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Does social capital determine health? Empirical evidence from MENA countries

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ABSTRACT

Using data from the World Value Survey (2010–2012) for 18 MENA countries, this paper investigates the causal relationship between social capital and health by applying simultaneous-equations based on structural modeling and IVs regression. Our main findings corroborate the hypothesis of reverse causality between social capital and health i.e. bidirectional causality running from social capital to health and from health to social capital is identified. Furthermore, our empirical findings show that individual-level social capital appears more salient in determining health, while community-level social capital seems less relevant in explaining health differences between individuals. Overall, the present study makes evident that high levels of social capital (i.e. high levels of social participation and high levels of trust) and high individual-level socioeconomic factors (i.e. high levels of income and high levels of education) may generate better health outcomes that policymakers must take into account to improve individual and community health.
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1. Introduction

Over the few last decades, the concept of 'social capital' has attracted widespread attention in the public health literature and a growing number of researchers have used this concept to explain individual and community health (e.g., Buonanno, Montolio, & Vanin, 2009; D'Hombres, Rocco, Suhrcke, & McKee, 2010; Folland, 2007; Kawachi & Berkman, 2000; Kawachi, Subramanian, & Kim, 2008; Kim, Baum, Ganz, Subramanian, & Kawachi, 2011; Mellor & Milyo, 2005; Poortinga, 2006a, 2006b; Rocco, Fumagalli, & Suhrcke, 2014; Veenstra, 2005). However, the concept of 'social capital' has been analyzed for the first time by Pierre Bourdieu since 1980s to refer to one of the types of resources available to individuals and social groups. According to Bourdieu, social capital is defined as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (Bourdieu, 1986, p. 248).

The concept of 'social capital' is further developed and disseminated in the diverse disciplines including health by the Putnam's work. In broad terms, Putnam defined social capital as the "features of social organization, such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (Putnam, 1995, p. 67).

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The literature on social capital provides evidence on the significant role play by social capital, as it contributes mostly to better health outcomes and is generally considered to be the utmost noteworthy factor in determining individual health behavior. It would appear that social environments characterized by high-levels of trust and civic participation tend to produce more individuals with a minimum of public responsibility to each other (Kawachi & Berkman, 2000; Portes, 1998). Such sets of connections appear to be significant factors of social capital through which individual's health may be improved (D'Hombres et al., 2010; Folland, 2007; Kawachi et al., 2008; Poortinga, 2006b). However, as we have observed from the different empirical studies that each concept of social capital may have a specific effect on health outcomes.

In contrast, certain studies based on cross-country investigation have shown that social capital could generate negative consequences (e.g. Kawachi & Berkman, 2000; Kennelly, O'Shea, & Gavey, 2003; Lochner, Kawachi, Brennan, & Buka, 2003; Muntaner, Lynch, & Davey Smith, 2001; Poortinga, 2006b). Such studies make it evident that social capital does not explain health differences between people. It has also found that social capital cannot always generate better health outcomes. In the same direction, Kawachi and Berkman (2000) and Durlauf (2002) suggest that the benefits that social capital produces for one group can disadvantage another. Poortinga (2006b) also suggest that social capital does not consistently benefit individuals who are living in the same society. Similarly, Muntaner et al. (2001), Lindström, Moghaddassi, Bolin, Lindgren, and Merlo (2003) and Brown, Scheffler, Seo, and Reed (2006) have shown that strong associations among individuals would likely lead to increase the risk of certain health outcomes. For instance, strong friendship networks of peers lead to increase the risks of smoking and drinking and further produce higher risk of violent crime and homicide. These findings can be partly explained by the fact that social capital is a contextual variable and that aggregated data can cause some local specifications, that is why the individual track to aggregate social capital may be difficult to identify (Glaeser, Laibson, & Sacerdote, 2002).

Moreover, many multilevel studies have investigated the effect of individual and area-level social capital on health by using 'aggregated' social capital measures (individual level responses). It has shown that there is evidence of the positive impact of multilevel measures of social capital on individual health outcomes. It has also found that social capital impact was more underestimated when multilevel effect is not taken into account (Kawachi, Kennedy, & Glass, 1999; Mohan, Twigg, Barnard, & Jones, 2005; Olsen & Dahl, 2007; Snelgrove, Pikhart, & Stafford, 2009; Subramanian, Kim, & Kawachi, 2002; Sundquist & Yang, 2007; Veenstra, 2005).

The literature reveals that though research on the relationship between social capital and health outcomes using different set of countries, data and estimation techniques are voluminous. However, the association between social capital and health in the context of the Middle East and North Africa (MENA) region is yet not well empirically investigated. Therefore, the main purpose of this study is to investigate empirically this association in MENA region using simultaneous-equation models and instrumental variables (IVs) regression. Specifically, we have raised the question whether the association between social capital and health can reflect reverse causality or there are other factors (i.e. individual factors, social environments characteristics) that are also expected to affect social capital and health.

The paper is organized as follows. Section 2 presents the relevant review of literature on the association between social capital and health. Section 3 discusses the data and the econometric methodology. Section 4 presents the results and discussion. Section 5 concludes by summarizing the main results.

2. Literature review

The relationship between individual and area-level social capital and population health has been the subject of considerable academic research over the past few decades (e.g. Buonanno et al., 2009; D'Hombres et al., 2010; Engström, Mattsson, Järleborg, & Hallqvist, 2008; Folland, 2007; Hamano et al., 2010; Kawachi & Berkman, 2000; Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Kawachi et al., 2008; Kennedy, Kawachi, & Brained, 1998; Kim et al., 2011; Lochner et al., 2003; Mellor & Milyo, 2005; Pollack & von dem Knesebeck, 2004; Poortinga, 2006a, 2006b, 2006c; Richard & Nicolas, 2008; Rocco et al., 2014; Sampson, Raudenbush, & Earls, 1997; Subramanian et al., 2002; Veenstra, 2005; Wilkinson, Kawachi, & Kennedy, 1998). The empirical studies have used different set of countries, data and estimation techniques to investigate the effects of individual and contextual/area-level social capital on population health.

However, to investigating the effects of social capital on mortality in 39 US states, Kawachi et al. (1997) have used four 'aggregated' social capital measures (i.e. social distrust, perceived lack of fairness, perceived helpfulness of others and memberships in groups-taking each one separately). They found that each of the measures was positively associated with mortality and income inequality. Moreover, Sampson et al. (1997) have used a cross-sectional multilevel study based on data from the 1995 Project on Human Development in Chicago Neighborhoods. They used an index of collective efficacy (including mutual trust and social cohesion both at individual and contextual level) as a proxy of social capital, and violent crime and homicide rates as measures of health. They reported that collective efficacy was negatively associated with neighborhood variations in violent crime and homicide rates.

In Russia, Kennedy et al. (1998) have used a cross-sectional data for 40 provinces to test the impact of social capital on mortality rates. The aggregated level social capital measures used are trust in government, civic engagement and social cohesion (i.e. divorce rate, per capita crime rate, conflicts in workplace). These findings suggest that, over the period of the Russian mortality crisis, social capital and cohesion indicators were closely associated with lower mortality rates. Another cross-sectional study was done by Wilkinson et al. (1998) by using the US General Social Surveys (1986–1990) and National Center for Health Statistics (1981–1991) for 39 US states, where social capital was measured by social mistrust and health

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was measured by two indicators of health status — mortality and violent crime rates. The study found that social mistrust was strongly associated with violent crime and mortality rates.

In a similar vein, Lynch et al. (2001) have used data from the World Values Survey (1990–1991) for a sample of 16 OCDE countries to investigate the effects of social distrust, organization membership and volunteering as aggregated social capital measures on health status (i.e. life expectancy, mortality, low birth-weight and self-related health). They reported that all the measures of aggregated social capital were weakly associated with age-specific and cause-specific mortality rates. In another study, Subramanian et al. (2002) have used a cross-sectional data that has come from the 2000 Social Capital Community Benchmark Survey to investigate the contextual and compositional social trust effects on self-rated health for 21,456 individuals living in 40 US states. The results showed that individual self-rated health is positively and significantly associated with high community levels of social trust. The results also indicate the existence of cross-level interaction effect between individual and community trust.

Using the 1995 Community Survey of the Project on Human Development for 342 Chicago Neighborhoods, another cross-country study was conducted by Lochner et al. (2003) where social capital was measured by reciprocity, trust and civic participation, and mortality rates as health measures. They found that higher levels of neighborhood social capital were closely related with lower neighborhood death rates for entire mortality as well as death from heart disease. Moreover, Pollack and von dem Knesebeck (2004) have employed a cross-national study based data on Germany and the USA to examine the relationship between individual level social capital as measured by both norms (reciprocity and civic trust) and behaviors (social participation), and health status as predicted by three measures of self-reported health — general health, depression and functional limitations. The empirical investigation reveals that, in both countries, poorer self-rated health and depression were strongly related to lack of reciprocity and poorer self-rated health was strongly related to civic mistrust, in the same direction, poorer self-rated health and depression were closely related to the lack of participation in Germany rather than in the USA.

In case of Canada, Veenstra (2005) used a cross-sectional multilevel investigation data for 25 communities of British Columbia, to examine the effects of individual and contextual level social capital on self-rated health. The self-rated health status was measured by physical health (i.e. long-term illness, health problem that limits daily activities or the work) and mental health (i.e. emotional well-being). Individual-level social capital was measured by individuals' perception (defined as social participation in voluntary associations and political trust). The community level social capital based on three determinants (i) the average levels of community and political trust, (ii) the number of per capita voluntary associations, (iii) the number of per capita public spaces. The study indicates that political trust and household income were the strongest predictors of poor self-rated health and long-term illness at individual level than community level. The study also confirms that there was no significant relationship between community level social capital and poor self-rated health.

Using state-level data and two measures (levels of trust and civic participation) as a proxy for state social capital, Mellor and Milyo (2005) constructed Putnam's index of state social capital to examine the influence of social capital on individual health. They concluded that persons with low trust and low civic participation had generally an increased probability of poor self-reported health and vice versa. Similary, the studies of Poortinga (2006c), Folland (2007), Kawachi et al. (2008), Scheffler and Brown (2008), D'Hombres et al. (2010) and Hamano et al. (2010) concluded that high levels of – civic participation, social trust, neighborhood social capital, social cohesion and social networks – were associated with enhanced mental health and lower probability of poor self-reported global health after adjusting for age, gender and household income.

Recently, Kim et al. (2011) investigated the contextual effects of state-level social capital on individual self-rated health for 167,344 adults in 64 European nations by using IVs and ordinary least squares (OLS) regression. The study reported that higher average state-level trust was associated with better self-rated health among women and among men, but these relations are more significant in women reporting social trust. More recently, Rocco et al. (2014) examined the relationship between social capital and self-rated health for 25 European countries by estimating simultaneous equation models. The study reveals that there is a positive and causal relationship between individual social capital and self-rated health.

However, the existing empirical studies had several methodological limitations. For instance, in the context of cross-sectional investigation, it is evident that one cannot deny the possibility of reverse causality between social capital and health. As we observed, social capital is endogenous and most of the studies have not used IVs to permit for consistent estimation of parameters. This problem was more problematic for studies that have examined empirical evidence on individual level social capital. Furthermore, given the vagueness in the area level social capital indicators employed in various empirical studies, there is evidence of a possibility of measurement errors in an explanatory variable, which would lead to inconsistent estimation of models.

Although the literature on the relationship between social capital and health has increased over the last few decades, there is relatively very little research investigating this relationship via simultaneous-equations models and IVs technique (see, Rocco & Suhrcke, 2012; Rocco et al., 2014). Similarly, the present empirical study will further strengthen the literature on social capital and health using data on up to 105,166 adults in 18 countries in the MENA and World Value Survey (2010–2012) and applying simultaneous-equations based on structural modeling and IVs.

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Table 1
Number of observation by country.

Country	Frequency	Percent	Cumulative
Algeria	7,253	6.89	6.89
Bahrain	2,286	2.17	9.06
Egypt	7,694	7.32	16.38
Iran	7,880	7.49	23.87
Iraq	6,968	6.62	30.49
Jordan	5,425	5.16	35.65
Kuwait	3,685	3.52	39.17
Lebanon	4,553	4.33	43.50
Libya	5,398	5.13	48.63
Morocco	6,764	6.43	55.06
Oman	4,263	4.05	59.11
Qatar	3,234	3.07	62.18
Saudi Arabia	6,643	6.32	68.50
Sudan	7,224	6.87	75.37
Syria	6,227	5.92	81.29
Tunisia	5,793	5.51	86.8
Turkey	7,423	7.06	93.86
Yemen	6,453	6.14	100.00
Total	105,166	100.00	

Source: data processed by authors using WVS (2010–2012).

3. Data and descriptive statistics

In this study, we used a cross-sectional data come from the World Value Survey (2010–2012) (http://www.worldvaluessurvey.org) for 18 MENA countries namely; Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, and Yemen. Table 1 provides the number of observation by country. Overall, 105,166 respondents aged 18 years and over were studied (73,090 male and 32,076 female).

It is well-known that the World Value Survey provides a range of information about social capital measures (i.e. social networks, social relationships, civic participation, trust in government/institutions) and health status and behaviors (i.e., mortality rate, violent, crime victim, homicide rate, mental health) for several countries (i.e. European countries — OECD and non-OECD countries, MENA countries). In this survey, the participants have reported information on socio-demographic and socio-economic characteristics such as gender, age, household income, education attainment, occupational status, birthplace, marital status and religion.

Furthermore, we used 'MENASTATREGION' as additional database to complete the information about regional characteristics such as employment, GDP growth rate at regional level, per capita GDP at regional level, number of hospital beds per 1,000 inhabitants and health workers per 100,000 inhabitants.

Table 2 depicts the descriptive statistics of the different variables for respondents. On average, the self-reported health of respondents was 3.76 (SD 0.92), this value ranged from 1 that indicates bad perceived health to 5 that indicates good perceived health. The average value of individual trust was −0.35 indicates that a person has distrust in other people and large institutions. In addition, the mean age and educational attainment level reported by the respondents were 46.75 (SD 17.85) and 11.92 (SD 4.03) years, respectively. The mother's and father's education attainment levels declared were 1.88 (SD 0.61) and 2.92 (SD 0.95), respectively. The mother's and father's employed declared were 0.34 (SD 0.10) and 0.77 (SD 0.15), respectively.

3.1. The econometric model

In this study, we use three structural equation models, which allows one to simultaneously investigate the impact of (i) social capital on individual health, (ii) the misreporting in individual social capital, (iii) level of individual health on social capital. The three structural equation models are as follows:

$$h = \alpha_0 + \alpha_1 S^* + \alpha_2 \bar{S}^* + X\omega_1 + \varepsilon \quad (1)$$

$$S = S^* + (1 - \lambda)(\bar{S} - S^*) + \gamma h + \theta \quad (2)$$

$$S^* = \beta h + Z\omega_2 + \delta \quad (3)$$

Eq. (1) states that the individual health h can be depended on the true individual social capital S^* and the true communitarian one $\bar{S}^*$ as well as the covariates X, including the regional fixed effects. We assume that the error terms are independent. Eq. (2) states that the self-reported individual social capital S can be depended on the true individual social capital S^*, the average social capital $\bar{S}$ in the community and the level of individual health h. Eq. (3) states that the true individual social

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Table 2
Descriptive statistics of the variables used in the regression analysis.

Variable	Description	Mean	Std dev	Min	Max
Health	Indicator of self-reported health of respondents, value 1 means bad perceived health and value 5 means good perceived health	3.76	0.92	1	5
Trust	Individual trust	−0.35	2.43	−5	5
Males	Indicator taking value 1 if the respondent is male and zero if is female	0.47	0.49	0	1
Age	Age in years	46.75	17.85	14	101
Age2	Age squared	2,563.58	1,815.91	193	9,801
Brncntr	Respondent born in the country of residence	0.72	0.26	0	1
Motherbirth	Birthplace of respondent's mother	0.83	0.27	0	1
Fatherbirth	Birthplace of respondent's father	0.89	0.28	0	1
Urban	Urban residence	0.62	0.49	0	1
Density	Population density at regional level	318.46	703.37	3.1	6,073.5
Married	Marital status	0.53	0.49	0	1
Educyrs	Education level declared (in years)	11.92	4.03	0	30
Mothereduc	Mother's education level declared	1.88	0.61	0	6
Fathereduc	Father's education level declared	2.92	0.95	0	6
Motheremploy	Mother's employed declared	0.34	0.10	0	1
Fatheremploy	Father's employed declared	0.77	0.15	0	1
Income	Household income declared	5.46	2.29	1	12
GDP	GDP per capita at regional level	9.76	2.27	3.48	21.66
GDPgrowth	Growth rate at regional level	3.27	1.43	−2.00	9.35
Hospital beds	Hospital beds per 1,000 people at regional level	1.53	1.19	1.04	2.39
Hospital workers	Health workers per 100,000 inhabitants	328.62	98.71	122.8	1.75
Mental health	Indicator of mental health of respondents, value 1 means bad mental health and value 5 means good mental health	3.74	0.35	3	5
Crime victim	Burglary victims during the five years period	0.20	0.39	0	1
Mcrime	Proportion of people that declared having been burglary victims during the five years period	0.19	0.08	0	0.624
Religious	Self-reported rate of religiosity	4.96	2.98	0	10

Source: data processed by authors using WVS (2010–2012) and MENASTATREGIO database (2012).
Note. Regional dummies are Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, and Yemen.

capital S^* can be depended on the level of individual health h and other variables of controls Z. We assume that S^* is not reported with error and $\bar{S}^*$ the average reported one.

By introducing the individual health h defined in Eq. (1) in Eq. (3) which represents the true social capital S^*, we claim that the shape of the relationship between social capital and health is circular. In fact, the dynamics of interaction with other people (and the trust toward them) are shaped by the individual health status. The most striking case is represented by mental health, but also physical one plays a role in determining the individual trust.

Taking the average of Eq. (2) and substituting it back into (2), we then obtain the specification as follows:

$$S = \lambda S^* + (1-\lambda)\bar{S}^* + \left[\frac{(1-\lambda)\gamma}{\lambda}\bar{h} + \frac{(1-\lambda)\bar{\theta}}{\lambda} + \gamma h + \theta\right] = \lambda S^* + (1-\lambda)\bar{S}^* + \Omega \tag{4}$$

From Eq. (4), we can express both S^* and $\bar{S}$, which we substitute in Eq. (1) and we obtain the following form:

$$h = \alpha_0 + \alpha_1 \frac{S - (1-\lambda)\bar{S} - \Omega}{\lambda} + \alpha_2 \frac{S - \lambda S^* - \Omega}{1-\lambda} + X\omega_1 + \varepsilon \tag{5}$$

Eq. (5) is recursive in h, and it is just a function of the reported average and individual reported social capital $\bar{S}$ and S, solving for h, the reduced form can be written as follows:

$$h = \frac{\alpha_0}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} + \frac{\frac{\alpha_1}{\lambda}}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} S + \frac{\left(\alpha_2 - \frac{\alpha_1(1-\lambda)}{\lambda}\right)}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} \bar{S} + \frac{\alpha_2 \frac{\gamma}{\lambda}}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} h - \frac{\alpha_2 \frac{\bar{\theta}}{\lambda}}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} + \frac{X\omega_1}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} - \frac{\frac{\alpha_1}{\lambda}\theta}{\left(1 - \frac{\alpha_1}{\lambda}\gamma\right)} + \varepsilon$$

Defining δ the quantity $(1/(1-(\alpha_1/\lambda)\gamma))$, we obtain the reduced form which can be estimated as follows:

$$h = \delta\alpha_0 + \delta\frac{\alpha_1}{\lambda} S + \delta\left(\alpha_2 - \frac{\alpha_1(1-\lambda)}{\lambda}\right)\bar{S} + \delta\left(\alpha_2\frac{\gamma}{\lambda}\right) h + \delta\alpha_2\frac{\bar{\theta}}{\lambda} + \delta X\omega_1 + \delta\frac{\alpha_1}{\lambda}\theta + \varepsilon \tag{6}$$

Eq. (6) is the new first equation of the system obtained using Eqs. (1) and (2), substituting Eq. (3) in (2), the reduced form equation to be estimated is then:

$$S = \lambda\left(\beta + \frac{\gamma}{\lambda}\right) h + Z\lambda\omega_2 + (1-\lambda)\bar{S} + \lambda\mu + \theta \tag{7}$$

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We are left with simultaneous-equation models composed by Eqs. (6) and (7), which are a function of on observed variables. From Eq. (7), we identify λ and, plugging it into Eq. (6), we obtain the structural parameters α_0, α_1, α_2, and γ/λ.

In fact, to estimate the simultaneous-equation probit models composed by Eqs. (6) and (7), we use a two-step procedure following Stern (1989) to solve the endogeneity problem. Indeed, in the first stage, we transform the reduced form of Eqs. (6) and (7) in Eqs. (8) and (9), which defined as follows:

$$h^* = X\Psi_h + \nu_h \tag{8}$$

$$S^* = X\Psi_s + \nu_s \tag{9}$$

where X contains all the exogenous variables in Eqs. (6) and (7), such as gender, age (and its square), place of habitation, educational attainment, household income, marital and occupational status, and religion. We consistently estimate the reduced form coefficients of Eqs. (8) and (9) by using probit specification equation by equation. After the estimation of the first stage, the predicted values $\hat{h}^*$ and $\hat{S}^*$ will be constructed in the second stage using the estimated coefficients of the first stage, that is, $\hat{\Psi}_h$ and $\hat{\Psi}_S$ and substituting them into Eqs. (6) and (7).

Our set of controls, common to all the equations, consist in individual characteristics like gender, age (and its square), place of habitation, marital status. Parental characteristics such as place of birth of the parents, their education and occupational status (when alive) and a dummy indicating the parents died status, education level, household income, religion and occupational status and regional characteristics length of the unemployment rate, density, GDP growth rate, GDP per capita, number of hospital beds and health workers.

3.2. Regional and time dummies

In addition, in the health equation, in line with our structural equation models, we introduce the average value of health at the regional level, which we assume is exogenous and not retained in Eq. (7). Moreover, we rule out the possibility of endogenous sorting into region both because we consider comparatively large aggregates and because we control for unobserved regional characteristics using the regional dummies.

As already mentioned in Section 3.1, in our setting three variables are considered endogenous: the self-reported health status, the individual social capital and the communitarian one (by construction), since one of its determinant, θ enters in the health equation (see Eq. (6)). In order to solve the endogenity problem, we have to find proper instruments. Given the multiple endogenous variables in this case, all instruments must satisfy the following two conditions: (i) all instruments must be pertinent and should be directly correlated with the endogenous variables, (ii) all instruments must be exogenous and all instrumented variables must have a direct effect on the individual health.

Consistent with several authors (Alesina & La Ferrara, 2002; Durlauf, 2002), we propose that the determinants of trust are not correlated with individual health. It is well-known that having been a victim of a burglary is significantly related to the degree of trust in other people, further, being a victim of a burglary is certainly an exogenous negative shock that can cause an extensive sensation of distrusts and fright against other citizens with the exception of close friends and relatives (Buonanno et al., 2009; Scheffler, Brown, & Rice, 2007; Subramanian et al., 2002).

In addition, having been victim of a crime or knowing a close person is absolutely not liked to an individual decision or under individual control (Buonanno et al., 2009). It is evident that the risk of violent crime and homicide may increase with the individuals characteristics (age-specific, low income, unemployment) and the social environment specification (Mohan et al., 2005; Rocco & Suhrcke, 2012). These variables may be more salient in explaining individual health differences. Therefore, we require to introduce these variables among individual and neighborhood controls so what we can claim that the instrument for individual social capital has no independent effects on health status.

As discussed above, we instrument the average trust in the region using a transformation of the previous instrument, that is, the percentage of people in the region who have been victim of a crime. Since one of the regressions is the average of another one, the coefficient of the aggregate variable can be positive even if such a variable does not have an independent power in determining the dependent one (Acemoglu & Angrist, 2000; Durlauf, 2002). In order to have consistent estimates, we need IVs strategy that treats both regressors as endogenous and the instruments for the two regressors should generate the same coefficient when only one variable is considered endogenous. Thus, our instruments meet such a condition.

Let us start considering suitable instruments for the self-reported health: the instruments we consider are the number of hospital beds in the region in which the individual lives and the number of health workers. There is clear evidence that the supply of health care can positively affect individual health, but in line with D'Hombres et al. (2010), and Rocco and Suhrcke (2012), we have excluded the idea that health care infrastructure can directly affect individual social capital.

Taken together, all our instruments might affect individual health that is not mediated entirely via social capital. In line with Scheffler et al. (2007), Rocco and Suhrcke (2012) and Rocco et al. (2014), this impact would be due to the instruments' correlation with three variables such as parental conditions, household income and regional development. Hence, once we control for the later, we claim that the exogeneity requirement is met.

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Table 3
Results of structural parameters for Eqs. (1)–(3).

Structural parameter	Coefficient	Std dev	t-statistics	p-value
α_1	0.312***	0.068	4.59	0.000
α_2	0.021	0.016	1.33	0.178
λ	0.962***	0.009	99.85	0.000
γ	−2.415**	1.113	−2.19	0.033
β	2.281**	1.139	2.00	0.048

** Significance at the 5% level.
*** Significance at the 1% level.

4. Results and discussion

Table 3 presents the estimates and the significance of the structural parameters of Eqs. (1)–(3). Column 1 and 2 report the value estimates and standard deviations while the last two columns present the t-statistics and the p-value, which test the significance of the instruments. Indeed, the estimated parameters of Eq. (1) as shown in first column ($\alpha_1 = 0.312$, $\alpha_2 = 0.021$) have both the positive expected sign, but these parameters differ in magnitude and significance. In fact, individual social capital (trust) has a significant positive impact on health at 1% level, while the communitarian social capital has insignificant positive impact on health. This suggests that individual level social capital appears more relevant in determining health rather than area level social capital.

About Eq. (2), which describes the relationship between true and reported social capital, gives us some interesting insights. As expected, our estimates reflect the presence of some level of misreporting of the social capital value. Indeed, the empirical results suggest that the individuals adjust the reported level of social capital according to the difference between individual trust and the average trust in the region in which they live. In particular, if the average trust is greater than the individual one, people would report a value which is greater than the true one. It is worth noting that the entity of the adjustment is not huge ($1 - \lambda$ is around 3%), making the coefficient plausible.

In addition, the magnitude of the structural parameters of Eq. (2) confirms the idea that health can play an important role in the misreporting of social capital. However, the negative sign (−2.415) of parameter γ shows that healthy people tend to declare a worth of individual social capital lower than the true latent value. The result is not surprising considering the nature of the measure of social capital we are considering. A justification of this is that people in good health are less dependent on other people's help, they underestimate the level of trust that they have. Moreover, the negative sign of parameter γ suggests also that the weakness to consider misreporting in social capital gives misleading results i.e. the health effect on the true social capital is underestimated. Finally, the estimate of coefficient β in Eq. (3) shows that social capital has a positive and proper causal impact on health confirming the circular and positive relationship between the two variables i.e. bidirectional causality running from social capital to health and from health to social capital is identified.

Overall, our results indicate that there is evidence of reversed causal effect between health and social capital i.e. individual social capital has a causal advantageous effect on individual health status and vice versa. In addition, our results suggest that the health impact on social capital seems more significant than the social capital impact on health. Moreover, the results also reveal that individual social capital appears more relevant in determining health and contributes positively to increase the probability of being in good perceived health, while community level social capital seems less relevant in explaining health differences.

It is worth noticing that we cannot compare the results shown in Tables 4 and 5, and with ones contained in other empirical studies given that they are just the coefficients con the reduced form Equations such that they do not have any causal interpretation and they just reflect the amount of social capital and health in equilibrium. However, the results of the first stages regression for Eqs. (1)–(3) on the association between social capital and health as shown in Table 4 provide us an assessment of the quality of our identification strategy and the validity of our exclusion restrictions. We think that our model is identified given that one of our exogenous variables – the average health in the region – is in fact significant and with the expected sign in the first stages regression. In addition, our instrument for the individual social capital, whether the respondent has been victim of a crime, is relevant.

Compared to the first stages regression, the results reported in the second stages (see Table 5) confirm those obtained in the first stages. It has shown that individual social capital significantly contributes to increase the probability of being in good health, and the same sign is found in the inverse relationship, whereas, health status has a significant negative impact on the misreporting of individual social capital. In addition, the results suggest that community level social capital affected health in a further shaded way once compared with the individual one, given that it turns out to be insignificant and very small. In particular, our results suggest that in regions and societies with higher level of social capital, the individual social capital marginal effect on health can be increases individual trust and therefore decreases the probability of being in fair or bad health. Moreover, these empirical findings make it evident that social capital effect is significantly and positively change with population density and community size structure.

Moreover, the significant negative coefficient associated with the interaction between the instrument and the size of the community show that in smaller communities trust has a significant positive impact on individual health than in larger communities and organizations given that cooperation is more likely to be achieved and maintained over time, yielding thus

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Table 4
First stages regression results for Eqs. (1)–(3).

Variable	Health		Ind social capital		Comm social capital	
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
Male	0.0703***	9.35	0.0470***	7.62	−0.0048	−10.02
Age	−0.0478***	−7.42	−0.0075***	−9.31	−0.0025	−0.74
Age2	0.0000***	7.96	0.0000***	8.37	0.0000	2.41
Brncntr	−0.0461**	−2.78	−0.0242	−2.14	−0.0224	−2.35
Urban	0.0043	2.62	−0.0205***	−6.22	−0.0449***	−8.74
Density	−0.0008*	−0.96	0.0003	1.58	0.0006	2.98
Married	0.0954***	8.71	0.0216**	3.94	0.0041	2.88
Educyrs	0.0312***	6.85	0.0288***	7.79	−0.0001	−0.06
Religious	−0.0033**	−1.83	0.0178***	4.98	0.0004	0.08
Mothereduc	0.0042**	2.29	0.0382**	2.33	0.0019**	1.03
Fathereduc	0.0009**	0.60	0.0013**	0.78	0.0051**	7.87
Motheremploy	0.0052***	1.39	0.0071***	2.69	0.0045**	0.99
Fatheremploy	0.0193***	6.99	0.0202***	7.95	0.0096**	1.17
GDP	0.0979**	2.36	−0.0000	−2.63	−0.0000	−0.37
GDPgrowth	0.00203	0.58	−0.0033	−0.88	−0.0731***	−9.16
Hospital beds	0.0000	0.49	0.0003*	1.66	0.0096***	7.58
Hospital workers	0.0002	1.22	0.0004**	2.47	0.0085***	5.41
Average health	0.1948***	10.05	−0.0334	−1.96	0.3342***	9.45
Crime victim	−0.147***	−10.59	−0.1021***	−9.25	0.0053	1.29
Mcrime	−0.465***	−10.32	−0.231*	−1.89	−4.358***	−10.01
Household controls	Yes		Yes		Yes	
Individual controls	Yes		Yes		Yes	
Parental controls	Yes		Yes		Yes	
Regional dummies	Yes		Yes		Yes	
Observations	105,166		105,166		105,166	

* Significance at the 10% level.
** Significance at the 5% level.
*** Significance at the 1% level.

Table 5
Second stages regression results for Eqs. (8)–(9).

Variable	Social capital		Health	
	Coefficient	t-statistics	Coefficient	t-statistics
Ind.health (predicted value)	−0.2319*	−2.03		
Ind.soc.cap (predicted value)			1.4096***	9.98
Comm.soc.cap	0.0382***	3.95	0.0370	1.13
Male	0.0624***	6.26	0.0042	0.49
Age	0.0183***	3.42	−0.0373***	−9.85
Age2	0.0001***	4.75	0.0001***	6.82
Brncntr	−0.0342	−1.79	−0.0118	−0.44
Urban	−0.0178**	−2.63	0.0345**	3.10
Density	0.0001	0.58	−0.0013*	−2.54
Married	0.0424***	3.42	0.0662***	5.41
Educyrs	0.0358***	9.73	0.0096*	2.52
Religious	0.0164***	9.88	0.0282***	8.95
Mothereduc	0.0048**	3.53	0.0036**	2.30
Fathereduc	0.0098**	2.98	0.0091**	2.65
Motheremploy	0.0079*	2.70	0.0075*	2.40
Fatheremploy	0.0248***	4.49	0.0212***	4.91
GDP	−0.0000	−0.33	0.0000	0.54
GDPgrowth	−0.0002	−0.22	0.0088*	2.23
Hospital beds			−0.0005	−1.76
Hospital workers			−0.0007*	−2.03
Average health			0.2310***	6.31
Crime victim	−0.1345***	−7.35		
Mcrime	−0.1362	−2.18		
Household controls	Yes		Yes	
Individual controls	Yes		Yes	
Parental controls	Yes		Yes	
Regional dummies	Yes		Yes	
Observations	105,166		105,166	

* Significance at the 10% level.
** Significance at the 5% level.
*** Significance at the 1% level.

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to significant benefits. Trust between citizens and cooperation among them may allow creation informal institutions based on reciprocity, even among extended families rather than only between individuals, which can lead more positive support and higher opportunities of interactions (Wakefield & Poland, 2005).

Our findings correspond to the justification of the relative deprivation assumption as proposed in the sociological literature (see, inter alia, Engström et al., 2008; Kim et al., 2011; Lochner et al., 2003; Veenstra, 2005; Wilkinson, 1996) the deleterious social capital effect on health is certainly related to the social conditions of neighborhoods or zone of habitation. As we can see, social networks and social participation are highly developed in large cities implying that the average level of social capital is highly significant and the negative effect of individual's perception on health is less emphasized (Fujisawa, Hamano, & Takegawa, 2009; Hamano et al., 2010; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997).

The empirical results in both stages indicate that high levels of household income, education and employment appear significant determinants of individual trust and social participation that positively influence health status both at individual and community level. In addition, high-levels of household income, education and employment would lead to healthier lifestyles and greater use of preventive services that policymakers must take into account to improve health outcomes for individuals.

Our presented findings correspond to the justification bias as proposed by certain past observational studies (e.g. D'Hombres et al., 2010; Kim et al., 2011; Richard & Nicolas, 2008; Rocco et al., 2014; Scheffler et al., 2007). In line with these studies, social capital has a moderating impact on the link between health and socioeconomic status, foremost to better health improvements among the worse off, compared to the lower cultured and those living in poorer socioeconomic conditions. However, most factors of social capital (e.g., social cohesion, social networks, trust, civic participation) are positively associated with the socioeconomic conditions such as household income, levels of education and employment. In fact, many studies that used cross-sectional multilevel analysis, suggest that communities with high levels of social capital are healthier life, living happier and have good perceived health status than did their counterparts (D'Hombres et al., 2010; Folland, 2007; Fujisawa et al., 2009; Fukuyama, 1995; Rocco & Suhrcke, 2012).

Finally, we recognize that higher average level of trust is associated with better self-perceived health among individuals. This association appears more significant in smaller communities than in larger one. In the same direction, the results indicate that poor self-rated health and poor mental health (depression) are strongly related to civic mistrust and the lack of participation. Furthermore, the results confirm that individual social capital was negatively associated with neighborhood variations in violent crime. The results also confirm that there is no significant association between community-level social capital and poor self-rated health. The presented findings suggest that individual-level social capital plays a key role in determining health rather than community-level social capital.

5. Conclusions

The present study investigates the causal relationship between social capital and health. While the literature on the association between social capital and health outcomes has known an increasing over the last few decades, relatively, there has been very little research investigating this association via simultaneous-equations models and IVs technique. Similarly, the objective of the present study is further to strengthen the literature on social capital and health using data from the World Value Survey (2010–2012) for a sample of 105,166 residents in 18 MENA countries and applying simultaneous-equations based on structural modeling and IVs regression.

Our presented findings corroborate the hypothesis of a positive and circular association between social capital and health i.e. bidirectional causality running from social capital to health and from health to social capital is identified. Furthermore, this study highlights that community level social capital plays a minor role in explaining health differences between people and that it is the individual level social capital the one that matters the most. On the other hand, the study reveals that differences in health observed in the most MENA countries are mainly affected by individual-level factors rather than by area-level characteristics.

Finally, the empirical investigation concluded that high levels of social capital (i.e. high levels of social participation, high levels of trust and high levels of social networks) and high individual-level socioeconomic factors (i.e. high levels of income and high levels of education) may generate better health outcomes that policymakers must take into account to improve individual and community health in MENA countries.

Authors' contributions

MY was responsible for analyzing and interpreting the data and drafting the manuscript. MC contributed to the conception and design of study. Both authors have read and approved the final version of the manuscript.

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opinions expressed in this text are not those of statistics WVS. We are also grateful to the anonymous reviewers for their help and comments.

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