Table 1. Cont.

		N	%	Age	Men (%)
Politics	participation	921	7.1	71.8±5.4	70.5
	non-participation	10,573	81.6	72.5±5.9	48.1
	missing	1,457	11.3	74.6±6.0	40.3
Citizen	participation	532	4.1	71.0±4.7	43.0
	non-participation	10,659	82.3	72.5±5.9	49.9
	missing	1,760	13.6	74.4±6.1	43.6

Discussion

In this study, we examined the relationship between incident functional disability and social participation from the perspective of number of types of organizations and type of social participation in a prospective cohort study. Social participation significantly lowered the risk of incident functional disability, and this effect increased with an increasing variety of organizations in which subjects participated. In analyses stratified by gender, as well as excluding subjects who became disabled within one year of follow-up, the results still suggested a protective effect of participating in more than two organizations. Previous studies have suggested that social participation can lower the risk of incident disability, [10], [11], which supports the results of the present study. Analysis adjusted for behavioral, psychosocial, and physiological factors resulted in a tendency towards weaker positive associations. Behavioral, psychosocial, and physiological pathways may be potential mechanisms for social participation to influence health, [24]. The results of the present study support that finding. In addition, participation in a greater number of different organizations brought the HR closer to 1.00. Participation in multiple organizations may have a protective effect on depression, [15], well-being, [16] and oral health status, [17], while having a role within the organization may reduce the risk of mental health problems, [18]. These findings indicate that social participation may decrease the risk of incident functional disability in older Japanese people, and that this effect may be strengthened by participation in a variety of organizations.

The relationship between social participation and prevention of functional decline may be under-pinned by at least three distinct mechanisms. First, social participation encourages older individuals to keep active (e.g. getting dressed each day to leave the house), and these daily routines may help to preserve functioning (the "use it or lose it" hypothesis). Secondly, social participation provides individuals with access to various forms of social support (e.g. access to material resources, or health-relevant information) which may promote the preservation of functional status. Thirdly, social participation may have direct physiological benefits such as buffering stress, boosting host resistance, and lowering biomarkers of disease risk, such as inflammation, [27].

Regarding type of social participation, the risk was significantly lower for participation in a local community, hobby, or sports organization. This decrease remained significant even when those who became certified for long-term care within a year were excluded from the analysis. When each gender was examined separately, the HR remained lower than 1.00 for participation in a local community organization, but this difference was no longer significant. Participation in a hobby or sport organization significantly lowered the risk for both men and women. In a similar trend, previous studies that each looked at different

organizations did not always show participation to lower the risk of all-cause mortality, [4], [5] or impaired cognitive function, [5]. The finding that participation in a hobby or sports organization significantly lowers the risk for both men and women is similar to the finding of an association with all-cause mortality, [4]. Among the different types of social participation, it is thus likely that participating in a local community, hobby, or sports group organization may be especially effective for decreasing the risk of requiring long-term care in the future.

For these three types of organizations, adjusting for behavioral, psychosocial, and physiological factors resulted in a tendency towards a weaker positive relationship. The association with participation in a hobby or sports organization may be due to the influence of hobby activities, [28] or physical activities, [29] that may help prevent incident functional disability. In addition to the benefits of physical activity, participation in a sports organization may have positive effects from the social interaction itself, e.g. instrumental and emotional support exchanged between members, or even just the social reinforcement (i.e. reinforcers such as acceptance, praise, and attention from other people) that comes from belonging to a group, [19]. The reason for the protective effect of local community organizations may be that sports and leisure activities are often included in the activities of these organizations, [20]. One type of neighborhood-based organization common throughout Japan is the community-based senior centers (called "salons"), which have been shown to improve self-rated health, [30] and increase emotional social support, [31]. These may help reduce the risk of needing long-term care. However, the association was weaker than that of participation in hobby and sports organizations, and was no longer significant when each gender was analyzed separately. The reason for this may be in the negative side of social relationships, such as sense of obligation to the community or burden, [32]. These findings point to the existence of behavioral, psychosocial, and physiological pathways in the weakening of the risk of incident functional disability due to participation in a local community, hobby, and sports organization. Significant associations remained for participation in three or more organizations and in participation in a hobby and sports organization even in Model 5 that included all covariates. Further studies are needed to elucidate the reason for this, as it is possible that there may be some other factor acting on these types of participation that were not examined here (such as eating behavior or physical fitness).

Of all types of participation, only participation in a religious group showed an inverse association with incident functional disability in the crude model, although the association became statistically non-significant in later models that adjusted for age and other variables. This result is contrary to a meta-analysis that found religious involvement to be related to low mortality, [33].

Table 2. Incident rate of functional disability for 4 years.

		N	Incident/Person year	Incident rate
Total				
		12,951	1,528/47,453	0.032
Number of types of organizations				
0		3,190	447/11,391	0.039
1		3,184	390/11,624	0.034
2		2,135	192/8,010	0.024
≥3		2,102	124/8,021	0.015
missing		2,340	375/8408	0.045
Type of social participation				
Local community	participation	6,851	715/25,395	0.028
	non-participation	4,948	589/18,004	0.033
	missing	1,152	224/4,054	0.055
Hobby	participation	3,557	253/13,528	0.019
	non-participation	7,799	987/28,261	0.035
	missing	1,595	288/5,665	0.051
Sports	participation	2,373	128/9,139	0.014
	non-participation	8,860	1,103/32,191	0.034
	missing	1718	297/6,124	0.048
Religion	participation	1,394	180/5,098	0.035
	non-participation	9,913	1,069/36,469	0.029
	missing	1,644	279/5,886	0.047
Industry	participation	1,199	96/4,472	0.021
	non-participation	10,124	1,145/37,160	0.031
	missing	1,628	287/5,821	0.049
Volunteer	participation	1,180	74/4,486	0.016
	non-participation	10,111	1,161/37,055	0.031
	missing	1,660	293/5,913	0.050
Politics	participation	921	90/3,417	0.026
	non-participation	10,573	1,170/38,854	0.030
	missing	1,457	268/5,183	0.052
Citizen	participation	532	45/1,999	0.023
	non-participation	10,659	1,177/39,169	0.030
	missing	1,760	306/6,286	0.049

doi:10.1371/journal.pone.0099638.t002

However, most of the studies in this topic have been conducted in western settings. Religious involvement has a very different connotation in Japanese society, where most people (84%) do not claim to adhere to any personal religion, [34]. We speculate that religious involvement in this context is more likely to be triggered by health problems, and hence the possibility of reverse causation is heightened."

The present study has five limitations. First and foremost is that we cannot completely exclude the possibility of reverse causation, even though the study was longitudinal and none of the subjects had disability at the start of follow up. Although we carefully controlled for a number of covariates, and even conducted a sensitivity analysis excluding people who developed disability within one year of baseline, there is nonetheless a possibility of residual confounding by underlying health status (e.g. vitality, "pep", or some other subtle difference in health that our measurements were unable to capture). Thus, subtle differences

in the vitality of individuals (for example in lung capacity or cardiovascular fitness) could cause them to selectively participate in more organizations, as well as to select more vigorous activities (such as sports) over more sedentary activities (like chatting to neighbors). Causal inference in this situation is quite challenging. Given the expense involved in conducting randomized experiments, some have advocated the use of "natural" experiments, such as instrumental variables. In a recent study, Ichida et al., [29] used "distance to the nearest newly opened community center" as an instrument for social participation, The authors found that old people who happened to live closer to a newly opened community "salon" were more likely to participate, and that salon participation was associated with improved health over follow-up. A second limitation is that the term "local community organization" covered neighborhood associations, senior citizen clubs and fire-fighting teams. We were therefore unable to distinguish how participation in each of these three types of organizations related

Table 3. Adjusted hazard ratios (95% confidence intervals) for incident functional disability.

	Crude		Model 1 [a]		Model 2 [b]		Model 3 [c]		Model 4 [d]		Model 5 [e]	
	HR	95%CI	HR	95%CI	HR	95%CI	HR	95%CI	HR	95%CI	HR	95%CI
Number of types of organizations												
0	1.00		1.00		1.00		1.00		1.00		1.00	
1	0.85*	0.75–0.98	0.83*	0.73–0.95	0.87	0.76–1.00	0.89	0.78–1.02	0.88	0.77–1.01	0.93	0.81–1.07
2	0.61*	0.51–0.72	0.72*	0.61–0.85	0.79*	0.66–0.93	0.82*	0.69–0.98	0.82*	0.69–0.98	0.91	0.76–1.09
≥3	0.39*	0.32–0.48	0.57*	0.46–0.70	0.63*	0.52–0.78	0.69*	0.56–0.86	0.68*	0.55–0.83	0.78*	0.63–0.96
Type of social participation (reference: non-participation of each organization)												
Local community	0.86*	0.77–0.96	0.85*	0.76–0.96	0.89*	0.79–1.00	0.90	0.80–1.02	0.89*	0.79–1.00	0.94	0.83–1.06
Hobby	0.53*	0.46–0.61	0.75*	0.64–0.87	0.78*	0.66–0.91	0.80*	0.69–0.94	0.82*	0.70–0.96	0.85*	0.73–1.00
Sports	0.41*	0.34–0.49	0.66*	0.54–0.81	0.69*	0.56–0.85	0.71*	0.58–0.87	0.69*	0.56–0.84	0.73*	0.59–0.90
Religion	1.20*	1.03–1.41	1.07	0.90–1.27	1.08	0.91–1.28	1.06	0.89–1.26	1.10	0.93–1.31	1.09	0.92–1.30
Industry	0.70*	0.57–0.86	1.07	0.84–1.35	1.08	0.85–1.37	1.11	0.87–1.41	1.09	0.86–1.39	1.13	0.88–1.44
Volunteer	0.53*	0.42–0.66	0.92	0.70–1.20	0.94	0.72–1.23	0.95	0.73–1.25	0.98	0.74–1.28	0.99	0.76–1.30
Politics	0.87	0.71–1.08	1.18	0.93–1.50	1.19	0.94–1.52	1.21	0.95–1.54	1.24	0.98–1.58	1.24	0.97–1.58
Citizen	0.75	0.56–1.01	1.33	0.96–1.84	1.32	0.95–1.83	1.37	0.99–1.90	1.36	0.98–1.89	1.36	0.98–1.90

[a]Model 1 is adjusted for age, sex, annual equivalized income, educational attainment, marital status, occupational status and self-reported medical conditions. In addition, participation in all 8 organizations is added only for **"type of social participation"**.
[b]Model 2 is adjusted for the covariates in Model 1 plus smoking, alcohol consumption, walking time and frequency of going outdoors.
[c]Model 3 is adjusted for the covariates in Model 1 plus depression, emotional support, instrumental support and frequency of meeting friends.
[d]Model 4 is adjusted for the covariates in Model 1 plus IADL.
[e]Model 5 is adjusted for the covariates in Model 1 plus smoking, alcohol consumption, walking time, frequency of going outdoors, depression, emotional support, instrumental support, frequency of meeting friends and IADL.
* Statistically significant variable (p<0.05).
doi:10.1371/journal.pone.0099638.t003

to incident functional disability. A third limitation is that we did not inquire about the frequency of participation in each organization. The frequency of meetings may vary greatly according to the type of organization, but the effects of variation in frequency are not reflected in this study. A fourth limitation is that we did not inquire about the level of involvement or commitment of the individual to the organization. The involvement of individuals in organizations may vary in intensity, e.g. according to whether they assume leadership roles or they choose to participate as regular members, [18]. Further studies are needed to examine these additional questions. A fifth and final limitation is that our response rate to the baseline invitation was only 46%, so that our findings may not be representative of the areas in Japan in which the surveys were conducted. However, a response rate of 40% is quite high by western standards (where the response to postal surveys can be as low as 10%). Moreover, depending on the objectives of the study, we need not insist on representativeness as an obligatory feature of a cohort study, [35].

In conclusion, social participation may lower the risk of incident functional disability in older Japanese people, and this effect may be strengthened by participation in a variety of organizations. Moreover, participating in a local community, hobby, or sports group or organization may be especially effective for decreasing the risk. These findings suggest that support for older Japanese people that encourage participation in a variety of organizations, centered on local community, hobby, and sports organizations, may be effective for preventing the need for long-term care.

Acknowledgments

Contributors

Members of the JAGES group are as follows:
Kondo K. (the lead investigator; BZH12275@nifty.ne.jp), Hanazato M., Hikichi H., Miyaguni Y., Sasaki Y., Nagamine Y., Chiba University, Chiba; Ashida T., Kondo N., Takagi D., Tani Y., The University of Tokyo, Tokyo; Aida J., Osaka K., Tsuboya T., Tohoku University, Miyagi; Jeong S., Murata C., Saito T., National Center for Geriatrics and Gerontology, Aichi; Ojima T., Okada E., Hamamatsu University School of Medicine, Shizuoka; Shirai K., Todoriki H., University of the Ryukyus, Okinawa; Saito M., Nihon Fukushi University, Aichi; Hirai H., Iwate University, Iwate; Misawa J., Rikkyo University, Tokyo; Suzuki K., Aichi Gakuin University, Aichi; Ichida Y., Doctoral Institute for Evidence Based Policy, Tokyo; Takeda T., Seijoh University, Aichi; Yamamoto T., Kanagawa Dental University, Kanagawa; Nakade M., Tokaigakuen University, Aichi; Cable N., University College London, London; Tamakoshi A., Hokkaido University Graduate School of Medicine, Hokkaido; Fujino Y., University of Occupational and Environmental Health, Fukuoka; Shobugawa Y., Niigata University, Niigata; Hayashi T., Tokai College of Medical Science, Aichi.

Author Contributions

Conceived and designed the experiments: SK YK JA KK HH The JAGES Group. Analyzed the data: SK YK JA KK YI. Wrote the paper: SK YK KK IK. Reviewing of manuscript: SK YK JA KK IK HH K. Shirai YI K. Suzuki The JAGES Group. Acquisition of data: KK HH K. Suzuki The JAGES Group.

References

1. Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, et al. (1999) Risk factors for functional status decline in community-living elderly people. Social Science & Medicine 48: 445–469.
2. Julianne HL, Timothy BS, Layton JBL (2010) Social relationships and mortality risk: a meta-analytic review. Plos Medicine 7(7): e1000316.
3. WHO. Active ageing: a policy framework. Available: http://whqlibdoc.who.int/hq/2002/WHO_NMH_NPH_02.8.pdf. Accessed 2013 Feb 28.
4. Aida J, Kondo K, Hirai H, Subramanian SV, Murata C, et al. (2011) Assesing the association between all-cause mortality and multiple aspects of individual social capital among the older Japanese. BMC Public Health; 11: 499.
5. Hsu HC (2007) Does social participation by the elderly reduce mortality and cognitive impairment? Aging & Mental Health 11: 699–707.
6. Glass TA, Medes de Leon C, Marottoli RA, Berkman LF (1999) Population based study of social and productive activities as predictors of survival among elderly Americans. BMJ 319: 478–83.
7. Väänänen A, Murray M, Koshinen A, Vahtera J, Kouvonen A, et al. (2009) Engagement in cultural activities and cause-specific mortality: Prospective cohort study. Preventive Medicine; 49: 142–147.
8. Iwasaki M, Otani T, Sunaga R, Miyazaki H, Liu Xiao , et al. (2002) Social networks and mortality based on the Komo-Ise cohort study in Japan. International Journal of Epidemiology; 31: 1208–1218.
9. Ali SM, Merlo J, Rosvall M, Lithman T, Lindström M (2006) Social capital, the miniaturization of community, traditionalism and first time acute myocardial infarction: A prospective cohort study in southern Sweden. Social Science & Medicine; 63: 2204–2217.
10. James BD, Boyle PA, Buchman AS, Bennett DA (2011) Relation of late-life social activity with incident disability among community-dwelling older adults. The journals of gerontology. Series A, Biological Sciences and Medical Sciences 66(4): 467–473.
11. Hirai H, Kondo K, Ojima T, Murata C (2009) Examination of risk factors for onset of certification of long-term care insurance in community-dwelling older people: AGES project 3-year follow-up study. Japanese Journal of Public Health 56(8): 501–512 (in Japanese).
12. Buchman AS, Boyle PA, Wilson RS, Fleischman DA, Leurgans S, et al. (2009) Association between late-life social activity and motor decline in older adults. Archives of Internal Medicine; 169: 1139–1146.
13. James BD, Wilson RS, Barnes LL, Bennett DA (2011) Late-life social activity and cognitive decline in old age. Journal of International Neuropsychological Society; 17: 998–1005.
14. Ciao C, Weng LJ, Botticello AL (2011) Social participation reduces depressive symptoms among older adults: an 18-year longitudinal analysis in Taiwan. BMC Public Health; 11: 292.
15. Cruwys T, Dingle GA, Haslam C, Haslam SA, Jetten J, et al. (2013) Social group memberships protect against future depression, alleviate depression symptoms and prevent depression relapse. Social Science & Medicine 98: 179–186.
16. Haslam C, Holme A, Haslam SA, Iyer A, Jetten J, et al. (2008) Maintaining group memberships: Social identity continuity predicts well-being after stroke. Neuropsychological Rehabilitation 18(5/6): 671–691.
17. Takeuchi K, Aida J, Kondo K, Osaka K (2013) Social participation and dental health status among older Japanese adults: a population-based cross-sectional study. Plos One; 8(4): e61741.
18. Takagi D, Kondo K, Kawachi I (2013) Social participation and mental health: moderating effects of gender, social role and rurality. BMC Public Health; 13: 701.
19. Kanamori S, Kai Y, Kondo K, Hirai H, Ichida Y, et al. (2012) Participation in sports organizations and the prevention of functional disability in older Japanese: the AGES Cohort Study. Plos One; 7(11): e51061.
20. Kondo K (2010) Health Inequalities in Japan: An Empirical Study of Older People. Melbourne: Trans Pacific Press. 291P.
21. Nishi A, Kondo K, Hirai H, Kawachi I (2011) Cohort Profile: The AGES 2003 cohort study in Aichi, Japan. Journal of Epidemiology 21(2): 151–157.
22. Tsutsui T, Muramatsu N (2005) Care-needs certification in the long-term care insurance system of Japan. Journal of the American Geriatrics Society 53(3): 522–527.
23. Osaka university commerce JGSS Research Center. JGSS no chousa gaiyou. Available: http://jgss.daishodai.ac.jp/surveys/sur_question.html. Accessed 2013 Aug 4.) (In Japanese).
24. Umberson D, Montez JK (2010) Social relationships and health: a flashpoint for health policy. Journal of Health and Social Behavior 51(suppl): S54–S66.
25. Sheikh JI, Yesavage JA (1986) Clinical gerontology: a guide to assessment and intervention. London: Routledge. 532P.
26. Koyano W, Shibata H, Nakazato K (1987) Prevalence of disability in instrumental activities of living among elderly Japanese. Japanese Journal of Public Health 34(3): 109–114. (In Japanese).
27. Glei DA, Goldman N, Ryff CD, Lin YH, Weinstein M (2012) Social relationships and inflammatory markers: an analysis of Taiwan and the U.S.. Social Science & Medicine 74(12): 1891–1899.

— 186 —

28. Takeda T, Kondo K, Hirai H (2010) Psychosocial risk factors involved in progressive dementia-associated senility among the elderly residing at home AGES-Three year cohort longitudinal study. Japanese Journal of Public Health 57(12): 1054–1065. (In Japanese).

29. Paterson DH, Warburton DE (2010) Physical activity and functional limitations in older adults: a systematic review related to Canada's Physical Activity Guidelines. The International Journal of Behavioral Nutrition and Physical Activity 7: 38–59.

30. Ichida Y, Hirai H, Kondo K, Kawachi I, Takeda T, et al. (2013) Does social participation improve self-rated health in the older population? A quasi-experimental intervention study. Social Science & Medicine 94: 83–90.

31. Takeda T, Kondo K, Hirai H (2009) Preventive intervention of senile dementia focusing on psychosocial factors: Intervention theory based on the population health approach and its evaluation of midterm outcomes (In Japanese). The Journal of Japanese Occupational Therapy Association 28 (2): 178–186.

32. Rook KS (1984) The negative side of social interaction: impact on psychological well-being. Journal of Personality and Social Psychology 46: 1097–1108.

33. McCullough ME, Hoyt WT, Larson DB, Koenig HG, Thoresen C (2000) Religious involvement and mortality: a meta-analytic review. Health Psychology 19(3): 211.

34. Earhart, H Byron (1974) Japanese Religion: Unity and Diversity. Encino, Calif: Dickenson Publishing Co. 148 p.

35. Rothman KJ, Gallacher JE, Hatch EE (2013) Why representativeness should be avoided. International Journal of Epidemiology 42: 1012–1014.

— 187 —

金銭的な貧困に関わらず物的・環境的な貧困層に約 1.5 倍不健康な人が多い
～年間所得 200 万円未満から物的・環境的貧困に陥るリスクが急増～

2010 年 8 月から 2012 年 1 月にかけて、全国 12 都道府県 31 市町村において要介護認定を受けていない 65 歳以上の高齢者 169,215 人を対象に郵送調査を行った（回収率：66.3%）．調査の結果，経済的理由によってテレビや冷蔵庫，冷暖房機などの日用品がない高齢者が 2～6%，親戚の冠婚葬祭に出席できなかった高齢者が 7%程度いることがわかりました。様々な特性を考慮したうえでも，上記に該当した高齢者には健康度自己評価が悪い人が 1.3～1.5 倍多く，抑うつ傾向の人も 1.5～1.8 倍多いことが示されました．本研究の結果から、貧困政策の文脈のみならず、健康政策との関連においても、単に周囲と比べて所得が低いという金銭的な指標に基づく貧困だけでなく，物的・環境的で周囲と比べて満たされていないという面にも着目し、多次元で貧困を捉え直す必要があることが示唆されました．

お問い合わせ先

連 絡 先：斉藤雅茂（日本福祉大学社会福祉学部准教授）

電 話：0569-87-2211　FAX：0569-87-1690

E-mail：masa-s@n-fukushi.ac.jp

＜研究方法＞

　2010 年 8 月から 2012 年 1 月にかけて、全国 12 都道府県 31 市町村における要介護認定を受けていない 65 歳以上の高齢者 169,215 人を対象に郵送調査を行った（回収率：66.3%）．このうち，物的環境的な貧困（＝相対的剥奪）に関する項目が含まれた 24 市町村 24,742 人について分析した．相対的剥奪状態（周囲の人と比べて物的・環境的に恵まれていない状態）は，テレビや冷蔵庫などの日用品から家族専用のトイレなどの住環境，経済的な理由による電気・ガス・水道の停止経験など 14 ないし 13 項目によって把握された．

＜結　　果＞

　第 1 に，経済的理由によってテレビや冷蔵庫，冷暖房機などの日用品がない人が 2〜6%，親戚の冠婚葬祭に出席できなかった人が 7%程度おり，剥奪項目に 2 つ以上該当した人は 17.4%であり，等価所得が 200 万円未満の群から剥奪状態への該当割合が急増することが確認された。

　第 2 に，従来よく使用されてきた所得など金銭的な貧困（相対的貧困）の該当者とは異なり，男性が該当しやすく，年齢と有意な関連がみられず，対人関係のサポートがより乏しい傾向にあることが示された。

　第 3 に，様々な特性を考慮したうえでも，相対的剥奪（周囲の人と比べて恵まれない状態）の該当者は健康度自己評価が「良くない」と回答する者が 1.3〜1.5 倍，抑うつ傾向にある者が 1.5〜1.8 倍多かった。とくに，対人関係のサポートがあっても，剥奪該当者は不健康に陥りやすいことが示唆された。加えて，これらの関連は相対的貧困との関連よりも強く，従来の貧困よりも剥奪の方が健康指標と密接に関わっていることが示唆された。

＜等価所得段階による相対的剥奪得点と剥奪状態該当者割合の相違＞
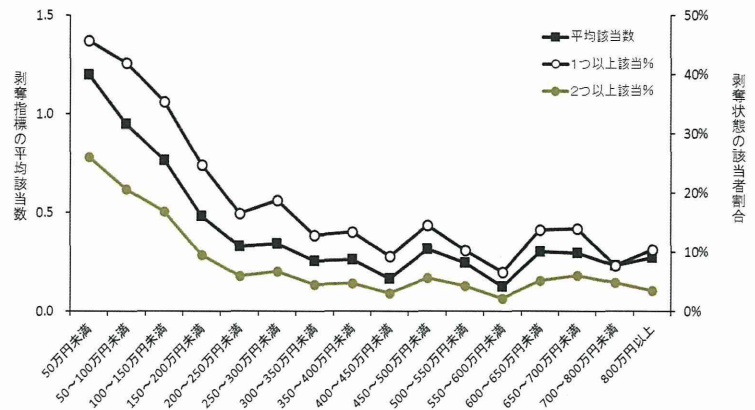
＜サポートの有無による相対的剥奪得点と健康度の相違＞
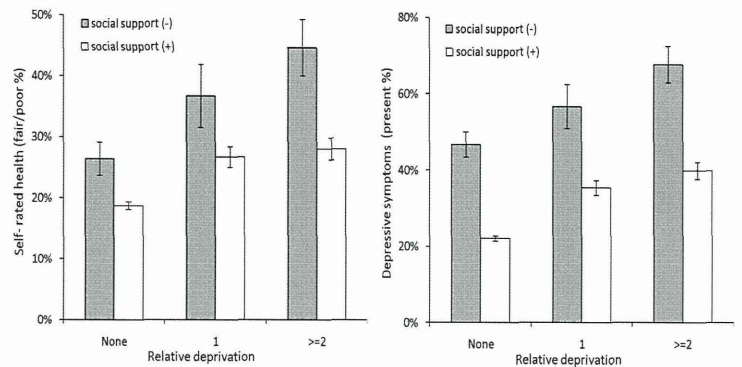
＜結　　論＞

　指標の簡便さからこれまで金銭的指標に基づく相対的貧困が使用されてきたが，貧困政策の文脈だけでなく，健康政策との関連でも物的・環境的な側面など多次元的な生活様式の貧しさから貧困を捉え直す必要があることが示唆された．

学術論文

　Saito Masashige, Kondo Katsunori, Kondo Naoki, Abe Aya, Ojima Toshiyuki, Suzuki Kayo, and the JAGES group (2014) Relative deprivation, poverty, and subjective health; JAGES cross-sectional study. *PLoS ONE*, 9(10): e111169. doi:10.1371/journal.pone.0111169

斉藤雅茂・近藤克則・近藤尚己・尾島俊之・鈴木佳代・阿部彩（2014）高齢者における相対的剥奪の割合と諸特性；JAGES プロジェクトによる横断調査より．*季刊社会保障研究*．50(3)：印刷中（2014 年 12 月予定）

PLOS ONE

Relative Deprivation, Poverty, and Subjective Health: JAGES Cross-Sectional Study

Masashige Saito[1]*, Katsunori Kondo[2], Naoki Kondo[3], Aya Abe[4], Toshiyuki Ojima[5], Kayo Suzuki[6] and the JAGES group[¶]

1 Department of Social Welfare, Nihon Fukushi University, Aichi, Japan, 2 Center for Preventive Medical Science, Chiba University, Chiba, Japan, 3 Department of Health Economics and Epidemiology Research, The University of Tokyo, Tokyo, Japan, 4 Department of Empirical Social Security Research, National Institute of Population and Social Security Research, Tokyo, Japan, 5 Department of Community Health and Preventive Medicine, Hamamatsu University School of Medicine, Shizuoka, Japan, 6 Department of Social Studies, Aichi Gakuin University, Aichi, Japan

Abstract

To evaluate the association between relative deprivation (lacking daily necessities) and subjective health in older Japanese adults, we performed a cross-sectional analysis using data from the Japan Gerontological Evaluation Study (JAGES). The data were obtained from functionally independent residents aged ≥65 years from 24 municipalities in Japan (n = 24,742). Thirteen items in three dimensions were used to evaluate relative deprivation of material conditions. Approximately 28% of older Japanese people indicated that they lacked some daily necessities (non-monetary poverty). A two-level Poisson regression analysis revealed that relative deprivation was associated with poor self-rated health (PR = 1.3–1.5) and depressive symptoms (PR = 1.5–1.8) in both men and women, and these relationships were stronger than those observed in people living in relative poverty (monetary poverty). The interaction effect between relative deprivation and relative poverty was not associated with poor health. As a dimension of the social determinants of health, poverty should be evaluated from a multidimensional approach, capturing not only monetary conditions but also material-based, non-monetary conditions.

Introduction

The association between poverty and health has been established. A number of studies have revealed that relative income poverty is significantly related to poor health [1–3]. However, this approach has limitations when attempting to capture the diverse and complex aspects of poverty. In reality, older people tend to have comparatively high-quality living conditions due to savings and property ownership, even if their income is low [4]. To overcome this limitation, poverty research has proposed the concept of relative deprivation in material conditions to reflect the multidimensional non-monetary aspects of poverty [5–15]. Townsend [5] developed 60 relative deprivation indices within 12 dimensions composed of items such as "Household does not have a refrigerator" and "Has not had a week's holiday away from home in the last 12 months," and found that poverty in the United Kingdom was more extensive than generally believed or officially reported. The Europe 2020 strategy has adopted the concept of relative deprivation as a material dimension of social exclusion and has set the elimination of severe material deprivation as a goal for the next decade [16].

In investigating relationships between poverty and health, some studies have applied a social indicator approach, such as the Carstairs deprivation score or Townsend deprivation index, to include unemployment rate or proportion of non-car ownership. These previous studies found that relatively deprived areas were associated with standardized mortality rates [17–20], cancer mortality rates [21], suicide rates [22], coronary heart disease [23], dental caries [24], number of sound teeth remaining [25], and depression symptoms [26]. However, there have been few studies analyzing the relationship between an individual's relative deprivation and his or her health. Some studies have shown an association between deprivation in living conditions and poor health [14], low levels of satisfaction with life [27], and poor social support [28]. Furthermore, no studies investigating the different associations between relative deprivation, relative poverty, and health have been conducted, although it has been suggested that people who live in relative deprivation have different character-

Table 1. Distribution of control variable.

Variable	Category	Total	Men	Women
Individual (n = 24,742)				
Sex	men	45.9	-	-
	women	54.1	-	-
Age	65–69	25.4	26.9	24.0
	70–74	29.1	29.5	28.7
	75–79	23.3	23.2	23.4
	80–84	14.1	13.5	14.7
	85 -	8.1	6.8	9.2
Education	>9	47.6	51.8	44.1
	=<9	49.9	46.5	52.9
	unknown	2.4	1.7	3.0
Marital status	married	69.0	84.0	56.0
	divorced	22.6	8.6	34.5
	separated	3.2	2.6	3.8
	never married	2.1	1.9	2.3
	unknown	3.1	2.9	3.4
Disease and/or impairment	no	22.4	24.1	20.8
	yes	68.5	67.6	69.3
	unknown	9.1	8.3	9.9
Self recognition of forgetfulness	no	79.3	79.5	79.1
	yes	16.8	16.5	17.1
	unknown	3.9	4.1	3.8
Social supports	present	85.6	84.4	86.7
	absent	8.1	9.9	6.5
	unknown	6.3	5.7	6.8
Municipality (n = 24)				
Proportion of older people	mean (SD)	24.4 (5.2)	-	-
Population density [1000 p/km²]	mean (SD)	1.70 (1.36)	-	-
Proportion of person receiving public assistance[‰]	mean (SD)	8.5 (10.7)	-	-

doi:10.1371/journal.pone.0111169.t001

istics than those living in relative poverty [9,13,15]. In order to clarify the relationships between poverty and health, it is important to identify the aspects of poverty that are the strongest predictors of health.

In addition, there have been few studies focusing on relative deprivation among older adults [8,15]. Previous studies comparing younger and older people found that both the prevalence and depth of deprivation were more severe in younger people or single parents of working age [4,13,29]. However, from a life course perspective, the impact of relative deprivation on health should be evidenced in older people because the influence of poverty on health may accumulate over time. Finally, with the exception of a study that analyzed 131,335 people in 11 countries [10], most of the previous related research has been conducted on a relatively small scale. Analysis of relative deprivation should be performed with a large sample in order to derive robust findings, as few cases fall into each of the deprivation indices.

The present study posed three research questions: (1) is relative deprivation associated with poor health, even after monetary poverty is controlled for; (2) is the interaction effect between

relative deprivation and relative poverty significantly associated with poor health, and (3) do older people with social support have good health, even if they are relatively deprived? In social psychology and sociology, the concept of relative deprivation has also been used to measure psychosomatic stress related to complaints or dissatisfaction based on comparisons with their reference groups [30–38]. However, our focus on relative deprivation is based on Townsend's definition used in the poverty and social policy research described above.

Methods

Study samples

We used data from the Japan Gerontological Evaluation Study (JAGES), which was cross-sectional in design. JAGES was a postal survey of 112,123 people aged ≥65 who were randomly selected from the older residents of 31 municipalities in Japan. Data were collected from August 2010 to January 2012, with a response rate of 66.3%. For our study, we included 24,742 respondents from 24 municipalities who answered a relative deprivation questionnaire. The average age of the respondents was 74.6 years [standard

Table 2. Distribution of relative deprivation index.

Dimension	Item	Category	n	%	Crude odds ratio (95% CI) self-rated health (1 = fair/poor)	Crude odds ratio (95% CI) depressive symptom (1 = present)
Lack of daily necessities due to economic reasons	no television	no	23,594	97.6	1.00	1.00
		yes (+)	592	2.4	1.47 (1.22–1.77)	2.25 (1.87–2.72)
	no refrigerator	no	23,781	98.3	1.00	1.00
		yes (+)	405	1.7	1.32 (1.05–1.66)	1.67 (1.32–2.11)
	no air conditioner	no	22,823	94.4	1.00	1.00
		yes (+)	1,363	5.6	1.62 (1.44–1.83)	2.23 (1.97–2.52)
	no microwave oven	no	23,315	96.4	1.00	1.00
		yes (+)	871	3.6	1.62 (1.40–1.88)	1.88 (1.61–2.19)
	no water heater	no	23,213	96.0	1.00	1.00
		yes (+)	973	4.0	1.63 (1.41–1.87)	2.14 (1.85–2.48)
Lack in living environment	private WC	yes	22,606	93.5	1.00	1.00
		no (+)	1,580	6.5	1.40 (1.24–1.57)	1.78 (1.58–2.01)
	private kitchen	yes	22,260	92.0	1.00	1.00
		no (+)	1,926	8.0	1.43 (1.29–1.59)	1.79 (1.60–2.00)
	private bathroom	yes	22,153	91.6	1.00	1.00
		no (+)	2,033	8.4	1.40 (1.27–1.56)	1.83 (1.64–2.04)
	dining room separated from bedroom	yes	20,585	85.1	1.00	1.00
		no (+)	3,601	14.9	1.48 (1.37–1.61)	1.81 (1.67–1.97)
Lack of social life due to economic reasons	no telephone	no	23,229	96.0	1.00	1.00
		yes (+)	957	4.0	1.52 (1.32–1.76)	2.25 (1.94–2.60)
	no ceremonial dress	no	23,644	97.8	1.00	1.00
		yes (+)	542	2.2	1.53 (1.27–1.85)	1.92 (1.58–2.34)
	absence from relative's ceremonial occasions	no	21,952	93.4	1.00	1.00
		yes (+)	1,549	6.6	2.47 (2.22–2.76)	3.27 (2.91–3.67)
	cut-off of essential services in the past year	no	23,509	98.4	1.00	1.00
		yes (+)	388	1.6	2.09 (1.70–2.59)	4.10 (3.27–5.14)
Number of relative deprivation index		none	16,812	72.0	1.00	1.00
		1	3349	14.3	1.61 (1.48–1.75)	1.93 (1.77–2.10)
		2	916	3.9	2.01 (1.74–2.32)	2.68 (2.31–3.12)
		3	480	2.1	2.04 (1.67–2.48)	2.89 (2.36–3.52)
		4	1109	4.8	1.61 (1.40–1.85)	2.04 (1.77–2.36)
		5	271	1.2	2.30 (1.77–2.98)	3.49 (2.66–4.58)
		>=6	401	1.7	1.75 (1.40–2.19)	2.92 (2.33–3.67)
		>=2	3177	13.6	1.86 (1.70–2.02)	2.57 (2.35–2.81)

(+) is related to relative deprivation.
doi:10.1371/journal.pone.0111169.t002

deviation (SD) = 6.4] and 54.1% were women. Our study protocol and questionnaire procedures were approved by the Ethics Committee in Research of Human Subjects at Nihon Fukushi University. Written informed consent was assumed with voluntary return of the questionnaire.

Dependent variables

We used self-rated health and depressive symptoms as indicators of subjective health. Self-rated health and depressive symptoms have been found to be highly valid predictors of mortality, regardless of other medical, behavioral, or psychosocial factors [39,40]. Self-rated health was measured using the question "How do you feel about your current health status: excellent, good, fair, or poor?" Responses were recoded into dichotomous response variables (excellent/good or fair/poor). Depressive symptoms were assessed using the short version of the Geriatric Depression Scale (GDS-15), which was developed for self-administration in the community using a simple yes/no format [41,42]. The validity and

— 193 —

Table 3. Combination of relative deprivation and poverty.

	n (%)	Self-rated health		Depressive symptom	
		fair/poor %	Crude OR (95%CI)	present %	Crude OR (95%CI)
No deprivation or poverty	10,241 (53.7)	16.9	1.00	21.0	1.00
Poverty only	3,987 (20.9)	23.3	1.50 (1.37–1.64)	29.0	1.54 (1.41–1.68)
Deprivation only (= 1)	1,334 (7.0)	23.1	1.48 (1.29–1.70)	32.1	1.78 (1.56–2.03)
Deprivation only (>=2)	893 (4.7)	25.4	1.68 (1.43–1.97)	36.4	2.16 (1.85–2.52)
Poverty and deprivation (= 1)	1,305 (6.8)	31.4	2.26 (1.98–2.57)	43.2	2.86 (2.51–3.26)
Poverty and deprivation (>=2)	1,300 (6.8)	33.8	2.51 (2.21–2.86)	48.4	3.53 (3.10–4.02)

doi:10.1371/journal.pone.0111169.t003

reliability of this scale have also been confirmed for Japanese older people, and it is often used in Japanese surveys [43,44]. According to Sheikh et al. [42], scores of ≥ 5 on the GDS-15 indicated the presence of depressive symptoms of mild to severe depression. Our data showed approximately 30% of respondents had depressive symptoms. It is consistent with preceding Japanese studies [43,44].

Independent variables: relative deprivation and relative poverty

The indicators of relative deprivation used in preceding studies differ, because the standard living condition or decent life varies by culture and times. In reference to preceding research including Japanese studies [5–8,10–12,14], we evaluated thirteen indices that equated "lack of daily necessities," "lack of living environment," and "lack of social life due to economic reasons" with a low standard of living. Although lack of access to medical and health care services is another important element of standard of living, this was excluded from our deprivation indices because we assumed it to be directly reflected in poor health. On the other hand, we included experience of cutoff of essential services as a typical condition of lacking decent life, which is also used as a measure of social exclusion in a Japanese study [45].

Indicators of "lack of daily necessities" included having no television, refrigerator, air conditioner, microwave oven, or water heater. "Lack of living environment" indicators included having no private toilet, kitchen, or bathroom in the house and having a dining room that was not separate from the bedroom. "Lack of social life due to economic reasons" indicators included having no telephone or formal dress, being absent from family celebrations and events during the previous year due to economic reasons, and having essential services such as water, electricity or gas, cut off in the previous year (except in cases of forgetting to make a payment).

Relative poverty was defined as an income of less than half of the median annual equivalent income in the National Survey of Family Income and Expenditure in Japan [46]; the threshold was 1.49 million Japanese yen. This is the definition of relative poverty accepted by the Organisation for Economic Co-operation and Development and is conceptually based on the relative approach of the Luxembourg Income Study [47]. We used annual pre-tax household income. For each response, we calculated the equivalent household income by dividing income by the square root of the number of household members. Responses were categorized

into three groups: poverty (28.2%), non-poverty (51.7%), and unknown (20.1%).

Covariates

We used several control variables at the individual level: sex, age, educational attainment (to represent ascribed and achieved statuses), medical treatment (to represent recent physical condition), self-recognition of forgetfulness (to represent prodrome of dementia), and social support (to represent a buffer between poverty and health). Medical treatment was determined by asking "Are you currently receiving any medical treatment?" Self-recognition of forgetfulness was measured by asking "Do people around you notice your forgetfulness, for example, by telling you that you often ask the same thing?" Social support was measured using two questions representing emotional and institutional support: "Do you have someone who listens to your concerns and complaints?" and "Do you have someone who looks after you when you are sick and have to stay in bed for a few days?" Responses of "no" or "nobody" to both questions indicated an absence of social support.

In our data set, individuals were nested within each municipality. Previous studies reported significant associations between individual health and regional characteristics such as social capital and income inequality [48,49]. We used the proportion of older people residing in the area (%), population density in inhabitable areas (1,000 person/km2), and the proportion of persons receiving public assistance (‰) for characteristics at the municipal level. These variables were based on 2010 census and government data for Japan. The distribution of these variables is shown is Table 1.

Statistical analysis

First, we confirmed the distribution of the relative deprivation index and calculated crude odds ratios for subjective health. Second, we applied two-level Poisson regression analysis of random-intercept and fixed-slope models to assess the relationship between relative deprivation and self-rated health and depressive symptoms, adjusting for individual factors and municipal-level covariates (level 1: 24,742 individuals, level 2: 24 municipalities). We adopted multilevel modeling in order to control for intraclass (municipal level) cluster correlation. We also examined the interaction effect of relative deprivation and relative poverty. Individual and municipality fixed parameters were converted to prevalence ratios (PR) with a 95% confidence interval (95%CI).

— 194 —

Table 4. Association of subjective health and relative deprivation by two-level Poisson regression analysis[a].

	Self-rated health (fair/poor)				Depressive symptom (present)			
	Men		Women		Men		Women	
	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)
FIXED EFFECTS								
Individual level								
Age (ref.: 65–69)								
70–74	1.06	(0.94–1.19)	1.09	(0.97–1.23)	0.92	(0.83–1.02)	1.00	(0.90–1.11)
75–79	1.24***	(1.11–1.40)	1.29***	(1.15–1.46)	1.03	(0.93–1.15)	0.98	(0.88–1.10)
80–84	1.31***	(1.15–1.49)	1.49***	(1.31–1.70)	0.95	(0.84–1.08)	1.02	(0.90–1.15)
85 -	1.23*	(1.05–1.45)	1.54***	(1.33–1.79)	0.95	(0.81–1.13)	1.15*	(1.00–1.33)
Education (ref.: >9 years)								
=<9 years	1.07	(0.98–1.16)	1.19***	(1.09–1.29)	1.16***	(1.07–1.25)	1.09*	(1.01–1.18)
Marital status (ref.: married)								
divorced	0.99	(0.86–1.13)	0.83***	(0.76–0.90)	1.23**	(1.09–1.39)	1.03	(0.95–1.12)
separated	1.22	(0.99–1.51)	0.91	(0.75–1.10)	1.37**	(1.14–1.65)	1.10	(0.92–1.31)
never married	1.17	(0.90–1.53)	0.92	(0.72–1.19)	1.29*	(1.03–1.62)	0.98	(0.77–1.26)
Disease and/or impairment (ref.: no)								
yes	4.76***	(4.05–5.60)	3.90***	(3.34–4.56)	1.33***	(1.21–1.46)	1.28***	(1.16–1.41)
Self recognition of forgetfulness (ref.: no)								
yes	1.47***	(1.34–1.61)	1.65***	(1.52–1.79)	1.71***	(1.57–1.86)	1.83***	(1.69–1.98)
Social supports (ref.: present)								
absent	1.37***	(1.21–1.54)	1.58***	(1.39–1.79)	1.57***	(1.41–1.75)	1.84***	(1.64–2.07)
Relative poverty (ref.: non-poverty)								
poverty (< ¥ 1.49 million)	1.25***	(1.11–1.40)	1.13*	(1.01–1.26)	1.34***	(1.20–1.50)	1.24***	(1.11–1.37)
Relative deprivation score (ref.: none)								
1	1.19*	(1.03–1.37)	1.31***	(1.15–1.50)	1.45***	(1.27–1.65)	1.36***	(1.19–1.55)
>=2	1.34***	(1.16–1.54)	1.27**	(1.10–1.46)	1.62***	(1.42–1.85)	1.43***	(1.25–1.64)
Interaction Effect								
poverty×deprivation (1)	1.08	(0.87–1.34)	0.95	(0.78–1.17)	1.03	(0.84–1.26)	1.00	(0.82–1.22)
poverty×deprivation (>=2)	1.01	(0.82–1.25)	1.06	(0.86–1.31)	0.94	(0.77–1.14)	1.01	(0.82–1.23)
Municipal level								
Proportion of older people [1%]	1.00	(0.99–1.01)	0.99	(0.98–1.00)	1.01*	(1.00–1.02)	1.02**	(1.01–1.03)
Population density [1000 p/km²]	0.96**	(0.94–0.99)	0.94***	(0.92–0.97)	1.03*	(1.00–1.06)	1.01	(0.99–1.04)
Prop. of receiving public assistance [5‰]	1.03*	(1.00–1.06)	1.04**	(1.01–1.07)	0.96**	(0.93–0.99)	0.95**	(0.93–0.98)

Table 4. Cont.

	Self-rated health (fair/poor)				Depressive symptom (present)			
	Men		Women		Men		Women	
	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)
RANDOM EFFECTS[b]								
Municipality level variance (standard error)	.039 (.050)		.046 (.042)		.045 (.031)		.035 (.031)	

***p<.001 **p<.01 *p<.05 PR: Prevalence ratio.
a)Each estimated coefficient of "unknown" category was omitted in above table.
b)Random effect in null model:
SRH(men) = .147(SE = .034), SRH(women) = .197(SE = .037), GDS(men) = .093(SE = .027), GDS(women) = .101(SE = .026).
doi:10.1371/journal.pone.0111169.t004

Finally, we calculated the proportion of poor health among deprived people with social support. We used the computer software, STATA 12.1 for all analyses.

Results

Table 2 showed that 1.6% to 8.4% of respondents lived in deprived conditions, as defined by the study parameters. A higher percentage of respondents did not have a dining room separate from the bedroom (14.9%). Univariate analysis showed that ORs for respondents living in deprived conditions, according to each relative deprivation index, were approximately 1.3–2.5 times higher for fair/poor self-rated health and 1.7–4.1 times higher for depressive symptoms than respondents who did not live in relative deprivation. In particular, the crude ORs for having essential services cut off and absence from family celebrations and events were relatively high. Relative deprivation scores also showed that respondents who were deprived of one item (14.3%) and two or more items (13.6%) were more likely to report fair/poor self-rated health [OR = 1.61 (95%CI: 1.48–1.75) and OR = 1.86 (95%CI: 1.70–2.02), respectively] and depressive symptoms [OR = 1.93 (95%CI: 1.77–2.10) and OR = 2.57 (95%CI: 2.35–2.81), respectively].

Table 3 shows the associations between subjective health and a combination of relative deprivation and relative poverty. The proportion of respondents with poor health was high with respect to "poverty and deprivation," "deprivation only," "poverty only," and "no deprivation or poverty." Odds ratios for respondents living in poverty and deprivation (two or more deprivation items) were 2.51 (95%CI: 2.21–2.86) and 3.53 (95%CI: 3.10–4.02) times higher for fair/poor self-rated health and depressive symptoms, respectively, than ORs for respondents with no deprivation or poverty.

Table 4 shows the results of a two-level Poisson regression analysis. Random effects showed that municipal-level variance in each model was smaller than that in the null model. This means that part of the municipal-level variance was explained by the individual- and municipal-level variables in the model. Fixed effects showed similar associations for both genders. Respondents with low educational attainment, no social support, under medical treatment, and prodrome of dementia tended to have poor subjective health, although relationships between age and municipal level variables were not consistent.

Relative deprivation was significantly associated with poor health, regardless of the status of relative poverty and other individual- and municipal-level characteristics. In male respondents with two or more deprivation items, rates of fair/poor self-rated health were 1.34 times (95%CI: 1.16–1.54) higher and rates of depressive symptoms were 1.62 times (95%CI: 1.42–1.85) higher than those observed in non-deprived individuals. Similarly, relative deprivation was associated with fair/poor self-rated health [PR = 1.27 (95%CI: 1.10–1.46)] and depressive symptoms [PR = 1.43 (95%CI: 1.25–1.64)] in women. Relative poverty was also related to self-rated health [men: PR = 1.25 (95%CI: 1.11–1.40); women: PR = 1.13 (95%CI: 1.01–1.26)] and depressive symptoms [men: PR = 1.34 (95%CI: 1.20–1.50); women: PR = 1.24 (95%CI: 1.11–1.37)]. The PRs for relative deprivation were comparatively higher than those for relative poverty. The interaction effect between relative poverty and relative deprivation for subjective health was not statistically significant.

Figure 1 shows different associations between subjective health and relative deprivation according to social support. The proportion of respondents with poor health was remarkably lower in those with social support relative to those without. However,
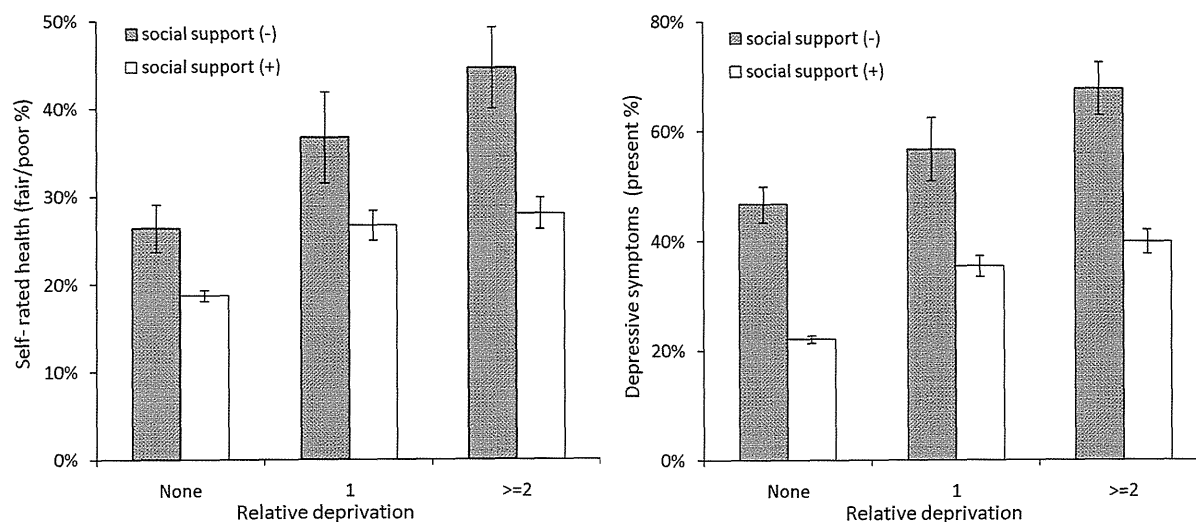
— 196 —

Figure 1. Proportion (95% Confidence Interval) of poor health in relation to relative deprivation and social support. Both figures show a low proportion of poor health in the presence of social support. Meanwhile, the proportion of those with poor health increases as the relative deprivation index score increases even with social support, indicating that social support does not fully cancel out the negative impacts of relative deprivation on health.
doi:10.1371/journal.pone.0111169.g001

relative to non-deprived respondents with any level of social support, the proportions of respondents with poor/fair subjective health were remarkably higher in the relative deprivation groups (1 and ≤2, respectively).

Discussion

It was previously thought that all Japanese people were middle class. However, recent surveys have shown that intergenerational inequality exists in Japan [50], and the number of older people on public assistance is increasing [51]. The World Health Organization stated that poverty and relative deprivation have a major impact on health and premature death [52]. On the other hand, most poverty research has been based solely on the concept of relative poverty (monetary poverty) since data on material and environmental poverty was severely limited in Japan.

The present study addressed the concepts of both relative poverty and relative deprivation through a large survey of older Japanese and analyzed the association between health and relative poverty and deprivation. Our results showed that relative deprivation and relative poverty were related to poor health, even after other variables were controlled for. Our results were consistent with preceding findings; Abe [14] found that relative deprivation is closely associated with poor self-rated health and the presence of depressive symptoms using national Japanese representative cross-sectional data of participants aged ≥20 years. In particular, our results suggest that the concept of relative deprivation could address a different aspect of poverty that is related to health but is not addressed by the concept of relative poverty. People who have overlapping multidimensional disadvantages are more likely to be socially excluded [9] and to experience premature death [53]. Our results also showed that the negative effects of relative poverty and deprivation on health are additive; people with both relative deprivation and poverty were more disadvantaged with respect to health, but the relationship was not multiplicative.

Our study adds new evidence regarding which elements of poverty have strong impacts on the health of older adults. An

important finding is that relative deprivation has a stronger association with subjective health than relative poverty for both sexes. Some studies have revealed that people living in relatively deprived conditions experienced long-term, severe poverty throughout their life course [10,11]. For example, Whelan et al. [10] reported that approximately 40% of persistent income poverty overlapped with lifestyle deprivation in a broadly uniform manner. Consequently, the concept of relative deprivation could capture severe and absolute poverty better than relative poverty, which is based on the distribution of income in society. This could mean that relatively deprived older people might tend to be more disadvantaged, even in good health.

Finally, similar to a preceding study using cross-sectional data from 5,624 women aged 2059 [28], our data confirmed that relative deprivation was associated with the absence of social support [15]. Moreover, our results showed that having social support of any form could mitigate some of the negative impacts of relative deprivation on health. However, it is important to note that even with social support, relatively deprived people have more disadvantages with respect to health than non-deprived people. Therefore, the effects of material and environmental deprivation on poor health cannot be explained only by the absence of social support. As shown in preceding study [30–38], relative deprivation might increase social stresses and anxieties while lowering self-efficacy by depriving a living standard most people in the society enjoy. Furthermore, unlike monetary poverty, poor standard of living such as relative deprivation might closely be related to unhealthy lifestyles including poor eating habit and nutrition and lack of access to healthcare and welfare services.

Compared to relative poverty, which is based on a simple indicator and is often used in international comparative studies, relative deprivation is composed of complex indicators and has limitations for use in comparative studies. In fact, most preceding studies have applied a consensual approach based on public opinion in creating and selecting daily necessities and basic needs indices [4,6,7,10,12–14]. As a result, each relative deprivation indicator was different among preceding studies, although they often reflected the characteristics of that nation and culture.

However, relative deprivation could more accurately represent the phenomenon of poverty due to multidimensional living conditions than it does relative poverty. Although measurements of relative deprivation have been made in order to establish the poverty line, our results suggest that relative deprivation is also important for public health policy as it represents a dimension of the social determinants of health.

Study limitations

The present study has some limitations. First, our relative deprivation indicators did not cover the full range of daily resources among older people in Japan. Although we included indicators used in preceding studies, the indicators should be more sophisticated. Second, while the overall response rate for our data was relatively high, the response rates among the lower income categories were comparatively lower [54]. Therefore, our findings may be underestimated because people living in serious poverty and deprivation may have been less likely to participate in our survey. Third, there is a possibility of selection bias at the municipal level since our data are not representative of the whole country. On the other hand, our subjects were randomly selected in each municipality, and it is important to note that we did perform a large-scale survey concerning non-monetary poverty among older people in more than one municipality. Further research should include longitudinal surveys to reveal whether a causal relationship between relative deprivation and health exits.

Conclusion

Relative deprivation (non-monetary poverty) is an important element in poverty. To the best of our knowledge, this is the first study to investigate the association between health conditions and relative deprivation and poverty among older Asian adults. The

results showed that relative deprivation has stronger associations with self-rated health and depressive symptoms than with relative poverty. There was an independent and additive association between relative deprivation and poverty with respect to subjective health, and the presence of social support may not fully mitigate the negative association between relative deprivation and health. Our results suggest that relative deprivation is one social determinant of health that the concept of relative poverty cannot address.

Author Contributions

Conceived and designed the experiments: MS NK KK. Performed the experiments: KK the JAGES group. Analyzed the data: MS. Contributed to the writing of the manuscript: MS KK NK AA TO KS.

References

1. Lynch J, Kaplan G (2000) Socioeconomic position. In: Berkman LF, Kawachi I, editors. *Social epidemiology*. New York: Oxford University Press, 13–35.
2. Claussen B, Davey Smith G, Thelle D (2003) Impact of childhood and adulthood socio-economic position on cause specific mortality: the Oslo Mortality Study. Journal of Epidemiology and Community Health, 2003, 57: 40–45.
3. Shaw M, Dorling D, Davey Smith G (2006) Poverty, social exclusion, and minorities. In: Marmot M, Wilkinson R, editors. *Social determinants of health; second edition*. New York: Oxford university press, 196–223.
4. Abe A (2006) Empirical analysis of relative deprivation in Japan using Japanese micro-data. The Journal of Social Policy and Labor Studies (Shakai-seisaku Gakkai Shi). 16: 251–275 (in Japanese with English abstract).
5. Townsend P (1979) *Poverty in the United Kingdom; a survey of household resources and standards of living*. Harmondsworth: Penguin Books.
6. Mack J, Lansley S (1985) *Poor Britain. London*, George Allen and Unwin.
7. Gordon D, Adelman L, Ashworth K, Bradshaw J, Levitas R, et al. (2000) *Poverty and social exclusion in Britain*. Rowntree Foundation.
8. Hiraoka K (2002) *Social inequalities among elderly people in Japan*. Tokyo: University of Tokyo Press. (in Japanese).
9. Bradshaw J, Finch N (2003) Overlaps in dimensions of poverty. Journal of Social Policy, 32(4): 513–525.
10. Whelan CT, Layte R, Maitre B (2003) Persistent income poverty and deprivation in the European Union; an analysis of first three waves of the European Community Household Panel. International Social Policy, 32(1): 1–18.
11. Iwata M, Hamamoto C (2004) Experience of poverty in deflationary depression. In: Higuchi Y, Ota K, the institute for research on household economics, editors. *Women in Heisei depression (Jyosei tachi no Heisei fukyo)*. Nikkei INC, 203–233. (in Japanese).
12. Saunders P (2008) Measuring well-being using non-monetary indicators; deprivation and social exclusion. Family Matters, 78: 8–17.
13. Saunders P, Abe A (2010) Poverty and deprivation in young and old: a comparative study of Australia and Japan. Poverty & Public Policy, 2(1): 67–97.
14. Abe A (2014). Constructing a deprivation scale for Japan; an index to supplement the relative poverty rate. the Quarterly of Social Security Research. 49(4): 360–371. (in Japanese).

15. Saito M, Kondo K, Kondo N, Ojima T, Suzuki K, et al. (2014) Prevalence and characteristics of relative deprivation among older people; from cross-sectional data in JAGES project. the Quarterly of Social Security Research. 50(3): in press. (in Japanese).
16. European Commission (2011) *The social dimension of the Europe 2020 strategy; A report of the social protection committee*. Directorate-General for Employment, Social Affairs and Inclusion.
17. Eames M, Ben-Shlomo Y, Marmot MG (1993) Social deprivation and premature mortality: regional comparison across England. British Medical Journal, 307(6912), 1097–1102.
18. Mac Loon P, Boddy FA (1994) Deprivation and mortality in Scotland, 1981 and 1991. British Medical Journal, 309(6967): 1465–1470.
19. Langford IH, Bentham G (1996) Regional variations in mortality rates in England and Wales: an analysis using multilevel modeling. Social Science & Medicine, 42(6): 897–908.
20. O'Reilly D (2002) Standard indicators of deprivation; Do they disadvantage older people? Age and Ageing, 31(3): 197–202.
21. Nakaya T (2011) Evaluation socio-economic inequalities in cancer mortality by using areal statistics in Japan: a note on the relation between municipal cancer mortality and areal deprivation index. Proceedings of Institute of Statistical Mathematics. 59(2): 239–265. (in Japanese with English abstract).
22. Mac Loon P (1996) Suicide and deprivation in Scotland. British Medical Journal. 312(7030): 543–544.
23. Lawlor DA, Davey Smith G, Patel R, Ebrahim S (2005) Life-course socioeconomic position, area deprivation, and coronary heart disease; findings from the British Women's Heart and Health Study. American Journal of Public Health. 95(1): 91–97.
24. Ellwood RP, Davies GM, Worthington HV, Blinkhorn AS, Taylor GO, et al. (2004) Relationship between area deprivation and the anticaries benefit of an oral health programme providing free fluoride toothpaste to young children. Community Dentistry and Oral Epidemiology, 32(3): 159–165.
25. Bower E, Gulliford M, Steele J, Newton T (2007) Area deprivation and oral health in Scottish adults: a multilevel study. Community Dentistry and Oral Epidemiology, 35(2): 118–129.
26. Walters K, Breeze E, Wilkinson P, Price GM, Bulpitt CJ, et al. (2004) Local area deprivation and urban-rural differences in anxiety and depression among people

— 198 —

older than 75 years in Britain. American Journal of Public Health. 94(10): 1768–1774.

27. Carp FM, Carp A (1981) Age, deprivation, and personal competence; effects on satisfaction. Research on Aging. 3(3): 279–298.

28. Sacker A, Bartley M, Firth D, Fitzpatrick R (2001) Dimensions of social inequality in the health of women in England: occupational, material and behavioral pathways. Social Science and Medicine, 52(5): 763–781.

29. Golant S, La Greca A (1995) The relative deprivation of U.S. elderly households as judged by their housing problems. Journal of Gerontology, 50B(1): S13–S23.

30. Stouffer SA, Suchman EA, Devinney LC, Star SA, Williams RM (1949) *The American Soldier. Volume I.: Adjustment During Army Life.* Princeton University Press.

31. Runciman WG (1966) *Relative deprivation and social justice: a study of attitudes to social inequality in twentieth century England.* London: Routledge & Kegan Paul.

32. Scase R (1974) Relative deprivation: a comparison of English and Swedish manual workers. Wedderburn.D (eds) *Poverty, inequality, and class structure.* London: Syndics of cambridge university press. 197–216.

33. Crosby FJ (1982) *Relative deprivation and working women.* New York: Oxford University Press.

34. Kosaka K (1986) A model of relative deprivation. Journal of Mathematical Sociology, 12(1): 35–48.

35. Turley RNL (2002) Is relative deprivation beneficial? the effects of richer and poorer neighbors on children's outcomes. Journal of Community Psychology, 30(6): 671–686.

36. Walker I, Smith HJ (2002) *Relative deprivation: specification, development, and integration.* Cambridge: Cambridge University Press.

37. Tougas F, Lagace M, Sablonniere R, Kocum L (2004) A new approach to the link between identity and relative deprivation in the perspective of ageism and retirement. International Journal of Aging and Human Development, 59(1): 1–23.

38. Kondo N, Kawachi I, Hirai H, Kondo K, Subramanian SV, et al. (2009b) Relative deprivation and incident functional disability among older Japanese women and men: prospective cohort study. Journal of Epidemiology & Community Health, 63(6): 461–467.

39. Idler EL, Benyamini Y (1997) Self-rated health and mortality: a review of twenty-seven community studies. Journal of Health Social Behaviour, 38(1): 21–37.

40. Royall DR, Schillerstrom JE, Piper PK, Chiodo LK (2007) Depression and mortality in elders referred for geriatric psychiatry consultation. Journal of the American Medical Directors Association, 8(5): 318–321.

41. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, et al. (1983) Development and validation of a geriatric depression screening scale: A preliminary report. Journal of Psychiatric Research, 17: 37–49.

42. Sheikh JI, Yesavage JA (1986) Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. Clinical Gerontologist, 5: 165–173.

43. Murata C, Saito Y, Kondo K, Hirai H (2011) Social support and depression among community living older people. Japanese Journal of Gerontology, 33(1): 15–21. (in Japanese with English abstract).

44. Watanabe M, Imagawa T (2013) Factor structure of short form of the geriatric depression scale (GDS): reliability, validity and cutoff points. the Japanese Journal of Personality, 22(2): 193–197. (in Japanese with English abstract).

45. Abe A (2007) Measuring Social Exclusion in Japan. the Quarterly of Social Security Research. 43(1): 27–40. (in Japanese).

46. Ministry of internal affairs and communications (2009) National Survey of Family Income and Expenditure. (in Japanese). (http://www.stat.go.jp/data/zensho/2009/index.htm. Accessed 2014 Oct 3.).

47. Förster MF (1994) Measurement of low incomes and poverty. OECD labour market and social policy occasional papers, no. 14. doi:10.1787/112854878327.

48. Ichida Y, Kondo K, Hirai H, Hanibuchi T, Yoshikawa G, et al. (2009) Social capital, income inequality and self-rated health in Chita peninsula, Japan: a multilevel analysis of older people in 25 communities. Social Science & Medicine, 69(4): 489–499.

49. Aida J, Hanibuchi T, Nakade M, Hirai H, Osaka K, et al. (2009) The different effects of vertical social capital and horizontal social capital on dental status; A multilevel analysis. Social Science & Medicine, 69(4): 512–518.

50. Krueger KG, Abraham KG, Shapiro C (2012) *Economic report of the president, transmitted to the congress February 2012; together with the annual report of the council of economic advisors.* United States government printing office.

51. National Institute of Population and Social Security Research (2013) *Japanese public statistics data base concerning public assistance* (in Japanese). (http://www.ipss.go.jp/s-info/j/seiho/seiho.asp. Accessed 2014 Oct 3.).

52. Wilkinson R, Marmot M (2003) Social determinants of health: The solid facts (2nd ed.). WHO Regional Office for Europe.

53. Saito M, Kondo N, Kondo K, Ojima T, Hirai H (2012) Gender differences on the impacts of social exclusion on mortality among older Japanese: AGES cohort study. Social Science and Medicine, 75(5): 940–945.

54. Kondo K (2010) *Health inequalities in Japan: An empirical study of the older people.* Melbourne: Trans Pacific Press.

— 199 —

投稿（論文）

高齢者における相対的剥奪の割合と諸特性
～JAGESプロジェクト横断調査より～

斉　藤　雅　茂・近　藤　克　則・近　藤　尚　己
尾　島　俊　之・鈴　木　佳　代・阿　部　　　彩

I　はじめに

1　研究の背景

近年，貧困者ないし生活困窮者対策は日本でも大きく取り上げられており，社会保障制度改革に際しても重要な論点の1つになっている。かつて日本は一億総中流社会ともいわれたが，年間所得のジニ係数は1980年代から上昇し，2000年代以降そのままほぼ横ばいで推移している。24～34歳の有配偶女性306名を8年間追跡した研究〔浜田2006〕では，所得階層および貧困の固定化が示されているほか，日本の格差の固定化は国際的にみて中等度であるとも報告されている〔Krueger et al. 2012〕。とりわけ，高齢期は他の年齢階層と比べて，所得格差が大きい〔大竹2005〕だけでなく，被保護世帯が多く〔国立社会保障・人口問題研究所2013〕，相対的貧困率も高いこと〔内閣府男女共同参画会議2011a〕，なかでも75歳以上・単身世帯・女性の間での貧困率が顕著に高いことが既に報告されている〔江口ら1974;山田ら2011〕。

他方で，これまでの国内における多くの研究は，利用可能なデータの制約から，貧困の事象のなかでも当該社会における相対的な所得や消費の乏しさに基づく相対的貧困（relative poverty）を扱っている。しかし，貨幣的な指標のみに着目するアプローチでは，複雑化・多様化した現代社会の貧困現象を十分に捉えることは困難であり〔平岡2001〕，とくに高齢期は，所得が低くても現役時代からの貯蓄や財産によって高い生活水準を保つことができる場合がある〔阿部2006〕。そうした批判に対応するものとして，所得や消費といったデータからは捉えることのできない多次元的な生活様式の貧しさに基づく相対的剥奪（relative deprivation）という概念がある。欧州連合（EU）では，この相対的剥奪概念が社会政策の実践にも取り入れられ，「欧州2020戦略」において貧困の削減目標の一つとして採択されている〔European Commission 2011〕。

相対的剥奪とは「所属する社会で慣習になっている，あるいは少なくとも広く奨励または是認されている種類の食事をとったり，社会的諸活動に参加したり，あるいは生活の必要諸条件や快適さを得るために必要な生活資源を欠いている状態〔Townsend 1979, p31〕」と定義されている。Townsend（1979）は，食生活や家庭用品，住環境など12分野60項目から相対的剥奪を把握し，従来よりも広範に貧困者が存在していることを明らかにしている。この点で，国内では一部，住居・健康・経済の観点から生活階層を析出した研究〔松崎1986〕もあるが，生活様式の貧しさに基づいて貧困層を分析した研究の蓄積は非常に限られている。

なお，相対的剥奪という概念には，社会心理学や社会学において準拠集団の相違による相対的な不満を説明するものとして使用されてきた系譜もある。主観的・客観的なアプローチによる検討が国内外で継続的に発表されている〔Stouffer et al 1949;Runciman 1966;Scase 1974;Crosby 1982;Kosaka 1986;Turley 2002;Walker

et al. 2002;Tougas et al. 2004;Kondo et al. 2009〕が，上記の貧困や社会政策との関連で言及される相対的剥奪とは主たる関心が異なるものである。また，貧困研究における相対的剥奪のなかでも，当該地域の失業率や自動車の保有率などを用いた社会指標アプローチもあるが，本研究では個人レベルの相対的剥奪に着目する。

2 先行研究の主要な知見と課題

第1に，相対的剥奪者の割合に関しては，分析対象者の1～2割前後であることが報告されている〔Mack et al. 1985;Gordon 2000;岩田ら2004;阿部2006;Saunders 2008〕。たとえば，1983年にイギリスで行われたBreadline Britain調査では26の剥奪指標のうち3つ以上該当者が12％になること〔Mack et al. 1985〕，国内では全国20歳以上の男女1,520名を分析した研究〔阿部2006〕において，社会的必需項目に1つでも欠けている群が21％，2つ以上欠けている群が14％であることが報告されている。このほか，ホームレス経験者116名を分析した研究では，ホームレス状態を解消して生活保護を受給した後も7割が複数の剥奪項目を経験していること〔山田2013〕なども報告されている。しかし，ドイツ・デンマーク・オランダなど11カ国13万人を分析した研究〔Whelan et al. 2003〕など一部を除き，多くの先行研究における分析対象のサンプルサイズは大きくないという課題がある。個々の剥奪指標への該当者が極めて少数であることを考慮すると，一定のサンプルサイズに基づいた分析が必要である。また，蓄積された資産の影響から若年者よりも高齢者の間では相対的剥奪者が少ない〔Golant et al. 1995;阿部2006〕ともいわれているが，高齢者に焦点をあてた分析が極めて少ないという課題もある。他の年齢階層よりも所得格差が大きく，相対的貧困率も高い高齢期において，剥奪状態にある人々がどの程度存在するのかは，日本の社会保障研究においても検討すべき課題の一つと考えられる。

第2に，相対的剥奪と所得との関連については，相対的剥奪状態にある人々の所得水準が当該社会の貧困線になりうるという発想から，Townsend (1979) は，剥奪スコアが急激に上昇する所得の閾値を発見している。この点に関しては，一部，国内でも類似の結果が得られており，若年を含むデータにおいて世帯所得が400～500万円以下であると剥奪状態へのリスクが高まるという知見が報告されている〔阿部2006〕。また，閾値には言及していないが，東京都23区内の高齢者を分析した研究では，配偶者がいる高齢者世帯において夫婦の年収が225万円未満の群において，他の所得階層よりも相対的剥奪の割合が高くなるという結果も報告されている〔平岡2002〕。しかしながら，少なくとも日本における相対的剥奪と所得との関連を扱った研究自体が非常に限られている。相対的剥奪という概念を踏まえた場合に，日本社会において，どの程度の所得水準からが貧困層と考えられるのかは政策的にも重要な示唆を与えるものであり，多様なデータから検証されるべき課題といえる。

第3に，相対的剥奪に該当する人々の諸特性に関しては，高齢者に限定すると年齢は有意な関連がない〔平岡2002〕ほか，低学歴〔平岡2002〕や離別経験や配偶者の不在〔平岡2002;Whelan et al. 2003;阿部2006〕が関連していることが報告されている。また，相対的剥奪は，ソーシャル・サポートの乏しさ〔Sacker et al. 2001〕とも関連し，健康の社会的決定要因の一つである〔Wilkinson 2003〕といわれている。とくに，地域単位での剥奪に着目した研究では，剥奪水準の高い地域では抑うつ傾向の高齢者が多く〔Walters et al. 2004〕，がん死亡率〔中谷2011〕や早期死亡率〔Eames et al. 1993;Langford et al. 1996;O'Reilly 2002〕が高いといった知見も報告されている。以上のように，相対的貧困と同様に，相対的剥奪にはライフコースを通じた社会経済的地位や健康状態などが関連していることがいくつかの研究で報告されているが，相対的剥奪者と相対的貧困者の相違については必ずしも十分に検討されていない。所得の分布に基づく相対的貧困が貧困層の一部しか捉えていないとすれば，従来の相対的貧困と合わせて，物的・環境的な生活様式の貧しさに基づく相対的剥奪という概念で把握される高齢者

にどういった特性があるのかについても改めて検討する必要がある。

　そこで，本研究では，2万人を超える高齢者の横断調査の結果に基づいて，国内において一般的な生活様式を剥奪されている状態と考えられる高齢者がどの程度存在するのか，どの程度の所得水準以下になると相対的剥奪へのリスクが高まるのか，また相対的剥奪に陥っている高齢者は基本属性と社会経済的地位，健康度，社会関係などの面から見てどういった人々なのかを検討した。

Ⅱ　方　　法

1　データ

　調査は，2010年8月から2012年1月にかけて，全国12都道府県31市町村における要介護認定を受けていない65歳以上の高齢者169,215人を対象にして行われた。調査票の配布と回収は郵送法を原則とし，性別ないし年齢が不明を除く112,123人から回答が得られた（有効回収率=66.3％）。31市町村のうち，比較的小規模な16市町村については全数を対象にし（回収数:50,013人），他の大規模な市町村については1/2から1/20の無作為抽出により対象者を抽出した（回収数:62,110人）。調査票はコア項目と複数のオプション項目から構成されており，ここでは相対的剥奪に関するオプション項目が含まれた特定の調査票に回答した24市町村24,742人について分析した。分析対象者の平均年齢は74.6歳（SD=6.4），女性が54.1％であった。

　なお，本調査は，研究代表者の所属機関における研究倫理審査委員会（人を対象とする研究に関する倫理審査委員会;申請番号10-05）の承認を得て行われた。市町村からのデータ提供に際しては，各市町村と総合研究協定を結び，定められた個人情報取扱特記事項を遵守した。個人情報保護のために氏名を削除し，分析者が個人を特定できないよう配慮した。

2　使用した変数
（1）相対的剥奪
　相対的剥奪の前提となる一般的な生活様式自体

が時代や文化によって変容することもあり，先行研究における相対的剥奪指標は一部重複しているが，必ずしも共通しているわけではない（表1）。本研究では，既存の指標を参考にしたうえで，文化的な背景の相違と調査対象者が高齢者であることを考慮し，日用品，住環境，社会生活，医療受診（保障）という観点から14項目を設定した。その際に，社会的排除の指標〔阿部2007〕の1つでもある経済的理由によるライフラインの停止経験を社会生活における資源欠如の一側面として独自に加えた。なお，食生活に関する項目は，貧困線の検討において古くから使用されてきたが，個人の嗜好が強く反映されることと自記式郵送調査であることを考慮して，本研究の相対的剥奪指標からは除外した。また，貯蓄等の金融資産に関しては，理論的には重要な指標だが，調査実施上の制約から本分析では含められていない。

　日用品については，「テレビ」「冷蔵庫」「冷暖房機」「電子レンジ」「湯沸かし器」のうち，経済的理由や家庭の事情で欲しくても持っていないものがあるかをたずねた。住環境については，「家族専用のトイレ」「家族専用の炊事場」「家族専用の浴室」「寝室と分かれた食事をとる部屋」のうち，回答者の住居にないものを把握した。社会生活に関しては，経済的理由や家庭の事情によって「電話がない」「喪服がない」という項目のほかに，「過去数年間に，祝儀や交通費の負担のために，親戚の冠婚葬祭への出席ができなかったこと」があるか，「過去1年間に，支払いが滞ったために，水道，電気・ガス，電話・携帯電話などのサービスを停止されたこと（うっかり忘れていた場合を除く）」があるかをたずねた。医療受診については，「費用がかかる」ことを理由として「過去1年間に，病気や障害があるにもかかわらず治療を受けなかった，または中断したこと」があるかを把握した。偶然の可能性などを考慮して複数該当したケースのみを剥奪とした研究もある〔Mack 1985;Gordon 2000;平岡2002;岩田2004〕が，相対的剥奪の項目群は，社会生活上の必需リストであるため1項目でも該当すれば剥奪とした研究〔阿部2006〕もある。本研究では，1項目でも該