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To cite this article: Shinya Hisamatsu *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **294** 012086

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Logistic Regression Analysis of the Effect of Third Places on the Risk of Needing Long-Term Care

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Abstract. In Japan, late elderly people (≥ 75 years old) tend to be unable to create social groups, because they have decreased body functions and structures. Previous studies have shown that those who are able to visit so-called “third places”, places such as cafes, libraries, and parks where people can go and spend time freely, are significantly more outgoing and have more conversations with people. The aim of our survey was to clarify the effects of the third places on the need for long-term care and support in the late elderly. We conducted a questionnaire survey for 3 weeks from September to October 2016. The subjects were late elderly people located in Kitakyushu, Fukuoka. Survey questions included their utilisation of third places, their neighbourhood environment and their health condition. A total of 629 questionnaires were distributed by mail, and 349 were correctly completed (valid response rate = 55.5%). A total of 58.6% of respondents could identify their third place. Of those, 75.6% visit their third place more than once a week. We conducted logistic regression analysis to clarify the effect of a third place on the risk of being homebound (i.e., going out less than once a week), social isolation (having a conversation less than once a week), and long-term care/support needs. The analysis model considered age, BMI, marital status, body pain, household, educational attainment, and length of residence in the target area. The resulting odds ratio (OR) for the risk of being homebound was 8.46 ($p < 0.01$), for social isolation was 4.40 ($p < 0.01$) and for long-term care/support need was 3.70 ($p < 0.01$). These results show that not having a third place is strongly related to high risk for needing long-term care/support.

1. Introduction

Japan, with its ageing population, has the world's highest proportion of elderly people^[1] Increasing social security expenses due to ageing has become a problem. It is therefore important to find ways of extending the healthy life expectancy of the elderly in order to reduce these societal costs. In recent years, the early elderly (65–74 years old) have maintained excellent health. In contrast, the late elderly (≥ 75 years old) tend to be unable to create social groups, because they have decreased body functions and structures.^[2] Geriatric syndrome is the change in the elderly from an autonomous state to needing long-term care as a result of weakness and disease caused by ageing and environmental change that interferes with daily functioning, resulting in rapid and pronounced decline in quality of life (QOL).^[3] In recent years, much research has focused on local communities as a target for preventing the need for elder care. Among those studies, Ray Oldenburg focused on so-called “third places” as the core of the community and suggested their importance. A third place is defined as a place where people can go and spend time freely, in contrast to home (the first place) and school or work (the second place).^[4] Third places promote socializing, prevent isolation, and provide food support.^[5] Thus, third places have great potential to reduce the need for long-term care for elderly people.^[5] According to a previous study, areas where older people can gather and socialise have the potential to cut essential care certification rates by half.^[6] As described above, the effect of the third place on the need for long-term care is being verified. However, so far there has been insufficient verification of the risks of needing long-term care required by third places except public facilities. Thus, in this research, we focused attention on third places other than official facilities. The aim of our survey was to clarify the effects of these third places on the risk of needing long-term care or support in the late elderly.

2. Research Approach



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2.1. Research purpose and analysis method

In this study, we focused on third places as a living environment factor to prevent the need for long-term care. We examined the relationship between the presence or absence of a third place and the independence of late elderly people in the target area. We verified these relationships by multivariate analysis. The residential environment and health condition of the subjects were assessed by questionnaire survey. All statistical analyses were performed with SPSS ver. 24.0 software. A Mann-Whitney U test was carried out to prove the degree of influence that the presence or absence of a third place has on risk of needing long-term care, mood disorder, frequency of going out, and conversation frequency. A logistic regression analysis was performed using individual attributes such as sex and household composition as moderator effects. The aim was to analyse the relationship between health status and visits to third places by adjusting the influence of general health regulatory factors. To avoid multicollinearity, it was confirmed that the correlation coefficient between covariates was less than 0.5. In addition, the variable selection method used is a variable increase method (likelihood ratio).

2.2. Target area

The target area was a school catchment area in Takasu, a suburb of Kitakyushu that consists mainly of detached houses. The area has been home to many elderly residents for more than 20 years. In addition, the ageing rate, defined as the proportion of the population aged 65 years or older, is 33.4% in Kitakyushu's Wakamatsu Ward, which is higher than the overall rate in Japan (23.7% as of 2016). It is therefore necessary to consider the ageing of the population when conducting urban planning and development activities.^[7]

Table 1. Overview of survey

Survey Period	September 23 to October 14, 2016 (21days)
Targets	Late elderly residing in Takasu District, Wakamatsu-ku, Kitakyushu City, Fukuoka Prefecture, Japan
Number returned (rate)	Distribution: 629 subjects Collection: 349 subjects (55.5%)
Distribution and collection	The questionnaire survey was Distributed and collected by local community associations.
Survey Contents	<u>Health condition</u> : necessary long-term care risk, depression, etc. <u>House environment</u> : thermal insulation performance, age of the house, etc. <u>Neighborhood environment</u> : flower bed, hedge, bench, walking route, etc. <u>Third place and shopping behavior</u> : location, category, frequency, time to move, way to move and purpose <u>Individual attribute</u> : sex, age, BMI, household composition, educational attainment, etc. <u>Lifestyle diseases</u> : drinking, smoking habits, exercise habits, disease, etc.

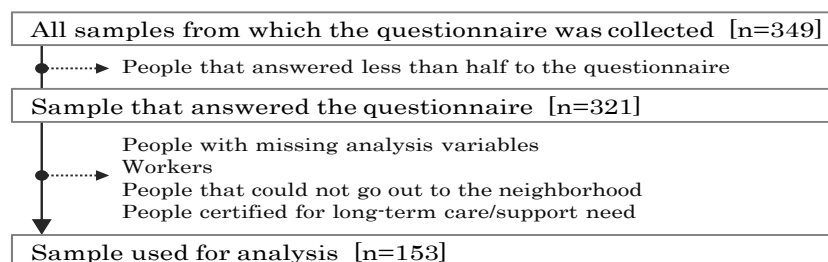


Fig. 1. Subject flow

2.3. Outline of questionnaire survey implementation

A questionnaire survey was conducted targeting all late elderly people in the area using indirect distribution via a self-governing association and indirect collection by post. Table 1 provides an outline of the implementation. The questionnaire asked about health condition, living environment, third places, shopping behaviours, and lifestyle. Health condition measures consisted of standard indicators in the field of epidemiology and covered the need for long-term care, mood disorders, withdrawal, and social isolation as well as a subjective health assessment. Risk of needing long-term care was judged based on the care prevention checklist.^{[8],[9]} Those who go out (leave their residence) less than once a week were defined as homebound. In addition, according to the past research.^[10] People who had conversations

with non-family members less than once a week were defined as socially isolated. We used the Geriatric Depression Scale (GDS)-5 to measure mood disorders. In order to assess the living environment, we asked about the existence of nearby features such as flower beds, hedges, benches, and walking paths. Each question had two choices (Having or Not-having). To assess third places, defined by Hino et al.^[11] as “a place where people can easily visit even when there is no plan”, we asked respondents to write their own descriptions. Frequency of use, transportation method, travelling time, and purpose of visits to third places were also investigated.

The questionnaire was distributed to 629 late elderly people in the target area and 349 completed questionnaires were collected (collection rate 55.5%). Of these, 321 were regarded as valid samples, after excluding questionnaires in which 10% or more of the responses were missing. For questions used in the analysis, samples that were missing variables to be input for multivariate analysis were excluded. In order to verify the effects of neighbouring environments, persons requiring assistance or nursing care and those who are homebound were also excluded. As a result, a total of 153 samples were used in the analysis (Fig. 1).

3. Results

3.1. Fundamental results of personal attributes

Table 2. Participants' attributes

		Sample that answered the questionnaire						Sample used for analysis					
		Overall (n=321)		Male (n=148)		Female (n=173)		Overall (n=153)		Male (n=108)		Female (n=97)	
		n	%	n	%	n	%	n	%	n	%	n	%
Age, years	75 – 79 years	137	42.7	75	50.7	62	35.8	86	56.2	49	56.3	37	56.4
	80 – 84 years	131	40.8	57	38.5	74	42.8	54	35.3	31	35.6	23	34.8
	85 years <	53	16.5	16	10.8	37	21.4	13	8.5	7	8.0	6	9.1
BMI	< 18.5	32	10.0	10	6.8	22	12.7	10	6.5	5	5.7	5	7.6
	18.5 – 24.9	215	70.0	108	73.0	107	61.8	113	73.9	66	75.9	47	71.2
	25.0 <	47	14.6	25	16.9	22	12.7	30	19.6	16	18.4	14	21.2
	Unknown	27	8.4	5	3.4	22	12.7	0					
Marital status	Unmarried	0	0	0	0	0	0	0	0	0	0.0	0	0
	Divorce or Bereavement	89	27.7	16	10.8	73	42.2	31	20.3	9	10.7	22	33.3
	Marriage	180	56.1	108	73.0	72	41.6	122	79.7	78	89.7	44	66.7
	Unknown	52	16.2	24	16.2	28	16.2	0					
Body pain	Not-having	222	69.2	113	76.4	109	63.0	127	83.0	76	87.4	51	77.3
	Having	78	24.3	27	18.2	51	29.5	26	17.0	11	12.6	15	22.7
	Unknown	21	6.5	8	5.4	13	7.5	0					
Household composition	Alone	44	13.7	16	10.8	28	16.2	19	87.6	8	9.2	11	83.3
	Others	265	82.6	126	85.1	139	80.3	134	12.4	79	90.8	55	16.7
	Unknown	12	3.7	6	4.1	6	3.5	0					
Educational attainment	< Junior high school	55	17.1	22	14.9	33	19.1	20	13.1	11	12.6	9	13.6
	High or Vocational school	167	52.0	78	52.7	89	51.4	93	60.8	52	59.8	41	62.1
	Junior college	28	8.7	6	4.1	22	12.7	14	9.2	3	3.4	11	16.7
	College	43	13.4	34	23.0	9	5.2	26	17.0	21	24.1	5	7.6
	Unknown	28	8.7	8	5.4	20	11.6	0					
Length of living in the target area	30 years <	179	55.8	78	52.7	101	58.4	83	54.2	46	52.9	37	56.1
	20 – 29 years	117	36.4	58	39.2	59	34.1	65	42.5	39	44.8	26	39.4
	< 19 years	7	2.2	3	2.0	4	2.3	5	3.3	2	2.3	3	4.5
	Unknown	18	5.6	9	6.1	9	5.2	0					
Third place	Not-having	128	39.9	48	32.4	80	46.2	41	26.8	21	24.1	20	30.3
	Having	188	58.6	97	65.5	91	52.6	112	73.2	66	75.9	46	69.7
	Unknown	5	1.6	3	2.0	2	1.2	0					
Certifying for long-term care need	Independence	238	74.1	119	80.4	119	68.8	-	-	-	-	-	-
	long-term care need	71	22.1	25	16.9	46	26.6	-	-	-	-	-	-
	Unknown	12	3.7	4	2.7	8	4.6	-	-	-	-	-	-
The ability to go out in the neighbourhood	No	48	15.0	14	9.5	34	19.7	-	-	-	-	-	-
	Yes	267	83.2	132	89.2	135	78.0	-	-	-	-	-	-
	Unknown	7	2.2	2	1.4	4	2.3	-	-	-	-	-	-
Occupation	Not employed	288	89.7	138	93.2	150	86.7	-	-	-	-	-	-
	Full-time homemaker	14	4.4	8	5.4	6	3.5	-	-	-	-	-	-
	Unknown	19	5.9	2	1.4	17	9.8	-	-	-	-	-	-

Table 2 provides the basic aggregation results by valid samples and samples used in the analysis. The mean age of valid samples was 80.2 ($\pm$ 5.9) years old; 80% of valid samples were from respondents between 75 years old and 84 years old; and 0% of valid samples were from unmarried respondents. These characteristics are in line with those expected of this particular residential area, which is one of the oldest “new towns” in Kitakyushu. In addition, 56.1% of valid samples were from married people, excluding divorce or bereavement, and 13.7% were from solitary households. A very high percentage of respondents (92.2%) had lived in the area for more than 20 years. This may be a cumulative effect of the environment of the target area. People requiring support and care recipients accounted for 22.1% of valid responses.

Table 3. Health condition

		Sample that answered the questionnaire						Sample used for analysis					
		Overall (n=321)		Male (n=148)		Female (n=173)		Overall (n=153)		Male (n=108)		Female (n=97)	
		n	%	n	%	n	%	n	%	n	%	n	%
Risk for Long-term care	High risk ($\geq$ 4 pts.)	115	35.8	50	33.8	65	37.6	35	22.9	23	26.4	12	18.2
	Low risk (< 4 pts.)	206	64.2	98	66.2	108	62.4	118	77.1	64	73.6	54	81.8
Frequency of going out	< 1 day / week	70	21.8	35	23.6	35	20.2	13	8.5	8	9.2	5	7.6
	$\geq$ 1 day / week	242	75.4	109	73.6	133	76.9	140	91.5	79	90.8	61	92.4
	Unknown	9	2.8	4	2.7	5	2.9	-	-	-	-	-	-
Frequency of having conversation	< 1 day / week	51	15.9	18	12.2	33	19.1	27	17.6	17	19.5	10	15.2
	$\geq$ 1 day / week	265	82.6	129	87.2	136	78.6	126	82.4	70	80.5	56	84.8
	Unknown	5	1.6	1	0.7	4	2.3	-	-	-	-	-	-
Depressive symptoms	High risk	89	27.7	36	24.3	53	30.6	25	16.3	15	17.2	10	15.2
	Low risk	232	72.3	112	75.7	120	69.4	128	83.7	72	82.8	56	84.8

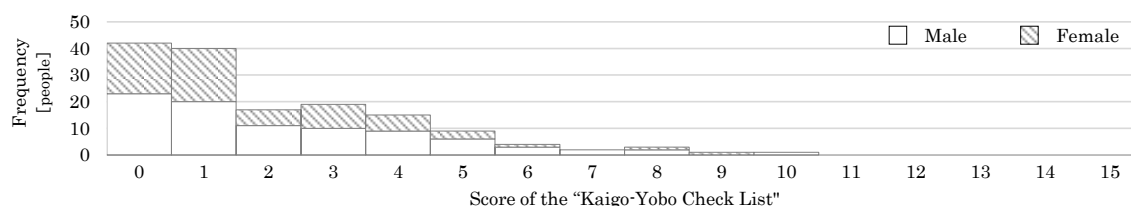


Fig. 2. Distribution of score of “Kaigo-Yobo Check List” (n=300)

3.2. Basic calculation of health status

Table 3 shows a summary of the health index related to geriatric syndrome. Among valid samples, 8.51% of respondents were homebound (), 17.6% were socially isolated (), and 16.3% had mood disorders (). From the nursing care prevention checklist, 35.7% needed long-term care. The score distribution is shown in Fig. 2. Although it shows a relatively high ratio, it is thought that this is due to the high average age of the subjects.

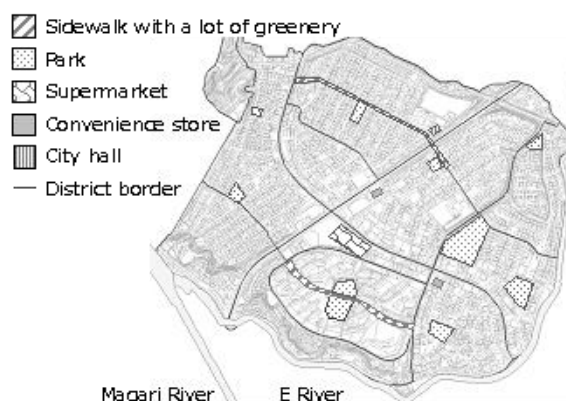


Fig. 3. Location of third place within the Takasu district

Table 4. The proportion of having third place based on location and type

	Overall		Within the district		Out of the district	
	n	%	n	%	n	%
Whole	188	100	101	51.6	53	48.4
Parks and Along the river	57	30.3	53	28.2	4	2.1
Shopping streets and malls	32	17.0	19	10.1	9	4.8
Exercise facilities	13	6.9	0	0.0	13	6.9
Regional activity	13	6.9	11	5.9	1	0.5
Relative and friends	9	4.8	2	1.1	5	2.7
Library	4	2.1	0	0.0	4	2.1
Others	64	34.0	6	3.2	6	3.2

Table 5. Frequency of visiting third place

	Overall		Male		Female	
	n	%	n	%	n	%
5 days / week <	46	24.5	33	34.0	13	14.3
3 - 4days / week	43	22.9	21	21.6	22	24.2
1 - 2days / week	53	28.2	27	27.8	26	28.6
2 - 3days / month	19	10.1	10	10.3	9	9.9
1 day / month <	17	9.0	5	5.2	12	13.2
Unknown	10	5.3	1	1.0	0	0.0

Table 6. Purpose of visiting third place

	Overall		Male		Female	
	n	%	n	%	n	%
Whole	188	100	97	51.6	91	48.4
Meeting friends	31	16.5	11	11.3	20	22.0
Regional activity	28	14.9	12	12.4	16	17.6
Exercise	63	33.5	41	42.3	22	24.2
Good location	19	10.1	9	9.3	10	11.0
Nothings	20	10.6	13	13.4	7	7.7
Others	20	10.6	8	8.2	12	13.2
Unknown	7	3.7	3	3.1	4	4.4

Table 7. Way to move third place

	Overall		Male		Female	
	n	%	n	%	n	%
Walking	107	56.9	50	51.5	57	62.6
Bicycle	9	4.8	8	8.2	1	1.1
Bus	17	9.0	4	4.1	13	14.3
Car	40	21.3	34	35.1	6	6.6
Taxi etc.	14	7.4	2	2.1	12	13.2
Unknown	1	0.5	0	0.0	2	2.2

3.3. Basic calculation of Third Place

Figure 3 shows third places in the target area. Among the valid samples, 188 of respondents (58.6%) said they had a third place. Of those, 48.6% said their third area was located outside the target area. The most common type of third place was parks and river banks (30.3%). The next most common was commercial facilities, especially among those whose third place was within the district.

The most common purpose for visiting a third place was exercise. This was especially for men, comprising 42.3% of their responses. It may be inferred that places in suburban areas where people can move, such as exercise facilities and parks, are likely to be a third place. This corresponds with the findings of previous researches.

Table 5 shows frequency of use of third places; 75.6% of respondents went to a third place at least once a week, which is consistent with the definition of a third place. Table 7 shows how people travelled to third places. Over half of respondents (56.9%) walked to the third place. A high proportion of men (35.1%) used cars. In addition to walking, women took buses and taxis most often. The most common length of time required to get to the third place was 6 to 10 minutes, but a large proportion of respondents took over 30 minutes to get to the third place.

3.4. Test of hypothesis concerning mean

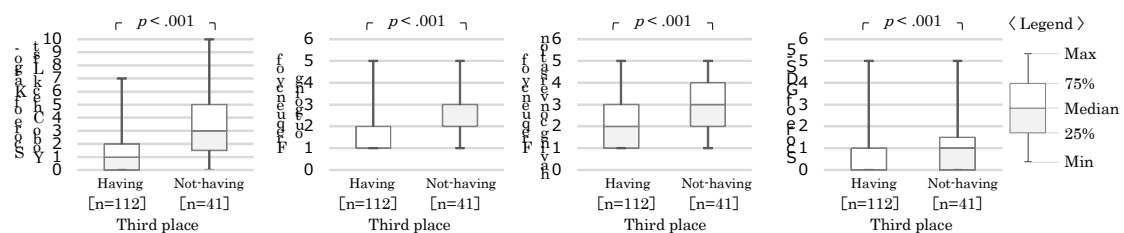


Fig. 4. Health condition based on presence of third place

First of all, we classified participants into two groups based on the presence or absence of a third place and compared the health status of both groups (Fig. 4). For each indicator of health status, a higher score indicates a higher tendency for being homebound, social isolation, mood disorder, and needing care. Those who did not have a third place showed higher risk of long-term care ($p < 0.01$), low frequency of going out, low frequency of conversation ($p < 0.01$), and high possibility of mood disorder ($p < 0.01$). This suggests that those who do not have a third place tend to have poorer health compared with those who have a third place.

Table 8. Logistic regression odds ratio for the risk of shut-in

	<i>p</i>	AOR	95%CI
Third place			
None (Ref. Having)	.003	8.46	2.09 ~ 34.33
BMI	.030		
18.5 – 24.9 (Ref. < 18.5)	.015	13.0	1.64 ~ 102.88
25.0 < (Ref. < 18.5)	.018	29.3	1.80 ~ 478.08

The fitness of model : 91.5%
Hosmer-Lemeshow test : 0.95

Table 9. Logistic regression odds ratio for social isolation

	<i>p</i>	AOR	95%CI
Third place			
None (Ref. Having)	.002	4.40	1.74 ~ 11.17
Age	.006		
80 – 84 (Ref. 75 – 79)	.803	1.14	0.41 ~ 3.13
85 ≤ (Ref. 75 – 79)	.003	0.13	0.13 ~ 0.49

The fitness of model : 83.7%
Hosmer-Lemeshow test : 1.00

Table 10. Logistic regression odds ratio for the risk of long term care/ support need

	<i>p</i>	AOR	95%CI
Third place None (Ref. Having)	.007	3.70	1.42 ~ 9.64
Sex Female (Ref. Male)	.039	3.04	1.06 ~ 8.75
Educational attainment H.S. (Ref. <J.H.S)	.021	5.21	1.61 ~ 16.88
Junior Col. (Ref. <J.H.S)	.006	3.48	0.53 ~ 22.75
College (Ref. <J.H.S)	.193	10.92	1.78 ~ 67.01
Body pain None (Ref. Having)	.010	0.24	0.08 ~ 0.71
Frequency of going out ≥1day /wk. (Ref. <1day /wk.)	.010	9.42	2.08 ~ 42.62

The fitness of model : 83.0%
Hosmer-Lemeshow test : 0.91

3.5. Validation by logistic regression analysis

Logistic regression analysis was performed for risk verification based on the presence or absence of a third place. For the covariates, “none or having of third places” and personal attributes were input as adjustment variables. Table 9 shows the results of the model in which the independent variable is set to “Closing (1. homebound; 0. going out)”. Table 9 shows the results of the model in which the independent variable is set to “social isolation (1. social isolation; 0. non-isolation)”. The adjusted odds ratio (AOR) for homebound elderly individuals was 8.46. This result indicates that those who do not have a third place are 8.46 times as likely to be homebound compared with those who do have a third place. Similarly, those who do not have a third place showed 4.4 times the rate of social isolation as those who do.

Subsequently, the independent variable was analysed by setting it as “needing long-term care risk (1. High risk; 0. Low risk)”. “Presence or absence of third place” and “moderator effects” were input as covariates. “Frequency of going out” and “Frequency of conversation” were also input as covariates. We also examined the effect of having a third place on the risk of needing long-term care.

The results of this analysis are provided in Table 10. The analysis model consists of presence/absence of a third place, sex, highest educational attainment, body pain, and frequency of going out. The AOR of the presence or absence of the third place for needing long-term care was 3.70. This result suggests that people who do not have a third place are at 3.7 times the risk of needing long-term care compared with those who do have a third place.

4. Conclusion

In this paper, using questionnaire survey data, we examined the relationship between third places and the need for long-term care. First, we focused on the presence or absence of a third place. We confirmed that the risk of mood disorder and need for long-term care is high among the late elderly. Therefore, a logistic regression analysis was performed using these risks as response variables. We found that the tendency to be homebound was 8.46 times higher ($p < 0.01$) and the tendency for social isolation was 4.40 times higher ($p < 0.01$) among those who did not have a third place. In addition, it was shown that those who do not have a third place have a 3.7 times higher rate of needing long-term care. Based on these results, we suggest that the presence or absence of a third place may be related to maintaining and promoting the health condition of the late elderly.

5. Acknowledgements

This study was carried out with assistance from the JSPS Grant-in-Aid for Scientific Research (JP16H06111). The authors thank the members of the residential association in Takasu and the survey respondents.

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