention mediates the effect of PBC on vegetable consumption.

The TPB model explains overall 81% and 67%, respectively, of the intentions and behaviour variance ($R^2$ values, Table 3). These results are very satisfactory considering prior applications of the TPB in predicting vegetable intake (Guillaumie et al., 2010), suggesting that the TPB provides a satisfactory description of the underlying data. Taking into account the feasibility and statistical significance of parameter estimates and the good fit of the model, the TPB in Table 3 best represents the vegetable consumption among young adults from the perspectives of both parsimony and substantive meaningfulness.

[Table 3 about here]

*4.3 The role of habits as moderator*

Initial testing of the hypothesized TPB model yielded a good fit to the data for low habit group ($\chi^2$ (56) = 100.541; CFI = 0.955; TLI = 0.937; RMSEA = 0.057), and a very well-fitting model for medium habit group ($\chi^2$ (56) = 77.712; CFI = 0.968; TLI = 0.956; RMSEA = 0.039) and for high habit group ($\chi^2$ (56) = 75.368; CFI = 0.970; TLI = 0.959; RMSEA = 0.038). The configural model (the baseline model) yielded well-fitting results ($\chi^2$ (168) = 253.621; CFI = 0.963; TLI = 0.948;

[1] Usually parameters representing regression relations between latent constructs are labelled with the Greek character "gamma" (γ) for the regression of an endogenous construct on an exogenous construct, and with the Greek character "beta" (β) for the regression of one endogenous construct on another endogenous construct. For simplicity, in this paper we referred at the regression coefficients as beta coefficients.

RMSEA= 0.026), thereby suggesting that dividing the sample into three subsamples represents the data very well. When testing for measurement equivalence across groups, i.e. invariant factor loadings (Byrne, 2010), the constrained model revealed a slight decrement in overall fit ($\Delta\chi^2$ (16) = 30.99, p = 0.013; ΔCFI = 0.006). In particular, the difference in $\chi^2$ from the configural model is statistically significant at p<0.05, although the difference between the CFI values meets the recommended cut-off criterion of 0.01. One item was found to operate differently across habit groups, i.e. "Eating at least 2 servings of vegetables per day next week is difficult/easy". Once this constraint is removed, the results yielded a nonsignificant difference between the configural and the constrained model ($\Delta\chi^2$ (14) = 22.57, p = 0.068; ΔCFI = 0.004). Thus, the item parameter was freely estimated in the following nested model. Testing for the invariance of the casual structure resulted in a slightly significant decrement of model fit ($\Delta\chi^2$ (10) = 22.88, p = 0.011; ΔCFI = 0.005). It can be concluded that the structural model also differs across habit groups, confirming the role of habits as moderator of the intention-behaviour relationship.

Although the correlations are all significant, attitude is a significant predictor of intention only for low habit students (beta = 0.42, p<0.001), while subjective norms affect intention to eat vegetables for low (0.34, p<0.001) and medium habit students (0.21, p<0.05). PBC significantly affects intention across the three groups (low habit = 0.37, p<0.001; medium habit = 0.64, p<0.001; high habit = 0.65, p<0.001). The behaviour is only affected by intentions for low habits respondents (0.52, p<0.01), whilst PBC is only significant predictor of the behaviour for high habits group (0.41, p<0.05).

*4.4 Underlying beliefs*

The TPB postulates that personal beliefs about the likely outcomes of the behaviour (behavioural beliefs), the normative expectations of others (normative beliefs), and the presence of factors that may facilitate or impede performance of the behaviour (control beliefs) influence attitude, subjective norms and PBC, and these effects mediate for their impact on intentions and behaviour

(Fishbein & Ajzen, 2010). Exploring the correlation of the salient beliefs with their relative direct measures and with intentions provides important indications on how to target intervention. In principle, the intervention should target the beliefs relevant for the component that carries most of the weight in predicting intentions. Table 4 reports the correlations of beliefs with their relative direct measures and with intentions. In the overall sample, several behavioural beliefs were found to be relevant, including considerations that eating vegetables gives more energy, helps people to feeling better and gives a higher control over weight. There is also a number of significant correlations between normative beliefs with the direct measure of subjective norm and intention, in particular considerations about opinions of friends, family and doctors. The relevant factors that could facilitate or interfere with vegetable consumption are cooking skills, having difficulty in conservation, being or not promoted by companies, and having pesticide residuals. All these beliefs correlate significantly with intentions too. The high habit group shows stronger correlations between control beliefs and, respectively, PBC and intention; in particular, the high cost represents a significant barrier only for this group. In addition, having cooking skills and longer conservation is more relevant for this group. Pesticide residuals and cooking skills are affecting PBC and intention in the medium habit consumers, whilst no control belief correlates significantly with PBC and intention in the low habit group. For this latter group of participants, the behavioural beliefs feeling better, having higher control over weight and more energy are significant positive outcomes of vegetables consumption affecting intention; friends, family and doctors are the referents perceived to exert pressure to eat or not vegetables.

[Table 4 about here]

## 5. Discussion

The TPB afforded excellent prediction of intentions to eat at least two servings of vegetables per day among young adults, accounting for 81% of the variance, as well as very good prediction of

256 reported vegetables consumption behaviour, accounting for 67% of the variance. The cross-
257 sectional design may have inflated the explained variance, although this is not always the case
258 (Guillaumie et al., 2010); the quality of psychometric instruments used to assess psychosocial and
259 behavioural measures may have also contributed to this high prediction efficacy. Attitude,
260 subjective norms and PBC are all significant predictors of the intention to consume vegetables,
261 therefore confirming hypotheses H1, H2 and H3 and the outcomes of other studies (Guillaumie et
262 al., 2010; Larson, Laska, Story, & Neumark-Sztainer, 2012). As postulated by H4, behavioural
263 intentions significantly predict the reported vegetable consumption among young adults. However,
264 hypothesis H5 is only partially supported since PBC is only a significant predictor of vegetables
265 consumption in the high habit group. Perceived barriers to healthy eating were also found to
266 negatively affect vegetable intake (Larson et al., 2012), and cost and availability were found to be
267 the major barriers to fruit and vegetable consumption among young adults in New Zealand
268 (Hartman, Wadsworth, Penny, van Assema, & Page, 2013). Participants with different habit
269 strength show heterogeneous patterns of perceptions and behaviour related with vegetables
270 consumption, confirming the hypothesis of moderation (H6). Lifestyle and parental habits were also
271 found to influence adolescents' vegetable consumption in Southern Italian regions (Grosso et al.,
272 2013a, 2013b). Intention significantly affected eating vegetable behaviour in participants with low
273 habits, but not in young adults with strong habitual behaviour. In contrast, for those more familiar
274 with vegetables consumption PBC is the main predictor of the behaviour. This confirms that
275 intention is a good predictor of relatively novel or unpractised behaviours, but it loses its predictive
276 validity when it comes to routine or habitual responses in familiar situations (Ajzen & Manstead,
277 2007). This finding supports evidence from other studies involving fruit consumption (De Bruijn et
278 al., 2007; De Bruijn, 2010; Menozzi & Mora, 2012), and other behaviours (e.g., physical activity in
279 van Bree et al., 2013).
280 The TPB suggests that interventions directed at behavioural, normative, or control beliefs may
281 succeed in producing corresponding changes in attitudes, subjective norms, and perceptions of

282 control, and these changes, provided that people is capable of carrying out their formed intentions,
283 may further influence intentions and behaviour in the desired direction. This happens only if there is
284 a strong link from intentions to behaviour and if the intervention is targeted to the component that
285 carries most of the weight in predicting intentions. It is necessary to identify the underlying beliefs
286 that, if changed, are likely to have a strong impact on the targeted component (Fishbein & Ajzen,
287 2010). Therefore, interventions to increase vegetable eating among young adults can target the three
288 variables attitudes, subjective norms and PBC, since they all significantly correlates with intention.
289 First, interventions should target PBC, which carries the highest regression weight; in particular,
290 actions are recommended to overcome barriers by improving cooking skills and conservation of
291 vegetables, increasing promotions by companies (e.g., retailers) and reducing pesticide residuals.
292 Targeted information should indicate places where to get cheap fruit and vegetables and quick and
293 easy recipes (Hartman et al., 2013; Kothe & Mullan, 2014). Reaching young adults requires using a
294 variety of media-channels easy, including billboards, emails and the internet. Possible methods to
295 increase perceived ability are persuasive communication, experience of successful enacting
296 behaviour, observing others performs behaviour and physiological feedback compatible with
297 successful performance (Hardeman et al., 2002). Regarding external barriers, increasing the variety
298 of vegetables than serving any single type, for instance in students cantinas, may have a positive
299 effect on vegetables consumption (Meengs, Roe, & Rolls, 2012). Second, salient benefits have to be
300 targeted to develop a more positive attitude, including positive outcomes related with vegetables
301 consumption like having more energy, having more control over weight, feeling better and healthier
302 in the future. In this case, information about short-term health implications of eating vegetables
303 should be preferred. The implementation of communication highlighting favourable opinions of
304 peers (friends), family and doctors about vegetables consumption is also recommended.
305 Finally, the suggested technique for helping individuals to act on their healthy intentions is to get
306 them to form implementation intentions, that is in helping people to specify where and when the
307 behaviour in question will be enacted (Fishbein & Ajzen, 2010). It has also been suggested that the

effect of the intervention is stronger when designed for a particular population segment or, carrying to the extreme, specified to the level of the individual (tailoring). Therefore, these strategies can be more effective if targeted to low habit consumers, since this group reports the lowest vegetables consumption in the last 24 hours and lower frequency of consumption during the last week, as well as lower scores in the main variables attitude, subjective norms, PBC and intention, compared to the other groups.

Some methodological limitations to the current study have to be acknowledged. First, the use of a cross-sectional data and self-reported measures presents conceptual problems in the causal ordering of the TPB and may have inflated the associations between TPB variables and behaviour. Nevertheless, it is common in several TPB studies (Guillaumie et al., 2010). Second, the sample represents a highly educated segment of consumers; since highly educated persons tend to eat vegetables more often (OECD, 2014), a generalization to the general Italian young adult population is difficult. Third, the behaviour was measured by asking participants to estimate vegetable consumption retrospectively, whilst the TPB variables were designed to assess a prospective behaviour. Despite these limitations, this study is one of the first to explore the determinants of vegetable consumption in a context of declining fruit and vegetable intake and to assist policy makers and companies to develop targeted interventions for low habit consumers. Further research efforts should investigate how these theory-based interventions are effective in changing young adults' behaviour.

## 6. Conclusions

The present study has tested the TPB model for its ability to predict vegetable consumption among young adults in Italy and to understand its main determinants, suggesting possible intervention strategies to promote it. The model accounted for 81% of the variance in intention and 67% of the variance in the behaviour. The self-reported mean vegetable consumption was three servings per day, but individuals reporting low habits consumed a lower number of servings and reported lower

frequency of consumption. The role of habits in moderating the intention-behaviour relationship has been confirmed: intention significantly affects vegetable eating behaviour in participants with low habits, while PBC is the main predictor of the behaviour in the high habits group. This indicates that vegetable consumption may be intentional as well as habitual, depending on the level of habit strengths. Efforts aiming at improving vegetable consumption in the low habit group should target the behavioural beliefs feeling better, having higher control over weight and more energy. Interventions directed at highlighting favourable opinions of friends, family and doctors about vegetables consumption are also recommended.

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448 Table 1. Sample socio-demographic characteristics: percentage (%), mean and standard deviations

449 (sd).

| **Socio-demographic classes and level** | **Total (n=751)** | **Low habit (n=250)** | **Medium habit (n=258)** | **High habit (n=243)** |
|---|---|---|---|---|
| **Gender** | *%* | *%* | *%* | *%* |
| Male | 45.1 | 55.6 | 52.7 | 26.3 |
| Female | 54.9 | 44.4 | 47.3 | 73.7 |
| **Age** | *mean (sd)* | *mean (sd)* | *mean (sd)* | *mean (sd)* |
| Age of respondents | 22.1 (2.6) | 22.0 (2.1) | 22.2 (2.4) | 22.2 (3.0) |
| **Region of origin** | *%* | *%* | *%* | *%* |
| Northern Italy | 67.1 | 64.8 | 68.6 | 67.9 |
| Central Italy | 5.2 | 4.0 | 4.6 | 7.0 |
| Southern Italy | 27.3 | 30.8 | 26.4 | 24.7 |
| Other countries | 0.4 | 0.4 | 0.4 | 0.4 |
| **Area of study** | *%* | *%* | *%* | *%* |
| Scientific | 31.4 | 26.8 | 35.3 | 32.1 |
| Sanitary | 23.7 | 22.8 | 21.3 | 27.2 |
| Social | 44.9 | 50.4 | 43.4 | 40.7 |

450 Cramer-V: Gender = 0.262 ($p<0.001$); Region of origin = 0.055 ($p=0.613$), Area of study = 0.071 ($p=0.106$).
451 Pearson's $\chi^2$: Gender = 51.712 ($p<0.001$); Region of origin = 4.473 ($p=0.613$), Area of study = 7.632 ($p=0.106$).
452 F-test: Age = 0.692 ($p=0.501$).
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456 Table 2: Analysis of vegetables consumption among young adults in Italy. Constructs Cronbach's

457 alpha, mean scores and standard deviations (in parenthesis).

| | Alpha | Total (n=751) | Low habit (n=250) | Medium habit (n=258) | High habit (n=243) |
|---|---|---|---|---|---|
| Attitude | 0.73 | 5.35 (1.14) | 4.55 (1.08) | 5.41 (0.91) | 6.10 (0.82) |
| Subjective Norm | 0.71 | 4.19 (1.39) | 3.53 (1.41) | 4.20 (1.18) | 4.86 (1.25) |
| Perceived Behavioural Control | 0.78 | 5.17 (1.61) | 4.11 (1.65) | 5.25 (1.28) | 6.18 (1.14) |
| Intention | 0.86 | 4.83 (1.70) | 3.45 (1.53) | 4.94 (1.28) | 6.13 (1.08) |
| Behaviour | 0.49 | | | | |
| Number of servings last 24 hours | | 2.98 (1.86) | 2.24 (1.79) | 3.10 (1.82) | 3.61 (1.73) |
| Frequency of consumption [a] | | 3.78 (1.28) | 2.94 (1.15) | 3.83 (1.04) | 4.59 (1.07) |

458 Note: All differences between groups are significant at $p<0.001$.

459 [a] The frequency of consumption is measured by the following item: "*How many servings of vegetables have been eaten*
460 *last week: 1 = less than three, 2 = from three to five, 3 = one per day, 4 = two per day, 5 = three per day, and 6 = more*
461 *than three per day*".

462

463

Table 3: Analysis of vegetables consumption among young adults in Italy. Results of structural equation models: coefficient of determination ($R^2$), correlations (r), standardized regression coefficients (b) and p-values (p).

| | **Total (n=751)** | | | | **Low habit (n=250)** | | | | **Medium habit (n=258)** | | | | **High habit (n=243)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **$R^2$** | **r** | **b** | **p** | **$R^2$** | **r** | **b** | **p** | **$R^2$** | **r** | **b** | **p** | **$R^2$** | **r** | **b** | **p** |
| *Behaviour predictors:* | 0.67 | | | | 0.57 | | | | 0.32 | | | | 0.42 | | | |
| Intention | | 0.58 | 0.65 | 0.000 | | 0.43 | 0.52 | 0.003 | | 0.37 | 0.63 | 0.116 | | 0.30 | 0.28 | 0.092 |
| Perceived Behavioural Control | | 0.51 | 0.19 | 0.059 | | 0.33 | 0.28 | 0.079 | | 0.26 | -0.08 | 0.670 | | 0.37 | 0.41 | 0.026 |
| *Intention predictors:* | 0.81 | | | | 0.77 | | | | 0.64 | | | | 0.52 | | | |
| Attitude | | 0.57 | 0.33 | 0.000 | | 0.46 | 0.42 | 0.000 | | 0.26 | 0.08 | 0.428 | | 0.18** | 0.10 | 0.301 |
| Subjective Norm | | 0.52 | 0.20 | 0.000 | | 0.48 | 0.34 | 0.000 | | 0.40 | 0.21 | 0.011 | | 0.25 | 0.04 | 0.597 |
| Perceived Behavioural Control | | 0.70 | 0.50 | 0.000 | | 0.58 | 0.37 | 0.000 | | 0.54 | 0.64 | 0.000 | | 0.54 | 0.65 | 0.000 |

Note: ** $p<0.01$; all other correlations are significant at $p<0.001$.

Table 4: Analysis of vegetables consumption among young adults in Italy. Correlations of beliefs with their relative direct measure (attitude – Att, subjective norm – SN, and perceived behavioural control – PBC), and with intention (Int) to eat at least 2 servings of vegetables per day next week.

| | **Total (n=751)** | | **Low habit (n=250)** | | **Medium habit (n=258)** | | **High habit (n=243)** | |
|---|---|---|---|---|---|---|---|---|
| *Behavioural beliefs* | *Att* | *Int* | *Att* | *Int* | *Att* | *Int* | *Att* | *Int* |
| More energy | **0.34** | **0.37** | **0.17**$^{**}$ | **0.29** | **0.14**$^{*}$ | **0.16**$^{**}$ | **0.38** | **0.24** |
| Higher control over weight | **0.26** | **0.35** | 0.12 [a] | **0.26** | 0.12 [a] | **0.25** | **0.34** | **0.36** |
| Feel better | **0.36** | **0.47** | **0.18**$^{**}$ | **0.33** | **0.14**$^{*}$ | **0.28** | **0.32** | **0.35** |
| Healthier in the future | **0.22** | **0.32** | 0.05 [a] | **0.18**$^{**}$ | **0.17**$^{**}$ | **0.25** | **0.22** | **0.39** |
| *Normative beliefs* | *SN* | *Int* | *SN* | *Int* | *SN* | *Int* | *SN* | *Int* |
| My family | **0.46** | **0.53** | **0.47** | **0.48** | **0.34** | **0.39** | **0.44** | **0.26** |
| Friends | **0.35** | **0.35** | **0.36** | **0.32** | **0.29** | **0.14**$^{*}$ | **0.34** | **0.12**$^{\#}$ |
| Family doctor | **0.29** | **0.35** | **0.35** | **0.32** | **0.15**$^{*}$ | **0.20**$^{**}$ | **0.23** | **0.19**$^{**}$ |
| Food industries and retailers | **0.32** | **0.26** | **0.31** | **0.30** | **0.21**$^{**}$ | **0.12**$^{\#}$ | **0.21**$^{**}$ | **0.17**$^{**}$ |
| *Control beliefs* | *PBC* | *Int* | *PBC* | *Int* | *PBC* | *Int* | *PBC* | *Int* |
| High cost | -0.05 [a] | -0.03 [a] | -0.06 [a] | -0.08 [a] | -0.**12**$^{\#}$ | **-0.**07 [a] | **-0.26** | **-0.20**$^{**}$ |
| Cooking skills | **0.19** | **0.16** | 0.03 [a] | -0.05 [a] | **0.14**$^{*}$ | **0.18**$^{**}$ | **0.35** | **0.21**$^{**}$ |
| Conservation difficulty | **-0.14** | **-0.09**$^{*}$ | -0.03 [a] | -0.05 [a] | -0.03 [a] | -0.04 [a] | **-0.34** | **-0.17**$^{**}$ |
| Pesticide residuals | **-0.09**$^{*}$ | **-0.08**$^{*}$ | -0.04 [a] | **-0.11**$^{\#}$ | **-0.17**$^{**}$ | **-0.11**$^{\#}$ | **-0.14**$^{*}$ | **-0.11**$^{\#}$ |
| Promoted by companies | **0.11**$^{**}$ | **0.10**$^{**}$ | -0.01 [a] | -0.02 [a] | **0.11**$^{\#}$ | 0.10 [a] | **0.24** | **0.21**$^{**}$ |

Signif. codes: '**' p<0.01; '*'p<0.05; '#'p<0.10; [a] Not significant; all other correlations are significant at p<0.001.