

## Supplements consumption, health oriented behaviour and beyond

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### Abstract

The dietary supplements use is constantly growing as proof that people pay always more attention to their diet and their physical status. Italy recorded the highest growth in the European market within 2008 and 2012. The reasons and the factors behind the consumption of dietary supplements are complex, combining social, psychological, knowledge and economic factors. In order to provide consumers' profiles and to estimate the following relationship between them and the socio-demo, lifestyle, health-related behaviour, a survey study was conducted on a sample of 400 Italian consumers. The main results highlight the presence of four different profiles, distinguished mainly by different lifestyle, health needs and self-perceived health status. Through a logit regression it was also estimated the probability to consume the different categories of supplements for each profile. In this way, this study could provide useful hints to implement public health guidelines and to avoid a no-proper use of supplements.

### Keywords

Food Supplements, Health behaviour, Cluster Analysis, Logit Regression

### Introduction

The use of dietary supplements has increased worldwide over the past decades. According to Euromonitor International data, Italy recorded the highest growth among the European food supplement markets, within 2008 and 2012; going from \$1.425,0 to \$1.527,9 (Nutraingredients, 2014). This data reflects people attitude to take control of their diet and their physical status by using products with enhanced health properties, such as functional food (Kaur and Das, 2011; Howlett J, 2008) and food supplements (Greger, 2001). Both these products may be used in the context of a healthy lifestyle or as a mean to compensate for an unhealthy lifestyle (De Jong et al., 2003; Landström et al. 2009), which is widespread across population. As a consequence, the health effects of functional food or supplement intake became of public interest. Policy makers aim to improve citizens' health and to reduce

costs in the healthcare system, it is therefore important to identify functional food and supplement users (Lambert et al. 2015, Wiltgren et al. 2015).

A large number of studies has dealt with the consumer understanding of functional food (Bonanno, 2012; Hailu et al, 2009, Diplock et al. 1999; Grunert, 2010; Siegrist et al., 2008; Siró et al., 2008) while literature about food supplements users is not so wide (Aschemann-Witzel and Grunert, 2015; Giammaroli et al. 2013; O'Connor and White, 2010; Oakes et al. 2005).

The term "dietary supplement" encompasses a wide range of different substances, including vitamins, minerals, herbal and botanical substances, fish oils, glucosamine, creatine and essential fatty acids (Egan et al. 2011). The European Union Directive on Food Supplements (which include plant food supplements) are defined as: " ...food stuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in 40 combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small quantities" (European Commission, 2002).

Scientific evidence suggests that the **reasons** for consuming dietary supplements are likely to be complex, combining social, psychological, knowledge and economic factors (Conner et al, 2001; de Jong et al., 2003; Rozin et al., 2004). In addition, supplement usage might be related to the increasing popularity of complementary and alternative medicine, which is driven by the search for alternative approach to health, well-being and lifestyle.

Several **factors** may influence consumers preference about supplements: interests in certain food types and dietary trends (Ritchie, 2007), the type of product or substance (de Jong et al., 2003), individual attitudes and interests for naturalness (Rozin et al., 2004), the perceived relevance of the effect (de Jong et al., 2003) and the beliefs and expectations about health outcomes (Conner et al, 2001).

Several evidences show that users of supplements are significantly more likely than nonusers to have somewhat better dietary patterns, exercise regularly, maintain a healthy weight and avoid tobacco products (MacKay and Dickinson 2014, Wiens et al. 2014). Recent studies pointed out the socio-demographic **profile** of supplement users: female, older and well-educated and willing to follow a healthy lifestyle (Beitz et al. 2004; Aschemann-Witzel and Grunert, 2015; Furnham, 2007). Despite the market figures of Italian consumption of food supplements presents a relevant scenario among other countries, scarce evidence about consumers' profile and motivations is provided by the economic and marketing literature (Giammarioli et al., 2013).

In light of these preliminary remarks, the aim of this study is to characterize users by demographic, lifestyle, health-related characteristics and behaviour.

In particular the research hypotheses to test are:

H1 – consumers of food supplements can be differentiated by a number of profiles;

H2 –consumption of specific supplements is correlated with consumers' profiles, each characterized by different motivations, habits, socio-demographics, health needs and products perceptions.

## Method

In order to estimate the key drivers of the consumption of specific categories of supplement, we constructed a sample of 400 supplements consumers and designed a questionnaire for a face-to-face survey to be conducted into drug-store, in Apulia region, Italy. Interviewees were selected randomly and conducted into the main cities and large towns of the region. Asking whether they assume supplements, we identified the consumers for the interview.

The questionnaire included questions to gather information on *socio-demographic characteristics* – such as income, education, age and households characteristics – *purchasing behaviour of supplement* – such as type of supplement, purchasing frequency, – *food habit and lifestyle variables* – such as spare time activities and diet awareness – *purchase motivations* – such as health status, unbalanced diet, prevention attitude – *choice influence variables* – such as suggestions at the drug store, physician advices, independent choice.

We test the research hypothesis by employing: factor analysis and clustering techniques, in order to provide consumers' profile and verify the H1; a set of logit regressions, in order to estimate the cause-effect relationship among the profiles identified and the probability of individuals consuming:

- Probiotics
- Multi-vitamins
- Body shaping
- Sport
- Cardiovascular related
- Bones and joint
- Other health related issues

The cluster analysis consisted into two steps: an analysis by principal components and a cluster analysis. In the first step, a principal components analysis was performed in order to identify the main aspects relative to the socio-demographic characteristics, the purchasing behaviour of supplement, the food habit and lifestyle variables, the purchase motivations and choice influence variables.

The reliability of the resulting principal components is supported by the KMO results (0,67) and the Bartlett test on sphericity (Approx. Chi-Square 1102,13)<sup>1</sup>. Next, based on these results, consumers have been classified, by applying a hierarchical procedure of cluster analysis in homogenous segments. The H2 has been tested with the use of Logit regression model. The specific choice of this regression techniques underlies the study of the change in probability of the hypothesized behaviour determined by a change in a variable. Therefore, odds-ratio and marginal effects will be estimated in order to estimate the significant drivers of supplements consumption.

The generalised model used here is the following:

$$Prob(Y_{ij} = 1) = \sum_k \beta_{kj} S_{kij} + e_{ij} \quad \text{Equation 1}$$

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<sup>1</sup> The KMO (Keiser Meyer Olkin) measure of sampling adequacy verifies whether partial correlations between variables are small. The Bartlett test on sphericity verifies whether the correlation matrix is a matrix of identity, which would imply the inadequacy of the factorial model.

Where,  $i$  refers to the individuals;  $j$  represents the given categories of supplements, expressed as dummy variables, thus equal to zero if no supplement belonging to the specific category is consumed and 1 otherwise.  $S$  refers to the  $k^{th}$  consumers' segments.

## Results

The application of the analysis by principal components shows that there are six extractable components and that they explain 60% of the phenomenon variance<sup>2</sup>.

By interpreting the results of table 2 the main purchasing components are detected. Particularly, the principal component may be synthetically defined as old age and poor health status "**old and sick status**" since it is related to older age, chronic disease problems (such as hypertension and diabetes) and to low self-perceived health status. The second component includes behaviours such as the belief that supplements could be a remedy against unhealthy eating habits, the factor could be deemed as "**guilty eating**", since it is highly related to the purpose of improving their own physical performance associated with an unhealthy diet (measured by self – assessed excess of food intake) and a healthy lifestyle. The third component is defined as "**no drugs but supplements**", since it is highly related to the habit of considering food supplements as alternative to medicines in presence of hypercholesterolaemia and associated with recommendation of medical doctor for their use. The fourth component is defined as "**prevention seeking**" since it is related to the purpose of delaying ageing and with a higher education level. The fifth component is defined as "**rational behaviour**", since it is characterized by the perception of price as the most important choice factor. The last component is defined as "**well-being seeking**", since it is highly related to the purpose of taking food supplements to improve the health status and well-being.

*Table 1a – Descriptives, frequency of consumption per category of supplements, age and education*

	fermenti	multi	slim	hair	salts	laxative	other vit.
Frequency	0,72	0,47	0,07	0,15	0,11	0,13	0,08
below 30	0,74	0,54	0,00	0,18	0,10	0,05	0,03
30-45	0,76	0,49	0,10	0,16	0,14	0,11	0,11
45-60	0,65	0,46	0,10	0,15	0,06	0,10	0,06
60-75	0,71	0,25	0,00	0,08	0,08	0,29	0,08
above 75	0,50	1,00	0,00	0,00	0,00	0,50	0,00
Mandatory education	0,55	0,40	0,00	0,20	0,15	0,30	0,15
high school	0,78	0,33	0,13	0,07	0,04	0,11	0,09
college	0,74	0,48	0,06	0,15	0,13	0,12	0,09
PhD/Msc	0,68	0,68	0,06	0,24	0,09	0,06	0,00

*Source: own elaboration*

<sup>2</sup> The number of extracted components was drawn on the basis of the Kaiser's rule according to which only the main components corresponding to an eigenvalue which is higher than or equal to 1 are kept.

*Table 1b – Descriptives, frequency of consumption per category of supplements, age and education*

	tonic	sport	ophtalmic	cholest	joint	sleep	other
Frequency	0,01	0,12	0,09	0,06	0,11	0,05	0,03
below 30	0,00	0,21	0,00	0,00	0,03	0,00	0,00
30-45	0,02	0,14	0,07	0,01	0,09	0,02	0,02
45-60	0,00	0,06	0,10	0,17	0,17	0,15	0,06
60-75	0,00	0,00	0,25	0,08	0,21	0,04	0,00
above 75	0,00	0,00	0,50	0,00	0,00	0,00	0,00
Mandatory education	0,00	0,05	0,30	0,10	0,25	0,10	0,05
high school	0,00	0,13	0,07	0,07	0,13	0,04	0,02
college	0,01	0,12	0,04	0,04	0,11	0,05	0,03
PhD/Msc	0,03	0,12	0,15	0,06	0,00	0,03	0,00

*Source: own elaboration*

On the basis of these results, we identified well assorted groups of consumers (table 3)<sup>3</sup> Particularly four adequately characterized groups have been detected<sup>4</sup>: the **more rational users** (5%), the **performers** (27%), the **health-oriented users** (55 %) and the **potential patients** (13%).

*Table 2 – Component matrix rotated. Rotation method: Varimax with Kaiser normalisation*

Variables	Component					
	1	2	3	4	5	6
Socio-demographic and health status						
Age	0,74	-0,08	0,32	0,10	0,03	0,17
Gender	-0,10	-0,76	0,00	0,08	0,13	-0,01
Education	-0,29	-0,01	0,00	0,52	-0,49	-0,12
Hypertension	0,70	0,08	0,14	-0,08	-0,08	0,13
Hypercholesterolaemia	0,15	0,08	0,53	0,10	0,07	0,13
Diabetes	0,53	0,00	-0,20	0,02	0,34	-0,03
Self- perceived health status	0,66	-0,14	0,20	-0,03	0,03	-0,06
Supplements purchasing behavior						
Frequency of consumption	0,24	-0,22	0,24	0,08	-0,18	-0,15
Habits and lifestyle						
Sports (gym and swimming pool)	-0,48	0,18	-0,09	0,00	0,05	0,19
Run	-0,28	0,23	0,07	0,22	-0,18	0,04
Self – perceived food intake	-0,21	0,62	0,04	0,11	0,07	0,02
Not consumption of functional foods	0,26	0,32	-0,27	-0,27	-0,51	-0,12

<sup>3</sup> A hierarchical procedure was used (Ward method) based on the usage of Euclidean distances to assess the level of similarity and dissimilarity (Rizzi, 1985; Molteni, 1993).

<sup>4</sup> The scree plot criteria was used to define the number of groups.

*Table 2 (continues) – Component matrix rotated. Rotation method: Varimax with Kaiser normalisation*

<b>Motivation/beliefs</b>						
Improvement of health status	0,08	-0,33	-0,23	0,13	-0,06	0,74
Improvement of physical performance	-0,21	0,65	-0,10	0,10	0,13	-0,15
Insufficient ingestion with diet	0,01	-0,14	-0,23	0,11	-0,03	-0,70
Delaying ageing	0,14	-0,04	0,30	0,72	0,06	0,11
Alternative to medicines	0,21	-0,06	0,77	0,01	-0,09	-0,14
Self-perceived benefits	-0,07	0,05	-0,08	-0,10	0,14	0,15
<b>Supplement choice factors</b>						
Price	0,07	0,06	-0,03	-0,07	0,76	-0,07
<b>Influence</b>						
Consumption under recommendation of medical doctor	0,05	-0,24	0,45	-0,59	0,04	0,20

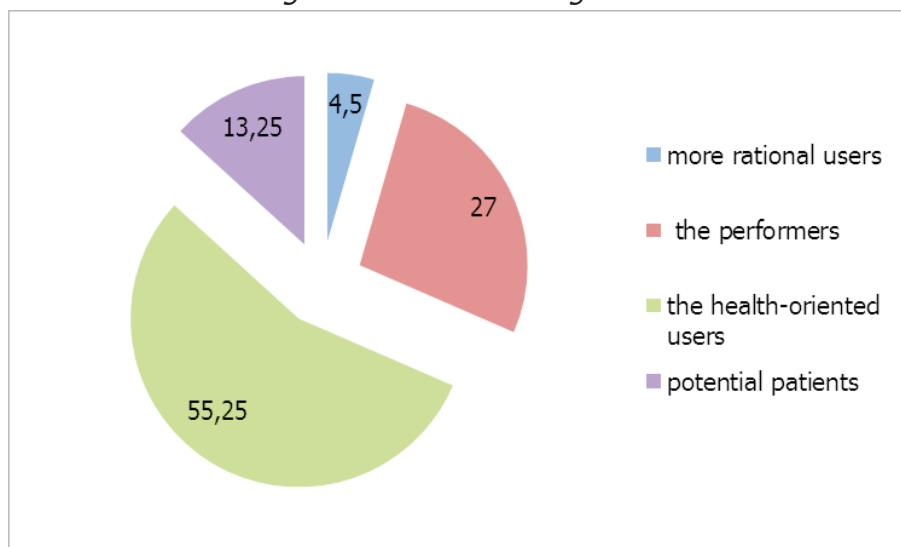
*Source: own elaboration*

*Table 3 – Consumer profiles*

	<b>Group</b>			
	1	2	3	4
Old and sick status	Positive	Insignificant	Insignificant	Insignificant
Guilty eating	Insignificant	Positive	Insignificant	Insignificant
No drugs but supplements	Insignificant	Insignificant	Insignificant	Positive
Prevention seeking	Insignificant	Insignificant	Insignificant	Positive
Rational behaviour	Very positive	Insignificant	Insignificant	Insignificant
Well-being seeking	Insignificant	Insignificant	Positive	Insignificant

*Source: own elaboration*

*Figure 1 – Consumer segments*



*Source: own elaboration*

Supplements choice of the more rational users is strongly driven by price. They are affected by hypertension or diabetes and have a poor self-perceived health status. This segment is characterised by higher age and a lower level of education.

The performers are young men with a low level of education that are driven by the purpose of improving physical performance. These supplement users showed an unhealthy eating pattern and a healthy lifestyle.

The health-oriented users are subjects that are driven by the search for improvement of health status and well-being. They tend to exhibit a relatively healthy lifestyle and an healthy eating pattern since they play sports and take control of their diets also with functional food. These subjects receive generally recommendations by doctors and have a great self-perceived of their benefit.

The potential patients are consumers that are well oriented towards prevention against possible health issues. They are driven by the purpose of delaying ageing and the possibility to use supplements as an alternative to medicines. They are mainly well educated women that play sports. They are also claimed to use functional food.

Logit regression estimates how the identified profile relates to the consumption probability of specific supplements. The coefficients indicate the probability to consume a category of supplements, more specifically the odds-ratio, when a consumer belongs to a certain segment.

Results indicate that probiotics are mainly consumed by price oriented, rational, consumers and those who are health oriented. Hence their consumption is influenced by the wish to pursue a healthy life style to keep the body in good shape. Similarly, multivitamins seem to be positively affected by the health oriented profile. Those consumers, in fact, play sports and tend to spend much attention to their body.

Performers, instead, most likely use supplements related to the keep the body in good shape, hence, low educated people driven by the purpose of improving their physical performance. Similarly, supplements dedicated to sport are most likely used by health-oriented consumers, but also to those that would like to improve their physical performance and the “potential patients”, which are well-educated women that play sports.

*Table 4 – Results of logit regressions*

	probiotic	multivitamin	bodyshape	sport	cardio	bonesjoint	health
Rational users	1.253* [0.567]	0.452 [0.483]	-1.253* [0.567]	-1.253* [0.567]	1.609* [0.632]	-2.079** [0.750]	-0.452 [0.483]
Performer	0.003 [0.192]	-0.111 [0.193]	1.904** [0.286]	0.375+ [0.196]	-2.833** [0.420]	-3.258** [0.510]	-1.421** [0.243]
Heath Oriented	0.686** [0.143]	0.282* [0.136]	-1.179** [0.159]	1.057** [0.154]	-3.579** [0.414]	-2.485** [0.252]	1.309** [0.164]
Potential patients	0.421 [0.281]	-0.113 [0.275]	-0.582* [0.286]	0.750* [0.294]	1.459** [0.351]	1.229** [0.328]	0.582* [0.286]
Observations	400						

Standard errors in brackets \*\* p<0.01, \* p<0.05, + p<0.1



*Source: own elaboration*

Supplements for cardiovascular problems are also consumed by “potential patients” but also most likely consumed by rational users, which adopt frequently price oriented choices. Potential patients are also consumers of supplements that integrate diet with elements that are beneficial to bones and joints. Finally, supplements of elements that improve other functionalities of the body, such as intestine mobility, sleep and ophthalmic are consumed by “potential patients”, which are also consumers of functional foods, and “health-oriented” people.

## **Conclusions**

Under the light of the substantial growth in consumption, recorded in Italy more than other countries, give the increasing awareness of consumers about the nutritional impact of an eventual unhealthy lifestyle, the present study furnish an additional piece of knowledge to the understanding of the determinants of the consumption, leading to a higher understanding of the role of nutrition awareness and beyond.

The present study is consistent with previous researches that focus on supplements consumption health oriented habits and attention to the body (Lambert et al. 2015, Wiltgren et al. 2015, MacKay and Dickinson 2014, Wiens et al. 2014).

Results indicate that the wider segments of supplements users are characterized, as expected, by a health-oriented behaviour, which confirm the “inverse supplement hypothesis”. The probable cause of this is that consumers motivated and able to lead a healthy lifestyle are more inclined to and capable to consume supplements. There are, however, determinants that go beyond lifestyle awareness. Socio-demographics differences as well as habits resulted keys to the understanding of the market dynamic and, hence, the consumption probability. These findings could have relevant implications for food industry, dieticians and policy makers. For example, “the health oriented users” and “the potential patients” segments, which cover together the 68% of the sample, are composed by consumers constantly willing to buy healthy products. They could be potential consumers of functional food and specific marketing campaigns could be directed to them.

In this way, this study could provide useful hints to implement public health guidelines that promote the assumption of both healthy food and supplements since childhood in order to prevent illness connected to an incorrect diet. Finally, more attention should be paid to nutrition policies oriented to adopt public communication campaigns for a proper use of supplements.

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