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Does walkable mean sociable? Neighborhood determinants of social capital among older adults in Japan

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ABSTRACT

Why are some communities more cohesive than others? The answer to the puzzle has two parts: (a) due to variations in the attributes of residents, and/or (b) due to variations in the attributes of places. However, few studies have sought to examine the community-level determinants of social capital. In the present study, we examined the associations between social capital and different area characteristics: (1) neighborhood walkability, (2) date of community settlement, and (3) degree of urbanization. We based our analysis on 9414 respondents from the Aichi Gerontological Evaluation Study (AGES), conducted in 2003. No significant positive association was found between the walkability score and any of the social capital indices. In contrast, community age and degree of urbanization were associated with many of the social capital indicators, even after controlling for characteristics of the residents. Community social capital thus appears to be more consistently linked to the broader historical and geographic contexts of neighborhoods, rather than to the proximal built environment (as measured by walkability).

1. Introduction

Social capital is defined as the resources available to individuals or groups through their social connections (Kawachi, 2010). The concept has been applied in diverse fields to explain outcomes in education, economic development, crime, and population health (Putnam, 2000). In the field of population health, researchers have used measures of perceived trust, cohesion, and civic participation as indicators of social capital (Kawachi et al., 2008). In turn, these indicators have been linked to a variety of health outcomes including mortality (Martikainen et al., 2003; Lochner et al., 2003; van Hooijdonk et al., 2008), self-rated health (Kawachi et al., 1999; Kim et al., 2006b), mental health (Lofors and Sundquist, 2007; Fujiwara and Kawachi, 2008), and health behaviors (Kim et al., 2006a; Poortinga, 2006). The proposed mechanisms linking social capital to health outcomes include: (a) exchange of resources such as instrumental and emotional support, (b) faster diffusion of information and innovations that promote health, (c) maintenance and enforcement of healthy norms within the group, and (d) improved ability to undertake collective action to safeguard health (collective efficacy) (Kawachi and Berkman, 2000).

A major focus of interest in social capital research has been to test whether or not neighborhood or community-level variations in the indicators of social cohesion can explain area variations in health outcomes. Researchers have reported community-level variations in social capital even after controlling for the individual characteristics of residents (Lindström et al., 2002; Subramanian et al., 2003). This has led to the proposition that community social capital may be a "contextual" influence on the health of residents (Kawachi, 2010). Social capital may be thus conceptualized as one dimension of the neighborhood *social* environment (Coutts and Kawachi, 2006), which together with the neighborhood *service* environment and neighborhood *physical* environment are hypothesized to shape the health of residents.

Although much attention has been directed toward demonstrating the contextual effect of neighborhood social capital on health outcomes (see Kawachi et al., 2008 for a systematic review), scant attention has been devoted to understand the determinants of neighborhood social capital (Kaasa and Parts,

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2008; Wood and Giles-Corti, 2008). Given that many previous studies have reported a positive association between social capital and health, an understanding of why some communities have more social capital than others is important to the improvement of public health (Leyden, 2003).

The question "Why are some neighborhoods more cohesive than others?" turns out to be a multi-level question. At the *individual* level, a number of characteristics predict trust and civic participation. These include educational attainment, marital status, age, gender, income, and employment status (Kaasa and Parts, 2008; Groot et al., 2007; Huang et al., 2009). Nevertheless, residual variation exists in neighborhood social capital even after controlling for the individual characteristics of residents (Subramanian et al., 2003). This implies that it is not sufficient to inquire only about the individual residents' characteristics that produce neighborhood variations in social capital; we also need to examine the *neighborhood-level* determinants of social capital.

Researchers have only recently begun to explore the environmental influences on the formation of social capital, including urbanization, suburbanization and sprawl, residential stability, and ethnic diversity (Brueckner and Largey, 2008; Letki, 2008; Nguyen, 2010; McCulloch, 2003; Putnam, 2000; Rosero-Bixby, 2006; Stolle et al., 2008). In his influential work, "*Bowling alone*," the political scientist Putnam (2000) blamed urban sprawl for being a cause of the decline of social capital in the US during the last 30 years. In recent empirical studies; however, more complex and contradictory findings have been reported. For example, Nguyen (2010) found that urban sprawl may support some types of social capital while negatively affecting others, while Brueckner and Largey (2008) found a negative effect of population density (tract-level) on social interaction.

Additionally, studies in urban planning and public health have begun to analyze the relationship between components of walkability (neighborhood built environments, including residential density, street connectivity, land use mix, and access to retail or other destinations) and measures of social capital (or closely related concepts such as collective efficacy or sense of community) (Frumkin et al., 2004; Wood and Giles-Corti, 2008). This work has been largely informed by the claims of New Urbanism, that walkable neighborhoods enhance social capital by increasing opportunities for interaction among residents (Lund, 2002; 2003). For example, from a survey in Galway, Ireland, Leyden (2003) reported that respondents who were living in walkable neighborhoods were more likely to know their neighbors, participate politically, trust others, and be socially engaged, compared to those who were living in car-oriented suburbs. Cohen et al. (2008) found that the number of parks was positively associated with collective efficacy. Other studies have also supported the premise that pedestrian-friendly environments are related to increased social capital (Lund, 2002, 2003; Podobnik, 2002; Rogers et al., 2010).

Nevertheless, other authors have found limited support or mixed results for the association between walkability and social capital. Based on data from an Australian sample and objective measures of walkability, du Toit et al. (2007) could not conclude that walkable neighborhoods were also more sociable. They found a weak positive relationship between their walkability index and sense of community, but found no associations between walkability and local social interaction, informal social control, or social cohesion. Wood et al. (2008) also reported complex results from Perth, Western Australia. They found that social capital had a negative relationship with the number of local destinations, but a positive association with perceived adequacy of facilities and proximity to shops. Similarly, Wood et al. (2010) reported that sense of community was associated with living in neighborhoods with lower levels of land use mix, but with higher levels of commercial floor area ratio.

Despite the growing body of literature, the evidence for an association between neighborhood environment and social capital remains inconclusive. Additionally, a number of gaps in the research remain to be addressed. First, "neighborhood" as a basic geographical unit for residential living space needs to be defined more carefully based on prior theory. With a few exceptions, such as du Toit et al. (2007) or Wood et al. (2010), previous studies have been largely based on arbitrarily defined administrative boundaries, such as municipality or census tract, and researchers have treated respondents in the same area as being "exposed" to the same context. In fact, some studies simply compared the levels of social capital between specific walkable neighborhoods and a few other regions. Using Geographical Information Systems (GIS); however, we can define neighborhoods for each resident in a sample. For example, a buffer zone, defined by a certain radius from home can be a more accurate representation of each resident's neighborhood. A second gap in the literature stems from the fact that the majority of studies to date have used data from Western societies, primarily the US and Australia. Recent studies of social capital and health have been extended to Asian settings, including Japan (Ichida et al., 2009; Fujisawa et al., 2009), with support for the generalizability of the association. Nevertheless, the contextual determinants of social capital remain unexplored in these settings. Third, previous studies on the contextual determinants of social capital have been mostly limited to a snapshot in time (e.g., assessing the walkability at the time of the survey), which ignores or overlooks the historical development of the community. Recent studies have begun to suggest that the history of the community (e.g., how long ago the residential area was developed) matters for the quantity and quality of social interactions among residents (Hanibuchi et al., 2007). Traditional neighborhoods are supposed to be more walkable (Frumkin et al., 2004; Smith et al., 2008), but they may also indicate the presence of longstanding organizations that encourage close-knit ties among residents. Thus, the effects of walkability on community social capital need to be teased out from its historical context. With the exception of Williamson (2002), who reported that residents of neighborhoods built before 1950 (housing age) were more likely to attend a public meeting (a measure of social capital), no studies to date have quantitatively addressed this issue, probably because of the difficulties in quantifying historical aspects of neighborhoods such as their period of development.

To address these gaps, the current study uses Japan as an example of a non-Western context, to explore key factors that are associated with area-level variations in social capital. Using survey data of Japanese older adults, along with GIS and spatial data (including historical maps), we measured different dimensions of the neighborhood environment – neighborhood walkability and community history (date of settlement) – to analyze whether or not these variables could explain area variations in social capital.

2. Methods

2.1. Data

Our analyses are based on cross-sectional data of the Aichi Gerontological Evaluation Study (AGES) conducted in 2003 (Kondo, 2010). We conducted a mail survey in a random sample of functionally independent, community-dwelling people aged 65 years and over (i.e., who were not eligible for public, long-term nursing care) in 15 municipalities from three prefectures in Japan. Based on the availability of geocoded data, the present study involved 11,876 respondents from 8 municipalities (response rate=48.7%) in the Chita Peninsula region.

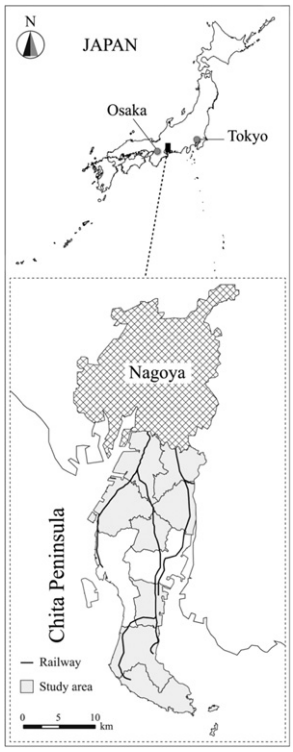

Fig. 1. Study area.

As shown in Fig. 1, the Chita Peninsula region (with a population of about 600,000) is adjacent to Nagoya City, which is the center of the third largest metropolitan area in Japan. The study area consisted of eight municipalities that included a variety of regions from urban/suburban areas (northern part of the Chita Peninsula) to rural areas (southern part), and from traditional to newly-developed residential areas. The study protocol and informed consent procedure were approved by the Ethics Committee in Research of Human Subjects at Nihon Fukushi University.

2.2. Social capital

We evaluated six indicators of social capital, following Putnam's (1993) work that defined social capital as features of social organization, such as trust, norms, and networks. The survey questions explored "general trust," "norms of reciprocity," and "attachment to place". We also inquired about whether or not residents belonged to "horizontal organizations" and "vertical organizations" (see below for definitions), and frequency of "meeting friends". All of the social capital variables were re-categorized into 1 (High) vs. 0 (Low). Thus, affirmative responses to the following questions were classified as "high" social capital: "Generally speaking, would you say that most people can be trusted?" (general trust), "Would you say that most of the time people try to be helpful?" (norms of reciprocity), and "Do you feel attached to the area you live?" (attachment to place). "Horizontal organizations" were defined as including "volunteer group," "citizen or consumer group," "sports group or club," and "hobby group". "Vertical organizations" were defined as consisting of "political organization or group," "industrial or trade association," "religious organization or group," and "neighborhood association/senior citizen club/fire-fighting team" (Aida et al., 2009). We classified those who responded "yes" to at least one organization as belonging to the "high" social capital group. Respondents who answered "once a week or more" to the question: "How often do you see your friends?" were classified into the "high" social capital group.

2.3. Neighborhood walkability

Neighborhood walkability score was calculated by combining four built environment measures. First, we measured residential density, street connectivity, land use mix, and availability of parks or green spaces, within the buffer zones of each respondent. This kind of objective measurement of the walkability, or its component variables, has often been used in studies of neighborhood built environment and health (Brownson et al., 2009), or social capital (Cohen et al., 2008; du Toit et al., 2007; Lund, 2003). Neighborhoods were defined by constructing a polygon-based network buffer around each respondent's home. Given that the relevant size of a neighborhood could vary according to the age group, we considered a radial distance of 500 m as representing the easily accessible space for older adults.

Population density was calculated using the 2005 census and a 1:25,000 Topographic Map of Japan, to exclude non-developed areas (e.g., rivers, ponds, and mountains), and some non-residential land use (farms and industrial districts) from the calculations. The number of street intersections (at least three-way) was used as an index of street connectivity. The information was obtained from the Digital Map 2500 (Spatial Data Framework), published by The Geospatial Information Authority of Japan, which provides basic spatial data on streets, public spaces, natural environments, and administrative boundaries (as of 2002). The number of local destinations was used to measure the land use mix. Considering previous studies, as well as the Japanese context, we chose 17 common destinations: banks, bookstores, cafes, clothing stores, community centers, convenience stores, dentists, electrical appliance shops, fast-food stores, hairdressing salons, hospitals, laundries, libraries, municipal offices, pharmacies, post offices, and supermarkets. The data was collected from the Yellow Pages in August 2010. We also measured the presence/absence of parks or green spaces within the buffer zones. Parks or green spaces also included open spaces, athletic grounds, and ball parks. The information was obtained from the Digital Map 2500 (Spatial Data Framework).

With reference to the procedure used by Leslie et al. (2007), we created a single scale for neighborhood walkability score, by calculating the sum of the standard score of the four built environment measures. Each variable was classified into deciles from 1 (lowest population density, intersections, and destinations) to 10 (highest population density, intersections, and destinations). The presence/absence of parks or green spaces was scored as 1 (absence) or 10 (presence). The sum of the four scores (ranging from 4 to 40), was calculated, and standardized into a value from 0 to 1. The Cronbach's α of the composite variable was 0.676.

We checked whether or not the created walkability score can predict some walking-related behavior. Since the questionnaire did not include established measures of walking, such as IPAQ, we chose three behavioral variables that might link the walkable environment to the social interactions among residents: (1) frequency of going out to see someone, going shopping, and going for a walk or to the hospital, etc. (dichotomized into 1=twice or three times a week or more vs. 0=else); (2) frequency of leisure time sports activity, including walking, jogging, or physical exercise (1=twice or three times a week or more vs. 0=else); and (3) total walking time (1=30 min or more vs. 0=else). Our analyses suggest that our walkability index is associated in the expected direction with two out of three indicators for physical activity. The results of the logistic regression analysis, adjusted for age, gender, marital status, educational attainment, equivalized

income, having paid work, SRH, GDS, and IADL, showed that the walkability score was positively associated with the frequency of going out (OR=1.87, 95% CI=1.49–2.34) and leisure time sports activity (OR=1.26, 95% CI=1.03–1.54), while it was not significantly related to total walking time (OR =1.03, 95% CI=0.85–1.26).

2.4. Community history

To quantify the history of each community, we calculated the date of settlement of each neighborhood using GIS overlaid on older versions of the Topographic Map of Japan. Surveyed topographical maps of Japan (with scales of 1–20,000 or 25,000) were first published around 1890, and have been revised every few decades. To our knowledge, these maps are the only sources for identifying the spatial distribution of developed areas, over a long-term and for a broad area. The procedure was as follows (Fig. 2).

First, topographical maps were geo-referenced on the coordinate systems. According to the availability of maps, we set five time cross-sections: circa 1890, 1920, 1960, 1980, and 2000 (the periods were: before 1890, 1890–1920, 1920–1960, 1960–1980, and 1980–2000). Subsequently, we used a dot grid counting method (Kimerling et al., 2009), since measuring exact areas was not feasible. The dots on the grid (at 50 m intervals) were overlaid with the maps, and we visually confirmed when each dot was developed. For example, if we found map symbols, such as settlements or buildings, beneath the dots on the map for 1890, we regarded the place as being developed before 1890. If we did not find map symbols on the 1890 map but found them on the 1920 map, we regarded the place as being developed from 1890 to 1920. Some non-residential land uses (farms and industrial districts) were not included as developed areas, since the land uses were not directly related to the neighborhood community.

In total, 4312, 1071, 2367, 14,669, and 4163 dots were identified as being developed before 1890, 1890–1920, 1920–1960, 1960–1980, and 1980–2000, respectively. To measure neighborhood level development periods, we aggregated the number of dots within the neighborhood of each respondent, based on the network buffer (r=500 m), and calculated the proportion for each period. For example, if 100 dots were included in respondent A's neighborhood, and the development indicated 15 dots before 1890, 5 dots during 1890–1920, 10 dots during 1920–1960, 50 dots during 1960–1980, and 20 dots during 1980–2000, the proportion of each period would be 0.15, 0.05, 0.1, 0.5, and 0.2, respectively. In the case where only one period was identified (i.e., the entire neighborhood was developed during the same period), the value would be 1.0.

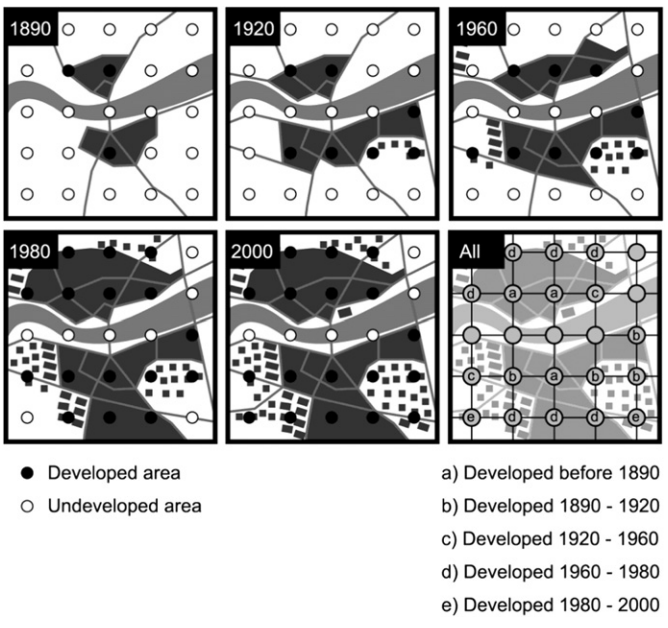

Fig. 2. Dot grid counting method for identifying the development periods.

2.5. Urbanization

In addition to the above two neighborhood indicators, we considered the degree of urbanization. The concept and measure of urbanization is as complex as that of social capital. A popular index for urbanization is population or population density of the region. Nevertheless, we did not use these since: (1) population density within a neighborhood is already used as one component of the walkability index (i.e., from this viewpoint, the walkability index is considered to be a kind of urbanization index at a micro scale); and (2) if the region is incorporated in a larger metropolitan area, population or population density cannot be valid, because populated areas are not necessarily urbanized, with regard to business or commercial function. Thus, we need to consider the strength of the region's connection to the center of the metropolitan area as another dimension of urbanization. For the study area, the Chita Peninsula region is strongly connected to Nagoya City. Although each municipality has its own city/town center, the region is also part of the larger metropolitan area. Considering commuting flow, for example, the proportion of the population commuting to work/school in Nagoya City was 10% or more in the three northern municipalities, between 5% and 10% in six municipalities, and less than 5% in the southernmost municipalities, for the 10 municipalities in the Chita Peninsula (as of 2005).

Considering the geographical context of the study area, we used "latitude" as a proxy measure for degree of urbanization on a broader scale. As shown in Fig. 1, Nagoya City is located directly north of the Chita Peninsula region, and railway, highway, and major roads lie along the north-south axis. Thus, latitude can be a proxy for the distance/time from each respondent's home to destinations in Nagoya City. Since the northern area (=high latitude) is closer to the center of the metropolitan area, it is considered to be more urbanized (on a broader scale) than is the southern area (=low latitude). Although not linear, population density is also high in the northern part of the region, and urban areas are advantaged in terms of economic indicators such as financial index or per capita income (Murata et al., 2008). This index also has the advantage of assessing continuous spatial variations of urbanization that are independent of arbitrarily defined administrative boundaries. Latitude was standardized from 0 (the lowest latitude=rural) to 1 (the highest latitude=urban).

We used ArcGIS 9.3 software for all spatial calculations. The "CSV address matching service" (provided by the Center for Spatial Information Science, The University of Tokyo) was used for the geocoding procedure. The accuracy of geocoding was at the "*Gaiku*" (city block) level; reference points were located at about 50 m intervals.

2.6. Statistical analysis

We performed logistic regression analysis using each of the six social capital indices (high=1) as dependent variables. Neighborhood walkability, community age, and urbanization were used as independent variables, and included as continuous variables. Since these geographical variables were standardized from 0 to 1, the magnitude of the association could be compared by the estimated odds ratios (ORs). For the neighborhood development

periods, the oldest period (before 1890) was used as the reference. In Model 1, crude ORs and 95% confidence intervals (CIs) of each of the geographical measures were calculated (separately, in the regression model). In Model 2, we adjusted for the major individual determinants of social capital: age (65–69, 70–74, 75–79, 80–84, ≥85 years), gender (male, female), marital status (married, divorced/widowed, never married), educational attainment (<6, 6–9, 10–12, ≥13 years of schooling), household equivalized income (<1 million yen, 1–2 million yen, 2–3 million yen, 3–4 million yen, ≥4 million yen), having paid work (Yes/No), self-rated health (SRH; fair and poor were collapsed into "Poor" vs. Excellent and Good, which were collapsed into "Good"). Considering the relationship between length of residence in an area and social capital, years of residence in the municipality (≤4 years, 5–9 years, 10–19 years, 20–29 years, 30–39 years, 40–49 years, ≥50 years) was added in Model 3. Finally, in Model 4, all three geographical measures, as well as all individual covariates, were included simultaneously (mutually adjusted).

The analyses were restricted to respondents who provided complete information on age and gender, and who were successfully geocoded. For other control variables, we created a "missing" category for missing data and included them in the analysis. Respondents living on two offshore islands were excluded from the analysis, since our measurement was based on the street network, which is difficult to evaluate, in terms of accessibility, for respondents on the islands. The final analytical sample consisted of 9414 respondents, though the number of samples for the regression varied, because of missing values for the outcome variables.

3. Results

The basic characteristics of the respondents are shown in Table 1. Table 2 demonstrates the correlation coefficients for the three geographical variables. From the table, a moderate correlation ($r=0.38$) is seen between walkability score and urbanization, suggesting that more urbanized areas tend to be more walkable. The relationship between walkability and the period of settlement was very weak. Urbanization was moderately correlated with period of settlement; a negative correlation with older periods and a positive correlation with more recent periods. This may reflect the spatio-temporal pattern of residential development. In the Chita Peninsula region, intense development took place mainly in the northern part, during the period of rapid economic growth in Japan (mid-1950s to early-1970s).

Table 3 demonstrates the results of the logistic regression analysis. Four of the six indices of social capital were significantly associated with walkability score in Model 1. The direction of the association was mixed. Only horizontal organization showed a positive association with walkability, which became statistically non-significant after controlling for individual covariates (Model 2). In addition, when number of years of residence was added to the model (Model 3), the associations also became non-significant for attachment to place and meeting friends. In the final model (Model 4), only vertical organization was significantly related to walkability score, though it was in the opposite direction to what was expected (OR=0.68; 95% CI=0.55, 0.85). This suggests that the respondents who lived in more walkable neighborhoods were less likely to belong to a vertical organization.

In contrast, the date of community settlement was associated with four of the six social capital variables, even after controlling for all of the individual covariates as well as the other geographical variables (Model 4). Generally speaking, the more recent the date of settlement of a community, the lower the levels of general trust, attachment to place, meeting friends, and

Table 1
Basic characteristics of the respondents in the study.

	Mean	(Min–Max)
Walkability		
	0.40	(0.00–1.00)
Urbanization		
	0.45	(0.00–1.00)
Community age		
Before 1890	0.24	(0.00–0.86)
1890–1920	0.06	(0.00–0.59)
1920–1960	0.14	(0.00–0.91)
1960–1980	0.46	(0.00–1.00)
1980–2000	0.09	(0.00–1.00)
	n	%
General trust		
Low	6668	72.7
High	2503	27.3
(Missing)	243	
Norms of reciprocity		
Low	6363	69.8
High	2751	30.2
(Missing)	300	
Attachment to place		
Low	5290	59.0
High	3679	41.0
(Missing)	445	
Horizontal organization		
Low	4728	60.1
High	3135	39.9
(Missing)	1551	
Vertical organization		
Low	2979	37.2
High	5035	62.8
(Missing)	1400	
Meeting friends		
Low	3695	40.5
High	5421	59.5
(Missing)	298	
Age		
65–69	3386	36.0
70–74	2765	29.4
75–79	1886	20.0
80–84	938	10.0
≥85	439	4.7
Gender		
Male	4519	48.0
Female	4895	52.0
Marital status		
Married	6759	71.8
Divorced/widowed	2321	24.7
Never married	127	1.3
Missing	207	2.2
Educational attainment		
<6	430	4.6
6–9	5242	55.7
10–12	2711	28.8
≥13	903	9.6
Missing	128	1.4
Equivalized income		
<1 million yen	937	10.0
1–2 million yen	2123	22.6
2–3 million yen	2161	23.0
3–4 million yen	1451	15.4
≥4 million yen	929	9.9
Missing	1813	19.3
Having paid work		
Yes	2272	24.1
No	6970	74.0

Table 1 (*continued*)

	Mean	(Min–Max)
Missing	172	1.8
SRH		
Good	6591	70.0
Poor	2585	27.5
Missing	238	2.5
Years of residence		
≤4 years	136	1.4
5–9 years	214	2.3
10–19 years	545	5.8
20–29 years	1023	10.9
30–39 years	1498	15.9
40–49 years	1403	14.9
≥50 years	4138	44.0
Missing	457	4.9

Table 2
Correlation coefficients for walkability, community age, and urbanization.

	Walkability	Urbanization
Walkability	1.00	0.38***
Urbanization	0.38***	1.00
Before 1890	−0.17***	−0.34***
1890–1920	−0.09***	−0.38***
1920–1960	0.07***	−0.15***
1960–1980	0.09***	0.40***
1980–2000	0.06***	0.13***

*** $p < 0.001$.

participation in vertical organizations. This indicates that the oldest neighborhoods are more likely to have higher social capital. In particular, vertical organization was strongly associated with the date of settlement. Relative to the oldest neighborhoods (before 1890), the ORs of belonging to a vertical organization was 0.23 (95% CI=0.10–0.53) for residents of communities established in 1890–1920; 0.20 (0.14, 0.28) for 1920–1960; 0.29 (0.22, 0.38) for 1960–1980; and 0.36 (0.26, 0.51) for 1980–2000. No significant association was found between settlement date and norms of reciprocity and horizontal organization in the mutually adjusted model (Model 4).

In addition, urbanization was clearly related to many social capital variables, even after controlling for all covariates. With regard to horizontal organization and meeting friends, urbanization was significantly associated in all models, though the directions of association were mixed. In Model 4, for example, ORs were 1.51 (95% CI=1.21, 1.89) for horizontal organization, and 0.69 (95% CI=0.56, 0.84) for meeting friends, suggesting that the degree of urbanization was related to more belongings to horizontal organizations but also to lower frequency of meeting friends. A significant association with vertical organization (OR=1.59; 95% CI=1.27, 1.99) was observed only when we added all of the geographical variables (Model 4). Urbanization was further associated with norms of reciprocity (OR=1.24; 95% CI: 1.01, 1.53).

When looking at the differences among the dependent variables, vertical organization had the clearest and strongest association with all of the geographical variables. Norms of reciprocity and horizontal organization were only related to urbanization, while general trust was only related to community date of settlement (Model 4). Attachment to place and meeting friends showed similar trends; both indices showed higher levels in rural, oldest, and less walkable neighborhoods, but the associations were strongly confounded by years of residence, especially for the associations with walkability.

All individual covariates were associated with some of the social capital variables (Table 4). Years of residence was positively and strongly related to attachment to place, horizontal organization, vertical organization, meeting friends, but negatively related to norms of reciprocity. Higher equivalized household income and better SRH were generally associated with the higher levels of social capital. Age was positively associated with general trust, norms of reciprocity, attachment to place, and vertical organization, but negatively related to horizontal organization and meeting friends. Female respondents showed a lower general trust and higher levels of horizontal organization and meeting friends. Those who had never married were related to lower levels of vertical organization and meeting friends. Education was associated with higher norms of reciprocity, horizontal organization, vertical organization, but to lower attachment to place. With the exception of horizontal organization, having paid work was generally related to higher social capital.

4. Discussion

In the present study, we sought to examine the associations between multiple dimensions of social capital with geographical measures of walkability, community settlement date, and urbanization in Japan. The strengths of our analysis include the large sample from eight municipalities, consisting of a mix of urban/suburban/rural areas, as well as our use of GIS techniques to measure the neighborhood environment for each respondent. An additional innovation was our unique approach to use historical GIS data to ascertain the date of settlement of communities in our sample. Our results indicate that the historical "age" of the community was the strongest predictor of social capital among residents, while walkability was generally not associated (with the exception of vertical associations). Significant associations were also observed between urbanization and social capital indicators, though the direction of associations was mixed. Our results suggest that the levels of social capital observed in a community at a given moment in time is largely driven by long-term historical forces as well as by broader geographic contexts (urbanization), rather than by the contemporaneous features of the built environment. Although caution must be exercised because our findings from one area of Japan may not be generalizable to other areas (or indeed to other parts of the world), our results nonetheless indicate that the levels of community social capital is dependent on long-term forces. Accordingly, planners need to be aware of the limitations of interventions that seek to boost social capital through changing the built environment, and consider the broader context in which communities are embedded.

Contrary to previous studies, we found that high walkability was not related to increased social capital. The only significant association was with vertical organization, though the direction was opposite to what was expected. Attachment to place and meeting friends were also negatively associated with walkability, but this became non-significant when the model included years of residence. This confounding effect could be explained by the fact that a longer residence may increase the attachment to place and the opportunity of meeting friends, while a shorter residence might reflect the residents' selection for more walkable places. Moreover, the use of individual items that made up the overall walkability score (i.e., population density, intersections, destinations, and parks or green spaces), nor the adoption of alternative radii for calculating the buffer zone surrounding each individual, did not alter our conclusions (data not shown).

Several explanations can be put forward to explain our null findings. First, the validity of the walkability index (derived mostly

Table 3
Associations between six indicators of social capital and walkability, community age, and urbanization.

Dependent variables	Model 1[a]		Model 2[b]		Model 3[c]		Model 4[d]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
General trust								
Walkability	0.99	(0.81, 1.20)	0.88	(0.72, 1.07)	0.92	(0.75, 1.13)	0.95	(0.76, 1.19)
Community age (Ref. before 1890)								
1890–1920	0.52^{+}	(0.24, 1.12)	0.60	(0.28, 1.31)	0.62	(0.28, 1.36)	0.61	(0.28, 1.36)
1920–1960	0.75^{+}	(0.54, 1.05)	0.74^{+}	(0.52, 1.04)	0.79	(0.56, 1.12)	0.80	(0.56, 1.13)
1960–1980	0.72**	(0.57, 0.90)	0.66***	(0.52, 0.84)	0.74*	(0.57, 0.96)	0.75*	(0.57, 0.98)
1980–2000	0.66**	(0.48, 0.90)	0.60**	(0.43, 0.82)	0.69*	(0.49, 0.97)	0.70*	(0.49, 0.98)
Urbanization	0.99	(0.83, 1.17)	0.83*	(0.70, 1.00)	0.91	(0.76, 1.10)	0.97	(0.78, 1.20)
Norms of reciprocity								
Walkability	1.07	(0.88, 1.30)	0.98	(0.81, 1.19)	0.95	(0.78, 1.16)	0.88	(0.71, 1.09)
Community age (Ref. before 1890)								
1890–1920	0.73	(0.34, 1.54)	0.79	(0.37, 1.69)	0.77	(0.36, 1.66)	0.89	(0.41, 1.93)
1920–1960	1.00	(0.72, 1.38)	0.97	(0.70, 1.35)	0.94	(0.67, 1.31)	0.97	(0.69, 1.36)
1960–1980	1.10	(0.88, 1.39)	1.04	(0.83, 1.32)	0.96	(0.75, 1.23)	0.91	(0.71, 1.18)
1980–2000	1.12	(0.83, 1.51)	1.02	(0.75, 1.38)	0.92	(0.66, 1.27)	0.90	(0.65, 1.25)
Urbanization	1.34***	(1.14, 1.58)	1.22*	(1.03, 1.44)	1.17^{+}	(0.98, 1.39)	1.24*	(1.01, 1.53)
Attachment to place								
Walkability	0.61***	(0.51, 0.74)	0.67***	(0.55, 0.80)	0.89	(0.73, 1.09)	0.96	(0.77, 1.18)
Community age (Ref. before 1890)								
1890–1920	0.42*	(0.21, 0.85)	0.41*	(0.20, 0.84)	0.53^{+}	(0.25, 1.09)	0.47*	(0.22, 0.99)
1920–1960	0.46***	(0.34, 0.63)	0.55***	(0.40, 0.76)	0.93	(0.67, 1.30)	0.94	(0.67, 1.30)
1960–1980	0.30***	(0.24, 0.37)	0.36***	(0.28, 0.44)	0.87	(0.68, 1.11)	0.92	(0.71, 1.18)
1980–2000	0.19***	(0.14, 0.25)	0.23***	(0.17, 0.31)	0.82	(0.58, 1.15)	0.85	(0.60, 1.20)
Urbanization	0.45***	(0.38, 0.52)	0.49***	(0.42, 0.58)	0.86^{+}	(0.72, 1.02)	0.84^{+}	(0.68, 1.03)
Horizontal organization								
Walkability	1.29**	(1.06, 1.56)	1.07	(0.87, 1.31)	1.09	(0.89, 1.34)	0.93	(0.74, 1.16)
Community age (Ref. before 1890)								
1890–1920	0.38*	(0.17, 0.82)	0.46^{+}	(0.20, 1.04)	0.48^{+}	(0.21, 1.10)	0.62	(0.27, 1.43)
1920–1960	0.95	(0.69, 1.33)	0.79	(0.56, 1.12)	0.80	(0.56, 1.14)	0.83	(0.58, 1.18)
1960–1980	1.34*	(1.06, 1.69)	1.01	(0.79, 1.29)	1.02	(0.78, 1.33)	0.91	(0.69, 1.19)
1980–2000	1.12	(0.83, 1.51)	0.77^{+}	(0.56, 1.05)	1.05	(0.74, 1.48)	0.98	(0.69, 1.38)
Urbanization	1.88***	(1.59, 2.22)	1.47***	(1.23, 1.76)	1.52***	(1.26, 1.83)	1.51***	(1.21, 1.89)
Vertical organization								
Walkability	0.65***	(0.54, 0.79)	0.62***	(0.51, 0.75)	0.71***	(0.58, 0.87)	0.68***	(0.55, 0.85)
Community age (Ref. before 1890)								
1890–1920	0.16***	(0.07, 0.34)	0.17***	(0.07, 0.37)	0.17***	(0.08, 0.39)	0.23***	(0.10, 0.53)
1920–1960	0.16***	(0.11, 0.22)	0.16***	(0.11, 0.22)	0.18***	(0.13, 0.26)	0.20***	(0.14, 0.28)
1960–1980	0.25***	(0.20, 0.32)	0.24***	(0.19, 0.31)	0.31***	(0.24, 0.41)	0.29***	(0.22, 0.38)
1980–2000	0.21***	(0.16, 0.29)	0.21***	(0.15, 0.28)	0.37***	(0.27, 0.52)	0.36***	(0.26, 0.51)
Urbanization	0.92	(0.78, 1.09)	0.88	(0.74, 1.05)	1.17^{+}	(0.98, 1.41)	1.59***	(1.27, 1.99)
Meeting friends								
Walkability	0.74***	(0.61, 0.88)	0.77**	(0.64, 0.93)	0.91	(0.75, 1.09)	1.08	(0.88, 1.33)
Community age (Ref. before 1890)								
1890–1920	0.82	(0.40, 1.67)	0.82	(0.40, 1.71)	0.94	(0.45, 1.97)	0.75	(0.35, 1.58)
1920–1960	0.52***	(0.39, 0.71)	0.53***	(0.39, 0.73)	0.68*	(0.49, 0.94)	0.66*	(0.48, 0.91)
1960–1980	0.53***	(0.43, 0.66)	0.55***	(0.44, 0.69)	0.83	(0.65, 1.06)	0.92	(0.71, 1.18)
1980–2000	0.35***	(0.26, 0.46)	0.34***	(0.25, 0.45)	0.70*	(0.51, 0.97)	0.74^{+}	(0.54, 1.02)
Urbanization	0.53***	(0.45, 0.62)	0.55***	(0.47, 0.65)	0.72***	(0.61, 0.85)	0.69***	(0.56, 0.84)

[a] Unadjusted, and each geographical variable was included separately.
[b] Age, gender, marital status, educational attainment, equivalized income, having paid work, and SRH were adjusted, and each geographical variable was included separately.
[c] Model 2+years of residence were adjusted, and each geographical variable was included separately.
[d] Model 3+all geographical variables were included simultaneously (mutually adjusted).
*** $p<0.001$.
** $p<0.01$.
* $p<0.05$.
$^{+}$ $p<0.1$.

from studies carried out in North America and Australia) remains unclear in the Japanese setting. Although recent studies in Japan have found an association between perceived neighborhood environment and physical activity (Inoue et al., 2009), evidence using objective measures of walkability is limited. In our dataset, the walkability score was positively associated with the frequency of leisure time sports activity (including walking) and the frequency of going out, though no such associations were found with total walking time. Accordingly, further research is warranted for developing and validating a walkability index for the Japanese setting. Second, community social capital research needs to carefully specify the geographical area of reference from a theoretically grounded perspective (Harpham, 2008). Most of the indices we used were not specific to the local/neighborhood environments of the respondents. For example, we did not use the measure of *neighborhood* trust, which refers to trust in/among neighborhoods, but instead, used *general* trust. This could explain why trust was not found to be related to walkability (nor to urbanization). To

Table 4
Associations between six indicators of social capital and individual characteristics of residents in the final model (Model 4).

	General trust		Norms of reciprocity		Attachment to place		Horizontal organization		Vertical organization		Meeting friends	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Age												
65–69												
70–74	1.04	(0.92, 1.17)	1.14 *	(1.01, 1.27)	1.21 **	(1.08, 1.35)	0.89 *	(0.79, 1.00)	1.38 ***	(1.22, 1.55)	1.01	(0.91, 1.13)
75–79	1.12 +	(0.98, 1.29)	1.06	(0.92, 1.21)	1.48 ***	(1.30, 1.69)	0.62 ***	(0.54, 0.71)	1.37 ***	(1.19, 1.58)	0.87 *	(0.76, 0.99)
80–84	1.24*	(1.03, 1.49)	1.01	(0.85, 1.22)	1.63 ***	(1.37, 1.94)	0.47 ***	(0.38, 0.58)	1.47 ***	(1.21, 1.78)	0.79 **	(0.66, 0.93)
≥85	1.22	(0.95, 1.58)	1.03	(0.80, 1.32)	1.54 ***	(1.21, 1.95)	0.22 ***	(0.16, 0.31)	0.83	(0.64, 1.07)	0.37 ***	(0.29, 0.47)
Gender												
Male												
Female	0.65***	(0.58, 0.72)	0.92	(0.83, 1.02)	1.04	(0.94, 1.15)	1.17 **	(1.05, 1.30)	0.97	(0.87, 1.08)	2.02 ***	(1.83, 2.23)
Marital status												
Married												
Divorced/widowed	0.89 +	(0.78, 1.02)	0.93	(0.82, 1.05)	0.94	(0.83, 1.05)	0.91	(0.80, 1.03)	1.01	(0.89, 1.15)	1.25 ***	(1.11, 1.41)
Never married	0.86	(0.54, 1.35)	0.92	(0.61, 1.39)	1.10	(0.74, 1.64)	0.65 +	(0.42, 1.02)	0.49 ***	(0.33, 0.73)	0.64 *	(0.44, 0.93)
Missing	0.95	(0.66, 1.37)	0.84	(0.59, 1.20)	0.85	(0.62, 1.18)	0.77	(0.50, 1.18)	0.74	(0.50, 1.08)	1.41 *	(1.01, 1.97)
Educational attainment												
<6												
6–9	0.95	(0.74, 1.22)	1.10	(0.86, 1.41)	0.93	(0.74, 1.17)	1.41 *	(1.04, 1.92)	1.26 +	(0.99, 1.60)	0.93	(0.74, 1.16)
10–12	1.22	(0.94, 1.59)	1.29 +	(1.00, 1.66)	0.81 +	(0.63, 1.02)	2.43 ***	(1.77, 3.32)	1.40 **	(1.09, 1.80)	0.89	(0.71, 1.13)
≥13	1.26	(0.94, 1.68)	1.65 ***	(1.25, 2.19)	0.63 **	(0.48, 0.83)	3.22 ***	(2.30, 4.52)	1.34 *	(1.01, 1.78)	0.83	(0.64, 1.08)
Missing	1.14	(0.70, 1.85)	1.20	(0.74, 1.95)	1.00	(0.63, 1.60)	2.05 *	(1.16, 3.65)	1.08	(0.64, 1.80)	1.10	(0.69, 1.75)
Equivalized income												
<1 million yen												
1–2 million yen	0.99	(0.82, 1.20)	0.89	(0.74, 1.07)	0.92	(0.78, 1.09)	1.17	(0.96, 1.42)	1.09	(0.91, 1.31)	0.99	(0.84, 1.17)
2–3 million yen	1.29**	(1.07, 1.56)	1.19 +	(0.99, 1.42)	0.92	(0.78, 1.10)	1.37 **	(1.13, 1.66)	1.29 **	(1.07, 1.54)	1.08	(0.91, 1.28)
3–4 million yen	1.66***	(1.36, 2.02)	1.25 *	(1.04, 1.51)	1.16	(0.96, 1.39)	1.69 ***	(1.37, 2.07)	1.54 ***	(1.26, 1.88)	1.14	(0.95, 1.37)
≥4 million yen	1.83***	(1.47, 2.26)	1.27 *	(1.03, 1.56)	1.13	(0.92, 1.39)	1.75 ***	(1.40, 2.19)	1.41 **	(1.13, 1.75)	1.16	(0.94, 1.41)
Missing	0.91	(0.74, 1.11)	0.94	(0.78, 1.13)	1.08	(0.90, 1.28)	1.01	(0.82, 1.24)	0.91	(0.76, 1.11)	1.03	(0.87, 1.23)
Having paid work												
Yes												
No	0.87*	(0.78, 0.97)	0.85 **	(0.76, 0.95)	0.73 ***	(0.65, 0.82)	1.17 **	(1.04, 1.32)	0.73 ***	(0.64, 0.82)	0.87 *	(0.78, 0.98)
Missing	1.11	(0.77, 1.61)	0.78	(0.53, 1.14)	0.65 *	(0.44, 0.95)	0.90	(0.58, 1.38)	0.77	(0.51, 1.14)	1.64 +	(0.98, 2.76)
SRH												
Good												
Poor	0.72***	(0.64, 0.81)	0.80 ***	(0.72, 0.89)	0.80 ***	(0.72, 0.88)	0.54 ***	(0.49, 0.61)	0.84 **	(0.75, 0.94)	0.67 ***	(0.61, 0.74)
Missing	0.73 +	(0.53, 1.02)	1.05	(0.78, 1.41)	0.81	(0.59, 1.09)	0.83	(0.59, 1.18)	0.91	(0.65, 1.26)	0.81	(0.61, 1.08)
Years of residence												
≤4 years												
5–9 years	0.86	(0.52, 1.45)	0.55 *	(0.35, 0.89)	0.58 +	(0.32, 1.04)	1.41	(0.80, 2.46)	2.26 **	(1.38, 3.69)	1.08	(0.68, 1.71)
10–19 years	0.93	(0.60, 1.46)	0.71 +	(0.48, 1.06)	0.97	(0.60, 1.57)	2.11 **	(1.30, 3.43)	2.29 ***	(1.49, 3.54)	1.35	(0.90, 2.03)
20–29 years	0.89	(0.58, 1.36)	0.68 *	(0.47, 1.00)	1.17	(0.74, 1.85)	2.42 ***	(1.52, 3.86)	3.16 ***	(2.09, 4.79)	1.70 **	(1.15, 2.51)
30–39 years	0.98	(0.64, 1.48)	0.71 +	(0.49, 1.03)	1.74 *	(1.11, 2.73)	3.41 ***	(2.15, 5.42)	4.00 ***	(2.65, 6.03)	2.26 ***	(1.54, 3.32)
40–49 years	0.93	(0.61, 1.41)	0.59 **	(0.41, 0.86)	1.95 **	(1.24, 3.05)	3.20 ***	(2.01, 5.08)	4.30 ***	(2.84, 6.50)	2.64 ***	(1.79, 3.88)
≥50 years	1.09	(0.72, 1.64)	0.64 *	(0.44, 0.92)	4.71 ***	(3.03, 7.31)	2.94 ***	(1.86, 4.64)	5.06 ***	(3.38, 7.57)	3.27 ***	(2.24, 4.76)
Missing	0.92	(0.57, 1.48)	0.58 *	(0.38, 0.90)	1.27	(0.61, 2.68)	2.18 **	(1.21, 3.91)	1.92 *	(1.15, 3.20)	2.62 ***	(1.72, 4.01)

*** $p<0.001$.
** $p<0.01$.
* $p<0.05$.
+ $p<0.1$.

explore whether or not walkable environments facilitate informal social interaction in the neighborhood, survey questions need to be more specific to the respondents' neighborhood.

The inverse association between walkability and vertical organization was unexpected. It seems unlikely that a more walkable neighborhood environment would actually discourage individuals from belonging to the vertical organization. Rather, we suspect that the finding reflects the limitations of the measure of walkability used. In our sample, residents living in high walkability areas (defined by higher population density and proximity to destinations) may reflect living within, or in close proximity to, high-rise apartment buildings. These residential buildings are generally known to be less active in their neighborhood associations. Consequently, a higher walkability may have been associated with reduced participation in vertical organizations.

Our study also draws attention to the relationship between the historical 'age' of the neighborhood and its physical, built, and social environments. In US studies, older/traditional neighborhoods were often identified with more walkable environments, with their interconnected street networks, streets with sidewalks, and mixed land use, as opposed to newly-developed and automobile-dependent suburbs (Frumkin et al., 2004; Smith et al., 2008). In fact, some earlier studies used housing age as a proxy for the neighborhood age, which was supposed to be correlated with sprawl or the walkability of the area (Berrigan and Troiano, 2002; Boer et al., 2007; Smith et al., 2008; Williamson, 2002). Our measure of community age, using older surveyed maps and GIS, is likely more accurate than methods that use housing age. Self-reported housing age is less likely to be accurate, and difficulties arise when attempting to go back by more than a century. In

addition, since houses may need to be rebuilt over time, the housing age (median value in a district) cannot necessarily be equated with "community age". The validity of housing age tends to be low in countries/regions where housing life-spans are generally short (e.g., Japan).

From the results, community age was associated with some indices of social capital, independently of the attributes of residents as well as the other two geographical measures. Roughly speaking, respondents who lived in older neighborhoods tended to report higher social capital than those who lived in newly-developed neighborhoods. In particular, the likelihood of belonging to vertical organization was quite high in the oldest neighborhoods. As shown in Table 2, the proportion of the oldest neighborhoods showing a weak *negative* correlation ($r=-0.17$) with the walkability score, suggests that the oldest neighborhoods were not pedestrian-friendly, at least in the study area. Considering street connectivity (Fig. 3), for example, some traditional neighborhoods have less connected street patterns, while newly-developed housing complexes often show grid-like patterns. Many older cities and towns in Japan tend to have features of the built environment that are associated with *low* walkability; i.e., narrow streets, absence of sidewalks, poor visibility, low-rise buildings (=less populated), and fewer open spaces. Thus, the conclusions derived from western (or North American) patterns of urban development do not necessarily translate to the Japanese setting. Older/traditional patterns of urban plans do not equate with more walkability in Japan.

The degree of urbanization was also analyzed in relation to social capital. Similar to the case of Metro Vancouver, Canada (Marshall et al., 2009), the walkability score exhibited an urban-rural gradient (Table 2) with high walkability in urbanized areas. The walkability score consisted of population density, or number of destinations, and may reflect urbanization at a micro scale, while the urbanization index, defined by latitude, attempted to capture the degree of urbanization on a broader scale. Unlike the walkability score; however, urbanization was found to be related to many social capital indices, suggesting that the levels of social capital are more strongly affected by the broader geographical context, rather than by the more proximate neighborhood environment within a 500 m radius. Residents who lived in urbanized areas were more likely to belong to horizontal and vertical organizations, and to report stronger norms of reciprocity, but were also less likely to meet friends or feel attached to the place. Thus, more opportunities may exist for participating in organized/formalized social activities in urbanized areas, while more informal and local social interactions may be common for residents in rural areas. This points to the multi-dimensional nature of social capital and its differential spatial distribution. Recent studies on community social capital and health have begun to focus more closely on subtypes of social capital, including: bonding vs. bridging (Kim et al., 2006b; Iwase et al., 2010), and vertical vs. horizontal social capital (Aida et al., 2009).

As for the individual determinants of social capital, our results are generally consistent with previous studies. For example, income and education were basically related to higher social capital (e.g., Kaasa and Parts, 2008; Subramanian et al., 2003), though some variables were not significant or showed a negative relationship (education for the attachment to place). Mixed directions of the associations between age and different social capital variables were also similar to those reported by other authors (e.g., Kaasa and Parts, 2008; Nguyen, 2010). Positive associations between having paid work and most of the social capital variables were also consistent, though care must be taken in the comparisons since our samples consisted of older adults, and since not having paid work does not necessarily mean "unemployment". For the relationship between length of residence and social capital, mixed evidence has been reported so far (Wood et al., 2010). The results of our study were also mixed: strong positive relationships were seen between years of residence and the structural social capital, as well as with the attachment to place, while a negative association was seen with norms of reciprocity. Since studies on the individual determinants, and the neighborhood determinants, of social capital are sparse for Asian populations and for older people, further study is required.

We note some limitations in the current study. Although using a network buffer zone is a strength of the study, the approach is still debatable, as some authors question its presence and the extent to which a buffer area might correspond to the actual activity space of residents (Zenk et al., 2011). A more refined definition of neighborhood, with comparisons to multiple definitions and/or the use of GPS to assess the activity space, should be considered in future studies. Since our study area may not be representative of Japan, and the age group of the study population was limited to older adults, our findings need to be replicated in other areas and among different age groups. Moreover, our data was cross-sectional, limiting our ability to draw causal inferences. For example, we cannot reject the possibility of residential sorting

Fig. 3. Example of street pattern: older vs. newer neighborhoods.

and selection into different types of neighborhoods based on people's preferences for social interaction.

Another limitation is in the validity of the measurement for neighborhood walkability, which was based on combining four variables of the objectively measured built environment. Our GIS-based index of walkability fails to capture many other relevant aspects of the built environment, including esthetics, water bodies, etc. However, the index we used reflects the current practice in the field, and has been used widely by other researchers. In spite of its shortcoming, this index showed positive associations with some of the walking-related behavior of residents (i.e., frequency of going out and sports activity), though it needs to be fully validated in the Japanese setting. Thus, in future studies, we need to consider both perceived and objective measures of walkability and their relationship to the actual walking behavior, along with their relationship with social capital.

In addition, a year gap existed between some of the data: questionnaire in 2003, census in 2005, local destinations in 2010, and other spatial data in 2002. The unavailability of data from the same year may have influenced the null results for walkability and social capital. The built environment may have also influenced the residents' walking behavior in different ways, according to their age group. Therefore, the use of more comprehensive and valid measurements of neighborhood walkability for older people might have altered our findings, and these issues should be addressed in future studies.

In conclusion, this study highlights the importance of considering both the history and geography of communities for explaining area-level variations in social capital. Neighborhoods – not just the residents who live within them – are embedded within wider historical and geographical contexts. To understand and intervene with community social capital in a meaningful way, a broader understanding of these forces is needed.

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