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# Healthy communities: The challenge of social capital in the Lisbon Metropolitan Area

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ABSTRACT

The debate about social environment, sustainability and health has been highlighted by the interest in social capital. It has been suggested that social capital varies from place to place and that such variations are relevant for explaining variations in health. This paper explores the association between neighbourhood social capital (making a distinction between linking, bonding and bridging social capital) and self-rated health. The study has involved 4577 residents in 143 neighbourhoods of the Lisbon Metropolitan Area. Logistic regression was used to measure the relationship between social capital and self-rated health. The results show that social capital was strongly associated with self-rated health, even after an adjustment for individual attributes. It is not possible to divorce health planning from urban planning and from the promotion of social capital. A sense of place, identity and belonging needs to be at the core of all healthy planning interventions.



## Introduction

Much of the debate about health inequality and environment has been centred on the deleterious effect of poverty and deprivation. Nowadays, research also tends to focus upon connections between social settings and health. It is claimed that social settings affect bodily reactions in a way that is not reducible to matters of diet, exercise, smoking or health care (Edmonson, 2003). Social environmental factors are increasingly invoked in attempts to explain health variations, and social capital, broadly understood as a resource that enables communities to achieve desired goals and pursue shared objectives (Mitchell and Bossert, 2007), has become one of the most popular social determinants of health. According to Parkes and Kearns (2006), there are two ways in which social capital may affect health: the first one considers the role of peer influences, arguing that social capital promotes various health-enhancing behaviours (including physical activity), and exerts some measure of social control over deviant health behaviours (such as smoking and alcohol abuse); the second one contributes towards general self-efficacy, through the general promotion of an individual's sense of control over his/her everyday life. Cattell (2001) argues that this latter mechanism provides individuals with a solid sense of identity and can mitigate the deleterious effect on health of stress caused by poverty and inequalities.

## Theoretical perspectives on social capital

Concepts of social capital date back to the 19th century and the work of Durkheim, Simmel, Marx and Weber (Baum and Ziersch, 2003). In recent years, the renewed interest in social capital is due chiefly to the work of Putman and Bourdieu. These authors have decisively shaped this concept, understood as a resource produced through relationships and embedded in social structures. Despite the intensive research carried out in this area, social capital remains as an indistinct, unspecified concept. Lynch et al. (2000, p. 404) argue that: (…) "while the concept has had a meteoric rise in political, economic and public health rhetoric, it remains to be fully defined and understood". Avoiding the intellectual slackness underlying broader social capital definitions, Putman (2004) and others point to a "lean and mean" definition of social capital as "social networks and norms of reciprocity".

Notwithstanding the conceptual indistinctness, a burgeoning literature on the topic links social capital to diverse health outcomes (e.g. self-rated health, mortality, depression, anxiety, obesity, cardiovascular disease) (Lochner et al., 2003; Srinivasan et al., 2003; Kim et al., 2006a, b; De Silva et al., 2007). However, again, this research was unable to identify a single capital with impacts on health or a clear causal pathway to health. Along with the conceptual issue there comes the debate about the crucial levels at which social capital operates (Kawachi et al., 2004; Yip et al., 2007). Questions regarding what social capital is; what it does; how it does; how it can be measured remain permanently open.

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Addressing the multidimensionality of the concept, a useful typology unpacks the concept of social capital into bonding, bridging, and linking social capital (Szreter and Woolcock, 2004). Bonding social capital refers to horizontal ties, bounded within similar individuals or groups (Putman, 2004). This form of social capital acts at the microlevel of individual/family, strengthening social support and cohesion (Pridmore et al., 2007). Bridging and linking social capital refer to ties that cut across individuals/communities and probably operate at the mesolevel of neighbourhoods and cities and the macrolevel of states (Pridmore et al., 2007). Bridging social capital is related to an inequality thesis, arguing that the growing gaps in developed societies erode mutual respect and trust (Wilkinson, 2005). This form of social capital comprises relations of respect and mutuality and refers to formal or informal social participation and to solidarity in society as a whole. Linking social capital refers to vertical connections across explicit, formal or institutionalized power or authority structures, shaping perceived levels of justice in society (Sundquist and Yang, 2007). Relational, political and material aspects of social capital seem to be advantageous to health: at the microlevel, bonding social capital contributes to the necessary social support, while at the meso and macrolevel, bridging and linking social capital are related with communities' participation and empowerment. These latter forms of social capital lead communities to increase control of their lives and challenge local injustices, thereby promoting changes in policy, in access to resources/infrastructures and in living conditions (Szreter and Woolcock, 2004; Pridmore et al., 2007).

## Social capital, built environment and healthy communities: an integrated view

Healthy communities have been defined as the ones that "protect and improve the quality of life of their citizens, promote healthy behaviours and minimize hazards for their residents, and preserve the natural environment" (Dannenberg et al., 2003, p. 1500). This definition highlights not only the direct effects of physical, biological and chemical factors, but also the effects on health of the built environment, widely understood as including all that is created or modified by people, thus comprising physical, as well as social environment (Srinivasan et al., 2003).

A broad, holistic, built environment raises many complex challenges. Physical and social environments together make up the neighbourhood environment. Urban sprawl; availability of sidewalks; vehicle speed; lighting; crime rates; housing adequacy; availability of public transport; social relations; equity and cultural diversity are different features of the local environment that are closely connected, playing in interaction and interdependence. In a run-down physical and socioeconomic environment, crime rates and traffic-related injuries increase, making neighbourhoods less safe and less pleasant for walking (Srinivasan et al., 2003). Sedentary lifestyles and social isolation reduce the degree of cohesiveness in social relations and decrease social capital (Kawachi et al., 1999). In these neighbourhoods, which are increasingly anonymous, residents may be less willing to maintain their houses and feel less responsible for other physical characteristics (Van Lenthe et al., 2005). Structural degradation and deterioration follow. Social and physical environmental factors may enter into a downward spiral of decay or, conversely, an upward spiral of improvement and enrichment.

Concerning the role of the different types of social capital on health, the impact played by the "spiral up" or, conversely, the "downward spiral" must be highlighted. Bonding social capital operates at the microlevel, strengthening social support for individuals and improving overall health outcomes. Healthier individuals are better able to cope and participate in the community and are economically more productive (Pridmore et al., 2007). Participation and empowerment pursue, leading to changes in policy and access to resources, thereby fostering social justice and public health. Different types of social capital, interacting at different levels, play a fundamental role in the achievement of health and social equity.

In spite of the by and large pro-social and pro-health social capital effects, inherent risks of social capital should be pointed out. These risks include the possibility that strong communities' ties may exclude others as well as compromise the development of successful initiatives for those who do not fit in the norm (Pridmore et al., 2007). Mitchell and LaGory (2002) report a positive association between bonding social capital and distress, ascribing that perverse relation to the excessive obligations placed in the individual's time and resources through social participation, and Granovetter (1973) show that strong ties are less effective for job-seekers than weak ties, reporting an anti-social effect of social capital, even before the emergence of the social capital debate.

## Research aims

The purpose of this paper is to examine the contribution of the social context in which citizens lead their daily life and personal attributes on health. To achieve this, we began by creating tools for measuring the social capital in the neighbourhoods (parishes) of the Lisbon Metropolitan Area (LMA), and then we have analysed whether variations in self-rated health are related to different levels of different types (bonding, linking and bridging) of social capital.

## Data source and methodological issues

### *Study area*

The study focused upon the Metropolitan Area of Lisbon, Portugal, located in the central–southern part of the country, on either side of the River Tagus (Fig. 1).

The 3133 $km^2$ area comprises 19 municipalities and 216 parishes. In 2001, around 25% of Portuguese population (2,682,687 inhabitants) was concentrated in this area, with population densities ranging from 9 inh./$km^2$ in the most


**Fig. 1**

peripheral sprawling parishes to 34,173 inh./km$^2$ in the most central compact ones. The area includes some of the largest Portuguese cities, such as Lisbon, Amadora, Cascais, Almada, Seixal and Setúbal, nine of them belonging to the WHO healthy cities network. Nevertheless, the space is dominated by problems related to the high levels of poverty, deprivation and housing inadequacy, mainly in inner city areas (Nogueira and Santana, 2005), lack of resources, facilities and amenities, both in peripheral and central areas; low public transport availability and use in the most peripheral sprawling areas; low levels of social interactions and weak social networks, resulting from a high residential mobility and a persistent strong process of urbanization (Nogueira, 2007, unpublished thesis).

*Individual measures*

All individual data (health status, demographic, economic and behavioural characteristics) were assessed from the National Health Survey (NHS) for the years 1998/1999. NHS has been carried out by governmental institutions since 1987 (1987, 1995/1996, 1998/99 and 2005/2006, the latest with data of small areas not available) and is assessed by the National Center for Health Statistics of USA. Within small areas, a random sample drawn from the whole number of households was collected. In selected households, all individuals were interviewed face-to-face by well-trained interviewers. The sampling frame used in this study consisted of individuals living in the LMA. It is a representative sample of the population living in the LMA, composed of 9846 individuals from 143 neighbourhoods (of 216) of the LMA. In the present study, we have excluded subjects aged 14 years or younger, because in these cases the responses to the inquiry are not necessarily given by the individual him/herself (they may be provided by relatives living in the household). Participants with missing data for variables (dependent and independent) used in analysis were also excluded; the resulting study population comprised 4577 participants.

*Health outcome*

This study used self-rated health, measured on a five-point scale: very good (4.7% of the sample), good (34.8%), fair (43.8%), bad (12.7%), very bad (4.0%). 60.5% of the sampled individuals rated their health as less than good. This subjective and general health question has been validated as a good predictor of mortality (Idler and Benyamini, 1997) and has been largely used in social capital and health research (Cheng and Chan, 2006; Poortinga, 2006b; Sundquist and Yang, 2007; Yip et al., 2007).

*Sociodemographic*

All socioeconomic and demographic individual variables were included as dummy variables; age was also included as a continuous variable: (1) Gender: men (40.0% of the sample) vs. women (60.0%). (2) Age: 15–24 (9.1%); 25–34 (12.9%); 35–44 (16.4%); 45–54 (20.1%); 55–64 (18.5%); 65–74 (15.0%); 75 yr and over (8.0%). (3) Education: less than 4 yr (44.3%); 5–12 yr (41.2%); 13 yr and over (14.5%). (4) Economic activity: employed (52.9%); unemployed (5.2%); others (41.8%). (5) Occupation: manual (53.7%) vs. non-manual (46.3%).

*Behaviours*

Behavioural variables were included as dummy variables: (1) Smoking: smokers (21.8% daily smokers); non-smokers (62.8%); ex-smokers (15.4%). (2) Physical activity: with physical activity (32.7%, ranging from sports/athletics to light healthy daily activity, like walking and cycling, at least 4 h a week) vs. without physical activity (67.3%).

*Social capital: creating specific indicators*

Contextual measures of social capital were created through Principal Component Analysis (PCA). We began with the selection, analysis and interpretation of data able to reflect bonding, linking and bridging social capital. In a first stage, 66 contextual variables were organized, a priori, and assigned to the three dimensions of social capital. To explore and reduce these data, a PCA was performed, since this statistical procedure allows the extraction of factor scores (or components) based upon the collected data for each of the social capital indicators. All components (or factors) were rotated, using varimax (orthogonal) rotation to maximize factor loadings, and rejected when considered irrelevant, using Kaiser's criterion. In each extracted component, variables with a low loading onto components were discarded. Throughout this procedure, we systematically modified the number of entered variables, in order to generate a single and strong component in each of the social capital dimensions (Cummins et al., 2005). Three components (factor scores) were extracted and taken as social capital indicators:

1. Bonding social capital: the relational dimension was measured by a composite indicator of social participation and cohesion (Veentra, 2005), composed by three variables combined through a PCA: number of voluntary associations per capita, number of local newspapers and respective editions per capita (Cronbach's $\alpha = 0.51$). We argue that this indicator of community involvement is appropriate to measure co-operative relations resulting from horizontal ties connecting people. The indicator considers mainly residential quarter associations, mostly recreational, sports and religious, composed of close mates, friends and neighbours, thus appropriately reflecting horizontal bonds (Pridmore et al., 2007). Furthermore, local newspapers are often a material reflex of the associations' work and performance, and editions per capita reflect the way and extent of the associations' inclusion in the bosom of the community.
2. Linking social capital: the political dimension of social capital was measured by a composite indicator of political participation, also resulting from a PCA (formed by three variables relating the number of people in the neighbourhood who voted in three different elections, namely the local elections of 2001 and the national elections of 2002 and 2005, to the number that were entitled to vote) (Cronbach's $\alpha = 0.85$). We think that this indicator is able to measure levels of trust in government and political institutions. Moreover, linking social capital has been measured through voting in other studies linking social capital to self-rated health (Sundquist and Yang, 2007).
3. Bridging social capital: the material dimension of social capital was measured by a composite indicator of availability of family protection facilities. Again, this is composed by five variables combined through a PCA: day-nurseries under 3 years, nursing homes, day-care centres, child day-care centres, old people's homes (Cronbach's $\alpha = 0.86$). This indicator seems pertinent to measure bridging social capital, since it points to links and connections of people and systems of support outside one's own circle (Pridmore et al., 2007). According to McCulloch (2003), social capital and some local facilities are strongly linked and we believe that the facilities considered, resulting from the government and non-profit sectors, are suitable for measuring equity, solidarity and mutuality.

A reliability analysis was performed in order to assess the internal consistency of the generated composite indicators. The high values of the Cronbach's $\alpha$ scores (ranging from 0.51 to 0.86) show that indicators are reliable scales, confirming their consistency and capacity of measuring the latent social capital dimensions. Social capital indicators were included in the models as continuous variables.

*Modelling relationships: investigating links between social capital, place and health*

An ordered logistic regression analysis was performed to examine the relation between health outcome and social capital. To assess the effect of social capital beyond those of the key individual determinants on health, self-rated health was first regressed on sociodemographic factors and health behaviours, and then on the social capital measures. Following this order, variables with a conventional significance of $p \leqslant 0.05$ were selected. Logistic regression analysis for neighbourhood studies has been validated by other researchers (Dunn, 2002; Wilson et al., 2004; Veenstra et al., 2005; Mitchell and Bossert, 2007). In order to assess whether the social capital effects differed with gender, two distinct ordered logistic regression models were developed, one for each gender. Interactions between individual variables (socioeconomic and behavioural) and the contextual ones were calculated and tested in these stratified models. On the whole, three models were developed, stressing the effects of different dimensions of social capital on the health of different population groups. The impacts of social capital on self-rated health were measured through variations of one standard deviation in each indicator. For these three models, pseudo-$R^2$ and likelihood ratio statistics were displayed.

## Results

Table 1 shows the association between self-rated health, individual factors and social capital indicators.

Concerning Model 1 (the whole model), women tended to assess their health worse than men (69% more likely); age was found to have a detrimental effect on self-rated health, and the odds of individuals reporting poor health increased by 51% for each additional 10 years. Education showed the biggest influence on self-rated health, and individuals with lower levels of education were 98% more likely to report a negative health status, while 13 or more years of education showed a beneficial effect on health, decreasing by 47% the odds of a negative health status. Manual labour also played a part in increasing poor health ratings, with the odds of a negative health status increasing by 40%. Employment had a positive effect on health, decreasing the odds of a negative health status by 40%. With regard to behaviours, smoking had a detrimental effect on health status, with the odds of smokers reporting a worse health status increasing by 20%. Physical activity had a positive influence, and active individuals were 42% less likely to report a negative health status.

As for social determinants, a significant association was found between self-rated health and linking and bonding social capital. Through variations of one standard deviation, we concluded that individuals living in areas with lower levels of bonding social capital (poor community involvement) were 8% more likely to report a worse self-rated health; those living in areas with a poor linking social capital (lower political participation) were 10% more likely to report a negative health status. As to bridging social capital, the association was in the expected direction (the lower the levels, the poorer the self-rated health) but did not reach statistical significance.

In the female model (Model 2), only a slight influence of bonding social capital remains. Women living in areas with poor community involvement are 7% more likely to report a negative health status: (this influence is observed only to a statistically significant level of $p < 0.1$.) Women's self-rated health was not significantly sensitive to bridging or linking social capital. An individual predictor, smoking, lost its statistical significance in this model.

**Table 1**
Regression coefficients with 95% confidence intervals (CI) of self-rated health after inclusion of the neighbourhood variables and the individual variables

| Variables**** | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | Coefficient | 95% IC | Coefficient | 95% IC | Coefficient | 95% IC |
| | Total sample (4577) | | Women (2747) | | Men (1830) | |
| Sex (female) | −.526*** | −.65; −.40 | – | – | – | – |
| Age | −.041*** | −.05; −.04 | −.042*** | −.05; −.04 | −.039*** | −.05; −.03 |
| Occupation (manual) | −.387*** | −.53; −.25 | −.438*** | −.62; −.26 | −.315** | −.53; −.10 |
| Physical activity (with activity) | .536*** | .41; .65 | .35*** | .17; .53 | .736*** | .54; .93 |
| Employment (in labour force) | .514*** | .39; .64 | .472*** | .31; .64 | .559*** | .35; .76 |
| Tobacco consumption (smoker) | −.184* | −.33; −.04 | −.015[a] | −.23; .19 | −.248* | −.45; −.05 |
| Education: <4 years | −.681*** | −.83; −.53 | −.679*** | −.88; −.48 | −.665*** | −.90; −.43 |
| Education: 13+ years | .617*** | .43; .80 | .675*** | .43; .92 | .539*** | .25; .83 |
| Bonding social capital | −.08* | −14; −.015 | −.065**** | −.15; .017 | −.097* | −.20; .007 |
| Linking social capital | −.097** | −.17; −0.03 | −.0035[a] | −.012; −0.05 | −.177** | −.29; −0.7 |
| Bridging social capital | .015[a] | −.031; .06 | .031[a] | −.028; .091 | −.009[a] | −.081; .063 |
| Model fitting information: | Log likelihood ratio[b] = 1703.78*** | | Log lik ratio[b] = 1016.88*** | | Log lik ratio[b] = 610.75*** | |
| Pseudo $R^{2c}$ | Cox and Snell = .31 | | Cox and Snell = .31 | | Cox and Snell = .29 | |
| | Nagelkerke = .34 | | Nagelkerke = .34 | | Nagelkerke = .31 | |
| | McFadden = .15 | | McFadden = .15 | | McFadden = .14 | |

Logistic ordered regression response models. Portugal, Lisbon Metropolitan Area, ages 15 or over.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

**** $p < 0.1$.

[a] Without significance.

[b] Likelihood ratio tests that constrained models (all slope coefficients equal to 0) are nested in unconstrained models.

[c] Pseudo $R^2$ assesses goodness-of-fit (proportion of the variation in self-rated health that can be explained by the predictors).

Men's self-rated health, like women's, was sensitive to bonding social capital; the odds of reporting a poor self-rated health increased by 10% in areas of lower community involvement (Model 3). Moreover, linking social capital has a more intense influence on this gender, with the odds of reporting a poor self-rated health increasing by 19% in areas of lower political participation. Bridging social capital has no significant influence on men's health status.

These three models were characterized by a lack of statistical significance of availability of family protection services, the bridging social capital indicator. Furthermore, interactions between individual (socioeconomic and behavioural) variables and the contextual measures, introduced in the two stratified models, have shown no statistical significance. Pseudo-$R^2$ and likelihood ratio statistics confirm the models' validity and goodness of fit.

## Discussion

The importance of social capital for people's general health, well-established in the social epidemiological literature (Cummins et al., 2005; Poortinga, 2006a, b), was confirmed in this study. For the whole sample, two dimensions of social capital (bonding and linking) were shown to have an impact on health status. Living in neighbourhoods with weak ties and low levels of horizontal and vertical social capital has a negative effect on self-rated health. Our results stress the role of horizontal bonds, strengthening interpersonal trust, social support and social cohesion and vertical connexions, giving the opportunity to interact across formal power gradient and leading individuals to have more power and control over their lives (Sundquist and Yang, 2007). The observed relations between social capital and health are probably related to the prominence of poor inner city areas, being thus a direct result of poverty and lack of resources, as previously reported in the LMA (Nogueira and Santana, 2005; Nogueira, 2007, unpublished thesis) and elsewhere (Kawachi, 2000; Wilkinson, 2005). But it is also assuredly related to the lack of environments leading to the development of social organization and social capital (McCulloch, 2003). Poverty, deprivation and social capital are strongly linked. Fundamentally, as Wilkinson (2005) argues, the bigger the burden of absolute and relative deprivation is, the weaker and poorer social relations are. Even when personal ties are strong, daily experiences of distrust, uncertainty, stress, economic dependency, lack of general resources, crime, vandalism, graffiti and other signs of social disorganization shape an impoverished, unpleasant, unsafe local environment and are likely to explain the links between environment, the efficacy and effectiveness of collective actions, the individual vulnerability and the individual outcomes. The "downward spiral" is reproduced here.

In spite of the general relation referred above, the stratified models point to the emergence of a more differentiated picture. Men's health status is influenced both by bonding and linking social capital, but only bonding social capital has an impact on women's health and in a more restricted way than in men. It is a commonplace that women invest more than men in relationships and in cultivating social support (Cheng and Chan, 2006), though recently Okamoto and Tanaka (2004) found that emotional support was related only to Japanese men's self-rated health. Portugal, like Ireland or Spain, is a solid catholic country, where women keep a traditional social role of wives, mothers and housewives. Even if nowadays they actively participate in the labour market, family and household are still feminist realms. Deeply imbued of their social role, embedded in family structures, it is possible that vertical ties lose their significance in women's health. Oppositely, Portuguese men's social relations are traditionally "turned outside". Social participation, vertical trust, powerfulness and control are still men's privilege and this can explain the increased impact of social capital, chiefly of linking social capital in men's self-rated health. Boardman (2004) argues that health variations between neighbourhoods were due to stress disparities, and Sundquist and Yang (2007) suggest that stress due to powerlessness and lack of control may lie in the pathway between lower levels of linking social capital and poor self-rated health.

Similarly to Veenstra et al. (2005) and Cheng and Chan (2006), the developed models were adjusted for health-related behaviours (smoking and physical activity) considered as individual predictors of self-rated health. However, it is difficult to establish the role of health-related behaviours, since they can be potential confounders, as well as potential mediators of associations between social capital and health. Being aware of this plausible ambiguous role, we argue that more research (theoretical and empirical) is needed in order to clarify potential pathways to health. Our suggestion is that studies considering health-related behaviours as independent variables would help to shed light on this issue, addressing the complexity of social capital and making easier and more secure the drawing of firm conclusions.

## Study weaknesses

Our measures were created at a neighbourhood (parish) level, which could misspecify some relationships; this is because Portuguese parishes are administrative census areas and not necessarily communities with identities and meanings for their inhabitants. Similarly, we were unable to measure social capital at more ecological levels, such as state and county-level that are nowadays implied in health variations (Kim et al., 2006a; Pridmore et al., 2007).

We have generated different measures representing different dimensions of social capital, but certainly all of them have drawbacks. A potential problem concerns the lack of statistical significance of bridging social capital, measured by the availability of family protection services. The absence of significance does not necessarily mean the absence of impact on health. It is possible that issues associated with the generation of data have occurred, such as misspecification (the wrong scale of measurement) or completeness (available data sources are only the sanctioned legal institutions, and thus do not consider informal, illegal services that could have a crucial importance not only on the LMA but on the whole country). Moreover, our indicator has assessed the whole provision of family protection services, joining public and private, institutional and non-profit services. Thus, data may not be an accurate representation of community bridging social capital.

The cross-sectional nature of the data prevents an exploration in causal relationships between social capital and self-rated health. We can only argue that these results show a jointed variation of self-rated health and social capital. In addition, health and social capital may influence each other, thus inflating coefficients. Moreover, it is usually assumed that a lack of social capital leads to a poorer health, but the reverse may also occur, i.e., individuals with poorer health may generate lower levels of social capital. Note, yet, that social capital and self-ratings may be influenced by factors not included in the regression models. It is the case of income, not used in the models owing to a lack of specification on the database, worsened by doubts relating to the rigour and veracity of the Portuguese's income reports.

This study was developed with logistic regression models, which assume independence of individual measures. It is postulated that if the outcome variable is clustered, i.e., if people

in the same neighbourhood are more similar to each other than to people from other areas, a multilevel regression is needed. If this assumption is violated, the results of the regression analysis are biased. However, multilevel modelling has stringent data requirements, namely an absolute minimum of 25 people in 25 places (Veenstra, 2005), the former condition not always fulfilled in these data.

Interactions between individual/contextual predictors, tested in the stratified models, have not shown any statistical significance. However, it is argued that social capital stimulates various positive health behaviours, including physical activity, and discourages deviant health behaviours, such as smoking (Kawachi and Berkman, 2000). Despite the lack of significance referred above, this kind of influence may occur, though uncaptured in this study.

Finally, it is important to note that this study was developed based upon a representative sample of the population living in the LMA. Remarks and conclusions are valid to this specific unit of "population-territory" and generalizations to other geographical or population group levels can be delusive.

## Study strengths

This study has created a set of new indicators that are more than aggregated measures; they are true contextual constructs. Avoiding difficulties related with the collection of contextual data, much research relies on a simple aggregation of individual variables at a community level. However, such aggregated indicators are surrounded by ambiguities regarding the interpretation of results and are often unable to clarify the underlying social processes that link social capital to health. If social capital is thought to operate at a neighbourhood or community level, related variables should also be observed and collected at the same level. Thus, in spite of issues respecting to contextual data (such as those related to scale, quality, generation, use and interpretation), we have made an effort to generate innovative and "true" ecological data. Moreover, the neighbourhood variables were collected from a different source than the individual measures.

Multiple dimensions of social capital (bridging, bonding and linking social capital) were assessed, facing the need to forward the development of cost-effective indicators of social capital. The influence of these dimensions on health was controlled for a range of covariables, in order to reduce potential model misspecification. The categorization of social capital used in this work is an important contextual construct in our understanding of the essence of social capital and its association with health. Perhaps one of the most useful aspects of this specification is its potential for informing future policymaking in Portugal. Both stimulating participation in organizations and building political/institutional trust are amenable to government intervention or action. National and local authorities, civic society, local institutions and local agents could play a major role in improving the health of population in general. Finally, the development of ordered category response models was an advantage compared with the use of a binary outcome.

## Conclusions

Place plays a role in shaping health and health-related behaviours. As several factors play an unequivocal role in improving health, interventions should be addressed beyond the health care system, looking at neighbourhood environment as a potential source of stress and disease, or well-being and health. Promoting neighbourhood social capital can be a promising, efficient, lasting strategy for increasing total health, since social capital is a resource provided by communities to their residents, thus potentially available to a large proportion of the population.

Strong social ties and equality strengthen the sense of place, identity, social support, reciprocity and trust. These social features can promote individual health and all of them can be achieved with diligent sustainable planning, designed to improve the physical and social local context. In stressful, hazardous neighbourhood environments, where people keep away due to fear of crime or traffic injuries, degradation, or the area's poor general appearance, there are fewer opportunities for the development of local networks and associations. Trust in formal, political institutions declines. Social disorganization rises and feeds further crime, producing a cycle of declining social capital. Conversely, pleasant safe environments, interconnecting people and promoting integrated communities and active lifestyles, lead to the strengthening of social interactions and social capital. Understanding the chain of vulnerability or opportunity played by social capital highlights the need of appropriate planning interventions, i.e. planning for sustainability and health, i.e. planning that is able to create communities that are aware of environmental health concerns, and environments that generate better (mental and physical) health and general well-being.

Finally, we must note that improving local social and physical environment is a shared multi-level challenge. The development of social capital takes place within neighbourhoods, but is also influenced by socioeconomic factors linked to the wider economy. The impact of vertical social capital shows that, besides interventions at community level, policies designed to address socioeconomic change and institutional mistrust need to be considered. As McCulloch (2003) argues, governments should develop top-down approaches, such as policies to reduce income inequalities, as a possible way of promoting social capital. The time to invest in social capital has come, and this requires partnerships and collaborations among policymakers, governments, researchers, communities and individuals, since only by working together can people take up the gauntlet of building sustainable, healthy communities.

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