Quality and quantity: the role of social interactions in individual health

Damiano, Fiorillo and Fabio, Sabatini
University of Naples Parthenope, Department of Economics, European Research Institute on Cooperative and Social Enterprises (Euricse), Trento, Sapienza University of Rome, Department of Economics and Law

22. March 2011

Quality and quantity: the role of social interactions in individual health[*]

Damiano Fiorillo[**] and Fabio Sabatini[♥]

March 2011

Abstract
The public health literature focusing on the detrimental effects of social isolation has shown that the quantity of social connections is positively correlated with individual health. Drawing on pooled cross-sectional data, we test this hypothesis on a representative sample of the Italian population. Our findings show that, besides the *quantity* of interactions, it is their *quality* – as measured by subjective satisfaction derived from relationships with friends – that works as the best predictor of health. We point out the existence of health disparities based on socio-economic status. Poorer and less educated individuals are exposed to a higher probability of reporting poor health conditions. The risk is even worse for unemployed and retired workers. This paper contributes to the literature in two substantive dimensions. This is the first empirical study of the relationship between social interactions and health in Italy. Second, we add to previous studies by carrying out the first assessment of the role of satisfaction in interpersonal relations.

JEL Codes: I12; I18; Z1
Keywords: health, well-being, satisfaction, social interactions, social capital, family, Italy.

[*] This paper was written in the frame of a research project supported by the European Research Institute on Cooperative and Social Enterprises (Euricse), Trento – Italy. Materials for the study of social interactions, health and development are retrievable on Social Capital Gateway, a website edited by the corresponding author of this article at the address www.socialcapitalgateway.org.

[**] University of Naples Parthenope, Department of Economics. Email: damiano.fiorillo@uniparthenope.it.

[♥] Corresponding author. Sapienza University of Rome, Department of Economics and Law, and European Research Institute on Cooperative and Social Enterprises (Euricse). Email: fabio.sabatini@uniroma1.it.

1. Introduction

In the last two decades, a growing number of empirical studies have tested the hypothesis that social interaction, social trust and community cohesion can improve health at the individual level. The literature has proposed several explanations for this linkage. More intense social relationships may facilitate individuals' access to social support and healthcare, as well as the development of informal insurance arrangements (Altschuler *et al*. 2004, Poortinga 2006, Baron-Epel *et al*. 2008, Ferlander and Mäkinen 2009, Giordano and Lindstrom 2010). They can promote the diffusion of health information, increase the likelihood that healthy norms of behaviour are adopted (e.g., physical activity and usage of preventive services) and exert social control over deviant health-related behaviours, such as drinking and smoking (Kawachi *et al.* 1999, Melchior *et al.* 2003, Lundborg 2005, Folland 2007, Takakura 2011). Cohesive networks may exert the so-called "buffering effect", balancing the adverse consequences of stress and anxiety through the provision of affective support, and by acting as a source of self-esteem and mutual respect (Kawachi *et al.* 1997, Araya *et al*. 2006, De Silva *et al.* 2007, Fujisawa *et al*. 2009).

This paper adds to the existing body of research by arguing that social relationships do not matter *per se*. What may really count is their "quality" or, in other words, whether these relationships are perceived as "satisfactory" or not. Indeed, only satisfactory relationships may be able to provide the moral support necessary to make the buffering effect work. Moreover, it seems reasonable to suspect that mutual assistance mechanisms, the circulation of health-related information and the promotion of healthy behaviours may occur only in the context of high quality relationships.

The aim of the paper is to empirically investigate the impact of the quantity and quality of social interactions on individual health in Italy. To reach this goal, we rely on a unique dataset that we built through the statistical matching of two existing sources: the Multipurpose Household Survey (MHS) conducted annually by the Italian National Institute of Statistics, and the Survey on Household Income and Wealth (SHIW) carried out by the Bank of Italy every two years. The MHS investigates a wide range of social behaviours and perceptions by means of face-to-face interviews on a sample of 24,000 households, roughly corresponding to 50,000 individuals, but it does not collect information on household income. The SHIW covers 7,768 households composed of 19,551 individuals and 13,009 income-earners and contains detailed information on the income and wealth of family members as well as socio-demographic characteristics of the household. Through the statistical matching procedure, we impute the household income of an individual from the SHIW to a similar individual from the Multipurpose Survey in a pooled cross section sample composed by four waves (1993, 1995, 1998 and 2000) of the MHS. The final dataset contains 216,994 observations.

Our dependent variable is self-reported health, as measured through the question "In general, would you say that your health is excellent, good, fair, poor, or very poor?" Responses are coded into a binary variable which is equal to 1 in case of good or fair health. As independent variables, we focus on various aspects of social interaction, including the frequency of meetings with friends and relatives, subjective satisfaction with relationships with friends, membership in voluntary associations, religious participation and perception of community problems. Plus, we use a number of socio-demographic and economic characteristics as control variables. We assess the role of independent variables through probit regressions and a number of robustness checks. The main limitation of the analysis is the difficulty of distinguishing the effect of social interaction from other local effects possibly influencing health. In this paper, we attempt to assess the potential role of omitted variables by means of a multivariate probit analysis.

Regressions results show that, besides the *quantity* of interactions, it is their *quality* that works as the best predictor of health. The frequency of meetings with friends is significantly and positively correlated with good health in all regressions. However, when we add our measure of the quality of relationships to the probit equations, the statistical significance of "quantitative" measures is scaled down. Satisfaction with relationships with friends exhibits a positive and highly significant

coefficient. Results of the multivariate probit analysis point out the potential role of unobservable variables suggesting the existence of endogeneity problems which require further investigations.
The contribution of this study to the literature is three-fold. First, we try to do justice to the very multidimensionality of the concept of social capital by accounting for different dimensions of the phenomenon. Second, we add to previous empirical studies pointing out the positive role of informal ties by taking into account not only the frequency of various kinds of meetings but also indicators of their "quality", as measured by agents' subjective satisfaction with their social participation. Third, to our knowledge this is the first econometric investigation into the socio-economic determinants of health in Italy. The reliability of the analysis also benefits from the uniqueness and comprehensiveness of our dataset, which tries to overcome a structural deficiency in Italian data by merging information on agents' behaviours and perceptions with data on household income.
The outline of the paper is as follows. Section 2 briefly reviews the literature on social capital and health. In Sections 3 and 4 we describe data and methodology. In Section 5 we present and discuss our results. Section 6 is devoted to a brief discussion of strengths and weaknesses of the analysis. The paper closes with some guidelines for further researches.

2. Social interactions and health

Over the past 20 years, the health economics and social epidemiology literatures have extensively analyzed the impact of social interactions on individual health. Various aspects of the relational sphere of individual lives have been addressed, from relationships with family and friends to membership in various kinds of associations, community cohesion, and the ability to carry out collective actions. Social interactions may improve health through at least four channels.
First, they facilitate the transmission of health information. Networks of relationships are a place to share past experiences on diseases, doctors, prices, health facilities and therapies. This privileged channel of information fosters matching procedures (in the sense that patients spend less time in finding the appropriate doctor), lowers the cost of health information, speeds up the diffusion of knowledge on health innovation and eliminates mistaken perceptions on the role of healthcare, discouraging patients from undertaking inappropriate treatments. The role of networks' ability to transmit information is stressed by several studies finding a significant and positive correlation between various aspects of social capital and actual or perceived health (Berkman *et al*. 2000, Kim *et al*. 2006, d'Hombres *et al*. 2010).
Second, social interactions favour the establishment of mutual assistance mechanisms. In case of sickness, the support of family and friends plays a fundamental role in ensuring access to healthcare services and facilities, for example through financial assistance, transportation services and help in dealing with doctors. In countries where public health systems do not provide universal coverage for all patients, informal financial support plays a fundamental role in ensuring access to services to individuals otherwise excluded from formal schemes. Mutual, spontaneous insurance arrangements are particularly relevant in underdeveloped areas, characterized by limited supply and widespread informal economy. Ayé *et al*. (2002) report that, in the Ivory Coast, poor people's access to modern healthcare services relies solely on solidarity and social capital. In other low-income countries, community-based health insurance is often the best means of providing the poor with financial protection from the cost of health care (Mladovsky and Mossialos 2008).
Social contacts may foster individual access to services even when public protection schemes are designed to provide universal coverage (van Doorslaer and Wagstaff 1992, van Doorslaer *et al*. 2004, Balsa *et al*. 2009). For example, empirical evidence on the Italian National Health System (NHS) – which theoretically covers all citizens on equal terms – suggests that the wealthy are more likely to be admitted to hospitals than the poor (Masseria and Giannoni 2010). With reference to Italy, Atella *et al*. (2004) find that individuals who might be considered vulnerable from a societal perspective – i.e. the sick, the elderly, women and those with low incomes – are less likely to seek care from specialists and more likely to seek care from general practitioners. Since, in the Italian

NHS, services are in principle equally accessible by all citizens, health inequalities based on socio-economic status may be related also to people's ability to acquire suitable information and to find the right contacts in the right places, which in turn is influenced by the extension of one's social network.

Third, social interactions may foster the development of social norms that support health-promoting behaviours, such as prevention and physical activity, or constrain unhealthy habits such as drinking and smoking. For example, jogging with a friend or joining a football team may make physical exercise less boring and painful, thus providing incentives to get fit and to keep weight under control. According to Haughton McNeill *et al*. (2006), "through social networks individuals form a sense of attachment and connectedness to one another providing access to resources and material goods that support physical activity (e.g., provision of child care services)" (p. 1014). Lindstrom *et al.* (2001) argue that social interaction may influence leisure-time physical activity through peer-pressure mechanisms. According to Folland (2007), sympathetic relationships can provide "coaching" practices similar to those practised by fitness trainers. These hypotheses have inspired a large amount of empirical research. One of the main findings of this literature is the existence of a significant and positive correlation between social participation and physical activity (Sherwood and Jeffery 2000, Brennan *et al*. 2003, Giles-Corti and Donovan 2003, Huston *et al*. 2003, Kahn *et al*. 2003).

On the other hand, social participation can discourage the adoption of risky behaviours. According to Brown *et al*. (2006), most groups exhibit shared norms against excessive drinking and smoking. Relational commitments and community engagement may help develop a sense of responsibility for the well-being of others. Brown *et al*. (2006) find that the proportion of community social capital attributable to religious groups is inversely and strongly related to the number of cigarettes that smokers consume. It is noteworthy that religious participation has been found also to be negatively correlated with alcohol consumption (Schiff 2006) and positively correlated with the use of preventive services (Reindl Benjamin and Brown 2004).

While the role of religious organizations is subject to question in the literature (see for example Koenig and Cohen 2002, Schaie et al. 2004), most studies converge on the finding that involvement in social networks prevents self-damaging behaviours (Robison and Hanson 1995, DeLeire and Levy 2001, Lindström *et al*. 2003, Weitzman and Chen 2004, Folland 2006, Chuang *et al*. 2008).

Fourth, social interactions and community cohesion provide moral and affective support which mitigates the psychological distress related to sickness. This "buffering effect" may play a fundamental role in improving patients' ability to recover, thereby improving the health status of sick people. The buffering effect of a cohesive network or community works for healthy people as well by preventing depression and mental disorders often related to social isolation and acting as a source of self-esteem and mutual respect (Kawachi *et al*. 1999, Hendry et al. 2002).

Evidence of the buffering effect is also provided by the growing body of studies on the relationship between volunteering and health. Besides providing opportunities for social interaction, volunteering increases self-esteem and empathic emotions, thereby improving life satisfaction and reducing mental distress with beneficial health effects (Whiteley 2004, Post 2005, Borgonovi 2008).

The studies mentioned above generally focus on quantitative measures of interpersonal relationships. Also, due to the lack of suitable data, their empirical strategy do not explicitly address the importance of quality and satisfaction within social interactions. The concept of quality seems to be considered solely in an implicit and indirect way, by assessing the relationship between social trust and good health. In fact, it is possible to argue that interactions with others are more likely to improve health in environments where people trust each other and share values of reciprocity. However, the social trust indicators adopted by most literature – generally measured through the famous question: "Generally speaking, do you think that most people can be trusted?" – explicitly refer to strangers (see for example Kennelly *et al*. 2003, Carlson 2004, Araya *et al*. 2006, Poortinga 2006b, Baron-Epel *et al*. 2008, Chuang *et al*. 2008, Berry and Walsh 2010, d'Hombres *et al*. 2010).

This approach raises a number of problems. Generalized trust is not based on past experience – as relationships with friends are. On the contrary, its roots may be traced in inherited moral and ideological norms (Uslaner 2002). Even if it seems reasonable to assume the existence of a positive correlation between social trust and the quality of relationships with friends and acquaintances, to our knowledge this relationships has never been tested in the social epidemiology literature. Moreover, it is easily possible that people who trust strangers may be surrounded with unsatisfactory and not trust-intensive relationships.

On the other hand, it is undeniable that the transmission mechanisms allowing social interactions to improve health mainly work at the individual level. What matters in the improvement of health is in fact the trust intensity of the individual's personal relationships with others, rather than his generic perception that unknown people can be trusted. We argue that the more the individual's personal relationships are satisfactory, the more they should be able to provide moral support and spontaneous forms of health-related assistance. Thus, our study differs from previous empirical investigations by accounting for indicators of both quality and quantity of social interactions.

As outlined in the introduction, the contribution of the paper to the literature is further improved by the focus on Italy and the uniqueness of our data source. The linkage between various aspects of social interaction and health has in fact been tested almost all over the world but, to our knowledge, not in Italy. Italy is a worthy case study for at least two reasons. First, the Italian National Health Service is aimed at providing universal coverage free of charge at the point of use. Equal access to uniform levels of health care according to needs is in principle guaranteed to everyone, yet significant disparities in the use of healthcare services have been registered based on socio-economic status and the area of residence (Atella *et al*. 2004, Giannoni *et al*. 2007, Masseria and Giannoni 2010). It is therefore an interesting task to investigate which socio-economic phenomena may favour the development of health inequalities. Moreover, the uniqueness of our dataset allows us to account for a wide range of socio-economic phenomena, thanks to statistical matching between different sources. Second, the Italian healthcare system is currently in the middle of a major transition that affects policy decisions, financing methods and service provision. These changes have taken place within the larger context of the so-called "devolution" process, which has afforded regions greater autonomy in the definition of health policies, including the responsibility of financing healthcare through regional taxes. According to some authors, this devolution creates a substantial risk of exacerbating the incidence of health inequalities (De Leonardis 2003, Sabatini 2007, Granaglia 2008). Besides its focus on the role of social interactions, our study provides an exploratory evaluation of the health effect of a number of differences in socio-economic status.

3. Data and methodology

Raw data is drawn from the 1993-2000 sections of the Multipurpose Survey on Households (MSH) conducted by Istat. This survey investigates a wide range of social behaviours and perceptions on a sample of 24,000 households, roughly corresponding to 50,000 individuals. However, it does not collect information on household income. In an attempt to fill this gap, we combine the Istat MSH with the Survey of Household Income and Wealth (SHIW) carried out by the Bank of Italy. The SHIW covers 7,768 households composed of 19,551 individuals and 13,009 income-earners and contains detailed information on the income and wealth of family members as well as socio-demographic characteristics of the household. Both samples are representative of the Italian population at the national and regional level. Basically, we impute the household income of an individual from the SHIW to a similar individual from the Multipurpose Survey through a statistical matching procedure (see Appendix A for further details). Our final dataset is a pooled cross section sample of 216,994 observations collected in the years 1993, 1995, 1998 and 2000.

Our dependent variable is self-reported health, as measured through the question "In general, would you say that your health is excellent, good, fair, poor, or very poor?" Responses are coded into a binary variable which is equal to 1 in cases of good or fair health.

The quantity of social interactions is measured through the following set of variables:

- The frequency of meetings with friends, coded as 1 if the interviewee meets friends every day or at least twice a week.
- The frequency of meetings with relatives, coded as above.
- Membership in organizations, distinguished between passive membership (if the individual participated in meetings of an organization in the 12 months prior to the interview) and active membership (if the individual did unpaid work for an organization in the 12 months prior to the interview). The organizations we accounted for are volunteer, charitable, ecological and cultural associations, political parties and trade unions.
- Religious participation as measured through a binary variable which is equal to 1 if the interviewee goes to a church or other place of worship one or more times a week.

The quality of social interactions with friends is assessed through subjective satisfaction with relationships with friends, as measured through the question: "How much do you feel satisfied with your relationships with friends?", where possible responses are very satisfied, fairly satisfied, not very satisfied, not at all. Responses are coded into a binary variable which is equal to 1 in case of fair or high satisfaction.

The quality of the relational environment is assessed also through indicators of subjective perception of its safety and of a number of other issues such as traffic and parking problems, pollution, dirtiness and the quality of public transport.

We controlled for gender, marital status, age, family size, presence and age of children, education, work status, homeownership, the home's characteristics (whether it is "civil" or "luxury") and newspaper reading.

Finally, we controlled for the natural logarithm of the imputed household income (sum of labour income, capital income and pensions) obtained through the statistical matching procedure. All the variables are described in detail in Table B1 in Appendix B. Summary statistics are reported in Table 1 below. The correlation matrix between the main variables of interest in the analysis is reported in Table 2.

Table 1 shows that, on average, respondents are female, married, have children, have a low education level, are employed as an employee, are homeowners, and they rate their health as good. In terms of the key independent variables, respectively, 71% and 29% of individuals meet friends and relatives one or more times per week, and 86% of people declare themselves to be fairly or highly satisfied with their relationships with friends. Furthermore, 22% of respondents are passive members of voluntary organizations while 12% are active members. Finally, 36% of the sample attends churches or other places of worship one or more times per week. Note that the dependent variable and the key independent variables are positively correlated with one another except for church attendance.

As a robustness check, we accounted also for a number of other activities implying a certain degree of relational engagement, such as the habit of talking about politics and several forms of cultural consumption, i.e. the frequency with which interviewees go to the cinema or the theatre, attend concerts, watching live sports or visit museums.

Table 1. Descriptive statistics			
	Observations	Mean	St. dev.
Dependent variable			
Self-perceived good health	213792	0.72	0.45
Frequency of meeting with friends and relatives			
Meetings with friends	215565	0.71	0.45
Meetings with relatives	216994	0.29	0.45
Satisfaction with relationships with friends	211528	0.86	0.35
Associational and religious participation			
Passive membership	212013	0.21	0.40
Active membership	211543	0.11	0.32
Church attendance	212604	0.36	0.48
Demographic and socio-economic characteristics			
Female	216994	0.52	0.50
Married	216994	0.58	0.49
Age21-40	216994	0.17	0.38
Age31-40	216994	0.18	0.38
Age41-50	216994	0.16	0.37
Age51-65	216994	0.21	0.41
Age > 65	216994	0.18	0.38
Household size	216994	3.22	1.31
Children 0-5	216994	0.13	0.40
Children 6-12	216994	0.18	0.47
Children 13-17	216994	0.22	0.50
Elementary	216994	0.25	0.44
Junior high school	216994	0.32	0.47
High school (diploma)	216994	0.29	0.45
Bachelor's degree and beyond	216994	0.07	0.25
Household income (ln)	216994	10.64	0.46
Self-employed	216994	0.11	0.32
Unemployed	216994	0.06	0.24
Student	216383	0.10	0.30
Retired	216994	0.21	0.41
Newspaper reader	212788	0.25	0.43
Homeowner	216994	0.71	0.45
Civil house	214251	0.61	0.49
Perception of community problems			
Micro-criminality	216556	0.03	0.17
No parking problems	215260	0.38	0.48
No traffic problems	214896	0.21	0.41
No pollution	215059	0.30	0.46
No dirtiness problems	215378	0.27	0.44
No public transport problems	214359	0.37	0.48

Table 2. Correlation matrix between self-reported health and social interactions indicators

	Self-perceived good health	Meetings with friends	Meetings with relatives	Satisfaction	Passive membership	Active membership	Church attendance
Self-perceived good health	1.00						
Meetings with friends	0.11***	1.00					
Meetings with relatives	0.05***	0.02***	1.00				
Satisfaction*	0.17***	0.23***	0.02***	1.00			
Passive membership	0.07***	0.10***	0.01***	0.06***	1.00		
Active membership	0.05***	0.08***	0.01***	0.05***	0.52***	1.00	
Church attendance	-0.05***	0.00	-0.01***	0.02***	0.02***	0.07***	1.00

Notes: * Satisfaction means satisfaction with relationships with friends.
*** Triple asterisk denotes that the coefficient is statistically significant at 1 percent.

Our empirical model of perceived health can be represented through the following estimation equation:

$$H_{it}^{*} = \alpha + SI_{it}^{'}\beta + \lambda Y_{it} + Z_{it}^{'}\delta + \varepsilon_{it} \quad (1)$$

where H is self-reported health for individual i at time t; SI are the social interaction variables defined at the individual level; Y is the annual household income; the Z vector consists of the other variables that are known to influence self-perceived health and ε is a random-error term.

We do not observe the "latent" variable H_{it}^{*} in the data. Rather, we observe H_{it} as a binary choice which takes value 1 (fair or good perceived health) if H_{it}^{*} is positive and 0 otherwise. Thus, the structure of (1) makes it suitable for estimation as a probit model:

$$\Pr(H_{it} = 1) = \Phi(\alpha - SI_{it}^{'}\beta - \lambda Y_{it} - Z_{it}^{'}\delta) \quad (2)$$

where $\Phi(\cdot)$ is the cumulative distribution function of a normal standard.

4. Results

Table 3 presents the results of probit estimates. To compare relative magnitudes of the effects of the independent variables, we report their marginal effects. In model 1, we solely focus on the frequency of meetings with friends, which is found to be significantly and positively correlated with self-rated health. Meeting friends at least twice a week raises the probability of reporting good health by 4.4%

However, when we fit the model with satisfaction with friendships (see columns 2 and 3 in Table 3), the size of the effect noticeably decreases to 1.8 %, although remaining significant. On the other hand, the indicator of the quality of relationships exhibits a very strong and positive association

with self-reported health: being very or fairly satisfied with relationships with friends increases the probability of reporting good health by 15%.
In both the models, education is another relevant predictor of health. Having a high-school degree increases the probability of good perceived health by about 10%. This probability rises to 12% when bachelor's degree and beyond is achieved. The effect of household income is significant, but its size seems to be negligible in comparison to that of other explanatory variables.
Work status is found to be another important predictor of perceived health. Being unemployed increases the individuals' probability of rating their own health as poor by about 4.5%. By contrast, self-employed workers exhibit a 2 point higher probability of reporting good health. A new and interesting result regards the habit of reading newspapers everyday, which is significantly and positively correlated with good health.

Table 3. Probit estimates

	Model I		Model II		Model III	
	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.
Social interactions						
Meetings with friends	0.044***	(0.002)	0.018***	(0.003)	0.019***	(0.003)
Satisfaction with friends' relationships			0.150***	(0.005)	0.150***	(0.005)
Meetings with relatives					0.015***	(0.002)
Passive membership					-0.003	(0.004)
Active membership					-0.006*	(0.003)
Religious participation					-0.002	(0.003)
Demographic and socio-economic characteristics						
Female	-0.002	(0.002)	-0.004	(0.002)	-0.004*	(0.002)
Married	0.053***	(0.004)	0.047***	(0.004)	0.046***	(0.004)
Age21-30	-0.011**	(0.006)	-0.013**	(0.006)	-0.013**	(0.006)
Age31-40	-0.032***	(0.007)	-0.033***	(0.007)	-0.032***	(0.007)
Age41-50	-0.051***	(0.007)	-0.053***	(0.007)	-0.051***	(0.007)
Age51-65	-0.118***	(0.009)	-0.119***	(0.009)	-0.116***	(0.009)
Age > 65	-0.292***	(0.013)	-0.288***	(0.013)	-0.283***	(0.012)
Household size	0.019***	(0.001)	0.018***	(0.001)	0.019***	(0.001)
Children 0-5	0.058***	(0.004)	0.060***	(0.004)	0.059***	(0.004)
Children 6-12	0.011***	(0.003)	0.012***	(0.003)	0.011***	(0.003)
Children 13-17	0.037***	(0.003)	0.034***	(0.003)	0.034***	(0.003)
Elementary	0.055***	(0.005)	0.051***	(0.006)	0.052***	(0.006)
Junior high school	0.089***	(0.007)	0.084***	(0.007)	0.085***	(0.008)
High school (diploma)	0.110***	(0.006)	0.104***	(0.007)	0.106***	(0.007)
Bachelor's degree and beyond	0.124***	(0.006)	0.119***	(0.006)	0.121***	(0.006)
Household income (ln)	0.048***	(0.004)	0.047***	(0.004)	0.047***	(0.004)
Self-employed	0.019***	(0.004)	0.018***	(0.004)	0.017***	(0.004)
Unemployed	-0.045***	(0.007)	-0.043***	(0.007)	-0.043***	(0.007)
Student	0.003	(0.005)	0.003	(0.005)	0.004	(0.005)
Retired	-0.038***	(0.005)	-0.040***	(0.005)	-0.040***	(0.005)
Newspaper reader	0.024***	(0.003)	0.019***	(0.003)	0.019***	(0.003)
Homeowner	-0.022***	(0.003)	-0.026***	(0.003)	-0.026***	(0.003)
Civil house	0.006***	(0.002)	0.005***	(0.002)	0.004**	(0.002)

Table 3. Continuation

Perception of community problems						
Micro-criminality	-0.018***	(0.006)	-0.017***	(0.006)	-0.018***	(0.006)
No parking problems	0.003	(0.003)	0.002	(0.003)	0.001	(0.003)
No traffic problems	0.010***	(0.003)	0.010***	(0.003)	0.009***	(0.004)
No pollution	-0.001	(0.004)	-0.002	(0.004)	-0.002	(0.004)
No dirtiness problems	-0.001	(0.003)	-0.002	(0.003)	-0.001	(0.003)
No public transport problems	0.004	(0.003)	0.003	(0.002)	0.003	(0.003)
Regional dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No. of observations	202568		200248		198466	
Pseudo R-squared	0.124		0.135		0.135	
Log-likelihood	-102617.79		-100186.39		-99275.37	

Note: The dependent variable *Self-perceived health* is a binary variable (1 = good and very good, 0 otherwise). The model is estimated with a standard probit. See Appendix B1 for a detailed description of regressors. Regional and year dummies are omitted for space reasons. Standard errors are corrected for heteroskedasticity and clustering of errors at the regional level. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10 percent.

Household characteristics matter as well. As expected, perceived health is found to decrease with age. Marital status and the household size are instead significantly and positively associated with very good health. Being married raises the likelihood of reporting good health by about 5%. A one-member increase in the household size is associated with a 2 percentage point higher probability of good perceived health. Having little children (aged 0-5) is another significant explanatory variable, which raises the probability of good health by about 6%.

The presence of micro-criminality in the area of residence seems to be a significant explanatory variable. Individuals who have been subject to pick-pocketing exhibit a 1.8 percentage point higher probability of reporting very bad health.

Besides micro-criminality, the subjective perception of other community problems seems not to be significant. Probit estimates point out just a modest association between the absence of traffic problems and self-reported health.

In model 3, we include the other indicators of the quantity of social interactions, i.e. the frequency of meetings with relatives, passive and active membership in organizations, and religious participation. Satisfaction with relationships with friends remains the best predictor of self-rated health, while the frequency of meetings with relatives seems to exert a significant yet negligible effect. Participation in voluntary organizations is not found to be a significant predictor of health, as well as religious participation. The significance, sign and size of all the other betas remain substantially unchanged.

Results are robust to the inclusion of a number of further control variables. In model 4, we consider the size of municipality through five dummy variables. In model 5, we add variables aimed at capturing other relational aspects of individual behaviours. In particular, we account for the habit of talking about politics and for several indicators of cultural consumption, such as the frequency with which interviewees go to the cinema or the theatre, attend concerts, watch live sports or visit museums. Estimates results are presented in Table 4. There are no significant health differences in relation to the size of the municipality of residence, with an exception made for people living in metropolitan suburbs, who have a 1.3 percentage points lower probability of reporting good health.

Other significant relational activities are the habit of talking about politics, which is associated with a 1% higher probability of reporting good health, the habit of going to the theatre (1.9%) or to the cinema (1%), of attending classical music concerts (3.4%) and going dancing (1.3%).

Table 4. Probit estimates: robustness analysis

	Model I		Model II	
	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.
Meetings with friends	0.019***	(0.003)	0.018***	(0.003)
Satisfaction with friends' relationships	0.150***	(0.005)	0.150***	(0.005)
Meetings with relatives	0.015***	(0.002)	0.016***	(0.002)
Passive membership	-0.003	(0.004)	-0.007**	(0.004)
Active membership	-0.006*	(0.003)	-0.005*	(0.003)
Church attendance	-0.002	(0.003)	0.001	(0.003)
Female	-0.004*	(0.002)	-0.003	(0.002)
Married	0.046***	(0.004)	0.045***	(0.004)
Age21-30	-0.013**	(0.006)	-0.011*	(0.006)
Age31-40	-0.032***	(0.007)	-0.031***	(0.007)
Age41-50	-0.051***	(0.007)	-0.051***	(0.008)
Age51-65	-0.116***	(0.009)	-0.116***	(0.009)
Age > 65	-0.283***	(0.013)	-0.281***	(0.013)
Household size	0.019***	(0.001)	0.019***	(0.001)
Children 0-5	0.059***	(0.004)	0.059***	(0.004)
Children 6-12	0.011***	(0.003)	0.012***	(0.003)
Children 13-17	0.034***	(0.003)	0.035***	(0.003)
Elementary	0.052***	(0.006)	0.051***	(0.006)
Junior high school	0.085***	(0.008)	0.085***	(0.008)
High school (diploma)	0.106***	(0.007)	0.104***	(0.007)
Bachelor's degree and beyond	0.121***	(0.006)	0.118***	(0.006)
Household income (ln)	0.047***	(0.004)	0.046***	(0.004)
Self-employed	0.017***	(0.004)	0.018***	(0.004)
Unemployed	-0.043***	(0.007)	-0.042***	(0.007)
Student	0.004	(0.005)	0.002	(0.005)
Retired	-0.040***	(0.005)	-0.040***	(0.005)
Newspaper reader	0.019***	(0.003)	0.019***	(0.003)

Table 4. Probit estimates: robustness analysis (continue)

Homeowner	-0.026***	(0.002)	-0.025***	(0.003)
Civil house	0.004**	(0.002)	0.003**	(0.002)
Micro-criminality	-0.018***	(0.006)	-0.017***	(0.006)
No parking problems	0.002	(0.003)	0.001	(0.003)
No traffic problems	0.009***	(0.004)	0.010***	(0.003)
No pollution	-0.002	(0.004)	-0.001	(0.004)
No dirtiness problems	-0.001	(0.003)	-0.001	(0.003)
No public transport problems	0.003	(0.002)	0.003	(0.002)
Size of municipality				
Metropolis	-0.010**	(0.005)	-0.011**	(0.005)
Neighbouring metropolis	-0.013**	(0.005)	-0.012**	(0.005)
2000-10000	-0.009*	(0.005)	-0.009*	(0.005)
10000-50000	-0.011*	(0.006)	-0.012*	(0.006)
>50000	-0.005	(0.005)	-0.005	(0.005)

Table 4. Probit estimates: robustness analysis (continue)

	Model I		Model II	
	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.
Politics			0.010***	(0.003)
Theatre			0.019**	(0.008)
Cinema			0.010**	(0.004)
Museum			-0.017*	(0.010)
Classical music			0.034***	(0.010)
Light music			0.002	(0.009)
Sports show			0.004	(0.003)
Disco			0.013***	(0.003)
Regional dummies	Yes		Yes	
Year dummies	Yes		Yes	
No. of observations	198466		191703	
Pseudo R-squared	0.135		0.136	
Log-likelihood	-99269.15		-95894.31	

Note: The dependent variable *Self-perceived health* is a binary variable (1 = good and very good, 0 otherwise). The model is estimated with a standard probit. See Appendix B1 for a detailed description of regressors. Regional and years dummies are omitted for space reasons. Standard errors are corrected for heteroskedasticity and clustering of errors at the regional level. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10 percent.

5. Limitations of our study

There are several reasons for treating these findings with caution. First, self-rated health is a subjective measure that can be misreported by interviewees. Both perceived health and satisfaction with relationships with friends are self-reported and thus exposed to common method bias. As explained by Fujiwara and Kawachi (2008), common method bias occurs when personality characteristics, such as negative affectivity, influence both life satisfaction and health status.

The pooled cross-sectional design of the study is another limitation which requires us to be cautious in advancing a causal interpretation of the estimates. More generally, the nature of the phenomena

we are dealing with exposes the analysis to endogeneity problems in two ways. First, the frequency of meetings with friends and relatives, as well as associational and religious participation, are results of individual choices, which depend on individual, specific and unobservable preferences. Hence, they are by definition endogenously determined. Unobservable individual characteristics such as personal interests or unexpected shocks may be correlated with both self-rated health and the individual propensity to social interaction. Second, the possibility of a reverse causality must be taken into account: individuals in poor health may be forced to reduce their social participation against their will.

Available data allow us to determine only whether self-reported health, the frequency of meetings with friends, and satisfaction with friendships are joint or independent decisions. Thus, we jointly estimate self-reported health, the frequency of meetings with friends, and satisfaction with friendships[1] using a Multivariate Probit model (hereafter MP)[2].

Unsurprisingly, results point to a joint process[3]. The estimated correlation coefficient (rho) across the error terms of the three equations is positive and statistically significant at 1%, indicating that the null hypothesis of the absence of correlation between the error terms can be rejected at the usual level of confidence. In other words, the perception of one's own health status is likely to depend also on unobservable variables which affect the frequency of meetings with friends and satisfaction with friendships as well.

Table 5. Covariances between possibly endogenous variables

$\rho_{21} = Cov(\varepsilon_{Meetingswithfriends}, \varepsilon_{Self-reportedhealth})$	0.079*** (0.004)
$\rho_{31} = Cov(\varepsilon_{Satisfactionwithfriends}, \varepsilon_{Self-reportedhealth})$	0.242*** (0.007)
$\rho_{32} = Cov(\varepsilon_{Satisfactionwithfriends}, \varepsilon_{Meetingswithfriends})$	0.390*** (0.008)

Note: *** Triple asterisk denotes that the coefficient is statistically significant at 1 percent.

Table 5 shows that estimated covariances of the three equations are significantly and positively correlated at the 1% level. This means that the assessment of the health status and of satisfaction with friendships, as well as the decision about the frequency of meetings with friends, are taken jointly. The problem of reverse causality thus remains open to question. The task of shedding more light on the causal nexus requires additional data which, unfortunately, are not available at the moment. Despite these limitations, our findings add various insights to the debate on the relationship between social capital-related phenomena and health. This is, in fact, the first study on the socio-economic determinants of perceived health in Italy. The robustness of the estimates to a number of checks, as well as their overall consistency with previous literature addressing other case studies, encourages us to keep up this course of research. Moreover, the high statistical significance of satisfaction with friendships points out the need to research further the measurement and the effect of the quality of relationships.

6. Discussion of results

Overall, results from estimates support the claims about the existence of health disparities based on socio-economic status in Italy. Even if, in principle, the Italian National Health System is designed to provide universal coverage for all citizens at the point of use, poorer and less educated

[1] In the MP model, dependent variables are self-reported health, the frequency of meetings with friends and satisfaction with friendships. Shared independent variables are all used in Table 3.

[2] For a short discussion about the MP theory, see Green (2003, pp. 931-933) and Green (2008, p. 36). Regarding the application in Stata of the MP model see Cappellari and Jenkins (2003).

[3] Results are available upon request to the authors.

individuals are exposed to a higher probability of reporting poor health conditions. The risk is even worse for unemployed and retired workers.

Social isolation is confirmed to be an important predictor of poor health. Our finding of a significant and positive association between several measures of the quantity of social interactions and self-rated health in Italy supports the claims about the beneficial role of social capital and community cohesion. As outlined in section 2, social interactions can improve health through at least four channels, i.e. the transmission of health information, the promotion of mutual assistance and insurance arrangements, the development of social norms supporting healthy behaviours, and the so-called buffering effect alleviating psychological distress.

However, when models are fitted jointly with quantity and quality measures, the "quantity effect" reduces its size, while the quality of relationships rises to be the best predictor of good health. This does not mean that the frequency of meetings with friends and relatives does not benefit health (correlations with good health remain significant and positive). Rather, it can be argued that social interactions are able to benefit health mostly to the extent to which they are perceived as satisfactory. It is not difficult to imagine that relationships based on the reiteration of "mechanical" habits, such as regularly paying a Sunday visit to parents or meeting every day in a bar to get drunk together, may be scarcely trust-intensive and unsatisfactory. This result seems coherent with previous findings on the existence of an inverse relationship between the intensity and the quality of relationships between relatives in Italy. According to Sabatini (2008, 2009), tight family ties may be perceived as binding and suffocating. The author finds a significant and negative correlation between the frequency of visits to parents and indicators of the actual willingness to help each other, such as gift exchange, the grandparents' willingness to babysit their grandchildren, and sons' availability to take care of their parents in case of sickness.

In general, it seems plausible that informal mutual assistance and insurance mechanisms, as well as the affective and moral support grounding the buffering effect, can take place only in the context of satisfactory relationships.

Another interesting result is the irrelevance of active and passive membership in associations. Apparently, this result conflicts with studies finding a significant and positive cross-country or cross-community correlation between participation in organizations and good health (Kawachi *et al*. 1999, Giordano *et al*. 2010). Still, it is worth noting that several empirical investigations addressing the link at the micro level have found only a weak or negative correlation (see for example d'Hombres *et al*. 2010). An interesting comparison between the macro and the micro level is carried out by Carlson (1994). Drawing on data from the 1990 wave of the World Values Survey for a sample of 21 counties, the author finds that, at the cross-country level, membership in non-political organisations is fairly closely related to self-perceived health. However, at the individual level, membership shows weak effects in most of the countries investigated. Lochner (2003) finds no association between membership in voluntary organizations (including religious organizations, neighbourhood associations, business or civic groups, neighbourhood ethnic or nationality clubs) and cancer mortality in Chicago neighbourhoods. De Silva *et al*. (2007) find no significant relationship between group membership and mental health in a sample taken from the Young Lives (YL) study across 234 communities in Peru, Ethiopia, Vietnam and Andhra Pradesh. Similar results are found by Rose (2000) drawing on the 1998 wave of the New Russia Barometer survey, as well as by Yip *et al*. (2007) drawing on a longitudinal survey in three rural counties of Shandong province, China and by d'Hombres *et al*. (2010) in a sample of eight former Soviet Union countries.

On the other hand, studies on high income countries sometimes show different results. For example, Giordano and Lindström (2010) draw on two waves of the British Household Panel to show that associational participation works well as an independent predictor of self-rated health. The same result is found for the U.S. by Kawachi et al. (1999) drawing on data from the General Social Survey and the Behavioral Risk Factor Surveillance System. Overall, the relationship between membership in associations and health is still controversial and appears to be strongly context-dependent. Further researches are needed, with particular regard to a better classification of

voluntary organizations and the forms of participation. For example, it seems advisable to account for the nature and degree of the relational involvement connected to associational participation and to distinguish organizations according to their aims and scope (e.g. Putnam-esque vs. Olsonian).
Being parents of young children (aged 0-5) is found to be a significant predictor of good health. This finding supports the hypotheses on the relational incentives towards healthy behaviour: as pointed out by Folland, "responsibility to others requires at a minimum that one stay alive and healthy" (2007, 2345).
Religious participation is not a significant predictor of health. This finding joins a controversial literature which, until now, has provided conflicting results. Some authors claim that religious groups play a role in the diffusion of social norms, promoting healthy behaviours and discouraging drinking and smoking habits. For example, drawing on longitudinal data from different sources, Brown *et al*. (2006) find that, in the U.S., religious groups improve community health through the containment of unhealthy lifestyles. According to the authors, at the community level religion may also be a factor promoting collective action, leading to better health services and amenities. As reported by Uslaner (1999) in a comprehensive review of the literature, religious values and involvement with institutions of faith may promote participation in other arenas, such as voting (Rosenstone and Hansen 2003) and volunteering (Wuthnow 1994). However, this seems not to be the case for Italy, where religion often has been claimed to be an alternative to social capital and cohesion (see for example Putnam *et al*. 2003). In Putnam *et al*.: "The Catholic Church there is hierarchical; it dissuades people from becoming involved in their communities" (1993, 107).
The negative role of pick-pocketing provides some support to the buffering effect hypothesis. Feelings of fear and insecurity raise stress and anxiety, which may in turn trigger a number of psychosomatic pathologies. Previous studies have pointed out how people feeling insecure about their neighbourhood may be more inclined to participate in unhealthy behaviours such as smoking. Patterson *et al*. (2004) found that when a geographical area was aggregately rated as a cohesive, safe and good place to live, individuals reported a lower tendency to smoke. Greiner *et al*. (2004) found that community rating (i.e. whether the community was rated as a good place to live) was associated with individual smoking.
An interesting result, which to our knowledge has no precedent in the literature, is the significant and positive association between the habit of reading newspapers and good perceived health. The probability of reporting very good health is 3.6 percentage points higher for individuals who read newspapers daily. Since newspapers are a channel of information about health-related behaviours, daily readers are likely to be more aware of the risks associated with smoking and drinking or the positive effects of a balanced diet, physical activity, and the use of preventive services.

7. Conclusions

This paper has carried out the first empirical investigation into the role of social interactions in self-reported health in Italy. Our results join the previous literature in highlighting the positive role of the frequency of meetings with friends and relatives. However, besides the *quantity* of interactions, it is their *quality* – as measured by subjective satisfaction in relationships with friends – that works as the best predictor of health. We point out the existence of health disparities based on socio-economic status. Poorer and less educated individuals are exposed to a higher probability of reporting poor health conditions. The risk is even worse for unemployed and retired workers.
At this stage of the research, the analysis still has some limitations, which should inform further developments of the work. As outlined in section 5, it is difficult to distinguish the effect of social interaction from other local effects and unobservable individual characteristics that potentially influence health. Moreover, it seems plausible that individuals in poor health may be forced to reduce their social participation. Endogeneity problems thus suggest a certain caution in advancing causal interpretations of the estimates.

Bibliography

Altschuler, A., Somkin, C. P., Adler, N. E. (2004). Local services and amenities, neighborhood social capital, and health. *Social Science and Medicine* 59, 1219–1229.

Araya, R., Dunstan, F., Playle, R., Thomas, H., Palmer, S., Lewis, G. (2006). Perceptions of social capital and the built environment and mental health. *Social Science and Medicine* 62 (12), 3072-3083.

Atella, V., Brindisi, F., Deb, P., Rosati, F. C. (2004). Determinants of access to physician services in Italy: a latent class seemingly unrelated probit approach. *Health Economics* 13, 657–668.

Ayè, M., Champagne, F., Contandriopoulos, A.-P. (2002). Economic role of solidarity and social capital in accessing modern health care services in the Ivory Coast. *Social Science and Medicine* 55, 1929–1946.

Balsa A. I., Rossi, M., Triunfo, P. (2009). Horizontal inequity in access to health care in four South American cities. ECINEQ WP 2009 – 131.

Bank of Italy, Survey of Household Income and Wealth, years 1993, 1995, 1998, 2000, Roma.

Baron-Epel, O., Weinstein, R., Haviv-Mesika, A., Garty-Sandalon, N., Green, M. S. (2008). Individual-level analysis of social capital and health: A comparison of Arab and Jewish Israelis. *Social Science and Medicine* 66, 900-910.

Berkman, L. F., T. Glass, I. Brisette, and T. Seeman (2000). From social integration to health. *Social Science and Medicine* 51 (6), 843-857.

Berry, H. L., Welsh, J. A. (2010). Social capital and health in Australia: An overview from the household, income and labour dynamics in Australia survey. *Social Science and Medicine* 70, 588–596.

Borgonovi, F. (2008). Doing well by doing good. The relationship between formal volunteering and self-reported health and happiness. *Social Science and Medicine* 66, 2321-2334.

Brennan, L. K., Baker, E. A., Haire-Joshu, D., & Brownson, R. C. (2003). Linking perceptions of the community to behavior: Are protective social factors associated with physical activity. *Health Education and Behavior*, 30(6), 740–755.

Brown, T. T., Scheffler, R. M., Seo, S., Reed, M. (2006). The empirical relationship between community social capital and the demand for cigarettes. *Health Economics* 15, 1159–1172.

Cappellari L., Jenkins S. P., (2003), Multivariate probit regression using simulated maximum likelihood, *The Stata Journal*, 3, 278-294.

Carlson P. (1998). Self-perceived health in East and West Europe: another European health divide, *Social Science and Medicine*, 46, 1355–1366.

Carlson P. (2004). The European health divide: a matter of financial or social capital?, *Social Science and Medicine*, 59, 1985–1992.

Chuang, Y.-C., Chuang, K.-Y. (2008). Gender differences in relationships between social capital and individual smoking and drinking behavior in Taiwan. *Social Science and Medicine* 67, 1321–1330.

Costa G, Spadea T, Cardano M (eds) (2004). Disuguaglianze di salute in Italia, *Epidemiologia e Prevenzione*, suppl. monografico al vol. 28, n. 3.

D'Hombres R., Rocco L., Shurcke M., Mckee M., (2010). Does social capital determine health? Evidence from eight transition countries, *Health Economics*, 19, 56-74.

D'Orazio M., Di Zio M., Scanu M., (2006). *Statistical matching: theory and practise*, West Sussex, England, Wiley.

De Leonardis, O. (2003). Le nuove politiche sociali, in L. Bifulco (ed), Il genius loci del welfare. Strutture e processi della qualità sociale, Roma, Officina Edizioni.

De Silva, M. J., Huttly, S. R., Harpham, T., Kenward, M. G. (2007). Social capital and mental health: A comparative analysis of four low income countries. *Social Science and Medicine* 64, 5–20.

Drukker, M., Buka, S. L., Kaplan, C., McKenzie, K., Van Os, J. (2005). Social capital and young adolescents' perceived health in different sociocultural settings. *Social Science and Medicine* 61, 185–198.

Engström, K., Mattsson, F., Järleborg, A., Hallqvist, J. (2008). Contextual social capital as a risk factor for poor self-rated health: A multilevel analysis. *Social Science and Medicine* 66, 2268-2280.

Ferlander, S., Mäkinen, I. H. (2009). Social capital, gender and self-rated health. Evidence from the Moscow Health Survey 2004. Social Science and Medicine 69, 1323–1332.

Fiorillo D., (2008), Le determinanti del capitale sociale in Italia, *Rivista Italiana degli Economisti*, 13, 81-135.

Folland S., (2007). Does 'Community Social Capital' contribute to population health? *Social Science and Medicine*, 64, 2342–2354.

Fujisawa, Y., Hamano, T., Takegawa, S. (2009). Social capital and perceived health in Japan: An ecological and multilevel analysis. *Social Science & Medicine* 69, 500–505.

Fujiwara, T., Kawachi, I. (2008). Social Capital and Health. A Study of Adult Twins in the U.S. *American Journal of Preventive Medicine* 35 (2), 139-144.

Giannoni M,. Rabito G, E Masseria C. (2007). L'equità nell'accesso Alle Cure Sanitarie: Prime Stime e Confronti Interregionali , Regione dell'umbria, D.G. Sanita' e Servizi Sociali, Perugia.

Giles-Corti, B., & Donovan, R. J. (2003). Relative influences of individual, social environmental, and physical environmental correlates of walking. *American Journal of Public Health*, 93(9), 1583–1589.

Giordano G. N., Lindstrom M., (2010). The impact of changes in different aspects of social capital and material conditions on self-rated health over time: a longitudinal cohort studies. *Social Science and Medicine*, 70, 700-710.

Granaglia, E. (2008). Equità orizzontale in un contesto di federalismo sanitario: implicazioni dalla prospettiva della giustizia distributiva. *Politiche Sanitarie* 9 (1), 5-14.

Green, W. H. (2003), Econometric Analysis, 5th ed., Upper Saddle River, Prentice Hall, New Jersey.

Green, W. H. (2008), Discrete Choice Modelling, in Millis T., Patterson K., (eds.), Handbook of Econometrics: Vol. 2, Applied Econometrics, Part 4.2, Palgrave, London,

Greiner K. A., Li C., Kawachi I., Hunt D. C., Ahluwalia J. S., (2004). The relationships of social participation and community ratings to health and health behaviours in areas with high and low population density*, Social Science and Medicine*, 59, 2303–2312.

Haughton McNeill, L., Kreuter, M. W., Subramanian, S. V. (2006). Social Environment and Physical activity: A review of concepts and evidence. *Social Science and Medicine* 63, 1011–1022

Hendry, M. S., Ahern M., Lovrich, N., McCurdy, A. (2002). Access to health care and community social capital. *Health Services Research*, 37(1).

Huston, S. L., Evenson, K. R., Bors, P., Gizlice, Z. (2003). Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *American Journal of Health Promotion*, 18(1), 58–69.

Italian Institute of Statistics (Istat). Multipurpose Survey on Households, years 1993, 1995, 1998, 2000, Roma.

Kadane J . B. (1978). Some Statistical Problems in Merging Data Files 1978 Compendium of Tax Research Office of Tax Analysis, Dept. of the Treasury Washington D.C.: U.S. Government Printing Office, 159-171.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E. (2002). The effectiveness of interventions to increase physical activity. A systematic review. *American Journal of Preventive Medicine*, 22 (4), 73–107.

Kawachi I., Kennedy B. P., Glass R., (1999). Social capital and self-rated health: a contextual analysis. *American Journal of Public Health*, 89, 1187–1193.

Kawachi I., Kennedy B. P., Lochner K., Prothrow-Stith D., (1997). Social capital, income inequality, and mortality, *American Journal of Public Health*, 87, 1491–1498.

Kennelly, B., O'Shea, E., Garvey, E. (2003). Social capital, life expectancy and mortality: a cross-national examination. *Social Science and Medicine*, 56(12), 2367-2377.

Kim, D., Subramanian, S. V., Gortmaker, S. L., Kawachi, I. (2006). US state- and county-level social capital in relation to obesity and physical inactivity: A multilevel, multivariable analysis. *Social Science and Medicine* 63, 1045–1059.

Koenig, H. G., Cohen, H. J. (eds) (2002). The Link between Religion and Health: Psychoneuroimmunology and the Faith Factor, edited by. Oxford University Press, New York.

Lindstrom, M., Hanson, B. S., Ostergren, P.-O. (2001). Socioeconomic differences in leisure-time physical activity: the role of social participation and social capital in shaping health related behaviour. *Social Science and Medicine* 52 (2001) 441-451

Lindström, M., Isacsson, S.-O., Elmståhl, S. (2003). Impact of different aspects of social participation and social capital on smoking cessation among daily smokers: a longitudinal study. *Tobacco Control* 12, 274-281.

Lochner, K. A., Kawachi, I., Brennan, R. T., Buka, S. L. (2003). Social capital and neighborhood mortality rates in Chicago. *Social Science and Medicine*, 56(8), 1797–1805.

Lundborg, P. (2005). Social Capital and Substance Use among Swedish Adolescents - An Explorative Study. *Social Science and Medicine* 61, 1151-1158.

Masseria, C. (2004). Equality and equity in inpatient care in the European Union: a particular analysis of the Italian hospital system. PhD thesis, Universita' Politecnica delle Marche and Universita' degli Studi di Roma, Tor Vergata.

Masseria, C. Giannoni, M. (2010). Equity in access to health care in Italy: a disease-based approach. *European journal of public health*, 1101-1262.

Masseria, C., Paolucci, F. (2005). Equità nell'accesso ai ricoveri ospedalieri in Europa e in Italia. *Quaderni acp*, 12 (1), 3-7.

Melchior M., Berkman L. F., Niedhammer I., Chea M., Goldberg M., (2003). Social relations and self-reported health: a prospective analysis of the French Gazel cohort, *Social Science and Medicine*, 56, 1817-1830.

Mladovsky, P., Mossialos, E. (2008). A Conceptual Framework for Community-Based Health Insurance in Low-Income Countries: Social Capital and Economic Development. *World Development* 36 (4), 590-607.

Patterson J., Eberly L., Ding Y., & Hargreaves M. (2004). Associations of smoking prevalence with individual and area level social cohesion. *Journal of Epidemiology and Community Health*, 58(8), 692–697.

Phelps C. (2000). Information diffusion and best practice. In A. J. Culyer, & J. P. Newhouse (Eds.), *Handbook of health economics*. Amsterdam: Elsevier Science B.V.

Poortinga, W. (2006). Social relations or social capital? Individual and community health effects of bonding social capital. *Social Science and Medicine* 63, 255–270.

Post, S. G. (2005). Altruism, happiness and health: it's good to be good. *International Journal of Behavioral Medicine* 12 (2), 66-77.

Putnam R. D., (1993). Making democracy work: Civic traditions in modern Italy. Princeton, Princeton University Press.

Reindl Benjamins, M., Brown, C. (2004). Religion and preventative health care utilization among the elderly. *Social Science and Medicine* 58 (2004) 109–118.

Robison, L. J., Hanson, S. D. (1995). Social capital and economic cooperation. *Journal of Agricultural Applied Economics* 1, 43–58.

Rodgers W.L., (1984). An evaluation of statistical matching, *Journal of Business and Economic Statistics*, 2, 91-102.

Rose, R. (2000). How much does social capital add to individual health? A survey study of Russians. *Social Science & Medicine*, 51(9), 1421-1435.

Rosenstone S., Hansen J. M. (2003). *Mobilization, Participation, and Democracy in America*. Longman Classics.

Rässler, S. (2002). *Statistical matching*, New York, Springer.

Sabatini F. (2008). Social Capital and the Quality of Economic Development. *Kyklos* 61 (3), 466-499.

Sabatini F. (2009). Social Capital as Social Networks: a New Framework for Measurement and an empirical analysis of its determinants and consequences, *Journal of Socio-Economics* 38 (3), 429-442.

Sabatini, F. (2007). Il decentramento delle politiche sociali in Italia. Il contesto normativo e istituzionale del nuovo sistema di welfare locale, in Cecchi, C., F. Sabatini, *Il capitale sociale per la pianificazione e gestione dei servizi pubblici locali*, Roma, Officina Edizioni.

Schaie, K. W., Krause, N., Booth, A. (eds) (2004). Religious Influences on Health and Well-Being in the Elderly. New York: Springer Publishing Company.

Schiff, M. (2006). Living in the shadow of terrorism: Psychological distress and alcohol use among religious and non-religious adolescents in Jerusalem. *Social Science and Medicine* 62 (2006) 2301–2312.

Sherwood, N. E., Jeffery, R. W. (2000). The behavioural determinants of exercise: Implications for physical activity interventions. *Annual Review of Nutrition* 20, 21–44.

Takakura, M. (2011). Does social trust at school affect students' smoking and drinking behavior in Japan? Social Science and Medicine 72 (2), 299-306.

Uslaner, E. (1999). Morality Plays, in van Deth, J., Maraffi, M., Newton, K., Whiteley, P. F., *Social Capital and European Democracy*. New York: Routledge.

Uslaner, E. (2002). The Moral Foundations of Trust. Cambridge: Cambridge University Press.

Van Doorslaer E., Koolman X., Jones A. (2004). Explaining income-related inequalities in doctor utilization in Europe. *Health Economics* 13, 629-647.

Van Doorslaer E., Wagstaff A. (1992). Equity in the delivery of health care: some international comparisons. *Journal of Health Economics* 11(4), 389-411.

Weitzman, E., Chen, Y.-Y. (2004). Risk modifying effect of social capital on measures heavy alcohol consumption, alcohol abuse, harms and secondary effects: National survey findings. *Journal of Epidemiology & Community Health* 59, 303–309.

Whiteley, P. (2004). The art of happiness: is volunteering the blue-print for bliss? London: Economic and Social Research Council.

Wuthnow R. (1994). *Producing the Sacred: An Essay on Public Religion.* Urbana: University of Illinois Press.

Yip, W., Subramanian, S. V., Mitchell, A. D., Lee, D. T. S., Wang, J., Kawachi, I. (2007). Does social capital enhance health and well-being? Evidence from rural China. *Social Science and Medicine* 64, 35–49

Appendix A

As in Fiorillo (2008), let *A* be the MSH dataset (the so-called "base file") collecting information on X_A variables for each of n_A records, and let *B* be the SHIW dataset (the "supplemental file") comprising X_B variables for each of n_B records. Let $X=(X_1,...,X_P)$ be the vector of variables measured in both the files, i.e. for each of the units n_A and n_B included in the two datasets. The remaining variables in each of the files will be referred to as $Y=(Y_1,...,Y_Q)$ in file *A* and as $Z=(Z_1,...,Z_R)$ in file *B*. The statistical matching procedure is aimed at creating a file *C* collecting all the variables *X*, *Y*, and *Z* for each of n_A records of the base file. For each unit in file *A* we identify a similar unit in file *B* as a function of the *X* "common" variables. Then, we impute the household income variable collected in the supplemental file *B* (the SHIW) to the matching records in the base file *A*, in order to obtain an original dataset *C* including all the variables of interest for the analysis. The inherent assumption in this procedure is that the random vector *Y* given *X* is independent of the random vector *Z* given *X*. The conditional independence assumption implies that *Y*'s relationship to *Z* can be totally inferred from *Y*'s relationship to *X* and *Z*'s relationship to *X*. Thus, the distributions of *X*, *Y*, and *Z* of the new file *C* must be identical to the distributions of *X*, *Y*, and *Z* empirically observed in the original files *A* and *B*. As a consequence, the best test to evaluate the quality of the statistical matching relies on the marginal distributions of the variables. As stated by Rässler (2002, 23), "A statistical match is said to be successful if the marginal and joint empirical distributions of *Z* and *Y* as they are observed in the donor samples are nearly the same in the statistically matched file". It should be clear, however, that "the statistical matching procedure does not generate new information about the conditional relationship of the *Y*-*Z* pair, but only reflects the assumptions used in creating the matched file" (Kadane 1978, 166).

The common variables $X=(X_1,...,X_P)$ shared by the original datasets are identified according to the following criteria: 1) they must have been classified and measured in the same (or very similar) way in both of the surveys. 2) They must have been observed for all the individuals included in the samples. 3) They can be assumed as possible determinants of health and social interaction in the base file. Based on hints from previous studies, we chose the following variables: gender, age, education, family size, number of children, region of residence, work status, sector of activity, and

homeownership. The statistical matching was then performed through a regression imputation with random residuals. More in particular, the regression parameters of Z (i.e. the household income) on X were estimated on the SHIW. Then, a random residual was added to the regression prediction to obtain the imputed value of z for each $a = 1,...,n_A$ record in file A. Finally, the quality of the procedure was controlled by comparing, for each of the considered years, the conditional distribution of the household income given X in the new and the original files. The marginal distributions are not found to be statistically different[4].
Our final dataset C is a pooled cross section sample of 216,994 observations collected in the years 1993, 1995, 1998, and 2000. In this file, the level of household income "drawn" from the Survey on Household Income and Wealth carried out by the Bank of Italy is imputed to the n_A statistical records included in the Istat Survey on Households.

Appendix B

Table B1. Detailed description of variables

Dependent variable	
Self-perceived good health	Individual assessment of health; 1 = good and very good
Frequency of meeting with friends and relatives	
Meetings with friends, 1 = everyday or more times a week	
Meetings with relatives, 1 = everyday or more times a week	
Satisfaction with friends' relationships, 1 = very or quite satisfied	
Associational and religious participation	
Passive membership	Participation in meetings of formal organizations, 1 = volunteer service, ecological, cultural, political party and unions
Active membership	Unpaid activity for formal organizations, 1 = volunteer service, other, political party and unions
Church attendance	Whether the respondent goes to church once or more a week, 1 = yes
Demographic and socio-economic characteristics	
Age21-40	Age of the respondent, 1 = age between 21 and 30. **Reference group: age14-20.**
Age31-40	Age of the respondent, 1 = age between 31 and 40
Age41-50	Age of the respondent, 1 = age between 41 and 50
Age51-65	Age of the respondent, 1 = age between 51 and 65

[4] Distributions are available upon request to the authors.

Age>65	Age of the respondent, 1 = age above 65
Household size	Number of people who live in family
Children0_5	Age of children, 1 = children aged between 0 and 5 years. **Reference group: no children.**
Children6_12	Age of children, 1 = children aged between 6 and 12 years
Children13_17	Age of children, 1 = children is aged between 13 and 17 years
Elementary	Education of the respondent, 1 = completed elementary school (5 years)
Junior high school	Education of the respondent, 1 = completed junior high school (8 years)
High school (diploma)	Education of the respondent, 1 = completed high school (13 years)
Bachelor's degree	Education of the respondent, 1 = university degree and/or doctorate (18 years and more)
Household income (ln)	Natural logarithm of imputed household income (sum of labour income, capital income and pensions)
Self-employed	Employment status of the respondent, 1 = self-employed. **Reference group: employed**
Unemployed	Employment status of the respondent, 1 = unemployed
Student	Employment status of the respondent, 1 = student
Retired	Employment status of the respondent, 1 = retired
Newspapers	Whether the respondent reads newspapers every-day a week; 1 = yes
Homeowner	Whether the respondent owns home outright, yes = 1
Civil house	Whether the respondent lives in a civil house, yes = 1
Perception of community problems	
Micro-criminality	Whether the respondent has suffered pickpockets, yes = 1
No parking problems	Whether the respondent declares that there is not difficulty in parking in the area where he lives, yes = 1
No traffic problems	Whether the respondent declares that there is not traffic in the area where he lives, yes =1
No pollution	Whether the respondent declares that there is not pollution in the area where he lives, yes =1
No dirtiness problems	Whether the respondent declares that there is not fifth in the area where he lives, yes =1
No public transport	Whether the respondent declares that there is not a problem connecting with public transport, yes=1
Size of municipality	

Metropolis	Whether the respondent declares that he lives in a metropolitan area, yes=1. **Reference group: <2000**
Neighboring metropolis	Whether the respondent declares that he lives in a municipality neighbouring metropolitan area, yes=1
2,000-10,000	Whether the respondent declares that he lives in a municipality with 2,000-10,000 inhabitants, yes=1
10,000-50,000	Whether the respondent declares that he lives in a municipality with 10,000-50,000 inhabitants, yes=1
>50,000	Whether the respondent declares that he lives in a municipality with more than 50,000 inhabitants, yes=1

Politics	Speaks politics, 1 = everyday or more times a week
Cultural Consumption	
Theatre	Whether the respondent goes to the theatre more times a year (>7), 1 = yes
Cinema	Whether the respondent goes to the cinema more times a year (>7), 1 = yes
Museum	Whether the respondent goes to museums more times a year (>7), 1 = yes
Classical Music	Whether the respondent goes to the concert of classical music more times a year (>7), 1 = yes
Light music	Whether the respondent goes to the concert of classical music more times a year (>7), 1 = yes
Sports show	Whether the respondent goes to sports show more times a year (>7), 1 = yes
Disco	Whether the respondent goes to the disco more times a year (>7), 1 = yes