Impact of the economic crisis on health-related behaviors in Italy

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Table 1 – Results of linear regressions (2000-2007 vs. 2008-2015).

Figure 1 – Smoking behavior among people aged > 14 years old (Nr. of smokers per 100 persons with same features)

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INTRODUCTION

After the onset of the late 2000s Great Recession (GR), many concerns arose regarding the possible impact of the economic downturn on the health of the populations (World Health Organization, 2011). A large amount of evidence produced in the last years pointed out a general detrimental effect of economic crises on health when austerity measures are implemented, namely when the budget destined to welfare and social protection is cut (Stuckler & Basu, 2013; Frasquilho et al., 2016; Margerison-Zilko et al., 2016; Martin-Carrasco et al., 2016). Possible moderators of this were recognized in the amount of investments in active labor market programs, and, more generally, in social protection (Stuckler et al., 2009; Stuckler & Basu, 2013). With respect to the GR, its outcome on health seems to have been largely negative worldwide (Margerison-Zilko et al., 2016). Only a few studies, however, have investigated the impact of the crisis on health-related behaviors, though this topic is particularly relevant, considering the change occurred in the last twenty years in the ranking of major risk factors for the global burden of disease, namely the shift from risks for communicable diseases (peculiarly among children) towards risks for non-communicable diseases (peculiarly among adults) (Lim et al., 2013). For example, tobacco smoking and secondhand exposure (still the second leading risk factor for global disease burden) are responsible for about 6.3 million annual deaths worldwide and 6.3% of the global burden of disease, mostly in low- and middle-income countries (Lim et al., 2013; Ezzatti & Riboli, 2013). In western Europe and north America smoking (active or second hand) is the leading risk factor, while in eastern Europe, Andean Latin America, and southern sub-Saharan Africa in 2010 was alcohol use. As far as diet and physical inactivity are concerned, in 2010 they accounted for 10% of global DALYs (Lim et al., 2013).

Another reason why health-related behaviors are worth studying is represented by their link with psychological conditions and mental health. With respect to alcohol and tobacco consumption, it is

widely recognized the frequent co-occurrence of such behaviors in groups of people affected by mental disorders, along a spectrum that spreads from the construct of dual diagnosis to the coping mechanisms an individual can activate to regulate negative emotions and face a stressful situation, as financial strain and unemployment (Cooper et al., 1995; Kessler, 2004; De Vogli & Santinello, 2005; Graham et al., 2007; Sinha, 2008). The link between the latter and harmful substance use was recently addressed by de Goeij et al. (2015), who proposed two behavioral mechanisms that may impact on alcohol-related behaviors and tobacco use in times of financial hardship. The first one posits that during economic crisis alcohol consumption decreases since less money is spent on alcoholic beverages, due to tighter budget constraints. This mechanism seems cross-sectional to all population subgroups, across the majority of countries. The second behavioral mechanism is based on psychological distress and leads to increase alcohol consumption.

Placed within the framework of the stress-vulnerability model, alcohol consumption and tobacco smoking may represent “mechanisms of coping”, though ultimately dysfunctional, to obtain short-term relief in times of heavy distress, such as in periods when work is threaten (Jarvis & Wardle, 1999). Similarly, food may represent an easy-to-obtain “anxiolytic”, considering the well-known relation between stress and diet (Yau & Potenza, 2013). Therefore, changes in the individuals’ diet may be due not only to decreased availability of money, with subsequent access to low quality food; as for tobacco and alcoholics, food choices may represent a way of coping with a difficult and stressful moment of life. Another similarity concerning tobacco and alcohol on the one hand, and diet and obesity on the other, is that stress represent a common risk factor for both obesity and addiction (Sinha & Jastreboff, 2013).

Steptoe and Marmot (2003) studied the associations between biobehavioral risk factors and quality of life. Even if no association stemmed out between health behaviors and the psychosocial adversity and vulnerability index studied, significant associations emerged with psychological distress, depression,

hopelessness, sleep problems, hostility, low self-esteem and loneliness, independently of age, sex, socioeconomic status, and marital status. Also, higher psychosocial adversity or vulnerability was associated with levels of glycohemoglobin, plasma fibrinogen, plasma viscosity, and body mass (the latter among women). Altogether, these data encourage to further study the relation between socioeconomic environment, individuals' distress, behavioral responses and mental health outcome.

The aim of the present study is to assess the impact of the economic crisis on health-related behaviors linked to population mental health in Italy. Differently than other Eurozone members, since 2008 Italy has suffered a triple-dip recession, with the first begun in 2008, the second in 2011, and the third in 2014 (O'Brien, 2014). In the same period, austerity measures were implemented by the Italian Governments, and negative short-term effects on the health of the Italian population were reported. In the first years of economic crisis (i.e. 2008-2010), an increase in suicides and attempted suicides specifically due to financial problems was reported in Italy (Mattei et al., 2011; De Vogli et al., 2012; Mattei et al., 2014). Also, a noticeable effect was pointed out in terms of increased ischemic heart disease and cardiovascular mortality (Mattei et al., 2014; Torbica et al., 2015), consumption of nicotine (Gallus et al., 2011) decreased consumption of expensive illicit drugs and increased consumption of cheap illicit drugs (Zuccato et al., 2011), and an increase in the "occasional" consumption of alcoholic beverages (Mattei et al., 2014). Yet, the majority of studies published on the impact of the economic crisis on the health of the Italian population concerned the first years of economic crisis and there is little information on how the crisis changed health related behaviors such as smoking, diet and physical activity, that may be linked to the change in the socio-economic environment by means of psychological mechanisms and levels of perceived distress. Starting from available evidence on this topic, our hypothesis was that the economic downturn had caused an increase in alcohol and tobacco consumption (Hammarström & Janlert, 2003), as well as an increase in physical activity (since in times of

financial hardship people travel less, especially by car, with a noticeable reduction in traffic fatalities; Uutela, 2010). With respect to overweight and obesity, we had actually no conclusive hypothesis, given that both increased and decreased overweight may have been expected: the first due to cheap, junk food consumption, the latter due to increased physical activity.

METHODS

Study design and data collection

This is a descriptive study. The following health indicators were collected: alcohol consumption (data refer to people aged over 11 years old, consuming alcohol in the year, everyday, occasionally or out of meal; also, data referring to males and females aged over 15 years old, consuming alcoholics, namely wine and beer, in the week or everyday were collected), smoking behavior (number of current smokers, number of former smokers, number of non-smokers, number of smoked cigarettes: 1-5 per day, 6-10 per day, 11-20 per day, >20 per day, mean number of smoked cigarettes per day), physical activity (number of people practicing regularly, unregularly, only sometimes or never) obese people aged >18, obese males aged >18, obese females aged >18, overweight people (males and females) aged >18, overweight males aged >18, overweight females aged >18; people, males and females, eating beef and fish every week, and cheese and vegetables everyday. All indicators represented the number of people having that condition or behavior per 100 people with the same features. Also, following economic indicators were collected: Italian families' expenditure for alcohol beverages, tobacco and narcotics,

Italian families' expenditure for alcohol beverages only, tobacco and narcotics, Italian families' expenditure for narcotics only (all expressed in Euro per year), rate of unemployment, GDP per capita. All data were obtained from the website of the Italian National Institute of Statistics, ISTAT (www.istat.it), in particular from the ICT system "Health for All Italia", a territorial informatics system about health that may be freely downloaded at the following site: http://www.istat.it/it/archivio/14562 and from I.Stat, a wide database provided by ISTAT at the following site: http://dati.istat.it.

The period of time considered was 2000-2015, but please note that for some indicators data were not available for the entire period.

Dating the Great Recession

As far as the recession dating is concerned, it is important to notice that it did not start simultaneously worldwide. In the present study, as far as Italy is concerned, 2008 was considered the first year of recession, given that the third and fourth trimester of that year recorded a consecutive negative variation of GDP (source: ISTAT). Also, in 2008 the Italian rate of unemployment increased for the first time after ten years, starting from the fourth trimester. It can be assumed that the second half of 2008 corresponds to the time when the Italian population began *experiencing* the crisis (Mattei et al., 2014). Further details about the GR and the main causes that led to the worst economic crisis since the 1929 Great Depression may be found elsewhere (De Vogli & Owusu, 2014).

Statistical analysis

The analysis was carried on by means of linear regression models, with the dependent variable represented by all collected health indicators while independent variables were time and crisis years. Time was referred to years from 2000 to 2015; crisis was a dummy variable having the following values: 0 for years 2000-2007, 1 for years 2008-2015, to test the possible effect of the economic crisis on the collected indicators (absence of economic crisis vs. presence of economic crisis). As OLS regression analysis suits better when the assumption of homoscedasticity is valid, which is usually the exception in psychiatric epidemiology and econometrics, 95% confidence intervals were estimated for all coefficients on the basis of heteroscedasticity-robust standard errors. STATA 13.0 (Stata Corporation, College Station, TX, USA) was used for all analyses. Since data about alcohol consumption in the year, everyday, occasionally or out of meal in years 2000-2003 refer to the percentage of people aged over 14 years old, while in years 2005-2014 refer to people aged over 11 years old (data recording was changed by ISTAT), the regression analysis for such variables included observations only for years 2005-2014.

As data were anonymous and aggregated at the origin, Ethics Committee approval was not sought.

RESULTS

Table 1 shows the results of the regression analysis, that compares the years of economic crisis (2008-2015) with the previous ones (2000-2007).

With respect to alcohol consumption in the year and out of meal among people aged 11 or more, a significant reduction was noticeable in the period of time considered, with no apparent effect due to the crisis. Differently, considering the overall rate of people aged 15 or more who consume alcoholics more than once per week, a significant decrease was noticeable (Beta = -0.60, 95% CI = -0.96; -0.24), peculiarly among men (Beta = -0.95, 95% CI = -1.50; -0.41). The consumption of beer and wine showed a steady

and significant decline, without association with the economic situation; similarly, the percentage of people who never drank showed a steady increase, not influenced by the crisis. Binge drinking behaviors among people aged >11 years old were not associated with the years of economic crisis (2008-2015), though an increase was noticeable in the years of the GR (2008-2010), from a descriptive standpoint, both among men and women.

(Display Table 1 about here)

With respect to smoking (Fig. 1), the analysis pointed out an increase in the number of smokers (Beta = 1.68, 95% CI = 0.17; 3.20), heavy smokers, i.e. people smoking 11-20 cigarettes per day (Beta = 2.18, 95% CI = 0.12; 4.26) or more than 20 cigarettes per day (Beta = 1.04, 95% CI = 0.45; 1.62) and mean number of smoked cigarettes per day (Beta = 0.56, 95% CI 0.13; 0.99). Also, prevalence of overweight increased during the economic downturn (Beta = 0.91, 95% CI 0.03; 1.79). Italian families' expenditure for alcoholic beverages (expressed in Euro per year) were negatively associated with the economic crisis (Beta = -812.80, p = .01).

All variables concerning physical activity and diet were not influenced by the economic crisis.

(Display Figure 1 about here)

DISCUSSION

The main results of the present study concern smoking behavior, overweight and alcohol consumption. With respect to the latter, Italian data seem consistent with other studies (Bor et al. 2013; Asgeirsdottir et al., 2014; Toffolutti & Suhrcke, 2014), pointing out decreased prevalence of any alcohol use during the economic recession, and increased prevalence in binge-drinking. Based on existing literature, such

findings were expected; yet, our previous observations pointed out a short-term increase in alcohol consumption in 2009, the year featured by the worst real GDP decrease, in Italy (−5.1%, Mattei et al., 2014). Such discrepancies may be explained by a two-speed process, i.e. an acute phase (the very first years of crisis) in which both overall consumption and binge drinking increased, and a second, longer phase in which income reduction led to decreased alcoholics consumption. Notably, the present study covers a period of time longer than the GR, since the latter represented the beginning of a longer phase of economic crisis (and repeated recession), which prolonged until 2015. Also, it is worth noticing that the GR in Italy, rather than causing new, negative socio-economic conditions, speeded up already existing negative processes affecting the economy, in stagnation at least from year 2000 (Mattei et al., 2015). The decreased overall alcohol consumption among men may be due to the fact that in the first years of economic crisis the Italian male population was mainly hit by unemployment or fear of unemployment (Giovannini, 2009). Reduced income in such group may have determined less money to spend in alcoholic beverages (de Goeij et al., 2015).

Besides confirming previous observations referring to the very first years of recession (Gallus et al., 2011), our study adds that the effect on the economic downturn on tobacco smoking may have had a longer duration, as Figure 1 shows; we believe that this may be relevant for public health given the well-known effects of smoking (both active or second hand) on health, (either in the short, medium and long period). Also, our data does not support the hypothesis that increased smoking behavior was largely attributable to former smokers relapse, as other authors pointed out (Gallus et al., 2011). Other causes may have acted; for example, tobacco may be considered a cheap drug, easy to be obtained, and socially accepted, to turn to irrespectively from previous smoking habits. In the years of the economic crisis a decreased consumption of expensive illicit drugs was noticeable, while consumption of cheap

illicit drugs increased (Zuccato et al., 2011). Smoking may be considered, at least in part, a "cheap licit drug", to turn to easily in times of hardship, both economic or not.

Finally, our data support the hypothesis that, beside a steady increase in the prevalence of overweight, the crisis itself may have played an independent, additional role, acting via different mechanisms. On the one hand, the financial strain may have acted as chronic stressor, with noticeable and well-known effects on metabolism (Sinha & Jastreboff, 2013). On the other hand, it is possible that people who are still working, though are at risk of unemployment or experience work instabilities, have less time to dedicate to themselves and to their lifestyle (including food choice and physical activity), in the same way as less sick leave was documented due to fear of losing job (Mattei et al., 2015).

This study has several limitations. First, due to the nature of data, no causal relation can be drawn. Yet, relevant findings emerged concerning Italians' health-related behaviors, possibly due prolonged exposure to psychosocial stress, and consistently with other published literature. Second, we found many missing values (e.g., for alcohol indicators), and the period of time considered was relatively short. This may have led to spurious associations or lack of associations. Yet, the methods adopted made the study feasible, helping at gaining knowledge on a topic particularly controversial, as the effects of socio-economic changes on health. Third, it was pointed out that rates may be non-stationary unit root processes, making them unfit for the regression analysis with ordinary least square methods, for the risk of type I error (Ceccherini-Nelli & Priebe, 2011). Yet, the majority of studies in this field adopted regression analysis, with results similar to those that used other more sophisticated statistical approaches; also, we used heteroscedasticity-robust standard errors, to strengthen our analysis. Fourth, the present study did not include data on suicide and attempted suicide behaviors, though representing an important issue, frequently debated, in the last decade, especially with respect to the possible link with work and unemployment. Yet, this is one of the most studied topic, even in Italy, where a general

shortage of research concerning the effect of the economic crisis on health is noticeable. Other papers have already addressed this topic (e.g., De Vogli, 2013; De Vogli et al., 2013). Also, recent data about suicide behaviors from other countries such as Greece (Economu et al., 2016) are consistent with the hypothesis that suicide and attempted suicide may represent an acute response to economic downturns (Hong et al., 2011; De Vogli et al., 2013). In the present study a wider temporal frame was considered, unable to detect such rapid, acute increase, as well as aggregated data were used, while Italian studies on suicide using disaggregated data already exist. Also, it was our intention to point out other less studied and debated issues, that may be particularly relevant for public health and mental health services. Fifth, our analysis did not include data concerning cardiovascular mortality, though evidence in literature suggests a possible link with the socio-economic environment. Yet, this topic was already addressed by previous Italian studies published in recent years (e.g. Torbica et al., 2015), therefore we included in our paper less studied indexes, such as food consumption, overweight and obesity. Sixth and final, given the study design adopted, we focused on population as unit of analysis instead of people, therefore aggregated data were used; this may have partly limited our analysis, given that, as above mentioned, spurious associations (or lack of associations) may happen when data are excessively aggregated. Also, for the same reason we were not able to detect high-risk, vulnerable groups, which is still a crucial topic in epidemiology. Yet, this limitation of our study highlights the need for further research in this field, especially as far as the Italian population is concerned, based on disaggregated data.

CONCLUSIONS

The economic crisis seems to have determined an increase in smoking and overweight prevalence, and a decrease in overall alcohol consumption. An increase in binge drinking may have taken place in the years of the GR, though data are not conclusive. Future research is needed to assess the possible long-term consequences of such behavioral changes in terms of cardio-metabolic and oncological outcomes, especially because life expectancy in Italy started to decline after decades of steady increase for the first time in 2015 (ISTAT, 2016). This is crucial for the design of policies and interventions that can tackle the negative impact of the crisis on public health.

DISCLOSURES

The authors report no competing interests.

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None

AVAILABILITY OF DATA AND MATERIALS

All data used for the present study are available upon request addressed to the corresponding author.

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REVISED SUBMISSION WITH HIGHLIGHTED CHANGES

Impact of the economic crisis on health-related behaviors in Italy

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~~**Table 1 –** Values of considered variables from 2000 till 2015.~~

Table ~~2~~ 1 – Results of ~~univariate~~ linear regressions (2000-2007 vs. 2008-2015).

~~**Figure 1** – Binge drinking behavior among people aged > 11 years old in years 2003-2015.~~

Figure 1 – Smoking behavior among people aged > 14 years old in years 2001-2015.

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Impact of the economic crisis on health-related behaviors in Italy

ABTRACT

BACKGROUND: Evidence exists supporting the impact of the Great Recession on health-related behaviors internationally, though few studies are available concerning the Italian population.

AIM: To assess the impact of the late 2000s economic crisis on health-related behaviors linked to population mental health in Italy.

METHODS: Descriptive study. Health indicators came from the Italian Institute of Statistics database ~~in~~ (years 2000-2015). Statistics performed by means of linear regression models.

RESULTS: ~~During the economic crisis, an increase in the~~ Increased ~~number of~~ smokers (Beta = 1.68, p = .13), heavy smokers, i.e. people smoking 11-20 cigarettes per day (Beta = 2.18, p = .18) or more than 20 cigarettes per day (Beta = 1.04, p <.01) and mean number of smoked cigarettes per day (Beta = 0.56, p = .02) was noticeable. Also, prevalence of overweight increased (Beta = 0.91, p = .04), while the Italian families' expenditure for alcoholic beverages decreased (Beta = -812.80, p = .01). Alcohol consumption decreased (Beta = -.60, p <.01), especially in men (Beta = -.95, p <.01); ~~while~~ binge drinking increased in years 2009-2010. No change was noticeable in the diet indicators collected.

CONCLUSIONS The economic crisis may have increased smoking, overweight and binge drinking in Italy (though data on the latter phenomenon are not conclusive), and reduced overall alcohol consumption.

INTRODUCTION

After the onset of the late 2000s Great Recession (GR), many concerns arose regarding the possible impact of the economic downturn on the health of the populations (World Health Organization, 2011). A large amount of evidence produced in the last years pointed out a general detrimental effect of economic crises on health when austerity measures are implemented, namely when the budget destined to welfare and social protection is cut (Stuckler & Basu, 2013; Frasquilho et al., 2016; Margerison-Zilko et al., 2016; Martin-Carrasco et al., 2016). Possible moderators of this were recognized in the amount of investments in active labor market programs, and, more generally, in social protection (Stuckler et al., 2009; Stuckler & Basu, 2013). With respect to the GR, its outcome on health seems to have been largely negative worldwide (Margerison-Zilko et al., 2016). Only a few studies, however, have investigated the impact of the crisis on health-related behaviors, though this topic is particularly relevant, considering ~~also~~ the change occurred in the last twenty years in the ranking of major risk

factors for the global burden of disease, namely the shift from risks for communicable diseases (peculiarly among children) towards risks for non-communicable diseases (peculiarly among adults) (Lim et al., 2013). For example, tobacco smoking and secondhand exposure (still the second leading risk factor for global disease burden) are responsible for about 6.3 million annual deaths worldwide and 6.3% of the global burden of disease, mostly in low- and middle-income countries (Lim et al., 2013; Ezzatti & Riboli, 2013). In western Europe and north America smoking (active or second hand) is the leading risk factor, while in Eastern Europe, Andean Latin America, and southern sub-Saharan Africa in 2010 was alcohol use. As far as diet and physical inactivity are concerned, in 2010 they accounted for 10% of global DALYs (Lim et al., 2013).

Another reason why health-related behaviors are worth studying is represented by their link with psychological conditions and mental health. With respect to alcohol and tobacco consumption, it is widely recognized the frequent co-occurrence of such behaviors in groups of people affected by mental disorders, along a spectrum that spreads from the construct of dual diagnosis to the coping mechanisms an individual can activate to regulate negative emotions and face a stressful situation, as financial strain and unemployment (Cooper et al., 1995; Kessler, 2004; De Vogli & Santinello, 2005; Graham et al., 2007; Sinha, 2008). The link between the latter and harmful substance use was recently addressed by de Goeij et al. (2015), who proposed two behavioral mechanisms that may impact on alcohol-related behaviors and tobacco use in times of financial hardship. The first one posits that during economic crisis alcohol consumption decreases since less money is spent on alcoholic beverages, due to tighter budget constraints. This mechanism seems cross-sectional to all population subgroups, across the majority of countries. The second behavioral mechanism is based on psychological distress and leads to increase alcohol consumption.

Placed within the framework of the stress-vulnerability model, alcohol consumption and tobacco smoking may represent "mechanisms of coping", though ultimately dysfunctional, to obtain short-term relief in times of heavy distress, such as in periods when work is threaten (Jarvis & Wardle, 1999). Similarly, food may represent an easy-to-obtain "anxiolytic", considering the well-known relation between stress and diet (Yau & Potenza, 2013). Therefore, changes in the individuals' diet may be due not only to decreased availability of money, with subsequent access to low quality food; as for tobacco and alcoholics, food choices may represent a way of coping with a difficult and stressful moment of life. Another similarity concerning tobacco and alcohol on the one hand, and diet and obesity on the other, is that stress represent a common risk factor for both obesity and addiction (Sinha & Jastreboff, 2013).

Steptoe and Marmot (2003) studied the associations between biobehavioral risk factors and quality of life. Even if no association stemmed out between health behaviors and the psychosocial adversity and vulnerability index studied, significant associations emerged with psychological distress, depression, hopelessness, sleep problems, hostility, low self-esteem and loneliness, independently of age, sex, socioeconomic status, and marital status. Also, higher psychosocial adversity or vulnerability was associated with levels of glycohemoglobin, plasma fibrinogen, plasma viscosity, and body mass (the latter among women). Altogether, these data encourage to further study the relation between socioeconomic environment, individuals' distress, behavioral responses and mental health outcome.

The aim of the present study is to assess the impact of the economic crisis on health-related behaviors linked to population mental health in Italy. Differently than other Eurozone members, since 2008 Italy has suffered a triple-dip recession, with the first begun in 2008, the second in 2011, and the third in 2014 (O'Brien, 2014). In the same period, austerity measures were implemented by the Italian Governments, and negative short-term effects on the health of the Italian population were reported. In the first years of economic crisis (i.e. 2008-2010), an increase in suicides and attempted suicides

specifically due to financial problems was reported in Italy (Mattei et al., 2011; De Vogli et al., 2012; Mattei et al., 2014). Also, a noticeable effect was pointed out in terms of increased ischemic heart disease and cardiovascular mortality (Mattei et al., 2014; Torbica et al., 2015), consumption of nicotine (Gallus et al., 2011) decreased consumption of expensive illicit drugs and increased consumption of cheap illicit drugs (Zuccato et al., 2011), and an increase in the "occasional" consumption of alcoholic beverages (Mattei et al., 2014). Yet, the majority of studies published on the impact of the economic crisis on the health of the Italian population concerned the first years of economic crisis and there is little information on how the crisis changed health related behaviors such as smoking, diet and physical activity, that may be linked to the change in the socio-economic environment by means of psychological mechanisms and levels of perceived distress. Starting from available evidence on this topic, our hypothesis was that the economic downturn had caused an increase in alcohol and tobacco consumption (Hammarström & Janlert, 2003), as well as an increase in physical activity (since in times of financial hardship people travel less, especially by car, with a noticeable reduction in traffic fatalities; Uutela, 2010). With respect to overweight and obesity, we had actually no conclusive hypothesis, given that both increased and decreased overweight may have been expected: the first due to cheap, junk food consumption, the latter due to increased physical activity.

METHODS

Study design and data collection

This is a descriptive study. The following health indicators were collected: alcohol consumption (data refer to people aged over 11 years old, consuming alcohol in the year, everyday, occasionally or out of meal; also, data referring to males and females aged over 15 years old, consuming alcoholics, namely wine and beer, in the week or everyday were collected), smoking behavior (number of current smokers, number of former smokers, number of non-smokers, number of smoked cigarettes: 1-5 per day, 6-10 per day, 11-20 per day, >20 per day, mean number of smoked cigarettes per day), physical activity (number of people practicing regularly, unregularly, only sometimes or never) obese people aged >18, obese males aged >18, obese females aged >18, overweight people (males and females) aged >18, overweight males aged >18, overweight females aged >18; people, males and females, eating beef and fish every week, and cheese and vegetables everyday. All indicators represented the number of people having that condition or behavior per 100 people with the same features. Also, following economic indicators were collected: Italian families' expenditure for alcohol beverages, tobacco and narcotics, Italian families' expenditure for alcohol beverages only, tobacco and narcotics, Italian families' expenditure for narcotics only (all expressed in Euro per year), rate of unemployment, GDP per capita.

All data were obtained from the website of the Italian National Institute of Statistics, ISTAT (www.istat.it), in particular from the ICT system "Health for All Italia", a territorial informatics system about health that may be freely downloaded at the following site: http://www.istat.it/it/archivio/14562 and from I.Stat, a wide database provided by ISTAT at the following site: http://dati.istat.it.

The period of time considered was 2000-2015, but please note that for some indicators data were not available ~~(see Table 1 for details).~~ for the entire period.

Dating the Great Recession

As far as the recession dating is concerned, it is important to notice that it did not start simultaneously worldwide. In the present study, as far as Italy is concerned, 2008 was considered the first year of recession, given that the third and fourth trimester of that year recorded a consecutive negative variation of GDP (source: ISTAT). Also, in 2008 the Italian rate of unemployment increased for the first time after ten years, starting from the fourth trimester. It can be assumed that the second half of 2008 corresponds to the time when the Italian population began *experiencing* the crisis (Mattei et al., 2014). Further details about the GR and the main causes that led to the worst economic crisis since the 1929 Great Depression may be found elsewhere (De Vogli & Owusu, 2014).

Statistical analysis

The analysis was carried on by means of ~~univariate~~ linear regression models, with the dependent variable represented by all collected health indicators while independent variables were time and crisis years. Time was referred to years from 2000 to 2015; crisis was a dummy variable having the following values: 0 for years 2000-2007, 1 for years 2008-2015, to test the possible effect of the economic crisis on the collected indicators (absence of economic crisis vs. presence of economic crisis). As OLS regression analysis suits better when the assumption of homoscedasticity is valid, which is usually the exception in psychiatric epidemiology and econometrics, 95% confidence intervals were estimated for all coefficients on the basis of heteroscedasticity-robust standard errors. STATA 13.0 (Stata Corporation, College Station, TX, USA) was used for all analyses. ~~Please note that as far as the~~ Since data about alcohol consumption in the year, everyday, occasionally or out of meal ~~is concerned,~~ in years 2000-2003 ~~figures~~ refer~~s~~ to the percentage of people aged over 14 years old, while in years 2005-2014 refer to people

aged over 11 years old (data recording was changed by ISTAT)~~. Therefore~~, the regression analysis for such variables included observations only for years 2005-2014.

As data were anonymous and aggregated at the origin, Ethics Committee approval was not sought.

RESULTS

~~The dataset used for the analysis is reported in Table 1.~~

~~(Display Table 1 about here)~~

Table ~~2~~ 1 shows the results of the regression analysis, that compares the years of economic crisis (2008-2015) with the previous ones (2000-2007). ~~Note that there are missing values for some variables.~~

With respect to alcohol consumption in the year and out of meal among people aged 11 or more, a significant reduction was noticeable in the period of time considered, with no apparent effect due to the crisis. Differently, considering the overall rate of people aged 15 or more who consume alcoholics more than once per week, a significant decrease was noticeable (Beta = -0.60, 95% CI = -0.96; -0.24), peculiarly among men (Beta = -0.95, 95% CI = -1.50; -0.41). The consumption of beer and wine showed a steady and significant decline, without association with the economic situation; similarly, the percentage of people who never drank showed a steady increase, not influenced by the crisis. Binge drinking behaviors among people aged >11 years old were not associated with the years of economic crisis (2008-2015), though an increase was noticeable in the years of the GR (2008-2010), from a descriptive standpoint, both among men and women. ~~(Fig. 1).~~

(Display Table 1 about here)

~~(Display Figure 1 about here)~~

With respect to smoking (Fig. 1), the analysis pointed out an increase in the number of smokers (Beta = 1.68, 95% CI = 0.17; 3.20), heavy smokers, i.e. people smoking 11-20 cigarettes per day (Beta = 2.18, 95% CI = 0.12; 4.26) or more than 20 cigarettes per day (Beta = 1.04, 95% CI = 0.45; 1.62) and mean number of smoked cigarettes per day (Beta = 0.56, 95% CI 0.13; 0.99). Also, prevalence of overweight increased during the economic downturn (Beta = 0.91, 95% CI 0.03; 1.79). Italian families' expenditure for alcoholic beverages (expressed in Euro per year) were negatively associated with the economic crisis (Beta = -812.80, p = .01).

All variables concerning physical activity and diet were not influenced by the economic crisis.

(Display ~~Table~~ Figure 1 about here)

DISCUSSION

The main results of the present study concern smoking behavior, overweight and alcohol consumption. With respect to the latter, Italian data seem consistent with other studies (Bor et al. 2013; Asgeirsdottir et al., 2014; Toffolutti & Suhrcke, 2014), pointing out decreased prevalence of any alcohol use during the economic recession, and increased prevalence in binge-drinking. Based on existing literature, such findings were expected; yet, our previous observations pointed out a short-term increase in alcohol consumption in 2009, the year featured by the worst real GDP decrease, in Italy (−5.1%, Mattei et al., 2014). Such discrepancies may be explained by a two-speed process, i.e. an acute phase (the very first years of crisis) in which both overall consumption and binge drinking increased, and a second, longer phase in which income reduction led to decreased alcoholics consumption. Notably, the present study

covers a period of time longer than the GR, since the latter represented the beginning of a longer phase of economic crisis (and repeated recession), which prolonged until 2015. Also, it is worth noticing that the GR in Italy, rather than causing new, negative socio-economic conditions, speeded up already existing negative processes affecting the economy, in stagnation at least from year 2000 (Mattei et al., 2015). The decreased overall alcohol consumption among men may be due to the fact that in the first years of economic crisis the Italian male population was mainly hit by unemployment or fear of unemployment (Giovannini, 2009). Reduced income in such group may have determined less money to spend in alcoholic beverages (de Goeij et al., 2015).

Besides confirming previous observations referring to the very first years of recession (Gallus et al., 2011), our study adds that the effect on the economic downturn on tobacco smoking may have had a longer duration, as Figure 1 shows; we believe that this may be relevant for public health given the well-known effects of smoking (both active or second hand) on health, (either in the short, medium and long period). Also, our data does not support the hypothesis that increased smoking behavior was largely attributable to former smokers relapse, as other authors pointed out (Gallus et al., 2011). Other causes may have acted; for example, tobacco may be considered a cheap drug, easy to be obtained, and socially accepted, to turn to irrespectively from previous smoking habits. In the years of the economic crisis a decreased consumption of expensive illicit drugs was noticeable, while consumption of cheap illicit drugs increased (Zuccato et al., 2011). Smoking may be considered, at least in part, a “cheap licit drug”, to turn to easily in times of hardship, both economic or not.

Finally, our data support the hypothesis that, beside a steady increase in the prevalence of overweight, the crisis itself may have played an independent, additional role, acting via different mechanisms. On the one hand, the financial strain may have acted as chronic stressor, with noticeable and well-known effects on metabolism (Sinha & Jastreboff, 2013). On the other hand, it is possible that people who are

still working, though are at risk of unemployment or experience work instabilities, have less time to dedicate to themselves and to their lifestyle (including food choice and physical activity), in the same way as less sick leave was documented due to fear of losing job (Mattei et al., 2015).

~~Aim of the present study was to evaluate and report on the impact of the economic crisis on Italians' health-related behaviors. The main results concern smoking behavior, overweight and alcohol consumption, and are discussed in detail in the next paragraphs.~~

~~*Alcohol consumption*~~

~~As far as the latter are concerned, Martin-Carrasco et al. (2016) pointed out that during economic crisis, namely during the recent "Great Recession", a decrease in overall alcohol use was noticeable, and an increase in binge drinking behaviors.~~

~~Overall alcohol consumption among people aged > 15 years old decreased in the years of economic crisis, especially among men. This may be due to the fact that in the first years of economic crisis, the Italian male population was mainly hit by unemployment or fear of unemployment (Giovannini, 2009). With respect to binge drinking, data were too few to permit a robust statistical analysis (before the recession onset, data were available only for years 2003, 2005-2007), this may explain the results of the linear regressions as shown in Table 2. Yet, from a descriptive standpoint, an increase in binge drinking behaviors is noticeable soon after the Great Recession onset, both in males and females, as shown in Figure 1. Considered altogether, data concerning alcohol consumption seem consistent with other studies, reporting a decrease in the prevalence of any alcohol use during the economic recession in USA,~~

and an increased prevalence in binge drinking, especially among at risk populations, namely non Black, unmarried men under 30 years, recently become unemployed (Bor et al., 2013). With respect to this, our study leaves an open question, since data regarding binging are not conclusive, though consistent with a previous study of our research group (Mattei et al., 2014), where we pointed out an increase in "occasionally" and "in the year" consumption of alcoholics noticeable in 2009 (the year affected by the worst decrease in real GDP), from a descriptive standpoint. In 2009 and 2010 binge drinking behaviors increased, as well. Such datum rises several questions. On the one hand, it could be considered simply an outlier, showing only a temporal correlation with the onset of the economic crisis, actually not influenced by it. On the other hand, as we previously hypothesized, it could point out a short term increase in alcohol consumption, peculiarly due to increased binging.

De Goeij and coll. (2015) proposed two behavioural mechanism that may impact on alcohol-related behaviours in times of financial strain. The first one posits that in times of economic crisis alcohol consumption decreases since less money is spent on alcoholic beverages, due to tighter budget constraints. This mechanism seems cross sectional to all population subgroups, across the majority of countries. The second behaviour mechanism is based on psychological distress and leads to increase alcohol consumption. Our findings may be underpinned by both mechanisms, that may explain the reported decrease in expenditure for alcoholics among Italians and overall alcohol consumption, and the possible increase in binge drinking.

To sum up, data concerning alcohol consumption among Italians in the years of economic crisis seem consistent with current literature (Bor et al. 2013; Asgeirsdottir et al., 2014; Toffolutti & Suhrcke, 2014), though more research is needed especially concerning binge drinking behaviours, with a particular attention to possibly at-risk populations.

Smoking

Our data are partly consistent with those by Gallus and coll. (2011), who reported an increase in smoking prevalence in years 2008-2009, overall and among men and women, after a steady decline in the previous decades. They also suggested that this increase was largely attributable to a relapse of former smokers, possible via increase in psycho-social stress. We also found a significant increase peculiarly among heavy smokers. Differently, we found an increase in the mean number of smoked cigarettes per day, but not in the number of former-smokers, that may support the hypothesis that the increased smoking behavior in the crisis years was largely due to relapses.

These findings point out an increase in smoking behavior that may be imputed to the economic crisis, and in our opinion may be relevant for public health given the well-known effects of smoking on health. If, as we argue, this increase in only partly attributable to former-smokers' relapse, other causes or possible explanations should be taken into account. Nicotine, and tobacco in general, may be considered "cheap drugs", easy to be obtained. It is true that, on the one hand, the price of cigarettes steadily increased in the last years, partly as public health measure aiming at reducing long term consequences of smoking; yet, on the other hand, tobacco may be considered a cheap drug, easy to be obtained, and socially accepted. It is known that in the years of the economic crisis a decreased consumption of expensive illicit drugs was noticeable, while consumption of cheap illicit drugs increased [14]. Smoking may be considered, at least in part, a "cheap licit drug", to turn to easily in times of hardship, both economic or not.

It is also possible that specific groups of people be more vulnerable to the effects of the economic crisis in terms of health behaviors. In a more recent paper, Gallus and coll. (2016) identified specific

vulnerable subgroups of smokers, namely the young and subjects with low socio-economic status, that seem to have changed their smoking behavior due to the economic crisis. Interestingly, their findings pointed out that the large majority of current smokers did not change their smoking habit following the economic crisis. Once again, the contribution of former smokers and vulnerable groups may have played a central role in determining an increase in smoking prevalence, though our data are only partly consistent with those produced by the colleagues. The discrepancies may be explained by different methods adopted, with different samples and types of data.

Finally, even if the present study did not include data concerning cardiovascular mortality, it should be remembered the link existing between the latter and smoking; in this sense, it is worth noticing that other studies reported an increased in cardiovascular mortality, especially in the very first years of recession (Torbica et al., 2015).

Diet, Overweight and Physical Activity

The economic crisis may have increased the prevalence of overweight adults. As the increase in the number of smokers in the same period already discussed, this phenomenon may be due to increased psycho-social stress, as well. In other words, food may have acted as a sort of "cheap, easy to be obtained drug", in the same way as smoking, that may have long-term consequences as well, e.g. as far as cardio-metabolic and oncological diseases are concerned. It should be taken into account that, with respect to the other indicators considered, only aggregated data were available for the present study. Yet, it is known that in Italy there exist differences regarding nutrition behaviors, based on social position and geographical area: this may have partly affected our analysis. On the other hand, it was

pointed out that the economic crisis may have partly reduced the above mentioned differences in nutrition behaviors (Marra et al., 2015), therefore permitting us to take at least a snapshot of the phenomenon. Marra and coll. (2015) report that even if the economic crisis has been frequently pointed out as able to worsen nutrition behaviors, its real impact on Italians' nutrition was different, and not necessary negative, having reduced nutrition inequalities. Our data support the hypothesis that, beside a steady increase in the prevalence of overweight, the crisis itself may have played an independent, additional role, acting via different mechanisms. For example, people may have increased the consumption of cheap, low-quality or fast-food. Since it was not possible to get data concerning the latter, we cannot draw conclusion regarding fast food eating in Italy in the last years. Differently, with respect to some major classes of food (namely beef, fish, cheese and vegetables), our analysis pointed out no association with the economic crisis. Yet, it is noticeable that in the period of time considered (2000-2015), a significant and negative time-trend was noticeable with respect to cheese consumption, and a positive time trend was noticeable regarding vegetable consumption; this may be due to healthier food choices, irrespectively from the crisis.

If on the one hand it is difficult to find a link between diet, food choices and increased overweight people aged > 18 years old, on the other it seems licit to look for a possible explanation elsewhere, for example concerning physical activity. Actually, we would expect an increase in it, since it is known that in times of economic strain people reduce the use of motor vehicles (with a noticeable reduction in traffic fatalities) (Uutela, 2010). Yet, our data support no association between economic crisis and physical activity. Ad independent time trend is noticeable, suggesting a higher number of people practicing physical activity regularly in the last years, irrespectively from the beginning of the recession.

~~Once again, some features of our study (e.g. having used aggregated data, missing data availability of data) may have failed to get further knowledge concerning the reasons and mechanisms that may explain such increase in overweight; we believe that further research should focus on this peculiar topic.~~

~~Our study pointed out some changes in health behaviors, namely smoking and alcohol consumption; it also pointed out changes in outcome of health behaviors (namely, overweight). Yet, it leaves an open question concerning the reason(s) why behaviour changes in times of financial strain. As we have seen, some authors proposed mechanism that may be targeted by specific interventions (de Goeij et al., 2015), though more knowledge has to be achieved in this field, and it is possible that other research methods (e.g. qualitative studies) may be more helpful, for further studies.~~

~~*Limitations*~~

This study has several limitations. First, due to the nature of data, no causal relation can be drawn. Yet, relevant findings emerged concerning Italians' health-related behaviors, possibly due prolonged exposure to psychosocial stress, and consistently with other published literature. Second, we found many missing values (e.g., for alcohol indicators), and the period of time considered was relatively short. This may have led to spurious associations or lack of associations. ~~; in other words, may have weaken our analysis.~~ Yet, the methods adopted made the study feasible, helping at gaining knowledge on a topic particularly controversial, as the effects of socio-economic changes on health. Third, it was pointed out that rates may be non-stationary unit root processes, making them unfit for the regression analysis with ordinary least square methods, for the risk of type I error (Ceccherini-Nelli & Priebe, 2011). Yet, the

majority of studies in this field adopted regression analysis, with results similar to those that used other more sophisticated statistical approaches; also, we used heteroscedasticity-robust standard errors, to strengthen our analysis. Fourth, the present study did not include data on suicide and attempted suicide behaviors, though representing an important issue, frequently debated, in the last decade, especially with respect to the possible link with work an unemployment. Yet, this is one of the most studied topic, even in Italy, where a general shortage of research concerning the effect of the economic crisis on health is noticeable. Other papers have already addressed this topic (e.g., De Vogli, 2013; De Vogli et al., 2013). Also, recent data about suicide behaviors from other countries such as Greece (Economu et al., 2016) are consistent with the hypothesis that suicide and attempted suicide may represent an acute response to economic downturns (Hong et al., 2011; De Vogli et al., 2013). In the present study a wider temporal frame was considered, unable to detect such rapid, acute increase, as well as aggregated data were used, while Italian studies on suicide using disaggregated data already exist. Also, it was our intention to point out other less studied and debated issues, that may be particularly relevant for public health and mental health services. Fifth, our analysis did not include data concerning cardiovascular mortality, though evidence in literature suggests a possible link with the socio-economic environment. Yet, this topic was already addressed by previous Italian studies published in recent years (e.g. Torbica et al., 2015), therefore we included in our paper less studied indexes, such as food consumption, overweight and obesity. ~~Fourth~~ Sixth and final, given the study design adopted, we focused on population as unit of analysis instead of people ~~or patients~~, therefore aggregated data were used; this may have partly limited our analysis, given that, as above mentioned, spurious associations (or lack of associations) may happen when data are excessively aggregated. Also, for the same reason we were not able to detect high-risk, vulnerable groups, which is still a crucial topic in epidemiology. Yet, this

limitation of our study highlights the need for further research in this field, especially as far as the Italian population is concerned, based on disaggregated data.

CONCLUSIONS

The economic crisis seems to have determined an increase in smoking and overweight prevalence, and a decrease in overall alcohol consumption. An increase in binge drinking may have taken place in the years of the GR, though data are not conclusive. Future research is needed to assess the possible long-term consequences of such behavioral changes in terms of cardio-metabolic and oncological outcomes, especially because life expectancy in Italy started to decline after decades of steady increase for the first time in 2015 (ISTAT, 2016). This is crucial for the design of policies and interventions that can tackle the negative impact of the crisis on public health.

DISCLOSURES

The authors report no competing interests.

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None

AVAILABILITY OF DATA AND MATERIALS

All data used for the present study are available upon request addressed to the corresponding author.

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ORIGINAL SUBMISSION

Impact of the economic crisis on health-related behaviors in Italy

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Table 1 – Values of considered variables from 2000 till 2015.

Table 2 – Results of univariate linear regression (2000-2007 vs. 2008-2015).

Figure 1 – Figure 1 – Binge drinking behaviors among people aged > 11 years old.

Declaration of Interest: Nothing to declare

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Impact of the economic crisis on health-related behaviors in Italy

ABTRACT

BACKGROUND: Evidence exists supporting the impact of the Great Recession on health-related behaviors internationally, though few studies are available concerning the Italian population.

AIM: To assess the impact of the late 2000s economic crisis on health-related behaviors in Italy.

METHODS: Descriptive study. Health indicators came from the Italian Institute of Statistics database in years 2000-2015. Statistics performed by means of linear regression models.

RESULTS: During the economic crisis, an increase in the number of smokers (Beta = 1.68, p = .13), heavy smokers, i.e. people smoking 11-20 cigarettes per day (Beta = 2.18, p = .18) or more than 20 cigarettes per day (Beta = 1.04, p <.01) and mean number of smoked cigarettes per day (Beta = 0.56, p = .02) was

noticeable. Also, prevalence of overweight increased (Beta = 0.91, p = .04), while the Italian families' expenditure for alcoholic beverages decreased (Beta = -812.80, p = .01). Alcohol consumption decreased (Beta = -.60, p <.01), especially in men (Beta = -.95, p <.01), while binge drinking increased in years 2009-2010. No change was noticeable in the diet indicators collected.

CONCLUSIONS The economic crisis may have increased smoking, overweight and binge drinking in Italy, and reduced alcohol consumption.

INTRODUCTION

After the onset of the late 2000s Great Recession (GR), many concerns arose regarding the possible impact of the economic downturn on the health of the populations (World Health Organization, 2011). A large amount of evidence produced in the last years pointed out a general detrimental effect of economic crises on health when austerity measures are implemented, namely when the budget destined to welfare and social protection is cut (Stuckler & Basu, 2013; Frasquilho et al., 2016; Margerison-Zilko et al., 2016). Possible moderators of this were recognized in the amount of investments in active labor market programs, and, more generally, in social protection (Stuckler & Basu, 2013; Stuckler et al., 2009). With respect to the GR, its outcome on health seems to have been largely negative worldwide (Margerison-Zilko et al., 2016). Only a few studies, however, have investigated the impact of the crisis on health-related behaviors, though this topic is particularly relevant, considering also the change occurred in the last twenty years in the ranking of major risk factors for the global burden of disease, namely the shift from risks for communicable diseases (peculiarly among children) towards risks for non-communicable diseases (peculiarly among adults) (Lim et al., 2013). For example, tobacco smoking and secondhand exposure (still the second leading risk factor for global disease burden) are responsible for about 6.3 million annual deaths worldwide and 6.3% of the global burden of disease, mostly in low- and middle-income countries (Lim et al., 2013; Ezzatti & Riboli, 2013). In western Europe and north America smoking (active or second hand) is the leading risk factor, while in Eastern Europe, Andean Latin America, and southern sub-Saharan Africa in 2010 was alcohol use. As far as diet and physical inactivity are concerned, in 2010 they accounted for 10% of global DALYs (Lim et al., 2013).

The aim of the present study is to assess the impact of the economic crisis on health-related behaviors in Italy. Differently than other Eurozone members, since 2008 Italy has suffered a triple-dip recession, with the first begun in 2008, the second in 2011, and the third in 2014 (O'Brien, 2014). In the same period, austerity measures were implemented by the Italian Governments, and negative short-term effects on the health of the Italian population were reported. In the first years of economic crisis (i.e. 2008-2010), an increase in suicides and attempted suicides specifically due to financial problems was reported in Italy (Mattei et al., 2011; De Vogli et al., 2012; Mattei et al., 2014). Also, a noticeable effect was pointed out in terms of increased ischemic heart disease and cardiovascular mortality (Mattei et al., 2014; Torbica et al., 2015), consumption of nicotine (Gallus et al., 2011) decreased consumption of expensive illicit drugs and increased consumption of cheap illicit drugs (Zuccato et al., 2011), and an increase in the "occasional" consumption of alcoholic beverages (Mattei et al., 2014). Yet, the majority of studies published on the impact of the economic crisis on the health of the Italian population concerned the first years of economic crisis and there is little information on how the crisis changed health related behaviors such as smoking, diet and physical activity.

METHODS

Study design and data collection

This is a descriptive study. The following health indicators were collected: alcohol consumption (data refer to people aged over 11 years old, consuming alcohol in the year, everyday, occasionally or out of meal; also, data referring to males and females aged over 15 years old, consuming alcoholics, namely wine and beer, in the week or everyday were collected), smoking behavior (number of current smokers,

number of former smokers, number of non-smokers, number of smoked cigarettes: 1-5 per day, 6-10 per day, 11-20 per day, >20 per day, mean number of smoked cigarettes per day), physical activity (number of people practicing regularly, unregularly, only sometimes or never) obese people aged >18, obese males aged >18, obese females aged >18, overweight people (males and females) aged >18, overweight males aged >18, overweight females aged >18; people, males and females, eating beef and fish every week, and cheese and vegetables everyday. All indicators represented the number of people having that condition or behavior per 100 people with the same features. Also, following economic indicators were collected: Italian families' expenditure for alcohol beverages, tobacco and narcotics, Italian families' expenditure for alcohol beverages only, tobacco and narcotics, Italian families' expenditure for narcotics only (all expressed in Euro per year), rate of unemployment, GDP per capita.

All data were obtained from the website of the Italian National Institute of Statistics, ISTAT (www.istat.it), in particular from the ICT system "Health for All Italia", a territorial informatics system about health that may be freely downloaded at the following site: http://www.istat.it/it/archivio/14562 and from I.Stat, a wide database provided by ISTAT at the following site: http://dati.istat.it.

The period of time considered was 2000-2015, but please note that for some indicators data were not available (see Table 1 for details).

Dating the Great Recession

As far as the recession dating is concerned, it is important to notice that it did not start simultaneously worldwide. In the present study, as far as Italy is concerned, 2008 was considered the first year of

recession, given that the third and fourth trimester of that year recorded a consecutive negative variation of GDP (source: ISTAT). Also, in 2008 the Italian rate of unemployment increased for the first time after ten years, starting from the fourth trimester. It can be assumed that the second half of 2008 corresponds to the time when the Italian population began *experiencing* the crisis (Mattei et al., 2014). Further details about the Great Recession and the main causes that led to the worst economic crisis since the 1929 Great Depression may be found elsewhere (De Vogli & Owusu, 2014).

Statistical analysis

The analysis was carried on by means of univariate linear regression models, with the dependent variable represented by all collected health indicators while independent variables were time and crisis years. Time was referred to years from 2000 to 2015; crisis was a dummy variable having the following values: 0 for years 2000-2007, 1 for years 2008-2015, to test the possible effect of the economic crisis on the collected indicators (absence of economic crisis vs. presence of economic crisis). As OLS regression analysis suits better when the assumption of homoscedasticity is valid, which is usually the exception in psychiatric epidemiology and econometrics, 95% confidence intervals were estimated for all coefficients on the basis of heteroscedasticity-robust standard errors. STATA 13.0 (Stata Corporation, College Station, TX, USA) was used for all analyses. Please note that as far as the alcohol consumption in the year, everyday, occasionally or out of meal is concerned, in years 2000-2003 figures refers to the percentage of people aged over 14 years old, while in years 2005-2014 to people aged over 11 years old (data recording was changed by ISTAT). Therefore, the regression analysis for such variables included observations only for years 2005-2014.

As data were anonymous and aggregated at the origin, Ethics Committee approval was not sought.

RESULTS

The dataset used for the analysis is reported in Table 1.

(Display Table 1 about here)

Table 2 shows the results of the regression analysis, that compares the years of economic crisis (2008-2015) with the previous ones (2000-2007). Note that there are missing values for some variables.

With respect to alcohol consumption in the year and out of meal among people aged 11 or more, a significant reduction was noticeable in the period of time considered, with no apparent effect due to the crisis. Differently, considering the overall rate of people aged 15 or more who consume alcoholics more than once per week, a significant decrease was noticeable (Beta = -0.60, 95% CI = -0.96; 0.24), peculiarly among men (Beta = -0.95, 95% CI = -1.50; -0.41). The consumption of beer and wine showed a steady and significant decline, without association with the economic situation; similarly, the percentage of people who never drank showed a steady increase, not influenced by the crisis. Binge drinking behaviors among people aged >11 years old were not associated with the years of economic crisis (2008-2015), though an increase was noticeable in the years of the Great Recession (2008-2010), from a descriptive standpoint (Fig. 1).

(Display Figure 1 about here)

With respect to smoking, the analysis pointed out an increase in the number of smokers (Beta = 1.68, 95% CI = 0.17; 3.20), heavy smokers, i.e. people smoking 11-20 cigarettes per day (Beta = 2.18, 95% CI = 0.12; 4.26) or more than 20 cigarettes per day (Beta = 1.04, 95% CI = 0.45; 1.62) and mean number of smoked cigarettes per day (Beta = 0.56, 95% CI 0.13; 0.99). Also, prevalence of overweight increased during the economic downturn (Beta = 0.91, 95% CI 0.03; 1.79). Italian families' expenditure for alcoholic beverages (expressed in Euro per year) were negatively associated with the economic crisis (Beta = -812.80, p = .01).

All variables concerning physical activity and diet were not influenced by the economic crisis.

(Display Table 2 about here)

DISCUSSION

Aim of the present study was to evaluate and report on the impact of the economic crisis on Italians' health-related behaviors. The main results concern smoking behavior, overweight and alcohol consumption, and are discussed in detail in the next paragraphs.

Alcohol consumption

Overall alcohol consumption among people aged > 15 years old decreased in the years of economic crisis, especially among men. This may be due to the fact that in the first years of economic crisis, the

Italian male population was mainly hit by unemployment or fear of unemployment (Giovannini, 2009). With respect to binge drinking, data were too few to permit a robust statistical analysis (before the recession onset, data were available only for years 2003, 2005-2007), this may explain the results of the linear regressions as shown in Table 2. Yet, from a descriptive standpoint, an increase in binge drinking behaviors is noticeable soon after the Great Recession onset, both in males and females, as shown in Figure 1. Considered altogether, data concerning alcohol consumption seem consistent with other studies, reporting a decrease in the prevalence of any alcohol use during the economic recession in USA, and an increased prevalence in binge-drinking, especially among at risk populations, namely non-Black, unmarried men under 30 years, recently become unemployed (Bor et al., 2013). With respect to this, our study leaves an open question, since data regarding binging are not conclusive, though consistent with a previous study of our research group (Mattei et al., 2014), where we pointed out an increase in "occasionally" and "in the year" consumption of alcoholics noticeable in 2009 (the year affected by the worst decrease in real GDP), from a descriptive standpoint. In 2009 and 2010 binge drinking behaviors increased, as well. Such datum rises several questions. On the one hand, it could be considered simply an outlier, showing only a temporal correlation with the onset of the economic crisis, actually not influenced by it. On the other hand, as we previously hypothesized, it could point out a short-term increase in alcohol consumption, peculiarly due to increased binging.

De Goeij and coll. (2015) proposed two behavioural mechanism that may impact on alcohol-related behaviours in times of financial strain. The first one posits that in times of economic crisis alcohol consumption decreases since less money is spent on alcoholic beverages, due to tighter budget constraints. This mechanism seems cross-sectional to all population subgroups, across the majority of countries. The second behaviour mechanism is based on psychological distress and leads to increase alcohol consumption. Our findings may be underpinned by both mechanisms, that may explain the

reported decrease in expenditure for alcoholics among Italians and overall alcohol consumption, and the possible increase in binge drinking.

To sum up, data concerning alcohol consumption among Italians in the years of economic crisis seem consistent with current literature (Bor et al. 2013; Asgeirsdottir et al., 2014; Toffolutti & Suhrcke, 2014), though more research is needed especially concerning binge drinking behaviours, with a particular attention to possibly at-risk populations.

Smoking

Our data are partly consistent with those by Gallus and coll. (2011), who reported an increase in smoking prevalence in years 2008-2009, overall and among men and women, after a steady decline in the previous decades. They also suggested that this increase was largely attributable to a relapse of former smokers, possible via increase in psycho-social stress. We also found a significant increase peculiarly among heavy smokers. Differently, we found an increase in the mean number of smoked cigarettes per day, but not in the number of former-smokers, that may support the hypothesis that the increased smoking behavior in the crisis years was largely due to relapses.

These findings point out an increase in smoking behavior that may be imputed to the economic crisis, and in our opinion may be relevant for public health given the well-known effects of smoking on health. If, as we argue, this increase in only partly attributable to former-smokers' relapse, other causes or possible explanations should be taken into account. Nicotine, and tobacco in general, may be considered "cheap drugs", easy to be obtained. It is true that, on the one hand, the price of cigarettes steadily increased in the last years, partly as public health measure aiming at reducing long-term

consequences of smoking; yet, on the other hand, tobacco may be considered a cheap drug, easy to be obtained, and socially accepted. It is known that in the years of the economic crisis a decreased consumption of expensive illicit drugs was noticeable, while consumption of cheap illicit drugs increased [14]. Smoking may be considered, at least in part, a "cheap licit drug", to turn to easily in times of hardship, both economic or not.

It is also possible that specific groups of people be more vulnerable to the effects of the economic crisis in terms of health behaviors. In a more recent paper, Gallus and coll. (2016) identified specific vulnerable subgroups of smokers, namely the young and subjects with low socio-economic status, that seem to have changed their smoking behavior due to the economic crisis. Interestingly, their findings pointed out that the large majority of current smokers did not change their smoking habit following the economic crisis. Once again, the contribution of former-smokers and vulnerable groups may have played a central role in determining an increase in smoking prevalence, though our data are only partly consistent with those produced by the colleagues. The discrepancies may be explained by different methods adopted, with different samples and types of data.

Finally, even if the present study did not include data concerning cardiovascular mortality, it should be remembered the link existing between the latter and smoking; in this sense, it is worth noticing that other studies reported an increased in cardiovascular mortality, especially in the very first years of recession (Torbica et al., 2015).

Diet, Overweight and Physical Activity

The economic crisis may have increased the prevalence of overweight adults. As the increase in the number of smokers in the same period already discussed, this phenomenon may be due to increased psycho-social stress, as well. In other words, food may have acted as a sort of "cheap, easy to be obtained drug", in the same way as smoking, that may have long-term consequences as well, e.g. as far as cardio-metabolic and oncological diseases are concerned. It should be taken into account that, with respect to the other indicators considered, only aggregated data were available for the present study. Yet, it is known that in Italy there exist differences regarding nutrition behaviors, based on social position and geographical area: this may have partly affected our analysis. On the other hand, it was pointed out that the economic crisis may have partly reduced the above mentioned differences in nutrition behaviors (Marra et al., 2015), therefore permitting us to take at least a snapshot of the phenomenon. Marra and coll. (2015) report that even if the economic crisis has been frequently pointed out as able to worsen nutrition behaviors, its real impact on Italians' nutrition was different, and not necessary negative, having reduced nutrition inequalities. Our data support the hypothesis that, beside a steady increase in the prevalence of overweight, the crisis itself may have played an independent, additional role, acting via different mechanisms. For example, people may have increased the consumption of cheap, low-quality or fast-food. Since it was not possible to get data concerning the latter, we cannot draw conclusion regarding fast-food eating in Italy in the last years. Differently, with respect to some major classes of food (namely beef, fish, cheese and vegetables), our analysis pointed out no association with the economic crisis. Yet, it is noticeable that in the period of time considered (2000-2015), a significant and negative time-trend was noticeable with respect to cheese consumption, and a positive time-trend was noticeable regarding vegetable consumption; this may be due to healthier food choices, irrespectively from the crisis.

If on the one hand it is difficult to find a link between diet, food choices and increased overweight people aged > 18 years old, on the other it seems licit to look for a possible explanation elsewhere, for example concerning physical activity. Actually, we would expect an increase in it, since it is known that in times of economic strain people reduce the use of motor vehicles (with a noticeable reduction in traffic fatalities) (Uutela, 2010). Yet, our data support no association between economic crisis and physical activity. Ad independent time trend is noticeable, suggesting a higher number of people practicing physical activity regularly in the last years, irrespectively from the beginning of the recession. Once again, some features of our study (e.g. having used aggregated data, missing data availability of data) may have failed to get further knowledge concerning the reasons and mechanisms that may explain such increase in overweight; we believe that further research should focus on this peculiar topic.

Our study pointed out some changes in health behaviors, namely smoking and alcohol consumption; it also pointed out changes in outcome of health behaviors (namely, overweight). Yet, it leaves an open question concerning the reason(s) why behaviour changes in times of financial strain. As we have seen, some authors proposed mechanism that may be targeted by specific interventions (de Goeij et al., 2015), though more knowledge has to be achieved in this field, and it is possible that other research methods (e.g. qualitative studies) may be more helpful, for further studies.

Limitations

This study has several limitations. First, due to the nature of data, no causal relation can be drawn. Yet, relevant findings emerged concerning Italians' health-related behaviors, consistent with other published

literature. Second, we found many missing values (e.g., for alcohol indicators), and the period of time considered was relatively short. This may have led to spurious associations or lack of associations; in other words, may have weaken our analysis. Yet, the methods adopted made the study feasible, helping at gaining knowledge on a topic particularly controversial, as the effects of socio-economic changes on health. Third, it was pointed out that rates may be non-stationary unit root processes, making them unfit for the regression analysis with ordinary least square methods, for the risk of type I error (Ceccherini-Nelli & Priebe, 2011). Yet, the majority of studies in this field adopted regression analysis, with results similar to those that used other more sophisticated statistical approaches; also, we used heteroscedasticity-robust standard errors, to strengthen our analysis. Fourth and final, given the study design adopted, we focused on population as unit of analysis instead of people or patients, therefore aggregated data were used; this may have partly limited our analysis, given that, as above mentioned, spurious associations (or lack of associations) may happen when data are excessively aggregated. Also, for the same reason we were not able to detect high-risk, vulnerable groups, which is still a crucial topic in epidemiology. Yet, this limitation of our study highlights the need for further research in this field, especially as far as the Italian population is concerned, based on disaggregated data.

CONCLUSIONS

The economic crisis seems to have determined an increase in smoking and overweight prevalence, and a decrease in overall alcohol consumption. An increase in binge drinking may have taken place in the years of the Great Recession, though data are not conclusive. Future research is needed to assess the possible long-term consequences of such behavioral changes in terms of cardio-metabolic and oncological outcomes, especially because life expectancy in Italy started to decline after decades of

steady increase for the first time in 2015 (ISTAT, 2015). This is crucial for the design of policies and interventions that can tackle the negative impact of the crisis on public health.

DISCLOSURES

The authors report no competing interests.

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AVAILABILITY OF DATA AND MATERIALS

All data used for the present study are available upon request addressed to the corresponding author.

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Table ~~2~~ 1 – Results of univariate linear regression (2000-2007 vs. 2008-2015). Significant coefficients in bold.
In the analysis, dependent variables were all collected health indicators; independent variables were crisis years (for which coefficient, p-value, 95% CI and R^2 are reported) and time-trend. For the latter, when a significant ($p < 0.05$) association was noticeable, it is reported (+ indicating a positive time-trend, - indicating a negative time-trend). N.s. (not significant) means that that peculiar variable (e.g. birth rate) was not associated with time in the period of time considered.

	2000-2007 vs. 2008-2015				
	β	*p*	*95% CI*	R^2	*Time-trend association*
Alcohol consumption – *in the year* (2005-2014)	.97	.27	-.95; 2.88	.95	-
Alcohol consumption – *everyday* (2005-2014)	-5.24	.26	-15.40; 4.92	.37	n.s.
Alcohol consumption – *occasionally* (2005-2014)	.79	.40	-1.31; 2.88	.55	n.s.
Alcohol consumption – *out of meal* (2005-2014)	1.75	.09	-.34; 3.85	.49	-
Alcohol consumption - % of people (males and females, aged > 15) drinking alcoholics more than once per week	**-.60**	<.01	-.96; -.24	.70	n.s.
Alcohol consumption: % of people (males aged > 15) drinking alcoholics more than once per week	**-.95**	<.01	-1.50; -.41	.81	n.s.
Alcohol consumption: % of people (females aged > 15) drinking alcoholics more than once per week	-.28	.17	-.70; .14	.47	+
Alcohol consumption - % of people (males and females, aged > 15) drinking wine regularly	-1.00	.27	-2.89; .88	.94	-

	Alcohol consumption - % of people (males, aged > 15) drinking wine regularly	-1.56	.21	-4.10; .98	.95	-
	Alcohol consumption - % of people (females, aged > 15) drinking wine regularly	-.52	.42	-1.88; .84	.93	-
	Alcohol consumption - % of people (males and females, aged > 15) drinking > 0.5 L of wine everyday	-.14	.21	-.38; .09	.98	-
	Alcohol consumption - % of people (males, aged > 15) drinking > 0.5 L of wine everyday	-.39	.08	-.82; .05	.98	-
	Alcohol consumption - % of people (females, aged > 15) drinking > 0.5 L of wine everyday	.07	.67	-.26; .39	.81	-
	Alcohol consumption - % of people (males and females, aged > 15) drinking beer regularly	-.03	.90	-.55; .49	.81	-
	Alcohol consumption - % of people (males, aged > 15) drinking beer regularly	-.02	.96	-.92; .87	.78	-
	Alcohol consumption - % of people (females, aged > 15) drinking beer regularly	-.03	.79	-.31; .24	.72	-
	Alcohol consumption - % of people (males and females, aged > 15) drinking > 0.5 L of beer everyday	-.02	.74	-.22; .16	.85	-
	Alcohol consumption - % of people (males, aged > 15) drinking > 0.5 L of beer everyday	-.10	.61	-.53; .32	.78	n.s.

	Alcohol consumption - % of people (females, aged > 15) drinking > 0.5 L of beer everyday	.03	.38	-.05; .11	.69	-
	Alcohol consumption - % of people (males and females, aged > 15) who never drank alcoholics	-.19	.78	-1.67; 1.29	.90	+
	Alcohol consumption - % of people (males, aged > 15) who never drank alcoholics	.24	.66	-.92; 1.39	.92	+
	Alcohol consumption - % of people (females, aged > 15) who never drank alcoholics	-.57	.54	-2.55; 1.41	.84	+
	Alcohol consumption – % of males and females aged > 11 who adopt binge drinking behaviors	.01	.99	-1.37; 1.39	.40	n.s.
	Alcohol consumption – % of males aged > 11 who adopt binge drinking behaviors	-.13	.88	-2.18; 1.90	.46	n.s.
	Alcohol consumption – % of females aged > 11 who adopt binge drinking behaviors	.17	.65	-.64; .97	.10	n.s.
	Number of smokers	**1.68**	.03	.17; 3.20	.82	-
	Number of former smokers	.07	.91	-1.39; 1.54	.63	n.s.
	Number of non-smokers	-1.72	.16	-4.26; .82	.36	n.s.
	Number of smokers (cigarettes)	.36	.57	-1.00; 1.72	.21	n.s.

	Number of smokers (1-5 cigarettes per day)	-1.70	.11	-3.92; .50	.89	+
	Number of smokers (6-10 cigarettes per day)	-1.07	.26	-3.07; .93	.81	+
	Number of smokers (11-20 cigarettes per day)	**2.18**	.04	.12; 4.26	.91	-
	Number of smokers (> 20 cigarettes per day)	**1.04**	<.01	.45; 1.62	.97	-
	Mean number of smoked cigarettes per day	**.56**	.02	.13; .99	.93	-
	Italian families' expenditure for alcoholic beverages, tobacco and narcotics (Euro per year)	-1411.87	.43	-5137.99; 2314.25	.89	+
	Italian families' expenditure for alcoholic beverages (Euro per year)	**-812.80**	.01	-1397.62; -227.98	.88	+
	Italian families' expenditure for tobacco and narcotics (Euro per year)	-821.87	.64	-4549.90; 2906.15	.85	+
	Physical activity – regularly	.30	.53	-.71; 1.31	.82	+
	Physical activity – unregularly	.16	.67	-.63; .94	.54	-
	Physical activity – only sometimes	-.13	.90	-2.28; 2.03	.14	n.s.
	Physical activity – never	-.34	.70	-2.25; 1.56	.17	n.s.

	Obese persons, male and female, aged > 18	-.11	.75	-.86; .64	.69	+
	Obese persons, male only, aged > 18	.36	.37	-.48; 1.21	.75	+
	Obese persons, female only, aged > 18	-.55	.17	-1.39; .28	.47	+
	Overweight persons, male and female, aged > 18	**.91**	.04	.03; 1.79	.85	+
	Overweight persons, male only, aged > 18	1.15	.09	-.21; 2.51	.73	n.s.
	Overweight persons, female only, aged > 18	.69	.10	-.15; 1.53	.79	n.s.
	Food - % of people (males and females, aged > 3) who eat beef sometimes in the week	-1.19	.60	-6.12; 3.73	.42	n.s.
	Food - % males aged > 3 who eat beef sometimes in the week	-.97	.66	-5.73; 3.80	.36	n.s.
	Food - % of females aged > 3 who eat beef sometimes in the week	-1.40	0.56	-6.52; 3.71	.46	n.s.
	Food - % of people (males and females, aged > 3) who eat fish sometimes in the week	-1.64	.22	-4.44; 1.16	.29	n.s.
	Food - % males aged > 3 who eat fish sometimes in the week	-1.31	.29	-3.93; 1.30	.22	n.s.
	Food - % of females aged > 3 who eat fish sometimes in the week	-1.94	.19	-4.99; 1.09	.35	n.s.

	Food - % of people (males and females, aged > 3) who eat cheese at least once a day	.67	.47	-1.29; 2.64	.94	-
	Food - % males aged > 3 who eat cheese at least once a day	.22	.79	-1.57; 2.01	.95	-
	Food - % of females aged > 3 who eat cheese at least once a day	1.11	.31	-1.16; 3.37	.91	-
	Food - % of people (males and females, aged > 3) who eat vegetables at least once a day	-1.05	.35	-3.41; 1.30	.81	+
	Food - % males aged > 3 who eat vegetables at least once a day	-1.08	.20	-2.84; .67	.76	+
	Food - % of females aged > 3 who eat vegetables at least once a day	-1.02	.47	-4.03; 1.97	.81	+

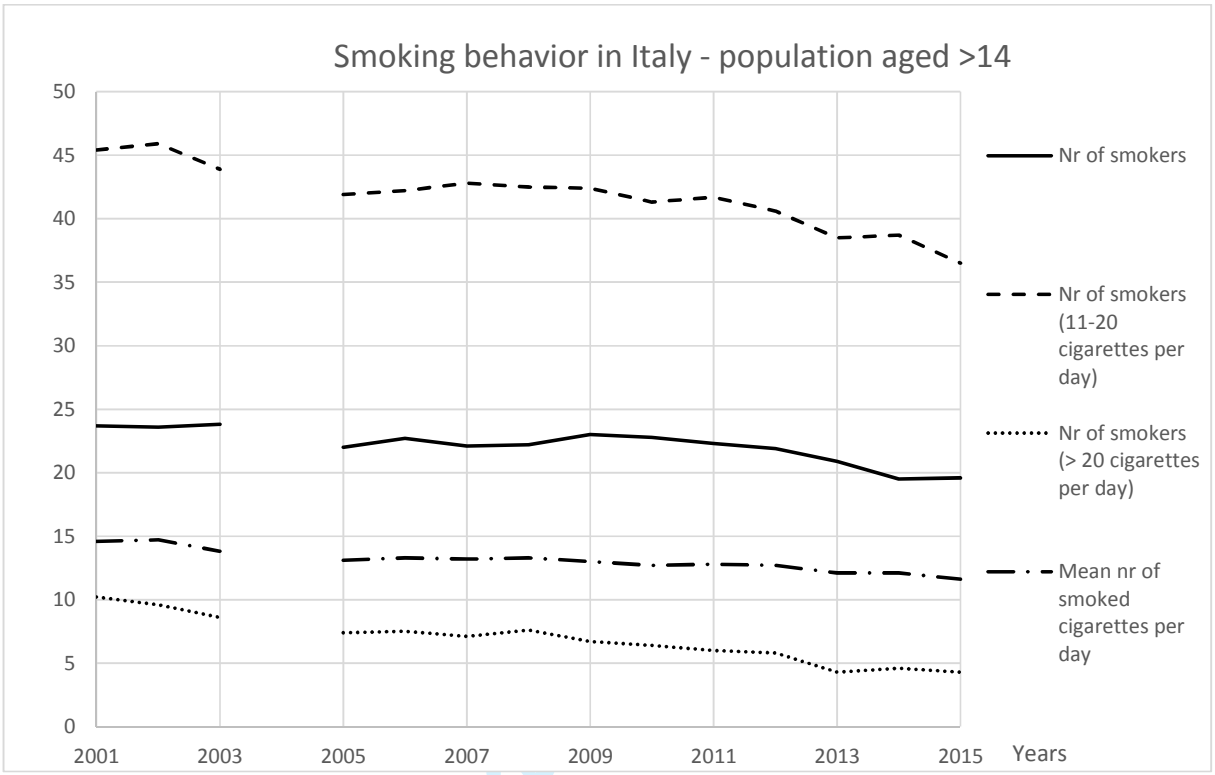

Figure 1 - Smoking behavior among people aged > 14 years old (Nr. of smokers per 100 persons with same features)