

An Analysis of Relationship between Economic Condition and Frailty Status among the Japanese Elderly Persons

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Abstract

In order to evaluate the relationship between economic condition and frailty status among the Japanese elderly persons, we conducted an analysis in one city of Fukuoka Prefecture in July 2010. We sent the original questionnaire included the items for health status, economic status, ADL, IADL, social support and questionnaires for frailty evaluation to 3000 aged who were randomly sampled and received response from 2593 aged (86.4%). According to the result of analysis, low self-evaluation of economic status and living in public housing showed relationship with frailty with statistical significance ($p < 0.05$). As health inequalities considered relating many factors including the socio-economics status, it is expected to create a new metrics that to be possible to construct appropriate multi-factor models. We considered that Japanese government should develop comprehensive medical and regional policy based on such a model.

Key words: Socio-economic status, health, inequality, frailty, aged, Japan

❖ Introduction

Social gradient of health attracts social, political and academic interests, and a number of studies have suggested the existence of health divide across socio-economic status. In 2003, WHO summarized the previous literatures as a report titled "Social Determinants of Health; The Solid Facts"¹⁾. For example, this report indicated that there were at least two times of differences in health status between the wealthiest and the poorest peoples. However, another report has indicated that the magnitude of the social gradient in health is not fixed; it varies between countries and, indeed, within regions in the same country. It has been reported that the degree of impact of social factors on health status differs according to the basic conditions,

such as age, sex and cultures as well as health indicators (mortality, subjective health status, ADL, and QOL)²⁾. Recent debate on the social determinants of health has indicated that the unequal distribution of health and well-being in national populations is a major challenge for public health governance.

Social disadvantages are described by various forms, such as few family assets, lower education attainment level, unstable employment, poor housing, lack of social network, etc. These disadvantages tend to concentrate among the same group during their life long period and as a result be more affective for their old ages.

Today Japan is rapidly becoming a highly aged society. Furthermore, a long lasting economic slump is damaging the life of citizen, especially that of aged people of lower socio-economic status. In this article, we have studied the relationship between economic condition and frailty status among the Japanese elderly persons.

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Table 1 Official check list for frailty

Question	Yes	No
1 Do you go out by a bus and a train alone?	0	1
2 Do you buy daily necessities?	0	1
3 Do you deposit and withdraw deposits and savings?	0	1
4 Do you visit the house of the friend?	0	1
5 Do you guide a family and the friend?	0	1
6 Do you go up the stairs without being transmitted through a handrail and the wall?	0	1
7 Do you stand up without any support from the sitting position on a chair?	0	1
8 Do you walk successively for around 15 minutes?	0	1
9 Have you fallen down for this one year?	1	0
10 Do you have big uneasiness for a fall?	1	0
11 Were there the weight losses more than 2-3 kg in six months?	1	0
12 Body Mass Index	1	0
13 Compared with 6 months ago, has it become more difficult to eat hard foods?	1	0
14 May you be choked on tea or soup?	1	0
15 Are you worried about the thirst of the mouth?	1	0
16 Do you go out more than once a week?	0	1
17 Does the frequency of going out decrease in comparison with last year?	1	0
18 Do other persons say that you have a problem of forgetfulness? i.e., "always hear the same thing"	1	0
19 Do you seek a phone number by oneself and do call?	0	1
20 Do you sometimes have time orientation problems of day and month?	1	0
21 For the last two weeks, do you have any thought that everyday life does not have a sense of fulfilment?	1	0
22 For the last two weeks, do you have any thought that you are not able to enjoy that you have enjoyed before?	1	0
23 For the last two weeks, do you feel uneasiness to do something that you were able to do it easy before?	1	0
24 For the last two weeks, do you feel a sence of worthless for yourself?	1	0
25 For the last two weeks, do you feel tired for no reason?	1	0

Criteria for "positive":

- sum of question 1 to 20 ≥ 10
- or sum of question 6 to 10 ≥ 3
- or sum of question 11 and 12 = 2
- or sum of question 13 to 15 ≥ 3

❖ Studied Population and Methods

Studied population

In July 2010, we have sent a questionnaire to 3,000 aged who were randomly sampled (about 20% extraction) from each district of Yukuhashi city, Fukuoka. We received responses from 2,593 aged (response rate was 86.4%). This questionnaire included the items for health status, economic status, ADL, IADL, social support and questionnaires for frailty evaluation.

Methods

After calculating the descriptive statistics for basic characteristics, such as age, sex, health status, economic status, ADL, IADL, social support, social exclusion and results of frailty evaluation, the relationships among these variables were examined. The criterion of "positive" for frailty is described in Table 1.

All statistical procedures were conducted by IBM SPSS Statistics ver.19 (Tokyo, IBM).

The study was approved by the ethical committee of studied city council and UOEH.

❖ Results

Table 2 shows distribution of frailty status according to sex and age category. Among the 2,593 investigated aged, 1,516 (58.5%) were female and 1,077(41.5%) were male. For the age category, 65-74 years old was the largest (1,015; 39.1%), followed by 75-84 years old (972; 37.5%) and 85 years old and more (606; 23.4%). Frail aged was dominant for female and higher age category with statistical significance ($p < 0.01$).

Table 3 shows distribution of health status according to sex and age category. In total, the figures for "very well", "well", "not so well" and "bad" were

Table 2 Frailty status stratified by sex and age category

Age category	Sex		Frailty evaluation			Total	p value*
			Not frail	Frail	Unkown		
65–74 yr old	Female	N	295	225	25	545	<0.01
		%	54.1%	41.3%	4.6%	100.0%	
	Male	N	291	158	21	470	
		%	61.9%	33.6%	4.5%	100.0%	
	Total	N	586	383	46	1,015	
		%	57.7%	37.7%	4.5%	100.0%	
75–84 yr old	Female	N	105	449	34	588	<0.01
		%	17.9%	76.4%	5.8%	100.0%	
	Male	N	159	200	25	384	
		%	41.4%	52.1%	6.5%	100.0%	
	Total	N	264	649	59	972	
		%	27.2%	66.8%	6.1%	100.0%	
85 yr old and more	Female	N	40	310	33	383	<0.01
		%	10.4%	80.9%	8.6%	100.0%	
	Male	N	64	142	17	223	
		%	28.7%	63.7%	7.6%	100.0%	
	Total	N	104	452	50	606	
		%	17.2%	74.6%	8.3%	100.0%	
Total	Female	N	440	984	92	1,516	<0.01
		%	29.0%	64.9%	6.1%	100.0%	
	Male	N	514	500	63	1,077	
		%	47.7%	46.4%	5.8%	100.0%	
	Total	N	954	1,484	155	2,593	
		%	36.8%	57.2%	6.0%	100.0%	
p value#	Female				<0.01		
	Male				<0.01		
	Total				<0.01		

*Statistical test for sex difference in each age category. #Statistical test for age difference in each sex.

147 (5.7%), 1,253 (48.3%), 577 (22.3%) and 386 (14.9%). Persons with lower health status were significantly dominant for female and higher age categories ($p < 0.01$).

Table 4 shows distribution of frailty status according to self-evaluation of economic status. For the aged of class 1 (the poorest) showed a very high rate of frail aged (78 of 88 persons; 88.6%), followed by class 2 (368 of 533; 69.0%), class 3 (160 of 286; 55.9%), class 4 (327 of 515; 63.5%), class 5 (137 of 259; 52.9%), class 6 (281 of 625; 45.0%) and class 7 (the richest) (133 of 287; 46.3%) ($p < 0.01$).

Table 5 shows distribution of frailty status according to ownership of residence. The prevalence

of frailty was 55.4% (1256 of 2269 aged) for the aged live in one's own house, 82.2% (60 of 73) for public rental residence and 79.2% (19 of 24) for private rental room ($p < 0.01$).

Discussion

As other literatures indicated^{1–4}, the present results also have suggested that economic condition relates to health status. The aged of lower economic situation showed higher possibility to be “frail” with statistically significance. It is very important to recognize that ownership of residence is associated with health status of the aged with statistical significance

Table 3 health status stratified by sex and age category

Age category	Sex	Subjective health status					Total	p value*	
		Very well	Well	Not so well	Bad	Unkown			
65-74 yr old	Female	N	41	311	92	60	41	545	<0.01
		%	7.5%	57.1%	16.9%	11.0%	7.5%	100%	
	Male	N	45	287	85	31	22	470	
		%	9.6%	61.1%	18.1%	6.6%	4.7%	100%	
	Total	N	86	598	177	91	63	1,015	
		%	8.5%	58.9%	17.4%	9.0%	6.2%	100%	
75-84 yr old	Female	N	16	228	166	119	59	588	<0.01
		%	2.7%	38.8%	28.2%	20.2%	10.0%	100%	
	Male	N	19	176	91	60	38	384	
		%	4.9%	45.8%	23.7%	15.6%	9.9%	100%	
	Total	N	35	404	257	179	97	972	
		%	3.6%	41.6%	26.4%	18.4%	10.0%	100%	
85 yr old and more	Female	N	11	156	91	76	49	383	<0.01
		%	2.9%	40.7%	23.8%	19.8%	12.8%	100%	
	Male	N	15	95	52	40	21	223	
		%	6.7%	42.6%	23.3%	17.9%	9.4%	100%	
	Total	N	26	251	143	116	70	606	
		%	4.3%	41.4%	23.6%	19.1%	11.6%	100%	
Total	Female	N	68	695	349	255	149	1,516	<0.01
		%	4.5%	45.8%	23.0%	16.8%	9.8%	100%	
	Male	N	79	558	228	131	81	1,077	
		%	7.3%	51.8%	21.2%	12.2%	7.5%	100%	
	Total	N	147	1,253	577	386	230	2,593	
		%	5.7%	48.3%	22.3%	14.9%	8.9%	100%	
p value#	Female						<0.01		
	Male						<0.01		
	Total						<0.01		

*Statistical test for sex difference in each age category. #Statistical test for age difference in each sex.

($p < 0.01$). As Hayakawa has indicated, the healthy housing is a fundamental of public health policy⁵). Unfortunately, the housing policy has long been separated from the public health policy in Japan. Hayakawa reported that many aged people in the lower socio-economic class were obliged to live in old and narrow-spaced houses⁵). He also reported that the aged peoples were often denied to borrow a house because of their age and health problems.

It is very important to know that the current difficult situation has been partly caused by the poor housing policy of our country. In most of the developed countries, such as UK and France, the development of residence has been organized as a part of social secu-

rity policy. On the contrary, the Japanese government has long depended on the private initiative for the construction of residence. During the highly economic development era, the preparation of residence for workers and their family was an important fringe benefit of welfare services organized by each company. Furthermore, workers were recommended to save money in order to construct their own house. The company prepared a variety of supportive services, such as a saving account with higher interest rate and a special loan with low interest rate. Furthermore, the public housing had characteristics of "temporary residence" and inhabitants were expected to quit the public housing after they become afford to obtain their own pri-

Table 4 Frailty status stratified by income status

Income status	Frailty evaluation			Total	
	Not frail	Frail	Unkown		
Class 1	N	8	78	2	88
	%	9.1%	88.6%	2.3%	100.0%
Class 2	N	123	368	42	533
	%	23.1%	69.0%	7.9%	100.0%
Class 3	N	109	160	17	286
	%	38.1%	55.9%	5.9%	100.0%
Class 4	N	153	327	35	515
	%	29.7%	63.5%	6.8%	100.0%
Class 5	N	109	137	13	259
	%	42.1%	52.9%	5.0%	100.0%
Class 6	N	316	281	28	625
	%	50.6%	45.0%	4.5%	100.0%
Class 7	N	136	133	18	287
	%	47.4%	46.3%	6.3%	100.0%
Total	N	954	1,484	155	2,593
	%	36.8%	57.2%	6.0%	100.0%

p<0.01; chi square test

Table 5 Health status stratified by residence type

Type of residence	Frailty evaluation			Total	
	Not frail	Frail	Unkown		
One's own home	N	884	1256	129	2269
	%	39.0%	55.4%	5.7%	100.0%
Private rental residence	N	26	59	2	87
	%	29.9%	67.8%	2.3%	100.0%
Public rental residence	N	10	60	3	73
	%	13.7%	82.2%	4.1%	100.0%
Private rental room	N	5	19	0	24
	%	20.8%	79.2%	.0%	100.0%
Others	N	16	42	2	60
	%	26.7%	70.0%	3.3%	100.0%
Unknown	N	13	48	19	80
	%	16.3%	60.0%	23.8%	100.0%
Total	N	954	1484	155	2593
	%	36.8%	57.2%	6.0%	100.0%

vate residence. Thus most of the public housing have not paid enough attention to the vulnerable groups such as the aged and handicapped. For example, most of the public housing constructed during 60's and 70's consists of 4 or 5 stairs without elevator. Today the frail aged living in higher stairs of such residences has

lots of problems for daily activities because of this physical barrier. Our past study also showed that the aged living in the public housing required the reconstruction for better daily life the most frequently⁶⁾. Furthermore, it is very important to recognize that the single household aged live dominantly in the public

housing.

Appropriate housing facilitates the social participation of frail aged persons and could make it easier for home care workers to support the frail aged. This would lighten the financial burden of care for the frail aged. Thus, it is strongly recommended to integrate the housing policy into the local public health policy.

There is little doubt that social inequalities in health are due in large part to income gaps among individuals. Our previous research based on the Family Income and Expenditure Survey indicated that people living in the household of lower socioeconomic status were likely to consume more tobacco⁷⁾. The increase in income inequality between wealthy and less wealthy people has come to the attention of the politicians and academics recently around the world even in the developed countries. In Japan, since the mid of the 1990s, mechanisms for income redistribution no longer suffice to correct the increase in income inequalities among Japanese households. This problem seems to be severer for the poor aged households that are not fully covered by social security system.

Social disadvantages are described by various forms, such as few family assets, lower education attainment level, unstable employment, poor housing, lack of social network, etc. These disadvantages tend to concentrate among the same group during their life long period and as a result be more affective for their old ages.

If social determinants of health is “The Solid Facts” as WHO indicated¹⁾, we have to organize appropriate social programs in order to solve it. However, as Hashimoto indicated⁸⁾, we have not enough evidence of causal chain between social determinants and health status.

There are several problems to be solved for clarifying the causality path between the socio-economic status (SES) and health status. For example, we have to establish the appropriate metrics for measuring SES. For example, in this article, we have measured SES of the aged by income. As Allin et al suggested⁹⁾, this is particularly difficult for later aged persons. Previous literatures have suggested that income and occupation status lose their significance, and wealth (i.e., accumulated economic assets) becomes more important for measuring SES among the aged. Interventions tackling the SES related health inequalities need to be based on an assessment of their magnitude and on the

identification of population groups that are most exposed or most vulnerable to SES risks. This requires “solid metrics” for SES that makes comprehensive assessments possible at both national and international levels.

As health inequalities are related to various determinants such as age, income, education, occupation, gender, ethnicity and place of residence, such metrics must be comprehensive and make it possible to construct appropriate multi-factor models. Based on these models, social experiments can be organized in order to solve the SES related health problems. For example, we are planning to organize a workfare type of health promotion program for the middle and young aged (50-65 yr old) in a Japanese community. We would like to report the results of this intervention in a future literature.

◆References

- 1) Wilkinson RG. and Marmot M. (eds). *Social Determinants of Health; The Solid Facts*, 2nd editions, Geneva, WHO, 2003.
- 2) Mackenbach JP, Stirbu I, Roskam AJR, et al.: Socioeconomic inequalities in health in 22 European countries, *The New England Journal of Medicine* 358, 2468–2481 (2008).
- 3) Robertson A.: Social inequalities and the burden of food-related ill-health, *Public Health Nutrition* 4, 1371–173 (2001).
- 4) Drewnowski A.: Obesity, diet, and social inequalities, *Nutrition Review* 67 (Suppl.1), 36–39 (2009).
- 5) Hayakawa K.: *Welfare of housing (Kyoju fukushi)*, Tokyo: Iwanami shoten, 1997.
- 6) Matsuda S. and Fujino Y.: Healthy Housing as an infrastructure of health support system, *APJDM* 2, 55–61 (2008).
- 7) Yano J, Pham TM. and Matsuda S.: The income elasticity of education and tobacco smoking in Japan: The family income and expenditure survey during the 2000-05 year period, *APJDM*, 4 (2010).
- 8) Hashimoto H.: Social gradient of health; conceptual and methodological challenges. *Journal of Health Care and Society* 22, 5–18 (2012) (in Japanese).
- 9) Allin S, Masseria C. and Mossialos E.: Measuring socio-economic differences in use of health care services by wealth versus by ncome, *American Journal of Public Health* 99, 1849–1855 (2009).