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ORIGINAL ARTICLE

The association between social capital measures and self-reported health among Muslim majority nations

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Abstract
Objectives Much evidence suggests that social capital (e.g. networks, trust, organizational memberships) has a significant effect on self-reported health. Previous research, however, has focused primarily on Western countries. The current research seeks to remedy this problem by investigating the association between multiple social capital indicators and subjective health in a novel empirical setting.
Methods The data come from the Comparative Values Survey of Islamic Countries (1999–2006) which consists of probabilistic samples from Muslim majority nations. Three-way multilevel analysis is used to examine the social determinants of health.
Results Statistical results from hierarchical linear modeling shows that frequent contact with strong and intermediate ties (i.e. family members and friends, respectively) is significant, while interaction with weak ties (coworkers) has no association. General trust and trust in the central government are also significantly related to subjective health, as is trust in religious authority, albeit in an inverse way.
Conclusions This study calls for a more contingent view of the relationship between social capital and self-reported health. Future research needs to take this into consideration in hypothesizing and testing the potential health benefits of social capital.

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Introduction

Decades of research have shown that social capital (Bourdieu 1986; Coleman 1988; Putnam 1993) play a crucial role in maintaining and fostering physical health and subjective well-being, as evidenced by a growing. Body of multidisciplinary literature (Almedom 2005; Ferlander 2007; Kawachi et al. 2004; Klein et al. 2012; Salonna et al. 2012; Smith and Christakis 2008; Uchino 2006). As has been observed, however, the bulk of previous research on the health benefits of social capital has focused on developed nations (Habibov and Afandi 2011; Kumar et al. 2012; Mansyur et al. 2008; Sapag et al. 2008; Yip et al. 2007). According to a recent study based on the Gallop World Poll dataset covering 139 countries, the reputed link between "social capital and health in non-Western countries is a yet a matter of debate" (Kumar et al. 2012: 697). Social capital may be more important for the physical welfare of people living in underdeveloped parts of the world, since they suffer from a relative scarcity of medical services and related social protection systems in comparison with their more privileged counterparts in richer societies (Habibov and Afandi 2011; Kumar et al. 2012). Cleary, more evidence is needed to see whether "the indicators of social capital developed in North America and Western Europe are valid in other cultural contexts" (Sapag et al. 2008: 79).

The present study seeks to contribute to the literature by analyzing a cross-national dataset on a group of Islamic countries. Traditionally, these understudied geographical regions have been characterized by lower annual per capita

expenditure on health and higher health risks, in stark contrast to the figures typically found in non-Muslim majority countries (Razzak et al. 2011). By shedding light on the ways in which social capital relates to subjective evaluation of health among Muslim populations, this research serves to fill an existing empirical gap. It focuses on two sets of social capital measures, cognitive and structural (Ferlander 2007; Fujiwara and Kawachi 2008; Mansyur et al. 2008). The cognitive variables consist of general or social trust and two types of institutional trust (i.e. political confidence in the central government and trust in religious authority). The structural dimension of social capital taps into the degree of network interaction, or contact frequency, with relatives, friends, and colleagues.

Although the social trust variable gauges the "trustworthiness of the social environment" or the "individual's willingness to trust or trustfulness" has been an issue of concern (see Abbott and Freeth 2008). This article assumes that the two are not mutually exclusive, but may have a reciprocal relationship, i.e., a person may be more willing to trust in a more trustworthy environment and vice versa. When concerning the role of network interaction in promoting health, scholars have proposed several pathways. According to Berkman et al. (2000), for example, networks operate by providing social support (e.g., sense of belonging, intimacy), exerting social influence (e.g., disseminating healthy behavioral norms), and channeling (health-related) information and material resources. Accordingly, this study hypothesizes that frequent contact with one's network members should have a positive impact on self-evaluation of health. In the literature, the question of whether social capital should be conceptualized as an individual attribute or a higher level (community, neighborhood, country, etc.) characteristic has been a matter of some debate (Poortinga 2006: 292). It is thus customary to measure social capital at multiple levels to examine its potential health benefits (Kawachi et al. 2004; Subramanian et al. 2002). Similar approach is taken here by creating six separate social capital measures to test their independent effects on self-rated health at both individual and collective (country) levels to avoid possible ecological or individualistic fallacies.

Much of the previous health research on social capital can be characterized as having taken a "communitarian approach" (Moore et al. 2006) based on the definition of social capital as *civic participation*, *norms of reciprocity*, and *interpersonal and institutional trust* (c.f., Kawachi et al. 1997). A measure that has been used much less frequently is network contact or "informal social interaction" (Kim and Kawachi 2006). This study differentiates between three types of network relations based on tie strength specifically "strong", "intermediate", and "weak"—which correspond to relationships with family, friends, and workplace colleagues, respectively. In addition to these structural forms of social capital, three more concepts are utilized to examine the health impact of cognitive social capital; namely, general trust, confidence in government, and trust in religious authority. A substantial amount of empirical evidence supports the relationship between attitudinal (cognitive) and behavioral (structural) measures of social capital and self-rated health. This study seeks to test whether this relationship holds among Islamic countries, as it has been shown in the Western context.

Methods

Data

The data ($N = 29{,}928$) for this study come from the Comparative Values Survey of Islamic Countries (1999–2006), a subset of the World Values Survey (WVS), which consists of representative samples from countries with Islamic majorities specifically, Albania, Algeria, Bangladesh, Egypt (pre-9/11 and post-9/11), Indonesia, Iran, Iraq, Jordan, Morocco (pre-9/11 and post-9/11), Nigeria, Pakistan, Saudi Arabia, Tanzania, and Turkey. Sampling procedures varied slightly from country to country. However, generally multistage probability samples were chosen. A full explanation of country-specific collection processes, sampling methods, response rates, etc., can be obtained from the Association of Religious Data Archives (http://www.thearda.com), which is housed in the Social Science Research Institute at the Pennsylvania State University.

Measures

Self-reported health as the dependent variable

The dependent variable (Health) is the subjective evaluation of physical well being, or self-reported health (SRH). The survey contains the following question: "All in all, how would you describe your state of health these days? Would you say it is very good, good, fair, poor, or very poor?" The original answers are reverse-coded and then dichotomized so that the choices "very good" and "good" take on the value of 1 and 0 otherwise, a coding strategy consistent with previous studies that model the likelihood of high self-reported health (e.g. d'Hombres et al. 2010; Moore et al. 2011; Sapag et al. 2008; Subramanian et al. 2002).

Independent variables

There are six variables that measure different dimensions of behavioral and attitudinal aspects of social capital at the

individual level (level 1). Related to the behavioral or structural dimension, the respondents answered the following questions: "How often do you spend time with your *family* and *relatives*?" "How often do you spend time with *friends*?" "How often do you spend time with *colleagues* from work?" The first question probes into the respondents' degree of engagement with strong ties. The second one is about their intermediate-level connections. The last one measures their connection to weak relationships. The answers are recorded on a 5-point ordinal scale (from 5 = "Everyday" to 1 = "Not at all") based on which three variables are constructed: StrongNetwork, IntermediateNetwork, and WeakNetwork.

When concerning the attitudinal or cognitive aspect of social capital, the survey asks the participants to rate their level of institutional trust in the government and religious authority ("I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them?"). The answer choices range from "A great deal" (=6) to "Not at all" (=1). Based on the responses, two additional social capital indicators are created, Trust_Religion, and Trust_Government. The general trust variable (Trust_General) is based on the following question: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" ("Most people can be trust" = 1; "Cannot be too careful" = 2; "It is somewhat relative" = 3; "Unsure" = 4). The responses to this survey item are dichotomized so that those who answered affirmatively take on the value of 1 and 0 otherwise.

As mentioned, whether social capital is an individual-level attribute or something that belongs to higher level entities (e.g. neighborhoods, communities, societies) has been a topic of much interest and debate (De Silva et al. 2005; Hooghe and Vanhoutte 2011; Mohnen et al. 2011; Phongsavan et al. 2006; Poortinga 2006; Subramanian et al. 2002). Consistent with the previous research social capital is also conceptualized at the contextual (i.e., country) level. They are taken into consideration by summing up the survey-weighted individual-level responses at the national level (level 3) and then taking the average value of them. The following six aggregated measures capture the contextual effects of social capital: C_TrustGeneral, C_TrustReligion, C_TrustGovernment, C_StrongNetwork, C_IntermediateNetwork, and C_WeakNetwork.

Control variables

A number of socio-demographic covariates are included in the analysis as control variables, including: age, marital status ("married" = 1), gender ("male" = 1), employment status, religiosity, education, and income. Age is divided into six ordered categories, with the youngest group ("15–24") as the omitted baseline category. The employment status is a dummy variable that takes a value of "1" for all those who worked full-time (including the self-employed). Religiosity is measured based on the following question: "Apart from weddings, funerals and christenings, about how often do you attend religious services these days?" The answer choices vary from "More than once a week" (=7), and "Only on special holy days/Christmas/Easter days" (=4) to "Practically never" (=1).

Education is an ordinal variable consisting of six reordered categories: (1) no education, (2) having some or complete elementary education, (3) having incomplete or complete secondary education (technical/vocational type), (4) having incomplete or complete secondary education (university-preparatory type), (5) having some university education (lower level tertiary), and (6) having a university degree or higher (upper level tertiary). The "no education" category forms the reference group. Lastly, the income variable is constructed from the responses to the statement that says: "Here is a scale of incomes. We would like to know in what group your household is, counting all wages, salaries, pensions, and other incomes that come in, before taxes and other deductions". The original coding is based on a ten-point scale (1 = "Decile 1", 2 = "Decile 2",… 10 = "Decile 10"). Five new income categories are created by combining each pair of the responses in order: deciles 1 and 2 are combined to create "Group 1", deciles 3 and 4 are combined to create "Group 2", etc. Group 1, the two lowest deciles, forms the baseline income category in the analysis.

The dataset also contains information on 145 communities or regions, with the number of residents varying between as few as 19 to as many as 1,013. Within each of the 145 geographical regions, there are also multiple residential categories ("towns") defined by the number of inhabitants. Measured as an ordinal variable, it ranges from 1 (="2,000 inhabitants or less") to 8 (="500,000 or more"). By summing up and averaging these numbers, a variable called R_TownSize is created to control for population density. Based on the individual-level answers to the questionnaire, the following aggregate indicators are also constructed: the proportion of people who graduated from college (R_College) and those who belong to the highest income bracket (R_Income), which consists of the top two deciles (i.e., Group 5), are also taken into consideration. Three additional controls include the proportion of people who are over 64 years old (R_Age), i.e. the oldest group in the age category, the proportion of individuals from the same community who are unemployed (R_Unemployed), and the level of religiosity (R_Religiosity). These "neighborhood or structural characteristics" (Browning and Cagney 2002) are incorporated into the analysis to offer a more conservative test of the effects of

social capital on self-reported health. The descriptive statistics for the outcome and the multilevel exogenous variables are summarized in Table 1. Table 2 shows the list of country-specific figures for the dependent variable (self-rated health) and the six social capital indicators.

Analytical strategy

The Comparative Values Survey of Islamic Countries consists of nested data at three levels: 29,928 individuals (level 1) nested in 145 regions/communities (level 2) which are in turn nested across 14 countries (level 3). Sampling weights are applied to account for any possible selection bias or differential non-response. Statistical analysis is performed using HLM 7 (Raudenbush et al. 2010). Three-level random-coefficient logistic regression models were fitted using the maximum likelihood estimation. The empirical model of health is represented by the following equation:

$$Y_{ijk} = B_0 + B_1\mathbf{X}_{ijk} + B_2\mathbf{R}_{jk} + B_3\mathbf{C}_k + u_k + v_{jk} + \varepsilon_{ijk},$$

where Y_{ijk} is the dependent variable, self-rated health for individual (i) in region (j) and country (k), taking the value of 1 if individuals belong to the category of being in "very good" or "good" health and 0 otherwise. $\boldsymbol{X}$ is a vector of individual-level variables (including socio-demographic and social capital indicators), $\boldsymbol{R}$ consists of a vector of regional-level structural factors, and $\boldsymbol{C}$ is a vector of country-level aggregate measures. u_k is the random intercept for country k, v_{jk} is the random intercept for region (j) and country (k), and ε_{ijk}, represents the random component of the error term.

Results

Table 3 contains the output from estimating the hierarchical linear models. The intra-class correlation (ICC) coefficient shows that 7.3 % of the variation in the individual self-reported health can be explained at the country level (level 3). From the null model, levels 2 and 3 intercepts are also significant, confirming the existence of both community- and country-level effects. Moving on to Model 2, which includes the six cognitive and structural measures of social capital, only three of them reach the level of statistical significance; namely, StrongNetwork ($b = 0.0393$; $p < 0.01$), IntermediateNetwork ($b = 0.0356$; $p < 0.0001$), and Trust_General ($b = 0.0461$; $p < 0.001$). That is, interacting frequently with relatives and friends are positively related with health. Placing one's trust in generalized others is also associated with the outcome variable. Social interaction with colleagues from work or institutional trust in political and religious authorities, on the other hand, has no effect.

Model 3 introduces the control variables. Education is a major factor: better educated people report themselves as

Table 1 Descriptive statistics (Comparative values survey of Islamic countries, 1999–2006)

Variables	Mean	Std. dev.	Min.	Max.
Level 1(individual)				
Health	0.71	0.45	0	1
StrongNetwork	3.48	0.81	1	4
IntermediateNetwork	3.38	0.83	1	4
WeakNetwork	2.69	1.27	1	4
Trust_General	0.25	0.43	0	1
Trust_Religion	3.42	0.87	1	4
Trust_Government	2.63	1.04	1	4
Married	0.58	0.49	0	1
Male	0.52	0.50	0	1
Age				
25–34	0.31	0.46	0	1
35–44	0.23	0.42	0	1
45–54	0.13	0.33	0	1
55–64	0.08	0.27	0	1
65+	0.04	0.20	0	1
Education				
Elementary	0.19	0.40	0	1
Vocational	0.19	0.39	0	1
Preparatory	0.20	0.40	0	1
Some_College	0.08	0.27	0	1
University	0.13	0.33	0	1
Income				
Group 1	0.32	0.47	0	1
Group 2	0.23	0.42	0	1
Group 3	0.12	0.33	0	1
Group 4	0.04	0.19	0	1
Employed	0.45	0.50	0	1
Religiosity	4.89	2.20	1	7
Level 2 (regional)				
R_Townsize	4.11	2.60	1	8.00
R_College	0.14	0.11	0	0.44
R_Income	0.04	0.05	0	0.28
R_Age	0.04	0.04	0	0.18
R_Unemployed	0.09	0.07	0	0.30
R_Religiosity	4.82	1.09	2.60	6.81
Level 3 (country)				
C_TrustGeneral	0.25	0.03	0.24	0.36
C_TrustReligion	3.48	0.39	2.84	3.98
C_TrustGovernment	2.70	0.42	2.26	3.34
C_StrongNetwork	3.49	0.15	3.19	3.70
C_IntermediateNetwork	3.33	0.31	2.94	3.81
C_WeakNetwork	2.70	0.49	2.01	3.46

Table 2 Description of the outcome and key predictor variables by countries (Comparative values survey of Islamic countries, 1999–2006)

	N	Health (%)	StrongNetwork	IntermediateNetwork	WeakNetwork	Trust_General (%)	Trust_Religion	Trust_Government
Albania	1,000	75	3.52 (0.78)	2.95 (0.87)	2.71 (1.14)	24	2.84 (1.04)	2.62 (0.94)
Algeria	1,282	44	3.61 (0.69)	3.20 (0.90)	2.48 (1.25)	11	3.48 (0.79)	2.48 (1.05)
Bangladesh	1,500	58	3.59 (0.66)	3.30 (0.82)	2.76 (1.27)	24	3.88 (0.36)	3.28 (0.73)
Egypt (pre-9/11)	3,000	68	3.62 (0.59)	3.22 (1.00)	2.80 (1.25)	38	3.32 (0.81)	2.66 (0.92)
Egypt (post-9/11)	1,000	81	3.41 (0.89)	3.07 (1.09)	2.60 (1.20)	38	3.28 (0.93)	2.61 (0.89)
Indonesia	1,004	74	3.42 (0.80)	3.81 (0.44)	3.46 (0.89)	52	3.71 (0.53)	2.57 (0.73)
Iran	2,532	76	3.55 (0.77)	3.04 (0.91)	2.45 (1.22)	65	3.46 (0.80)	2.86 (0.89)
Iraq (2004)	2,325	77	4.45 (0.87)	4.26 (0.99)	3.72 (1.55)	48	3.18 (0.93)	2.20 (1.01)
Iraq (2006)	2,701	66	3.64 (0.71)	3.12 (0.90)	2.04 (1.38)	41	3.27 (0.84)	2.69 (1.15)
Jordan	1,223	84	3.63 (0.77)	3.18 (1.07)	2.64 (1.36)	28	3.54 (0.68)	3.34 (0.83)
Morocco (pre-9/11)	1,251	71	3.65 (0.71)	3.37 (0.97)	2.20 (1.39)	23	3.97 (0.21)	2.67 (1.10)
Morocco (post-9/11)	1,013	81	3.70 (0.63)	3.76 (0.56)	3.46 (0.95)	23	3.74 (0.61)	2.59 (1.08)
Nigeria	2,022	89	3.36 (0.90)	2.94 (0.78)	2.01 (1.05)	26	3.77 (0.58)	2.48 (1.04)
Pakistan	2,000	66	4.39 (0.95)	3.94 (0.93)	3.41 (1.39)	31	3.58 (0.73)	2.26 (0.90)
Saudi Arabia	1,502	89	3.19 (0.93)	3.40 (0.84)	3.21 (1.07)	53	3.81 (0.49)	3.34 (0.90)
Tanzania	1,171	64	3.28 (0.90)	3.47 (0.80)	2.44 (1.34)	8.1	3.56 (0.69)	2.28 (1.09)
Turkey	3,401	64	3.42 (0.82)	3.59 (0.67)	2.58 (1.06)	19	2.84 (1.04)	2.31 (0.83)
Total	29,927	72	3.52 (0.78)	2.95 (0.87)	2.71 (1.14)	33	3.41 (0.85)	2.62 (0.94)

Standard errors are in parentheses

being healthier. There is also a significant inverse relationship between age and health. Not surprisingly, older individuals feel less healthy. While this observation is generally true, there is no significant difference between the omitted baseline category (the youngest group) and those who are between the ages of 25 and 34. Income is another significant factor. All four income dummies reach the level of significance, i.e., the higher the income category, the healthier the individual feels on average. Looking at the coefficients for the six social capital indicators, the findings are identical as those reported previously in Model 2. Specifically, only three of the six measures have a significant effect on the outcome variable: frequency of social interaction with relatives (strong ties) and friends (intermediate ties) and trusting in strangers. Once again, institutional trust in religious or political authority or network relations with colleagues (i.e., weak ties) is not found to have any linkage with subjective health.

Model 4 incorporates into the analysis a set of regional level (level 2) variables. According to the results, residential size is positively associated with health: people who live in regions with others located in larger or denser communities report themselves as being healthier ($b = 0.0131$; $p < 0.05$). The community level educational attainment is also a significant factor ($b = 0.314$; $p < 0.05$). However, neither the aggregate income nor age variable has any association with the subjective evaluation of health. An unexpected finding is the effect of aggregate religiosity. The negative sign ($b = -0.076$; $p < 0.0001$) suggests that living in a community with higher levels of religious participation by the co-residents leads to poorer perceptions of personal health. This finding deviates from the previous research that demonstrates a positive link between health and religiosity (Koenig et al. 2000; Kumar et al. 2012). Turning to the social capital indicators, consistent results appear: general trust and maintaining close and intimate relationships with family members and friends are associated with self-rated health.

Lastly, Model 5 is the full model that includes all of the variables in predicting subjective health. For the socio-demographic covariates, the pattern of findings is the same. Older people feel less healthy; better educated individuals and those with higher income report themselves as being healthier. The results for the regional-level factors are also consistent: the (within region) average residential size and the proportion of co-residents who belong to the highest educational category (having a university degree) are positively related to subjective health ($p < 0.05$), while the aggregate religiosity variable has a consistently negative effect ($p < 0.0001$).

Table 3 Fixed and random parameter estimates from the multilevel analysis of self-reported health (Comparative values survey of Islamic countries, 1999–2006)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Fixed effects					
Constant		0.709 (0.039)***	0.699 (0.040)***	0.693 (0.041)***	0.694 (0.047)***
Individual level					
StrongNetwork		0.039 (0.012)*	0.019 (0.008)*	0.019 (0.008)*	0.019 (0.008)*
IntermNetwork		0.358 (0.006)***	0.028 (0.006)**	0.028 (0.006)**	0.028 (0.006)**
WeakNetwork		0.013 (0.008)	0.007 (0.006)	0.007 (0.007)	0.006 (0.006)
Trust_General		0.046 (0.012)**	0.049 (0.013)**	0.048 (0.013)**	0.049 (0.013)**
Trust_Religion		0.002 (0.011)	0.007 (0.001)	0.007 (0.009)	0.008 (0.009)
Trust_Gov		0.003 (0.006)	0.011 (0.007)	0.010 (0.007)	0.010 (0.007)
Married			0.029 (0.018)	0.030 (0.018)	0.030 (0.018)
Male			0.017 (0.0128)	0.019 (0.012)	0.019 (0.012)
Age					
25–34			−0.030 (0.014)	−0.030 (0.014)	−0.030 (0.014)
35–44			−0.078 (0.026)*	−0.080 (0.026)*	−0.080 (0.026)*
45–54			−0.160 (0.039)**	−0.161 (0.03)**	−0.161 (0.040)**
55–64			−0.260 (0.052)***	−0.261(0.05)***	−0.259 (0.053)***
65+			−0.312 (0.067)**	−0.316 (0.06)**	−0.311 (0.068)**
Education					
Elementary			0.080 (0.026)*	0.083 (0.026)*	0.082 (0.026)*
Vocational			0.082 (0.026)*	0.083 (0.025)**	0.081 (0.025)**
Preparatory			0.104 (0.025)**	0.103 (0.024)**	0.102 (0.024)**
Some_College			0.101 (0.030)**	0.099 (0.031)*	0.098 (0.031)*
University			0.125 (0.031)**	0.122 (0.030)**	0.120 (0.030)**
Income					
Group 2			0.040 (0.013)*	0.042 (0.013)*	0.042 (0.013)*
Group 3			0.102 (0.017)***	0.102 (0.01)***	0.104 (0.018)***
Group 4			0.120 (0.023)***	0.125 (0.02)***	0.123 (0.025)***
Group 5			0.156 (0.034)**	0.155 (0.035)**	0.152 (0.035)**
Employed			0.021 (0.014)	0.021 (0.015)	0.022 (0.014)
Religiosity			−0.001 (0.003)	−0.001 (0.004)	−0.000 (0.03)
Community level					
R_Townsize				0.013 (0.006)*	0.013 (0.006)*
R_College				0.314 (0.141)*	0.300 (0.140)*
R_Income				−0.398 (0.312)	−0.397 (0.312)
R_Age				0.069 (0.333)	0.064 (0.333)
R_Unemployed				0.155 (0.198)	0.164 (0.198)
R_Religiosity				−0.080 (0.01)**	−0.076 (0.014)***
Country level					
C_TrustGeneral					2.660 (0.784)*
C_TrustReligion					−0.255 (0.077)*
C_TrustGov					0.196 (0.066)*
C_StrongNetwork					0.515 (0.177)*
C_IntermNetwork					0.075 (0.141)
C_WeakNetwork					0.181 (0.084)
Random effects					
Variance components					
Level 1 (individual)	0.433 (0.188)	0.425 (0.181)	0.403 (0.162)	0.403 (0.162)	0.403 (0.162)
Level 2 (regional)	0.094 (0.009)	0.096 (0.009)	0.097 (0.009)	0.089 (0.008)	0.089 (0.008)

Table 3 continued

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Level 3 (country)	0.124 (0.015)	0.122 (0.015)	0.127 (0.016)	0.132 (0.016)	0.151 (0.023)
−2LL	17,340.67	16,931.34	15,609.08	15,582.82	15,576.73

Standard errors are in parentheses

* $p < 0.01$

** $p < 0.05$

*** $p < 0.001$

Looking at the country-level (level 3) social capital indicators, a number of statistically significant findings are shown. First, concerning the subjective or cognitive dimension, all three social capital indicators are found to have an independent effect on the outcome variable. The aggregate general trust is associated with people's subjective evaluation of health ($p < 0.05$), i.e., the individuals whose compatriots exhibit greater levels of general trust are more likely to feel healthier. The same is true of political trust ($p < 0.05$). The higher the country-level trust in the central government, the greater the likelihood of people to rate themselves higher on the subjective health scale. Interestingly, however, the coefficient for the variable that measures trust in religious authority (R_Religiosity) has a negative sign ($p < 0.05$), which further challenges the previous findings in the literature concerning the positive connection between religion and health. As for the structural or behavioral aspects of social capital, only one of the three variables (C_StrongNetwork) is shown to have an effect ($p < 0.05$): specifically, at the aggregate level self-rated health is connected to frequent interaction with family members, but not friends or colleagues. At the individual level, the same set of social capital variables from previous multilevel models is associated with how people feel about their health; namely, only the indicators that capture the frequency of social interaction with strong and intermediate ties, i.e., family and friends, respectively, and the degree of general trust.

Discussion

This study set out to test the health associations of social capital measured simultaneously at individual and contextual levels, while controlling for a number of background variables. In previous research, only a limited number of studies conceptualized and analyzed structural or behavioral social capital in terms of network interactions. Aside from few exceptions, those that included this component collapsed different network measures into a "single, unidimensional concept, without any consideration of either the strength of individual ties, or the distinction between core and significant ties" (Binder et al. 2012, pp. 213). In recognition of this limitation, the current study measured three distinct network relations- strong, intermediate, weak—and examined the independent association of each variable on subjective health. By doing so, more nuanced findings have emerged, which illustrate the contingent effects of network relations (see, e.g., Falci and McNeely 2009). That is, not all interpersonal ties are similarly related to subjective health. Rather, the strength or type of network ties matters. One significant implication of the findings is that while the frequency of interaction is obviously important, perhaps more important is the identity of the network contacts. In other words, whom one interacts with is a critical factor associated with one's perception of health status. When it comes to interpersonal and institutional trust, the findings from this study also do not conform to a consistent pattern but show divergent outcomes across different levels of analysis.

The main empirical results raise the following questions: Why are only strong and intermediate networks associated with self-rated health, while weak ties fail to exhibit any significant effect? In addition, what is the nature of the relationship between trust and people's subjective perception of health? These questions are of critical importance especially since in previous research the "precise identification of the mechanisms by which social capital affects health has been limited" (Moore et al. 2010, pp. 536). In the public health literature, there are "three distinctions" (Fujiwara and Kawachi 2008) in defining and measuring social capital: cognitive versus structural, individual versus collective, and bonding versus bridging. "Bonding" social capital, which consists of dense connections among similar others, "constitutes a kind of sociological superglue" (Putnam 2000, pp. 23). The value of this type of social capital is that it provides the necessary social support for people in maintaining and improving their health outcomes (Szreter and Woolcock 2004), which is more likely to emerge and operate among close contacts, or strong ties. This is because social obligations to assist others are more likely to occur in the context of bonding social capital, or what Coleman (1988) calls network closure. The results from analyzing the Muslim populations support some of

the previous studies that highlight the contingent health benefits of network interaction. For example, according to Barefoot et al. (2005), social contact of all types "except neighbors and work colleagues" is associated with health outcomes for a Danish sample. Binder et al. (2012) similarly report that access to "core", as opposed to "significant", ties are linked with reduced loneliness based on another European sample. As Song and Lin (2009) explain in their research on Taiwan, "stronger ties benefit health to a greater degree than weaker ties by implicating higher availability of social support or providing higher quality of social support" (pp. 151).

"Bridging" social capital, on the other hand, has its value not in creating solidarity and reciprocal obligation among network members, but in reaching across disparate social identities and groups and, in doing so, providing useful information and resources that may be unavailable to those individuals located in isolated cliques (see, e.g., Cornwell and Waite 2009). The bridging function of social capital is especially important for people in disadvantaged communities or societies (such as those analyzed in this study) who lack proper access to material and psychosocial resources because being overly embedded in local social groups and activities could lead to worse health (Sapag et al. 2008). The mechanism underlying the association between social trust and self-rated health found in this research is closer to bridging, rather than bonding, social capital. People who have a higher propensity to place their trust in generalized others (strangers) or institutional authorities are more likely to interact with dissimilar others. If people typically obtain information through social interaction and not formal channels, then those who have wider network ties that transcend ascriptive boundaries are more likely to have better access to valued information and resources (Burt 1992; Granovetter 1973; Neilson and Paxton 2010). Therefore, to extend the argument, "high trusters" have an advantage over "low trusters" in tapping into information and resources that are more relevant to maintaining and improving their health.

In their comprehensive review of the extant literature, Smith and Christakis (2008: 417) conclude: "most studies have evaluated only indirectly how networks work through (various) mechanisms to affect health". This shortcoming constitutes a key and challenging agenda for public health scholars. Future studies need to construct more precise hypotheses and collect more accurate data to probe into the complex roles of social capital in influencing people's physical and psychological well-being.

Limitations of this study

Because the data analyzed is cross-sectional, causal inference from the multilevel models need to be made with caution. The endogeneity issue has been a thorny problem in the social capital research on health (Binder et al. 2012; Cornwell and Waite 2009; Habibov and Afandi 2011; Kim and Kawachi 2006; Subramanian et al. 2002). Reverse causation cannot be ruled out, unfortunately, given the nature of the dataset analyzed. For example, people's health status may affect their degree of voluntary organizational participation (Li and Ferraro 2006) as well as the structure of their social interactions with close contacts (Cornwell and Waite 2009). Given that the causal arrow may flow in both directions, the regression models produce biased estimates of the effects of social capital on self-reported health. The findings in this study thus reveal only the extent to which the individual- and contextual-level measures of cognitive and structural social capital are linked with subjective evaluation of health. They are not intended to provide conclusive evidence on their causal relationship.

References

Abbott S, Freeth D (2008) Social capital and health: do trust and reciprocity have an effect, and if so, how? J Health Psychol 13:874–883

Almedom A (2005) Social capital and mental health: an interdisciplinary review of primary evidence. Soc Sci Med 61:943–964

Barefoot J, Gronbaek M, Jensen G, Schnohr P, Prescott E (2005) Social network diversity and risks of Ischemic heart disease and total mortality: findings from the Copenhagen City Heart Study. Am J Epidemiol 161:960–967

Berkman LF, Glass T, Brissette I, Seeman TE (2000) From social integration to health: Durkheim in the new millennium. Soc Sci Med 51:843–847

Binder JF, Howes A, Smart D (2012) Harmony and tension on social network sites. Info Comm Soc 15:1279–1297

Bourdieu P (1986) The forms of capital. In: Richardson J (ed) Handbook of theory and research for the sociology of education. Greenwood, New York, pp 241–258

Browning CR, Cagney KA (2002) Neighborhood structural disadvantage, collective efficacy, and self-rated physical health in an urban setting. J Health Soc Beh 43:383–399

Burt R (1992) Structural Holes: The social structure of competition. University Press, Cambridge, Harvard

Coleman JS (1988) Social capital in the creation of human capital. Am J Soc 94:95–120

Cornwell EY, Waite LJ (2009) Social disconnectedness, perceived isolation, and health among older adults. J Health Soc Beh 50:31–48

d'Hombres B, Rocco L, Suhrcke M, McKee M (2010) Does social capital determine health? Evidence from eight transition countries. Health Econ 19:56–74

De Silva MJ, McKenzie K, Harpham T, Huttly S (2005) Social capital and mental illness: a systematic review. J Epidemiol Comm Health 59:19–627

Falci C, McNeely C (2009) Too many friends: social integration, network cohesion, and adolescent depressive symptoms. Soc Forces 87:2031–2061

Ferlander S (2007) The importance of different forms of social capital for health. Acta Soc 50:115–128

Fujiwara T, Kawachi I (2008) A prospective study of individual-level social capital and major depression in the US. J Epidemiol Comm Health 62:627–633

Granovetter M (1973) The strength of weak ties: a network theory revisited. Am J Soc 78(6):201–233
Habibov N, Afandi E (2011) Self-rated health and social capital in transitional countries: multilevel analysis of comparative surveys in Armenia, Azerbaijan, and Georgia. Soc Sci Med 72:1193–1204
Hooghe M, Vanhoutte B (2011) Subjective well-being and social capital in Belgian communities: the impact of community characteristics on subjective well-being indicators in Belgium. Soc Ind Res 100:17–36
Kawachi I, Kennedy BP, Lochner K, Prothrow-Stith D (1997) Social capital, income inequality, and mortality. Am J Public Health 87:1491–1498
Kawachi I, Kim D, Coutts A, Subramanian SV (2004) Commentary: reconciling the three accounts of social capital. Int Epidemiol Assoc 33:682–690
Kim D, Kawachi I (2006) A multilevel analysis of key forms of community- and individual-level social capital as predictors of self-rated health in the US. J Urb Health 83:813–826
Klein J, Vonneilich N, Baumeister ES, Kohlmann T, von dem Knesebeck O (2012) Do social relations explain health inequalities? Evidence from a longitudinal survey in a changing eastern German region. Int J Public Health 57:619–627
Koenig HG, McCullough ME, Larson DB (2000) Handbook of religion and health. Oxford University Press, London
Kumar S, Calvo R, Avendano M, Sivaramakrishnan K, Berkman LF (2012) Social support, volunteering and health around the world: cross-national evidence from 139 countries. Soc Sci Med 74:696–706
Li Y, Ferraro F (2006) Volunteering and depression in later life. J Health Soc Behav 46:68–84
Mansyur C, Amick B, Harrist R, Franzini L (2008) Social capital, income inequality, and self-rated health in 45 countries. Soc Sci Med 66:43–56
Mohnen S, Groenewegen P, Volker B, Flap H (2011) Neighborhood social capital and individual health. Soc Sci Med 72:660–667
Moore S, Haines V, Hawe P, Shiell A (2006) Lost in translation: a genealogy of the "social capital" concept in public health. J Epidemiol Comm Health 60:729–734
Moore S, Bockenholt U, Daniel M, Frohlich K, Kestens Y, Richard L (2010) Social capital and core network ties: a validation study of individual-level social capital measures and their association with extra- and intra- neighborhood ties, and self-rated health. Health and Place 17:536–544
Moore S, Bockenholt U, Daniel M, Frohlich K, Kestens Y, Richard L (2011) Social capital and core network ties: a validation study of individual-level social capital measures and their association with extra- and intra- neighborhood ties, and self-rated health. Health Place 17:536–544
Neilson L, Paxton P (2010) Social capital and Political consumerism: a multilevel analysis. Soc Probl 57:5–24
Phongsavan P, Chey T, Bauman A, Brooks R, Silove D (2006) Social capital, socio-economic status and psychological distress among Australian adults. Soc Sci Med 63:2546–2561
Poortinga W (2006) Social capital: an individual or collective resource for health? Soc Sci Med 62:292–302
Putnam RD (1993) Making democracy work: civic traditions in modern Italy. Princeton University Press, Princeton
Putnam R (2000) Bowling alone: the collapse and revival of American community. Simon and Schuster, New York
Raudenbush SW, Bryk AS, Congdon R (2010) *HLM* 7: Hierarchical linear and nonlinear modeling. Scientific Software International, Lincolnwood
Razzak JA, Khan UR, Azam I, Nasrullah M, Pasha O, Malik M, Ghaffar A (2011) Health disparities between Muslim and non-Muslim countries. East Med Health J 17:654–664
Salonna F, Geckova MA, Zezula I, Sleskova M, Groothoff WJ, Reijneveld AS, van Dijk PJ (2012) Does social support mediate or moderate socioeconomic differences in self-rated health among adolescents? Int J Public Health 57:609–617
Sapag JC, Aracena M, Villarroel L, Poblete F, Berrocal C, Hoyos R, Martinez M, Kawachi I (2008) Social capital and self-rated health in urban low income neighbourhoods in Chile. J Epidemiol Comm Health 62:790–792
Smith KP, Christakis NA (2008) Social networks and health. Ann Rev Soc 34:405–429
Song L, Lin N (2009) Social capital and health inequality: evidence from Taiwan. J Health Soc Behav 50:149–163
Subramanian SV, Kim DJ, Kawachi I (2002) Social trust and self-rated health in US communities: a multilevel analysis. J Urb Health 79:S21–S34
Szreter S, Woolcock M (2004) Health by association? Social capital, social theory, and the political economy of public health. Int J Epidemiol 33:650–667
Uchino B (2006) Social support and health: a review of physiological processes potentially underlying links to disease outcomes. J Beh Med 29:377–388
Yip W, Subramanian SV, Mitchell AD, Lee TS, Wang J, Kawachi I (2007) Does social capital enhance health and well-being? Evidence from rural China. Soc Sci Med 64:35–49