

Rurality and Participation in Mass Preventive Health Services: A Nationwide Descriptive Study

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ABSTRACT

People's engagement in community activities is reportedly stronger in rural areas than in urban areas. However, it is unknown whether this affects the health-seeking behaviour of residents in rural communities. We examined whether the rurality-related index of a community was associated with the participation rate of residents in community-based preventive health services. Based on the national census data on all the 1816 municipalities in Japan in 2007, the correlation was evaluated between the participation rate in cancer screening (stomach cancer, colorectal cancer) or influenza vaccination programmes among those older than 65, and each of the municipality-level variables. The correlations were examined by simple correlation and multiple regression analyses. The correlations were also evaluated between voting rate (a parameter of people's engagement in community activities) and each municipality-level variable with multiple regression analysis. Simple correlation analysis showed that the population density was negatively correlated with the participation rate of all (stomach cancer, colorectal cancer, and influenza) preventive programmes ($r = -0.367, -0.171$ and -0.188 , respectively; each $p < 0.001$). The significant correlations were maintained even after adjustment for other socioeconomic factors in multiple regression analysis in stomach cancer screening and influenza vaccination ($\beta = -0.279$ and -0.133 , respectively; each $p < 0.05$). Population density was negatively correlated with voting rate ($\beta = -0.488$; $p < 0.001$). Residents in rural communities were more likely to participate in community-based mass preventive services and were more actively engaged in political activities than their urban counterparts. These results suggest that rural residents have a stronger sense of community, and this could potentially facilitate residents' engagement in mass preventive services.

Key words: *Rural areas, Screening programs, Voting rate, Social capital, Japan*

Living in a rural area can potentially influence a person's health, both advantageously and disadvantageously^{7,25}. Residents living in rural areas tend to be more closely related with each other and more actively engaged in community activities than those living in urban areas⁹. This characteristic of rural areas may have a beneficial effect on the health-seeking behaviour of rural people. However, the number of studies that have shown a direct link between rurality and healthier behaviour is limited^{6,29}.

Cancer screenings and influenza vaccinations are publicly funded preventive health services held annually in all municipalities in Japan. Cancer is the most common cause of death in Japan, and its early detection leads to a better prognosis^{2,16,17,23,24,30}.

The active engagement of rural people in their community activities may positively affect their participation in these preventive services.

In this study, we examined whether the rurality of a community was related to a better rate of participation of residents in community-based cancer screening and influenza vaccination programmes. We also examined whether rural areas showed a higher level of engagement in voting.

MATERIALS AND METHODS

Japan has three levels of administration: national, prefectural, and municipal. Municipalities comprise cities, towns and villages. The data analysed in this study include population density,

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voting rate, participation rate in cancer screenings, influenza vaccination rate among residents and various demographic/geographic/socio-economic healthcare variables of all 1816 municipalities in Japan. Because various socio-economic factors are known to influence the rate of attendance at health check-ups and cancer screenings, correlations between the rurality of a community and participation rate in preventive services were examined with adjustment for these community-level variables^{5,6,8,14,21,27,29}.

The data on the participation rate in cancer screenings and influenza vaccination in each municipality was obtained from the website of the Ministry of Health, Labour and Welfare in the 2007 Report on Regional Health Services. The report includes data on the number of participants in elementary health check-ups and stomach, colorectal, lung, cervical, endometrial, and breast cancer screenings. The report also contains data on the number of those who have received an influenza vaccination. Because there were missing values for elementary health check-ups and lung cancer screenings, this data was not used. The data on cervical, endometrial and breast cancer screenings were also not used because these cancer screenings are not conducted annually. As a consequence, data on stomach and colorectal cancer screenings and influenza vaccination were used for analysis. The participation rate was calculated as the proportion of participants over 65 years old in a municipality. The reason for restricting the age of participants is that many people under 65 participate in cancer screenings provided by the companies/ organizations they work for, rather than those offered by communities. (The retirement age in Japan is usually between 60 and 65 years old.) According to the National Livelihood Survey, the participation rate of people who took any health check-up or cancer screenings provided by the community in 2007 was 22% in those aged 50 to 54, 28% from 55 to 59, 45% from 60 to 64, 65% from 65 to 69 and 74% from 70 to 74¹⁵.

Data on population, elderly rate (proportion of those over 65 years old among the whole population), number of physicians, number of public health nurses, average household income, and debt/budget ratio of each municipality were collected from the Statistical Observations of the Municipalities 2009 produced by the Ministry of Internal Affairs and Communications. We used population density as a parameter for rurality, average household income for personal wealth, debt/budget ratio for community financial power, and physician/population ratio and public health nurse/population ratio for healthcare resources.

We used voting rate as a parameter of civic activity. The election administration website of each of 47 prefectures was used to collect the

voting rate result for each municipality in the 21st election of the House of Councillors on July 29, 2007. Voting rate was defined as the voter-to-constituency ratio. The voting rate in Japan in 2007 was 58.6%, which was not very different from turnouts at the same elections in other years.

ANALYSIS

Pearson's simple correlation coefficient was evaluated between the participation rate for each cancer screening or influenza vaccination and each municipal variable. Because the participation rates for stomach and colorectal cancer screenings were not normally distributed, these were log₁₀-transformed. For the same reason, some other explanatory variables (population density, physician/population ratio and public health nurses/population ratio) were also log₁₀-transformed.

Next, we conducted multiple regression analysis in order to examine the independent correlation between the participation rate in each screening/influenza vaccination and each municipality variable. All the variables used in the simple correlation were added to the multiple regression model. The correlation strength was shown by standardized coefficient (β). The variance inflation factor (VIF) was calculated to examine the degree of collinearity among explanatory variables.

To demonstrate the association between the level of civic activities and the rurality of the areas, we examined the correlation between voting rate and population density, using multiple regression analysis. As a co-variable, debt/budget ratio, average household income and elderly rate were added to this model.

Statistical analyses were performed using SPSS version 17 for Windows. A p value less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the basic characteristics of municipalities. The median voting rate in the House of Councillors Election in 2007 was 63%. The median participation rate for stomach cancer screening was 18%, that for colorectal cancer was 26%, and that for influenza was 57%.

The results of simple correlation analysis between municipal variables and participation rates in three preventive services are shown in Table 2. Public health nurses/population ratio, elderly rate and voting rate were positively correlated in all three participation rates. Population density was negatively correlated with all three participation rates.

Table 3 shows results of multiple regression analysis between each municipal variable and the rate of participation in each screening/immunisation. The voting rate was positively correlated with all three participation rates independently of all the

Table 1. Basic characteristics of municipalities (N=1816)

	Median	IQR
Population	24725	9076.5 - 62739.5
Population density (persons/km ²)	222.8	68.7 - 751
Physicians per 100,000 population	117.4	70.5 - 177.6
Public health nurses per 100,000 population	26.1	16 - 43.3
Debt/budget ratio	14.9	11.8 - 17.9
Average household income (million-yen)	3.3	2.6 - 4
Voting rate*	63	58.1 - 68.8
Elderly rate	24.6	19.6 - 29.6
Participation rates**		
Stomach cancer	17.7	9.9 - 28.5
Colon cancer	25.5	15.8 - 38.8
Influenza vaccination	56.8	50.5 - 62.4

IQR: Interquartile range

*Data of the 21st election of the House of Councillors in 2007 were used.

**Data of residents over 65 years were used.

Table 2. Simple correlation between each municipal variable and the rate of participation in each screening/immunisation

		Physician/ population ratio	Public healthnurse/ population ratio	Debt/budget ratio	Population density	Household income	Voting rate	Elderly rate
Stomach cancer	Coefficient*	-0.191	0.333	0.011	-0.367	-0.164	0.289	0.253
	p value	<0.001	<0.001	0.644	<0.001	<0.001	<0.001	<0.001
Colorectal cancer	Coefficient*	-0.128	0.182	-0.041	-0.171	-0.006	0.217	0.137
	p value	<0.001	<0.001	0.081	<0.001	0.785	<0.001	<0.001
Influenza	Coefficient*	-0.047	0.162	0.065	-0.188	-0.055	0.221	0.137
	p value	0.045	<0.001	0.006	<0.001	0.019	<0.001	<0.001

*Pearson's correlation coefficient

Participation rates in stomach and colorectal cancer screenings, physician/population ratio, public health nurse/population ratio and population density were log₁₀-transformed

other community-level variables. Population density was negatively and independently correlated with stomach cancer screening and influenza vaccination. No strong colinearity was observed among the explanatory variables (each variance inflation factor (VIF) < 4).

Table 4 shows the results of multiple regression analysis examining the correlation between voting rate and rurality. Population density was negatively and independently correlated with voting rate. No strong colinearity was observed among the explanatory variables (each variance inflation factor (VIF) < 4).

DISCUSSION

The results showed that the participation rate in stomach cancer screening and influenza vaccination programmes was higher in rural areas than in urban areas. The voting rate was also higher in rural areas. These results indicate that the motivation of community residents for participating in civic activities (such as voting) and in

preventive services is higher in rural areas. The voting rate is known as a parameter of social capital and used as its proxy in European studies^{13,19,20,28}. The results suggest that higher social capital in rural areas contributes to better participation in preventive services in these areas.

Nowadays, a sense of unity among residents and their level of engagement in community activities are combined into a single concept: social capital^{4,18,20}. Previous studies have demonstrated the association between social capital and various health-related outcomes^{1,11,12,22}. Social capital is a community-level variable comprised of the extent of interpersonal trust among residents, and the density of civic associations that facilitate cooperation for mutual benefit^{4,18,20}. It is likely that social capital is stronger in rural areas⁹. This may lead to the higher participation rate in preventive services in rural areas.

Kawachi et al showed a better health status in communities with higher social capital, but the mechanism by which high social capital leads to a high level of community health was largely un-

Table 3. Multiple regression analysis between each municipal variable and the rate of participation in each screening/immunisation

		β^*	p value	VIF
Stomach cancer (N=1799)	Physician/population ratio	-0.04	0.111	1.263
	Public health nurse/population ratio	0.104	0.005	2.775
	Debt/budget ratio	-0.063	0.007	1.140
	Population density	-0.279	<0.001	3.730
	Household income	0.038	0.249	2.216
	Voting rate	0.08	0.012	2.061
	Elderly rate	-0.051	0.203	3.242
	Multiple correlation coefficient (R)	0.375		
	R ²	0.141		
	P for R	<0.001		
Colorectal cancer (N=1799)	Physician/population ratio	-0.046	0.073	1.260
	Public health nurse/population ratio	0.052	0.175	2.826
	Debt/budget ratio	-0.062	0.012	1.144
	Population density	-0.064	0.152	3.798
	Household income	0.128	<0.001	2.212
	Voting rate	0.152	<0.001	2.071
	Elderly rate	0.053	0.201	3.218
	Multiple correlation coefficient (R)	0.259		
	R ²	0.067		
	P for R	<0.001		
Influenza (N=1813)	Physician/population ratio	0.043	0.098	1.260
	Public health nurse/population ratio	0.019	0.616	2.841
	Debt/budget ratio	0.028	0.258	1.142
	Population density	-0.133	0.003	3.796
	Household income	0.091	0.008	2.209
	Voting rate	0.173	<0.001	2.073
	Elderly rate	-0.018	0.660	3.229
	Multiple correlation coefficient (R)	0.241		
	R ²	0.058		
	P for R	<0.001		

* Standardized coefficient

VIF: variance inflation factor

Participation rates in stomach and colorectal cancer screenings, physician/population ratio, public health nurse/population ratio and population density were log₁₀-transformed.

Table 4. Multiple regression analysis between each municipal variable and voting rate

		β^*	p value	VIF
Voting rate (N=1787)	Debt/budget ratio	0.032	0.072	1.116
	Population density	-0.488	<0.001	2.411
	Household income	0.227	<0.001	2.079
	Elderly rate	0.399	<0.001	2.849
	Multiple correlation coefficient (R)	0.700		
	R ²	0.490		
	P for R	<0.001		

* Standardized coefficient

VIF: variance inflation factor

Population density was log₁₀-transformed

known^{11,12}). It is likely that in communities with high social capital, information on social activities, including preventive services, is more easily transmitted among residents than in communities with lower social capital. In addition, the number of residents in such communities participating in preventive services is possibly increased by a

chain reaction termed “population effect”, which is a psychological reaction that causes residents to think they should take part in preventive services because neighbors do it. It is likely that in this way, social capital facilitates resident participation in preventive services, and then affects health-related outcomes in the community.

The participation rate in stomach cancer and influenza vaccination programmes was higher in rural areas than in urban areas. The participation rate in programmes for colorectal cancer, however, was not significantly correlated with rurality. The reason may be that colorectal cancer screening is not recognized as an important screening test for the population in rural areas compared with the urban population. Colorectal cancer is known to be related to Western-style food customs and, in consequence, the incidence rate of colorectal cancer in Japan is increasing, particularly in urban areas³). People in rural areas might be unaware of the importance of the screening because of the lower incidence of colorectal cancer.

Two earlier papers have examined the correlation between the participation rate in preventive services and rurality in Japan. Fukuda et al showed that participation rates in stomach, colon, uterine and breast cancer screenings were significantly higher in non-metropolitan than in metropolitan areas based on data of individuals sampled at random from all prefectures⁶). Watanabe, based on data sampled from some prefectures, showed that the participation rate for cancer screening was significantly higher in non-metropolitan areas²⁹). These findings are supported by the results of this present study, which is based on data from all municipalities in Japan. The present study also suggests that rurality increases not only mass health promotion activities, but also political activity in the community. These two kinds of activity are likely derived from the same underlying sense of community or social capital in the community.

On the other hand, rural residents were less likely to receive preventive services in the United States^{10,26}). The reasons for this may be the lower socioeconomic status and lower rate of health insurance coverage among the rural US population. Similarly, in Japan, there is an income disparity between the rural and urban populations, but due to the egalitarian provision of preventive services by municipalities, the chances for receiving cancer screening and immunisation are equally given to both urban and rural populations. The difference in public health systems between the USA and Japan would have led to a gap in the research findings.

The most important limitation of this study is that it did not use social capital itself as an independent variable. The voting rate has been known to correlate well with the level of social capital and it has been used as a surrogate indicator of social capital in some social science studies^{13,19,20,28}). However, the relationship between voting rate and social capital has not been tested in Japan, and consequently it is better to measure social capital directly rather than to use a proxy. Another limitation is that we used community-level data, and did not take individual-level data into account in our analysis, unlike Fukuda et al⁵). It is possible

that the characteristics of municipalities with low preventive service participation rates are not the same as the characteristics of the individuals who participate. A third limitation is that coefficients of determination (R^2) in the multivariate analysis were low. There would be many other community-related factors that influenced participation rates, including the eagerness of the municipal government to achieve a high participation rate and the strength of the network among health professionals. A final limitation is that we analysed only the data of residents over 65 years of age. Caution is needed when the results are applied to populations that include other age groups.

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REFERENCES

1. **Ali, S.M., Merlo, J., Rosvall, M., Lithman, T. and Lindström, M.** 2006. Social capital, the miniaturisation of community, traditionalism and first time acute myocardial infarction: a prospective cohort study in southern Sweden. *Soc. Sci. Med.* **63**: 2204-2217.
2. **Berry, D.A., Cronin, K.A., Plevritis, S.K., Fryback, D.G., Clarke, L., Zelen, M., Mandelblatt, J.S., Yakoviev, A.Y., Habbema, J.D., Feuer, E.J. and Cancer Intervention and Surveillance Modeling Network (CISNET) Collaborators.** 2005. Effect of screening and adjuvant therapy on mortality from breast cancer. *N. Engl. J. Med.* **353**: 1784-1792.
3. **Center for Cancer Control and Information Services, National Cancer Center, Japan.** Trends in Age-adjusted Incidence Rate (1958-2009). (Online). Available: http://ganjoho.jp/public/statistics/pub/statistics02.html#prg4_1 (Accessed 25 February 2013).
4. **Coleman, J.S.** 1990. The foundations of social theory. Cambridge, Mass: Harvard University Press. 300-321.
5. **Fukuda, Y., Nakamura, K. and Takano, T.** 2005. Accumulation of health risk behaviours is associated with lower socioeconomic status and women's urban residence: a multilevel analysis in Japan. *BMC Public Health* **27**: 5-53.
6. **Fukuda, Y., Nakamura, K. and Takano, T.** 2005. Reduced likelihood of cancer screening among women in urban areas and with low socio-economic status: a multilevel analysis in Japan. *Public Health* **119**: 875-884.
7. **Gamm, L., Hutchison, L., Dabney, B. and Dorsey, A.** 2010. Rural healthy people 2010: a companion document to healthy people 2010. Volume 1-3. College Station, Texas: School of Rural Public Health, Texas A&M University, 2003
8. **Hamashima, C. and Yoshida, K.** 2003. What is important for the introduction of cancer screening in the workplace? *Asian Pac. J. Cancer Prev.* **4**: 39-43.
9. **Hofferth, S.L. and Iceland, J.** 1998. Social Capital

- in Rural and Urban Communities. *Rural Sociology* **63**: 574-598.
10. **Hueston, W.J. and Hubbard, E.T.** 2000. Preventive services for rural and urban African American adults. *Arch. Fam. Med.* **9**: 263-266.
 11. **Kawachi, I., Kennedy, B.P. and Glass, R.** 1999. Social capital and self-rated health: a contextual analysis. *Am. J. Public Health* **89**: 1187-1193.
 12. **Kawachi, I., Kennedy, B.P., Lochner, K. and Prothrow-Stith, D.** 1997. Social capital, income inequality, and mortality. *Am. J. Public Health* **87**: 1491-1498.
 13. **Knack, S.** 2002. Social capital and the quality of government: Evidence from the States. *Am. J. Pol. Sci.* **46**: 772-785.
 14. **Makuc, D.M., Breen, N. and Freid, V.** 1999. Low income, race, and the use of mammography. *Health Serv. Res.* **34**: 229-239.
 15. **Ministry of Health, Labour and Welfare.** 2008. National livelihood survey 2007. Tokyo: MHLW.
 16. **Ministry of Health, Labour and Welfare.** 2009. Population survey report. (Online). Available: <http://www.mhlw.go.jp/toukei/saikin/hw/jinkou/suikai09/index.html> (Accessed 3 March 2012).
 17. **Pignone, M., Rich, M., Teutsch, S.M., Berg, A.O. and Lohr, K.N.** 2002. Screening for colorectal cancer in adults at average risk: a summary of the evidence for the U.S. Preventive Services Task Force. *Ann. Intern. Med.* **137**: 132-141.
 18. **Putnam, R.D.** 1993. The prosperous community. *American Prospect*. 35-42.
 19. **Putnam, R. D.** 2000. *Bowling Alone: The Collapse and Revival of American Community*. Simon & Schuster.
 20. **Putnam, R.D., Leonardi, R. and Nanetti, R.** 1993. *Making democracy work*. Princeton: Princeton University Press.
 21. **Robb, K., Wardle, J., Stubbings, S., Ramirez, A., Austoker, J., Macleod, U., et al.** 2010. Ethnic disparities in knowledge of cancer screening programmes in the UK. *J. Med. Screen.* **17**: 125-131.
 22. **Scheffler, R.M., Brown, T.T., Syme, L., Kawachi, I., Tolstykh, I. and Iribarren, C.** 2008. Community-level social capital and recurrence of acute coronary syndrome. *Soc. Sci. Med.* **66**: 1603-1613.
 23. **Schroder, F.H., Hugosson, J., Roobol, M.J., Tammela, T.L., Ciatto, S., Nelen, V., et al.** 2009. Screening and prostate-cancer mortality in a randomized European study. *N. Engl. J. Med.* **360**: 1320-1328.
 24. **Smith-Bindman, R., Miglioretti, D.L., Lurie, N., Abraham, L., Barbash, R.B., Strzelczyk, J., et al.** 2006. Does utilization of screening mammography explain racial and ethnic differences in breast cancer? *Ann. Intern. Med.* **144**: 541-553.
 25. **Smith, K.B., Humphreys, J.S. and Wilson, M.G.** 2008. Addressing the health disadvantage of rural populations: how does epidemiological evidence inform rural health policies and research? *Aust. J. Rural Health* **16**: 56-66.
 26. **South Carolina Rural Health Research Center.** 2009. Rural residents lag in preventive services use; Lag increases with service complexity. *Rural Health Research Gateway*.
 27. **Swan, J., Breen, N., Coates, R.J., Rimer, B.K. and Lee, N.C.** 2003. Progress in cancer screening practices in the United States: results from the 2000 National Health Interview Survey. *Cancer* **97**: 1528-1540.
 28. **Theresa Santangelo, B.A.** 2011. Does voting really matter? The effect of voting turnout rates on crime. Georgetown University.
 29. **Watanabe, R.** 2003. Gan-kenshin jushinkoudou ni kansuru youinbunseki (an analysis of participation in cancer screening in Japan). [in Japanese] *Iryo-To-Syakai*. **13**: 113-132.
 30. **Zackrisson, S., Andersson, I., Manjer, J. and Janzon, L.** 2004. Non-attendance in breast cancer screening is associated with unfavourable socio-economic circumstances and advanced carcinoma. *Int. J. Cancer* **108**: 754-760.