



Choosing a healthy and sustainable diet: A three-level approach for understanding the drivers of the Italians' dietary regime over time

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ABSTRACT

Dietary patterns play key roles in health promotion and in preserving the environment. A growing number of studies show the importance of individual factors on food consumption choices, such as socio-economic status, lifestyle variables and contextual and social factors that characterize the geographical area in which individuals reside. The Mediterranean Diet is a sustainable diet that respects the environment, thus reducing per capita emissions from food production in respect to less sustainable diet. The aim of this paper is to determine the Italians' prevailing food patterns using a composite indicator and to identify which factors determine a higher adherence to the Mediterranean Diet in Italy. By using 15 waves of the ISTAT "Aspect of Daily Life" survey, we constructed an original data set and referred to the multilevel approach which enabled us to distinguish between temporal and cross-sectional effects thus providing valuable insights to policy makers and stakeholders in order to promote the Mediterranean Diet and reap environmental and public health. The results show that education plays an important role in determining food consumption behavior while the tendency to practice sports on a regular basis and to have breakfast and lunch at home positively influence people's adherence to this diet.

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1. Introduction

Over the last decades, the environmental consequences of food patterns have become a major issue for policy makers, especially in developed countries where government, non-government and charitable organizations as well as civil society movements have developed sustainable dietary recommendations which safeguard human health and the environment (Barilla Center for Food and Nutrition, 2011; Health Council of the Netherlands, 2011, 2015; Inran, 2003; Swedish National Food Agency, 2015).

Indeed, food consumption and dietary patterns have proved to be strongly associated with individuals' health-related quality of life and with environmental impacts on ecosystems (Donati et al., 2016; Duchin, 2005; Goodland, 1997; Sáez-Almendros, Obrador, Bach-Faig, & Serra-Majem, 2013; Weber & Matthews, 2008; WHO, 2008). The food sector is responsible for between 15% and 31% of total greenhouse gas emissions (GHGE) (Garnett, 2008;

Tilman & Clark, 2014) even if the environmental impact depends on the types of food produced and consumed (Vieux, Darmon, Touazi, & Soler, 2013). Meat products proved to have a higher environmental impact than cereal products, fruit and vegetables as demonstrated in numerous studies (White, 2000; Tilman & Clark, 2014; Tukker et al., 2006, 2011; Westhoek et al., 2014; Gerber et al., 2013; Reijnders & Soret, 2003; Ness & Powles, 1997; Joshipura et al., 2001).

Many studies have analysed the factors influencing individuals' food choice patterns in order to determine the requirements for an environmentally sustainable food system, more eco-friendly food patterns and to help policy makers to design healthy dietary guidelines (Aranceta and Perez-Rodrigo, 2012; Hadjikakou, 2017; Verzeletti, Maes, Santinello, Baldassari, & Vereecken, 2010).

Individual food choices are influenced by a wide variety of individual and environmental (contextual) variables. French (2003, p.842S) emphasized that "three main dimensions related to food choices are taste, perceived value (which includes price and portion size) and perceived nutrition". The importance placed on each dimension vary among different individuals.

In this stream of literature, the influence of socio-economic

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status - measured using various indicators such as level of education, income, employment status, type of employment as well as composite indicators of individual or household wealth - has proved to play an important role in determining individuals' food choice patterns (Dernini & Berry, 2015; Lopez et al., 2009; Moreno et al., 2005; Scali, Richard, & Gerber, 2001). Several studies have highlighted that "people belonging to the lower socio-economic groups are more likely to follow less nutritious diets" (Benedetti, Biggeri, Laureti, & Secondi, 2016) characterized by a high consumption of refined grains and added fats (Darmon & Drewnowski, 2008; Katsarou, Bountziouka, & Panagiotakos, 2010). By referring to the three dimensions identified by French (2003, p.842S) "individuals of lower socioeconomic status may place greater importance on perceived value, whereas those more concerned about health and nutrition may attach more importance on the nutritional quality of foods". Therefore, even if people are aware of the beneficial effects of healthy food when they are faced with dimensions of price and taste, they may choose tastier, cheaper, but less nutritious food. Pechey, Monsivais, Ng, and Marteau (2015) studied the differences in food patterns among the various socio-economic groups and showed that individuals with low socioeconomic status have a dietary pattern mainly composed of less healthy foods and beverages while people belonging to high socioeconomic groups tend to follow a healthier diet.

As regards to European countries, De Irala-Estevéz et al. (2000) found a positive association between socio-economic status and fruit and vegetable consumption, while in Spain, Aranceta, Perez-Rodrigo, Ribas, and Serra-Majem (2003) showed that children and young people with a low socioeconomic background and those with undereducated mothers consume high quantities of sweets, high-fat bakery products and sugary and salted snacks, but they consume fewer vegetables. Del Mar Bibiloni et al. (2011) analysed a sample of Balearic Islands' adolescents and found that "low parental socio-economic status, much leisure-time spent in sedentary behaviours such as media screen time and body image" are factors associated with the "Western" dietary pattern and therefore with a low level of adherence to the Mediterranean dietary regime.

Despite the increase in studies concerning the relationship between socio-economic and lifestyle factors and the adherence to a sustainable diet, few studies have been carried out on this issue in Italy therefore further research is required to improve policy-making.

The aim of this paper is to contribute to this literature by exploring the main socio-economic factors influencing people's food habits in Italy which is historically identified as a country with a high adherence to Mediterranean dietary patterns (Trichopoulos & Pagona Lagiou, 1997).

Among the various nutritional patterns, the traditional Mediterranean Diet (MD) appears to be the healthiest and most well-balanced diet due to environmental and human health benefits: healthy foods which should be frequently consumed - such as fruits, vegetables, cereals, legumes and fish (Trichopoulou et al., 2003; Bach-Faig et al., 2011) - are also foods with a low environmental impact.

In fact nowadays, the MD is appreciated for its low environmental impact, mainly due to the large amount of plant-derived products and reduced consumption of animal products compared to other dietary patterns (De Boer, Helms, & Aiking, 2006; De Boer, 2009; Tilman & Clark, 2014). Due to its nutritional characteristics as well as its economic, environmental and socio-cultural impacts, the MD has been recognized by Unesco as an intangible cultural heritage of humanity (Germani et al., 2014). The MD is a sustainable diet which, according to the recent definition of the FAO, has low environmental impacts, contributes to food and nutrition security

and promote healthy lifestyles for present and future generations. Moreover, sustainable diets safeguard biodiversity and ecosystems, are economically fair and affordable and optimize natural and human resources (FAO, 2010).

UNESCO considers the MD as a "Mediterranean way of living", which means eating healthy food but also adopting a specific way of life consisting in conviviality, traditions and a moderate amount of daily physical activity (Bonaccio, Iacoviello, & De Gaetano, 2012). In the most recent versions of the well-known "Mediterranean Diet Pyramid", there are further recommendations for a correct lifestyle, such as how much water and wine should be drunk, how much time should be dedicated to physical activity, the importance of consuming local produced food and the safeguarding of the environment with the aim of promoting a "healthier food-lifestyle" thus reducing the incidence of chronic diseases (Bach-Faig et al., 2011).

Some lifestyle factors are of particular interest in the context of the "Mediterranean Way": the social support and sense of community that accompanies sharing food with family and friends; lengthy meals that provide relief from stress and afternoon naps which give individuals the opportunity for rest and relaxation (Willett, 1995).

Bearing in mind these special characteristics of the MD, some studies have investigated the effects of the timing of eating events throughout the day (Ma et al., 2003) as well as daily food habits, such as dining with family members and having stricter dietary rules (Verzeletti et al., 2010). Moreover, Mancini, Marchini, and Simeone (2016) found that psychological stress is a potential risk factor for an incorrect dietary pattern and proved the existence of a cyclical and reciprocal interaction between stress, inadequate diet and socio-relational environment.

Most of the studies carried out in Italy evaluated citizens' adherence to the MD and the health benefits obtained (Sofi et al., 2010; Leclercq et al., 2009; Germani et al., 2014) while few studies have examined the role of socio-economic and lifestyle factors in creating differences among dietary patterns (Bonaccio et al., 2012; 2013; 2014) and refer to specific Italian regions or sub-groups of inhabitants. Grosso et al. (2013), in their study on Italian residents in Sicily, showed that adolescents living in the urban areas of the island were more likely to adopt different dietary habits from the traditional MD. Physically active adolescents showed higher adherence and higher odds of adherence to the MD than low active and sedentary adolescents. As regards to the Molise region, Iacoviello et al. (2012) found that the MD is widely followed by the elderly who are fond of local agricultural traditions.

By using 15 waves of the Istat "Aspect of Daily Life" (ADL) survey we constructed an original data set which include temporal (from 1997 to 2012), geographical (19 regions) and individual dimensions (more than 690,000 individuals) concerning food consumption habits in terms of frequency of intake of various types of food per day, week or less often. Although the ISTAT survey does not collect data regarding the quantities and quality of food, its representativeness at national and regional levels makes this survey an important official source of data for exploring the evolution of the Italians' dietary pattern.

In accordance with the Food-Frequency-Questionnaire approach, the degree of adherence to the MD in the Italian adult population for the period 1997–2012 was assessed by constructing a composite indicator. Focusing on the role lifestyle and socio-economic variables play in influencing citizens' adherence to the MD, we analysed individual food consumption patterns across the Italian geographical areas bearing in mind their evolution over time.

Using multiple waves of data taken from cross-national surveys within the multilevel framework enabled us to distinguish

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