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Does Social Capital Improve Community-based Integrated Care Systems?

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This study investigates three components of social capital (hereinafter SC). It also examines whether SC improves community-based integrated care systems by increasing individuals' self-rated health and subjective well-being. First, multiple regression analysis is conducted based on data from a survey conducted in 2017-18 in Kawasaki, Japan, (2,457 respondents, 44.8% valid). The results show that two components of SC, regional trust and participation in horizontal networks, affect self-rated health and subjective well-being, even controlling for socioeconomic status. Second, propensity score analysis clarifies that SC promotes self-rated health and subjective well-being, but not vice versa. Finally, the study concludes that in aiming to improve self-rated health and subjective well-being, approaching the whole population, not only its high-risk members, is more effective. This study concludes that enhancing individual and regional SC will improve community-based integrated care systems in Kawasaki, which are inclusive of all citizens.

Keywords: *social capital, community-based integrated care systems, self-rated health, subjective well-being*

What is social capital?

Social capital (hereinafter SC) has been one of the most influential sociological concepts of the last two decades. In Japanese, it is often rephrased as '絆'(*kizuna*, ties or bonds), '地域力'(*chiiki ryoku*, regional strength), or '住民力'(*jumin ryoku*, inhabitants' ability).

Economist Inaba Yoji defines SC as "trust which promotes people and/or organisations to take cooperative actions, norms that are based on a sense of mutual reciprocity, and network" (Inaba 2014, p. i). He argues that SC has three dimensions. When SC refers to trust and norms across the whole of society, it can be considered public goods, i.e. non-competitive and non-excludable goods which many people can utilise freely at the same time. When SC refers to trust and norms among specific people or groups, it can be seen as club goods, i.e. goods which you can obtain by belonging to specific groups or organisations. When SC refers to personal networks between people, it can be considered private goods, i.e. goods which are individually owned and utilised.

The idea of 'trust as a public good' means that the higher the ratio of people who trust others in a region, the more positive effects PC will have on the region's inhabitants, irrespective of how much a person in the region trusts others individually (Inaba 2014, p. 12). This idea can be rephrased as the proverb, "he who touches pitch shall be defiled therewith," or as the neighbourhood effect, a concept which suggests that neighbourhoods have both direct and indirect effects on individual behaviours (Faber and Sharkey 2015).

There are multiple dimensions to SC, and it is said to benefit several aspects of a society. Previous research has revealed the following promising results: local communities with higher SC have a tendency to more rapidly recover from disasters (Aldrich 2012); organisations with higher SC have higher productivity (Halpern 2005); local communities with higher SC have lower crime rates, more effective bureaucracy, and smoother market transactions (Halpern 2005); local communities with higher SC have higher birth rates (Japanese Cabinet Office 2003); and people who live in a community with higher SC become healthier (Berkman and Kawachi 2014).

This study tries to establish a causal relationship between SC, individual health, and subjective well-being by utilising causal inference methods, and proposes that promoting SC will be beneficial to the creation of community-based integrated care systems. The city-government of Kawasaki, one of the

twenty major cities close to Tokyo Metropolis, defined community-based integrated care systems in an official document in March 2015 as the "realisation of a local community that enables anyone to live with peace of mind in a town that they are used to living in or they wish to live in" (Kawasaki City 2015). It argues that community-based integrated care systems should include not only senior citizens, but many other individuals such as people with disabilities, parents with children, foreigners, and the poor and disadvantaged.

This study analyses community-based integrated care systems in Kawasaki, based on a survey that was conducted by the author in 2017 and 2018. Four small regions in each ward were selected for the survey, and two hundred residents aged eighteen years and older were selected from each region by random sampling. Kawasaki has seven wards, meaning that there was a total of 5,600 samples. Finally, the author and staff collected 2,457 responses, with a ratio of 44.8 percent valid responses.

SC from the perspective of social epidemiology

Social epidemiology, a "branch of epidemiology concerned with the way that social structures, institutions, and relationships influence health" (Berkman and Kawachi 2014, p. 2) has found that self-rated health, the degree to which respondents think that they are healthy, is useful as an indicator of their objective health and as an index to predict the mortality rate of the region in which the respondent lives. Self-rated health can be affected by both individual SC, which refers to individual networks and/or trust towards others, and regional or collective SC, which refers to the effects of living in a particular region, i.e. neighbourhood effects.

We used three simple but effective indicators in order to measure SC: trust, reciprocity, and social network. These indicators have been established by previous research (Inaba 2014). Regarding trust, respondents were asked: 'Do you agree that residents in your region can be trusted?'; those who answered 'Strongly agree' or 'Agree' were defined as belonging to a high-trust group, and the rest as belonging to a low-trust one. Similarly, for reciprocity, respondents were asked: 'Do you agree that residents in your region try to be helpful to others?'; respondents who answered 'Strongly agree' or 'Agree' were defined as a high-reciprocity group, and the rest as a low-reciprocity one. Regarding social network, we counted the frequency of participation in: (a) vertical organisations such as political organisations, business organisations,

clubs for the elderly, and neighbourhood associations; (b) horizontal organisations such as volunteer organisations, sports clubs, and hobby activity clubs (Inaba and Fujihara 2013, p.130). These are three elements of SC that can be considered private goods, but when we calculate the ratio of the three variables in a small region, we can specify the level of regional SC as collective public goods.

A strong positive correlation exists between regional SC and average self-rated health in a region. The Aichi Gerontological Evaluation Study (AGES) surveyed twenty-five local cities in the Chita Peninsula, in the middle of Japan, and found that local governments with lower SC (which was measured by the ratio of respondents who answered negatively to a question about general trust) had a higher ratio of respondents who stated that they were in poor health (Ichida et al. 2009).

In 2005, Kondo Katsunori conducted a survey in two towns in Akita Prefecture, northern Japan, measuring regional SC (Kondo 2016). This was an index assembled from answers to questions such as 'Do your neighbours try to help each other?', 'Do your neighbours pay attention to children when they play in an unsafe place?', and 'Do you love the town you live in?'. It was found that living in a town with higher regional SC lowers the level of depression in individuals. These findings were reached by conducting multilevel analysis, a cutting-edge multivariate analysis method, and confirmed the abovementioned hypothesis after controlling for individual traits such as age, sex, and educational background (Kondo ibid, p.155).

Does social capital promote self-rated health and well-being?

Many previous studies have found that SC increases individuals' self-rated health and subjective well-being (Kawachi, Subramanian, and Kim 2006; Ichida et al. 2009; Kondo 2016). However, many of these findings were based on cross-sectional data or one-shot surveys which found a strong correlation or a standard partial regression coefficient between individual or regional SC, self-rated health, and subjective well-being. Cross-sectional data do not rule out the possibility of an ecological fallacy, and it is difficult for one-shot surveys to establish causal relationships between SC, self-rated health, and subjective well-being.

As the city government of Kawasaki argues, this study supposes that promoting SC, individually or collectively, is beneficial to creating a unique and effective community-based integrated care system in a local government.

Table 1. Variables

Dependent variables:
Self-rated health: five-point scale
Subjective well-being: five-point scale
Independent variables I: personal socioeconomic status
Sex, Age, Household Income per year, Educational level
Independent variables II: three components of social capital
Regional Trust: five-point scale in the question, 'Do you trust people in your region?'
Reciprocity: five-point scale in the question, 'Do you want to be helpful to people in your region?'
Participation in horizontal networks such like volunteer activities, sport clubs or hobby clubs in a year
Participation in vertical networks such like neighbourhood association, political, occupational or religious organisations, or senior clubs in a year

table 2. Descriptive statistics

sex	Freq.	Percent	Cum.
female	1,316	53.93	53.93
male	1,124	46.07	100
Total	2,440	100	

Variable	Obs	Mean	Std. Dev.	Min	Max
self-rated health	2,317	3.42555	1.160372	1	5
subjective well-being	2,324	4.077883	0.889723	1	5
age	2,424	54.71947	17.8272	18	100
educational level	2,317	13.86491	2.180214	9	16
household income	1,725	793.4493	654.4094	0	5000
reciprocity	2,360	3.233898	0.830963	1	5
vertical networks	2,364	0.413706	0.492601	0	1
horizontal networks	2,330	0.441202	0.496637	0	1
regional trust	2,369	3.560996	0.854597	1	5

This is not only because improving SC promotes better self-rated health and subjective well-being but also because promoting SC leads to effective bureaucracy and public-private cooperation which include all citizens who need help.

Therefore, this study first performs multiple regression analysis, in which the dependent variables are self-rated health and subjective well-being, and specifies which components of SC affect the dependent variables even when controlling for socioeconomic status. Additionally, the present study conducts propensity score analysis and clarifies that SC promotes self-rated health and subjective well-being, rather than self-rated health and subjective well-being promoting SC.

Multiple regression analysis specifying factors that affect self-rated health and subjective well-being among Kawasaki residents

Firstly, this study specifies factors which affect self-rated health and subjective well-being among Kawasaki residents by conducting multiple regression analysis, which controls for other variables. By using this method, this study identifies which factors affect self-rated health and subjective well-being, and by how much. The variables used and their descriptive statistics are as follows(see Table 1 and 2).

No significant effects on self-rated health are found from variables such as sex, reciprocity, and participation in vertical networks. On the other hand, regional trust, education level, and participation in horizontal networks have significant effects on self-rated health. People with higher scores on these three variables rate their own health more highly (see Fig. 1).

As for subjective well-being, no significant effects of variables such as age and participation in vertical networks were found. On the other hand, regional trust, household income, education level, and participation in horizontal networks have significant effects on self-rated health. People with higher scores on these four variables feel happier than others (see Fig. 2).

The analysis (as depicted in Figs. 1 and 2) shows that regional trust and participation in horizontal networks (two of the four components of SC) have a large effect on self-rated health and subjective well-being.

Why do horizontal networks have a larger effect than vertical networks? A few arguments have been made. Putnam argues that a vertical network cannot sustain social trust and cooperation. This is not only because "vertical

Variables	B	β	
Age	-0.003	-0.050	+
Sex (Female ref.)	-0.060	-0.026	
Household Income	0.000	0.081	**
Educational Level	0.052	0.103	**
Reciprocity	0.025	0.017	
Vertical Networks	-0.053	-0.023	
Horizontal Networks	0.232	0.100	**
Regional Trust	0.180	0.132	**
(Constant)	2.018		
R^2	0.065		
Adjusted R^2	0.061		
N	1723		

+: p<.10, *: p<.05, **: p<.01
dependent variable: self-rated health

Fig. 1.— Multiple-regression anslysis of factors affecting self-rated

Variables	B	β	
Age	-0.001	-0.013	
Sex (Female ref.)	-0.167	-0.096	**
Household Income	0.000	0.120	**
Educational Level	0.037	0.096	**
Reciprocity	0.069	0.064	*
Vertical Networks	0.039	0.022	
Horizontal Networks	0.077	0.044	+
Regional Trust	0.153	0.149	**
(Constant)	2.776		
R^2	0.090		
Adjusted R^2	0.086		
N	1722		

+: p < .10, *: p < .05, **: p <. 01
dependent variable: subjective well-being

Fig. 2.— Multiple-regression analysis of factors affecting subjective well-being of Kawasaki Residents

flows of information are often less reliable than horizontal flows," but also because "sanctions that support norms of reciprocity against the threat of opportunism are less likely to be imposed upwards and less likely to be acceded to, if imposed" (1993, p. 174). Moreover, Aida et al. (2009, p. 517) argues that social capital has a positive effect on health by increasing access to health-related information and healthy behaviours, and horizontal social capital may facilitate the diffusion of information and behaviours, thereby working to preserve good health.

Causal inference on the relationship between SC, self-rated health, and subjective well-being through propensity score analysis

In the previous section, the results showed that regional trust and participation in horizontal networks promote self-rated health and subjective well-being. However, it is difficult to use such one-shot surveys to fully establish a causal relationship between SC, higher self-rated health, and subjective well-being. In other words, it is difficult to distinguish between the two directions of causality, i.e.: (a) that regional trust and participation in horizontal networks promote self-rated health or subjective well-being; or (b) that self-rated health or subjective well-being promote regional trust or participation in horizontal networks.

In order to overcome this limitation, social epidemiology and causal inference in data science have developed propensity score analysis.[1] In this study, propensity score analysis matches propensity scores (the respondents' probability of trusting in their region or of participating in horizontal networks), and selects respondents whose propensity scores are virtually identical to the group of respondents who have trust in their region or participate in horizontal networks and the control population.[2]

This study adopts nearest neighbour matching, which automatically

[1] Propensity score analysis is a ground-breaking method that "does pseudo-randomising based on observational data and can acquire equivalent outcomes with randomised controlled trial," and it is becoming popular for comparing outcomes of observational studies without intervention, which includes most social surveys (Yasunaga, Sasabuchi, Michibata and Yamana 2018, p. 3).

[2] Considering a survey where the response rate is less than 100%, there may remain a problem of selection bias even when you carry out random-sampling (Hoshino 2009, p. 20). The response rate of our survey is 44.5%. Even though this is not low for a mail survey of the general population, it is true that more than half the samples did not respond. Propensity score analysis is an effective method when you analyse data with a lot of missing samples.

Average Treatment Effect on the Treated(ATT): Horizontal networks and self-rated health				
Participation in Horizontal Networks	Control Group	ATT	Std. Err.	t
1022	899	0.229	0.079	2.911

Average Treatment Effect on the Treated(ATT): Horizontal networks and subjective well-being				
Participation in Horizontal Networks	Control Group	ATT	Std. Err.	t
1022	899	0.127	0.061	2.075

Average Treatment Effect on the Treated(ATT): Regional Trust and self-rated health				
Regional Trust	Control Group	ATT	Std. Err.	t
1326	787	0.316	0.082	3.861

Average Treatment Effect on the Treated(ATT): Regional Trust and subjective well-being				
Regional Trust	Control Group	ATT	Std. Err.	t
1326	792	0.199	0.067	2.986

Fig. 3.— Average Treatment Effect on the Treated based on nearest neighbour matching

matches a control population with the nearest propensity scores. This study calculates propensity scores of regional trust and participation in horizontal networks by using variables such as age, sex, marital status, child status, household income, length of education, and the degree of communication among neighbours.

Subsequently, this study compares 1,022 respondents who participate in horizontal networks and 899 members of the control population who do not participate in the networks, selected by the nearest neighbour matching, concerning the Average Treatment Effect on the Treated (ATT)[3] on self-rated health. The result, t = 2.911(> 1.96), is statistically significant. This means that participation in horizontal networks promotes self-rated health, but not vice versa. Moreover, this study calculates ATT for the subjective well-being, producing a result of t = 2.075 (> 1.96), which is also statistically significant (see Fig. 3). This means that participation in horizontal networks promotes subjective well-being, but not vice versa.

Third, this study compares 1,326 respondents who have trust in their region and 787 members of the control population who do not have trust in their region (selected by nearest neighbour matching), to calculate the ATT on self-rated health. The result, t = 3.829 (> 1.96), is statistically significant

[3] The ATT, defined as E(Ya − Ya*|A = a), measures the marginal treatment effect in the subpopulation that received the treatment and the subpopulation that did not (Hoshino 2016, Wang, Nianogo and Onyebuchi 2017). In this case, it means the size difference between a group of samples that trust in their region or participate in horizontal networks and the rest of group of samples at the samples group which trust in their regions or participate in horizontal networks. When the null hypothesis that the value is zero is rejected by t-test, this means the ATT is statistically significant.

(see Fig. 3). This means that regional trust promotes self-rated health, but not vice versa. Moreover, this study calculates ATT on the subjective well-being, resulting in t=2.075 (>1.96), which is also statistically significant. This means that participation in horizontal networks promotes a subjective well-being, but not vice versa.

Discussion and Conclusion

The results of this study show that regional trust and participation in horizontal networks, which are some of the basic components of individual SC, have a great influence on self-rated health and subjective well-being. It proves that the influence is a causal relation such that regional trust and participation in horizontal networks promote self-rated health and subjective well-being, but not vice versa.

Kawachi Ichiro, one of the most prominent social epidemiologists, and others argue that SC may influence health related behaviours of neighbourhood residents through four plausible pathways: (1) by promoting more rapid diffusion of health information or increasing the likelihood that healthy norms of behaviour are adopted (e.g. physical activity); (2) by exerting social control over deviant health-related behaviour such as adolescent smoking, drinking, and drug abuse; (3) by accessing local services and amenities such as local pressure groups to lobby for the provision of services; (4) by providing effective support and acting as a source of self-esteem and mutual respect (Kawachi et al. 2000, pp. 184-185). In future studies, we aim to show that SC improves public services for working mothers and increases individual tolerance for foreign residents, and that SC prevents social isolation which can be measured as absence of social contact.

One conclusion of this study is that when attempting to improve self-rated health and subjective well-being it is more effective to approach the whole population, not only its high-risk members. A high-risk approach tackles only those individuals identified as being high-risk targets (e.g. the elderly and disabled people) and the population approach targets a whole population whether they are exposed to risk factors or not. There are positive and negative aspects to each approach. Currie (2016) describes the prevention paradox known as the Rose hypothesis, which states that since diseases are rare, most individuals who adopt a behaviour designed to lower their risk of disease will not benefit directly, although a few individuals may benefit enormously. Although individuals with high risk factors may benefit

from interventions specifically targeted at them, the effect on the overall incidence of the disease will be limited in the absence of a population-oriented intervention. In contrast to this, the population approach recognises that society influences individual behaviour and risk reduction can be achieved at population rather than individual level (Currie 2016).

Kawasaki, the city in which our survey's respondents reside, has declared that it is trying to establish unique community-based integrated care systems. The aim for these systems is that they should include not only elderly people, disabled people, working mothers, and the poor and disadvantaged, but any citizen who needs help (Kawasaki City 2015). In accordance with their declaration, this study aimed to demonstrate that a population approach is one of the most effective ways to improve health and well-being. Finally, this study concludes that enhancing individual SC is essential for overall care systems.

A future direction for this study will be to examine regional traits concerning SC in twenty-eight smaller areas in Kawasaki and check if regional SC affects self-rated health, subjective well-being, and tolerance toward foreigners by utilising multi-level analysis. This study has clarified that individual SC, as private goods, promotes an individual's general quality of life. In future studies, we aim to clarify whether regional SC, as public goods, promotes an individual's quality of life.

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