

Exploring the Italians' food habits and tendency towards the Mediterranean diet

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Abstract

At first sight, the Mediterranean diet appears to be the best and most well-balanced diet to follow as it links environmental and human health. Unfortunately, it seems that Mediterranean countries are replacing the traditional Mediterranean diet with other less healthy eating habits and orienting their food choices towards products typical of the Western diet which is characterised by a high intake of animal products, refined grains, saturated fats without taking into consideration health issues and environmental sustainability.

By using repeated cross-sections of the ISTAT "Aspects of daily-life" survey over the period 1997-2012, we assess the Italians' prevailing food pattern and explore how it has changed over time and across regions in Italy. Moreover, the role of the socio-demographic and lifestyle factors are investigated.

Keywords

Mediterranean Diet; Socio-economic factors; repeated cross-sections

Introduction

Dietary patterns have consequences for both human health and environment: food production and consumption are also inevitably a driver of environmental pressures, particularly in relation to climate change, water use, toxic emissions and greenhouse gas emissions (GHG), such as CO₂, CH₄ and N₂O, which are responsible for global warming. In this stream of literature, an increasing number of studies investigate the environmental impact of dietary models. In particular, recent studies have shown that meat products have the most Global Warming Potential, while cereal products as well as fruit and vegetables have a lower impact on global warming (Tilman and Clark, 2014). Moreover, Weber and Matthews (2008) carried out a study in the U.S., which show that by eating local and seasonal food, and substituting meat with fish, eggs or pulses would lead to a reduction of CO₂ emissions. Scarborough et al. (2012) showed that by replacing meat with fruit, vegetables and cereals could reduce GHG emissions in the UK by up to 19%. Recently,

Green et al. (2015) showed that if the average diets of UK adults conformed to WHO recommendations, their associated GHG emissions would be reduced by 17%.

Therefore, the diffusion of dietary patterns that can contribute to solve the diet–environment–health trilemma is a global challenge of great environmental and public health importance (Tilman and Clark, 2014).

For these reasons, over the last few years, the Mediterranean diet (MD), a collection of eating habits traditionally followed by people in the various countries bordering the Mediterranean, has received growing attention as it represents a sustainable diet in which nutrition, local food production, biodiversity, culture and sustainability are strongly interconnected, with a low impact on the environment (Germani et al., 2014). Indeed, the traditional MD is characterized by a high consumption of vegetables, fresh fruit, legumes, cereals and a moderate intake of alcohol as main source of fiber and antioxidants, with fish, nuts, and olive oil that ensure a high intake of monounsaturated fatty acids, associated with a low intake of trans fatty acids from meat and sweets (Bach-Faig et al. 2011). Therefore, food groups that are recommended in higher quantities for health, such as fruits, vegetables and fish, also have a lower impact on the environment (BCFN,2011).

However, it seems that Mediterranean countries are replacing the traditional MD with other less healthy eating habits and orienting their food choices towards products typical of the Western diet which is rich in refined grains, saturated fats, sugars, red and processed meat, without taking into consideration health issues and environmental sustainability (Laccetti et al.2012).

There are several reasons why people keep on drifting from one dietary regimen to another. In recent years a growing number of research have focused on the exploration of the relationships between socio-economic factors and the adherence to the MD by emphasizing the role of occupation, income and education (Scali et al.2001, Lopez et al.2009) in influencing individuals' dietary patterns.

Several studies found that people in lower socio-economic status are more likely to exhibit poorer diets therefore emphasizing the role of socio-economic status as a barrier to a healthy lifestyle (Darmon and Drewnowski, 2008, Katsarou et al.2010). Bibiloni et al. (2011) focusing on a sample of adolescents living in the Balearic Islands found that low parental socioeconomic status, much leisure-time on sedentary behaviours such as media screen time as well as body image are factors associated with a low adherence to MD dietary pattern.

It is therefore essential to explore if and to what extent Italians adhere to the MD eating pattern and to identify those factors influencing people's dietary habits.

Recent nutritional surveys carried out in Italy also confirmed that income and education are associated with a greater adherence to Mediterranean style eating patterns. In particular, by focusing their research on a sample of Italian individuals involved in the Moli-sani project, Bonaccio et al. (2012) and Bonaccio et al. (2013) found that income and education are associated with a greater adherence to Mediterranean style eating patterns.

However, most studies are cross-sectional and focused on specific Italian regions and sub-groups of residents (see for example Grosso et al (2013) Iacovello et al (2007) Sofi et al (2005).

In May 2014 the Italian Statistical Institute (ISTAT) released micro-data from the Italian multipurpose "Aspect of Daily Life" (ADL) survey, carried out annually since 1993. Therefore,

for the first time micro-data on Italians' food consumption pattern are available from 1993 to 2012. Indeed, a specific section is devoted to the exploration of individuals' food consumption habits in which the participants are questioned about their frequency of intake of various types of food and they are asked to self-report the frequency of these intakes in terms of times per day, week or less often. Although the ISTAT survey does not collect data regarding quantities and qualities 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.

The aim of this paper is twofold. Firstly to assess the prevailing food pattern and explore how it has changed over time and across regions in Italy.

Secondly, to analyze the relationship between socio-economic characteristics and the Italians' food pattern, by constructing a wealth indicator and using more than 630,000 observations.

Method

The Italians' food pattern: from frequencies to a composite indicator

Various methods have been used in literature to construct Mediterranean diet indexes with the aim of evaluating the adherence of a population to the MD. These indexes summarize the diet by means of a single score that results from a function of different components, such as food, food groups or a combination of foods and nutrients, which are previously selected based on prior knowledge or scientific evidence (Bach et al., 2006).

In this paper we refer to the widely used approach based on *Food Frequency Questionnaires* which assigns positive or negative scores to the frequency of consumption of various types of food (Trichopoulou et al. 2003, Goulet et al 2003 Agnoli et al, 2011; Panagiotakos et al, 2014).

As already mentioned, the data set used for our analysis was constructed from the Istat multipurpose ADL survey, it is based on the frequency of consumption and does not consider the quantity of consumption thus leading our analysis to the trend of Italians' food pattern evolution rather than to the absolute values of adherence to the MD obtained for each year. It is worth noting that the types of food whose consumption has been monitored by the survey have increased across years: from 5 groups of food (meat and processed meat; milk and dairy products; vegetable; fruits; fish) considered in 1993, the survey has arrived to consider up to 15 types of food in the 2012 survey.

Bearing in mind the rationale of the MD, the components of the Mediterranean pyramid (Bach-Faig et al, 2011) and taking into consideration the availability of information across the various waves of the ISTAT survey, we considered in our analysis 15 repeated cross-sections of this survey for the period 1997-2012 and taking into account the Mediterranean pyramid recommendation, we evaluated the Italians' adherence to the MD by constructing the Mediterranean composite score. This index summarizes the frequency of consumption of 12 selected types of food as well as oils and/or fats used in the case of raw or cooked food.

Specifically, we identified the following 12 food groups to be analysed for the period 1997-2012 : i) Pasta, bread and rice; ii) Leafy vegetables (i.e. spinach, salads); iii) Vegetables (i.e. tomatoes, eggplant, carrots); iv) Fruit; v) Milk; vi) Fish and seafood; vii) White meat (turkey, chicken, rabbit); viii) Red meat (beef, veal, etc.); ix) Processed meat (sausages, ham, salami, etc...); x) Eggs; xi) Dairy products (yogurt, fresh cheese, mozzarella, etc) and cheese. In addition the types of oils and/or fats used for cooking food and for dressing were considered by distinguishing into olive oil, vegetable oil and other fats, butter and lard. Both for the use in raw or cooked food, the highest score (equal to 4) was assigned to olive oil, 2 points were assigned for vegetable oils while a score equal to zero were assigned for butter and lard.

As a result, we evaluated the adherence to the MD by constructing the Mediterranean composite indicator which summarizes for each individual included in the survey the frequency of consumption of the 12 types of food investigated as well as the consumption of oils and fats for cooking food and dressing. Therefore the frequencies of consumption of 14 types of food were included in the indicator we constructed. A score ranging from 0 to 4 was assigned to the frequency of consumption of each selected food component on the basis of the degree of adherence to the Mediterranean diet. For those types of food identified as beneficial components - identified as fruits, vegetables and leafy vegetables, cereals and grains, fish, olive oil (Trichopolou et al., 2003; Goulet et al., 2003; Bonaccio et al., 2012) - located at the bottom of the Mediterranean pyramid (Bach-Faig et al., 2011) a high score reflects a high consumption. On the other hand, for food groups in the higher part of the pyramid and for the types of food at the top of the pyramid (red meat and processed meat) a higher score was attributed for a lower frequency of intake. Table 1 and table 2 summarize scores for each of the 14 components considered in the analysis.

Table 1. Scores for each food group

Food group	More than once a day	Once a day	A few times per week	Less than once a week	Never
Pasta, rice and bread	4	3	2	1	0
Leafy vegetables	4	3	2	1	0
Vegetables	4	3	2	1	0
Fruit	4	3	2	1	0
Milk	3	4	2	1	0
Fish	1	3	4	2	0
White meat	0	1	4	3	2
Red meat	0	0	2	4	3
Pork	0	0	4	4	3
Processed meat	0	0	1	4	3
Eggs	0	2	4	3	1
Dairy products and cheese	1	2	4	3	0

Source: own elaboration

Let FFS_{zit} be the numeric score assigned to individual i ($i=1,\dots,N$) observed in period t ($t=1,\dots,T$) for the frequency of consumption of food group z ($z=1,\dots,Z$), the general formulation of the Mediterranean Diet Index (from now on: MDI or MD index) can be obtained for each individual in each period of time as follows:

$$MDI_{it} = \sum_{z=1}^Z FFS_{zit} \quad [1]$$

with Z=14 food groups, each of them contributing with unitary weight to the global indicator. As a result, the MDI can assume values between 0 (minimal adherence to the MD) and 56 (maximal adherence to the MD). It is worth noting that in the computation of the index we considered a minimum cut-off age equal to 14.

Table 2. Scores for types of oils and/or fats used

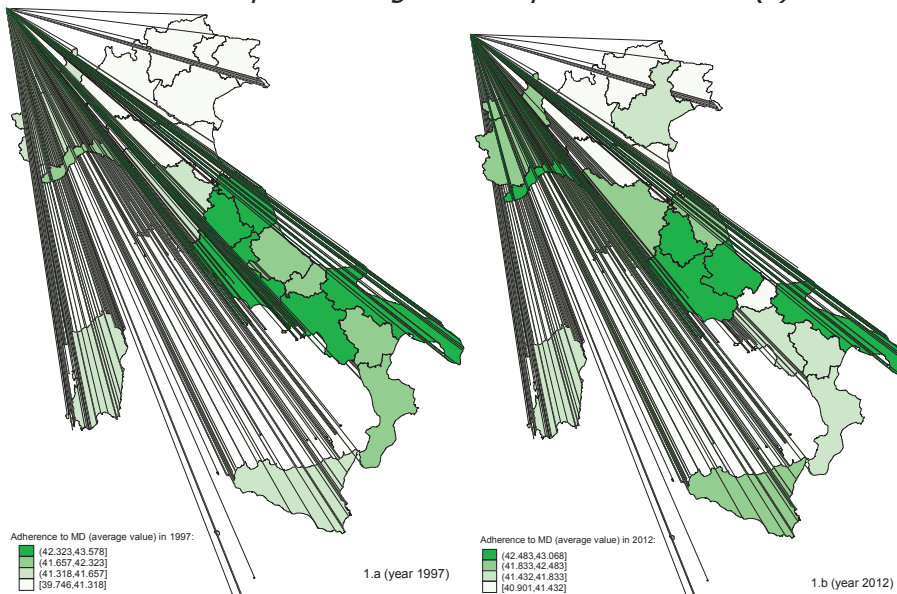
Type of oil/fats used for...	Olive oil	Vegetable oil and other fat	Butter and lard
Cooking food	4	2	0
Dressing food	4	2	0

Source: own elaboration

The Italians' food pattern: territorial differences and the role of socio-economic factors

Concerning differences across territorial areas, Figure 1 shows the classification of Italian regions into quartiles in 1997 and 2012 according to the ordered distribution of the average level of adherence to MD. Therefore each region is included in a specific quartile, which contains 25% of the observations.

Figure 1. Italians' food pattern: regional comparisons in 1997 (a) and 2012 (b)



Source: own elaboration based on Istat ADL survey data

It can be observed that Lazio, Umbria and Puglia are the regions in the highest quartile both in 1997 and in 2012. In 2012 Abruzzo and Liguria were also included in the 25% of the regions with the highest values of the Mediterranean score.

In our study we assessed the individuals' socioeconomic status by constructing a composite relative indicator through the Multiple Correspondence Analysis (MCA). Indeed, the MCA has been used for the construction of composite indicators when only categorical variables are available in a similar approach to the Principal Component Analysis (PCA) based approach used for constructing composite indicators when only quantitative variables are available.

The general formulation and the steps we carried out for constructing the Composite Wealth Indicator (CWI) can be summarized as follows.

From our data set we firstly identified five variables as proxies of individuals' wealth status, available in the ADL survey, to be included in the MCA: *i*) dwelling ownership; *ii*) whether one has spent a holiday period of at least 4 nights in the last 12 months or not; *iii*) number of cars owned; *iv*) judgment concerning the economic resources of all household members (categories ranging from "excellent" to "totally inadequate"). Then we computed the CWI by

using the weight $W_{j_k}^k = \frac{S^k}{\sqrt{\lambda_1}}$ obtained from the MCA as the ratio between the factor score s

on the first axis normalized by the eigenvalue. Therefore the CWI can be expressed as:

$$CWI = \frac{1}{K} \sum_{k=1}^K \sum_{j_k=1}^{J_k} W_{j_k}^k I_{j_k}^k \quad [2]$$

where k is the number of dimensions (variables) with $k=(1,2,\dots,K=4)$, j the number of modalities of each dimension with $j=(1,2,\dots,J_k)$ and I the binary (0/1) indicator of each modality. According to the expression [2], the composite indicator can be viewed as the average across dimensions (variables) of the weighted sum of each binary modality of each dimension. Lastly, we referred to the *min-max* approach for obtaining the relative CWI ranging between 0 and 1.

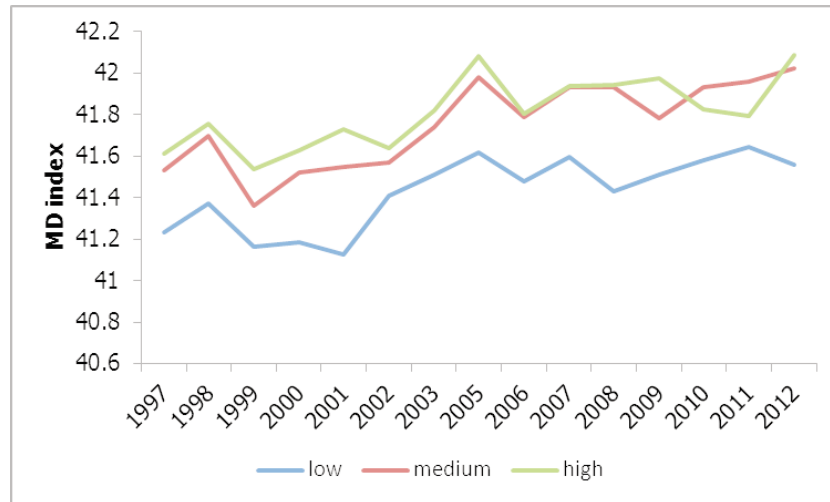
Figure 2 shows the average adherence to MD of Italians by distinguishing three levels of wealth. In fact, based on the values of the relative CWI we identified the following categories: *i*) individuals with a low level of wealth if values of CWI are lower to the first quartile (0.68); *ii*) individuals with a medium level of wealth if values of CWI range between the first and third quartile (0.83); *iii*) individuals with a high level of wealth if values of the CWI are greater than the third quartile.

It can be observed that people with a low level of wealth have lower adherence to the MD than individuals in the middle and high levels. In particular, the lowest level of adherence to MD for those individuals is observed in 2001. In the years following 2001 there was an increase of adherence up to 2005 while another relative minimum value was for this group of individuals in 2008.

For the individuals with a medium and a high level of wealth a similar trend is observed, above all in the years between 1997 and 2008. In 2009 we observed a reduction in the adherence to MD for individuals with a medium level of wealth middle-level while increasing values characterized the years from 2010 to 2012. On the other hand, stationarity is observed in the average values for individuals with a high level of wealth in the years 2007-2009 while decreasing values are observed in the years 2010-2011. In 2012 there was an

increase, which lead this groups of individuals to the have the highest average level of adherence to MD.

Figure 2. Italians' food pattern and wealth levels: years 1997-2012

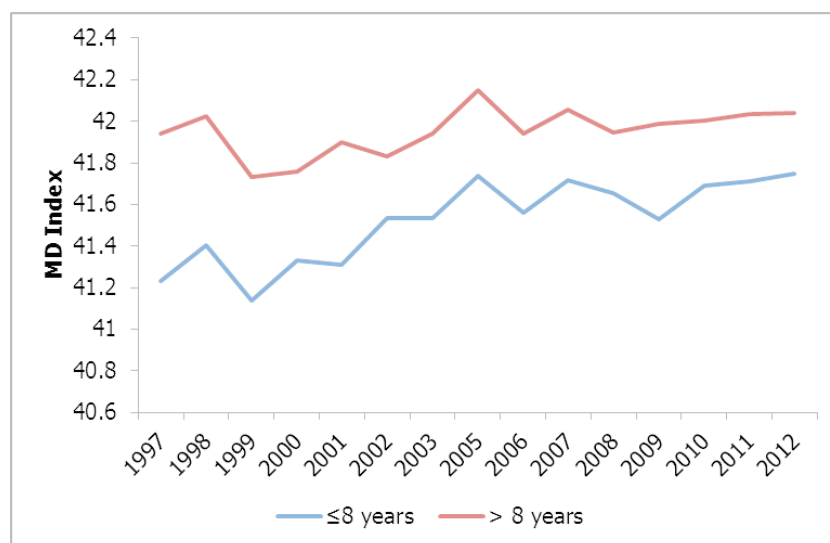


Source: own elaboration based on Istat ADL survey data

With the aim of analyzing the role of level of education, we computed for each individual the numbers of years of education completed. The variable ranges from 0 – for those individuals who have not completed any year of education - and 20 for individuals who completed the tertiary level of education (master or doctoral level). For the analyses presented in this section, the education level was divided into two classes: individuals with a *low level of education* if the number of years completed is lower or equal to 8 and people with a *medium-high level of education* if the number of years of education completed is greater than 8.

Figure 3 show the average levels of adherence to the MD for the two groups of individuals classified according to the level of education.

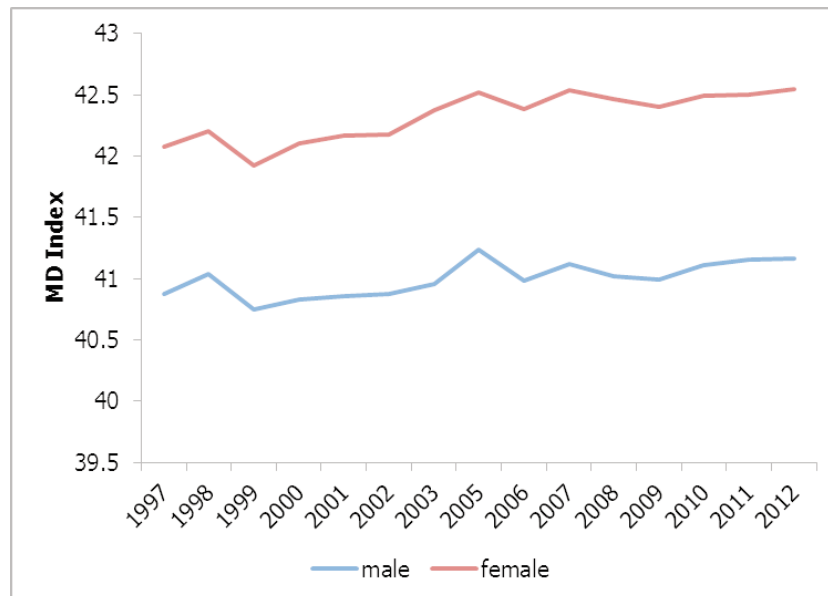
Figure 3. Italians' food pattern and education levels: years 1997-2012



Source: own elaboration based on Istat ADL survey data

It can be observed that individuals with a high level of education have maintained a higher level of adherence to MD throughout the entire period analyzed even if a reduction in the gap between the average levels can be observed. In fact the absolute distance between the average of two groups was approximately equal to 0.71 and reduced up to 0.31 in 2012. By distinguishing the Mediterranean score for gender, females proved to have a higher level of adherence towards the MD than males for all the years analyzed as shown in Figure 4. For males, the maximum level of adherence was registered in 2005 while for females in 2012.

Figure 4. Italians' food pattern and gender: years 1997-2012



Source: own elaboration based on Istat ADL survey data

By focusing on individuals aged at least 14 our pooled data set includes 633,204 individual observations. Table 3 shows the estimation results of the regression model on the pooled sample and by considering as dependent variable the MD indicator. The selection of covariates to be included in the model was carried out on the basis of ANOVAs and t-tests, whose results are not reported here due to space limitation.

Interesting results emerge from the estimated model. Firstly, demographic characteristics were found to be associated with the Italians' food pattern. In fact, older people tend to follow a dietary pattern closer to the MD as well as females compared to males. Secondly, a higher level of adherence to the MD characterizes non-smokers and former smokers who tend to follow a food dietary pattern closer to the MD compared to people who currently (at the moment of the interview) smoke. Thirdly, a healthier food pattern characterizes people with a medium or a high level of wealth status while individuals with a low level of education (less than 8 years) tend to follow a food dietary pattern different from the MD.

Table 3: Estimation results: Pooled OLS

	Coef.	Std. Err.	Sig
Gender (ref. Male)			
Female	1.130	0.013	***
Age			
14-24	0.042	0.134	
25-34	0.786	0.135	***
35-44	1.107	0.135	***
45-54	1.646	0.135	***
55-64	2.046	0.136	***
65 and over	2.105	0.136	***
Smoking status (ref. current smoker)			
Former	0.884	0.018	***
Never	0.983	0.016	***
Sport (ref. No)			
(At least) occasionally	0.434	0.017	***
Years of education completed (ref. > than 8 years)			
≤ than 8 years	-1.016	0.014	***
Wealth status (ref. Low)			
Medium	0.173	0.015	***
High	0.299	0.021	***
Occupational status (ref. Employed)			
Job seekers	0.176	0.026	***
Not in labour force	0.213	0.016	***
Marital status (ref. Unmarried)			
Married	0.627	0.018	***
Divorced or widowed	0.212	0.024	***
Year (ref. 1997)			
1998	0.096	0.029	***
1999	-0.173	0.032	***
2000	-0.069	0.032	**
2001	-0.072	0.032	**
2002	-0.049	0.032	
2003	0.100	0.032	***
2005	0.281	0.033	***
2006	0.046	0.033	
2007	0.172	0.033	***
2008	0.108	0.033	***
2009	0.058	0.033	**
2010	0.095	0.033	***
2011	0.124	0.033	***
2012	0.127	0.034	***
Intercept	39.171	0.136	***

Source: own elaboration based on Istat ADL survey data

Conclusions

This paper presents new empirical evidence on food consumption pattern in Italy using 15 repeated cross-sections obtained from the ISTAT ADL survey for the period 1997-2012. Although the data used did not include information on quantities of food and therefore the

analysis is limited to the frequencies of consumption, the analysis of factors influencing Italians' dietary habits could help to promote the MD thus reaping benefits both in terms of public health and environmental impact.

Our results show that education proved to have a central role in determining food consumption pattern as well as people with a higher wealth status who tend to adopt a dietary pattern closer to the MD. This result seems to confirm that the cost of MD could represent an economic barrier therefore hindering the diffusion of this sustainable diet.

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