and independent variables used in our empirical analysis.

Happiness is the dependent variable. It is almost impossible to precisely define happiness, which is multi-dimensional. Similar to numerous previous empirical studies of happiness, in this study we focused on *perceived* happiness that was expressed as a single item based on the survey results of the subjective assessment of happiness. The JGSS asked the respondents to answer the question "How happy are you?" on a five-point scale on which 1 was "happy" and 5 was "not happy." The ratio of the responses in the three-year pooled samples was 30.1%, 33.2%, 30.3%, 5.1%, and 1.3%, thereby indicating that happiness is skewed towards the high end in this survey. Taking into consideration that a very small proportion of respondents selected 4 or 5, we aggregated respondents who chose 3, 4, or 5 into one category, re-categorized the JGSS answers into three categories, and reversed the order as 1 (36.7%), 2 (33.2%), and 3 (30.1%), where 3 represented being happiest.

The Gini coefficient is the most important independent variable, and is one of the most widely-used inequality measures. This coefficient ranges from zero to one, with zero indicating the most equal distribution and one indicating the most unequal distribution. We collected pre-tax household income from the CSLCPHW and, similar to most previous studies, equalized it by dividing it by the root of the number of household members. Thereafter, we calculated the Gini coefficient for each prefecture. Individuals residing in the same prefecture in each survey year were found to have a common Gini coefficient.

In order to capture the association between individual happiness and area-level inequality as precisely as possible, we used various control variables at both the individual and prefecture levels, most of which were collected from the JGSS. At the individual level, household income is one of the key variables that must be controlled for. We included its categorized variables in order to distinguish the effect of area-level inequality from that of the concave relation between household (or individual) income and happiness (Subramainan and Kawachi, 2004). The JGSS asked respondents to select their household annual income for the previous year from among 19 categories. In this study, we equivalized the median value of each category and evaluated it at the 2005 consumer prices. Next, we divided income groups into 6 classes of almost the same size: from income class 1 (lowest—lower than 1.372 million yen) to 6 (highest—higher than 5.5 million yen).

Further, we considered gender at the individual level: males and females; age: "young" (aged 26–39), "middle" (40–59), and "old" (60–80); marital status: "married," "unmarried," and "divorced/widowed"; and level of education: "junior high school or lower," "high school," and "college or higher." In addition, we considered occupational status, which was divided into eight categories: "regular employee" (including management executives), "non-regular employee," "self-employed," "family worker," "unemployed," "retired," "homemaker," and "other." Moreover, we considered the number of children as an explanatory variable, along with its squared value, considering the possibility of its nonlinear associations with happiness. In addition to these widely-used control variables, we included general trust in people as a proxy for social capital, thereby reflecting previous analyses on the association between social capital and happiness (Bjornskov, 2006; Ram, 2009). The JGSS asked respondents whether

he/she believes that most people can be trusted; we ascribed a value of one to those who answered "yes."

With regard to prefecture-level predictors, we first controlled for (log-transformed) prefecture mean income. There is always a correlation between average income level and income inequality, and previous research has occasionally indicated that there is a substantial transformation in the effect of income inequality when average area-level income is controlled for.[1] We also included per capita budget expenditure of the local government and the proportion of people aged 65 and above. Individuals who enjoy higher levels of publicly-provided goods and services are likely to feel happier than others, while the impact of the area-level age structure is generally unknown. In addition, we included indicator variables for 12 area-level blocks—each of which comprised three–six prefectures (except Hokkaido)—in order to control for the unspecified characteristics of a region that is wider than a prefecture as well as the unspecified characteristics for three years in order to control for year-specific factors.

3. Methods

We employed two logit models—Models 1 and 2—for assessing the association between inequality and happiness. Model 1 allocated a value of one ("happy") to the top two categories and 0 ("not happy") to the bottom category; the proportion of "happy" and "not happy" were 63.3% and 36.7%, respectively. Model 2 placed the threshold at a higher level of happiness and allocated one to the top category and 0 to the remaining two categories. In this model, the proportion of "happy" and "not happy" were 30.1% and 69.9%, respectively.

In the estimation of these models, we explicitly took into account the nested structure of the data and used the generalized estimating equation (GEE) method developed by Liang and Zeger (1986), following Alesina et al. (2004) and numerous other empirical studies of the association between inequality and health. We focused on the population-averaged (or marginal) association between prefecture-level inequality and individual happiness, and assumed no correlation among variations of individuals nested within a prefecture.

As will be discussed subsequently, only Model 1 indicated a significant (and negative) coefficient on the Gini coefficient. Therefore, we used Model 1 as a benchmark model and conducted two additional analyses. First, we selected the individual attributes to be controlled for and examined how their choices affect the sensitivity to inequality. Model 1 included all individual attributes as predictors; however, the association with area-level inequality may be concealed by mediating processes at the individual level or artificially enhanced by statistical suppression between individual-level variables and area-level income inequality.

Second, we examined how the sensitivity to inequality differs according to individual attributes. In order to be certain, we included key individual attributes in the list of explanatory variables in the estimation of Model 1; however, the assumption that sensitivity to inequality is the same for all attributes may not hold. In order to explore this problem, we applied two

[1] For example, Blakely, Lochner, and Kawachi (2002) indicated that controlling for average area-level income reduces a negative association between area-level income inequality and individual self-rated health.

methods. First, we added the cross-term(s) between the Gini coefficient and each key individual attribute in Model 1 for the entire sample. For example, in order to examine the significance of area-level inequality for gender, we added the term (Gini × the dummy for female) and examined the significance of its sign and coefficient. Due to the limitations of freedom, we added the cross term(s) for only one of the attributes and estimated a modified Model 1 for each selected attribute. Second, we estimated Model 1 separately for individuals with different attributes and examined how the sensitivity to area-level inequality differs across these attributes. For example, we compared the coefficients on the Gini coefficient estimated separately for males and females. Although these two approaches are rather tentative, a combination of their results can enable the comparison among inequality sensitivities across different individual attributes.

In the abovementioned analyses, we considered eight key individual attributes: gender, age, marital status, educational attainment, occupational status, household income, relation with social capital, and political views. For occupational status, we condensed eight types of occupational status into three categories: regular employees as "stable"; non-regular employees, self-employed persons, family workers, other types of workers, and unemployed people as "unstable"; and retirees and homemakers as "out of labor force."[2] For household income, we condensed 6 income classes into three: "low" (income classes 1 and 2), "middle" (income classes 3 and 4), and "high" (income classes 5 and 6). With respect to political views, the JGSS asked respondents to answer the question, "Where would you place your political views on a five-point scale?" with 1 being conservative and 5 being progressive. We categorized the answers into "conservative" (1 and 2), "neutral" (3), and "progressive" (4 and 5). Political views were not used as explanatory variables in the logit models on account of possible simultaneity between these variables and happiness.

4. Results and discussion

4.1 Descriptive analysis

Before reporting the estimation results of logit models, Table 2 compares the means and standard deviations of happiness by key individual attributes when happiness is scored on the original five-point scale (5 represents being happiest). The following results are obtained with regard to the means of happiness: There is no substantial difference between males and females; middle-aged people are least happy (in other words, happiness is U-shaped over the life cycle. See Blanchflower and Oswald (2008)); married people are happier than others; higher educational attainment makes people happier; people with unstable occupational status are less happy than others; higher income makes people happier; those who trust in people are more happier than others, and politically conservative people are happier than others.

These results are generally reasonable and suggest that inequality sensitivity is affected by

[2] It is questionable whether self-employment, which accounts for 9.4% of the entire sample, must be categorized as unstable. We considered self-employed persons to be unstable because their mean income (3,869 thousand yen) was lower and its standard deviation (2,844 thousand yen) was higher than those of regular employees (4,192 thousand and 2,066 thousand yen, respectively). Even if we categorized self-employment as "stable," the results were not substantially different.

certain individual attributes, which will be examined in subsection 4.4. Caution must be exercised in interpreting any causality from them, particularly for marital status, occupational status, and political views. People may remain married because they are happy, may be unemployed because they are not satisfied with their jobs, and may be politically conservative because they are satisfied with their life.

4.2 Benchmark model estimations

Table 3 summarizes the estimation results of Models 1 and 2. The proportions of "happy" individuals are 63.3% and 30.1% for Models 1 and 2, respectively, with the threshold between "happy" and "not happy" placed at a higher level of happiness in Model 2 as compared with Model 1. In Model 1, the coefficient on the Gini coefficient is negative and significant at the 5% significance level, thereby confirming a negative, albeit modest, association between area-level inequality and happiness. The estimated coefficient on the Gini coefficient (–3.14) indicates that the odds ratio for reporting "happy" (3 or 2) as against "not happy" (1) in response to a one-standard-deviation increase in the Gini coefficient (0.027) is 0.919.[3] This result is significant in that it is obtained even after controlling for household income, which, as expected, is found to be positively associated with happiness.

We also find that married people and those with higher educational attainment are happier than others, while middle-aged individuals are less happy than young and old ones. In addition, general trust, which is treated as a proxy for social capital, makes people happier. These results are in keeping with those from the descriptive analysis reported in Table 2. At the prefectural level, higher spending by the local government increases happiness and a higher proportion of elderly residents reduces it.

In Model 2, the coefficient on the Gini coefficient is negative but not significant, and its absolute value is smaller than that in Model 1. This result indicates that area-level income inequality is more significant at a lower level of individual happiness. Individuals who are less happy due to certain individual or social attributes are more sensitive to area-level inequality. In other words, it may be true that area-level inequality increases the unhappiness of unhappy individuals, while it does not reduce the happiness of happy individuals. Meanwhile, the associations with the covariates are generally the same as those observed in Model 1; however, higher educational attainment reduces happiness and its association with household income is lower than in Model 1.

4.3 Different choices of individual-level covariates

We use Model 1 as a benchmark model; however, there is a danger of over-controlling due to the introduction of too many predictors at the individual level. It is easy to report findings or fail to identify important associations, because it is difficult to assess the dynamics between these individual-level variables and area-level inequality. Hence, it is interesting to examine how the sensitivity to inequality is affected by a choice of individual attributes to be controlled for in Model 1.

More specifically, we controlled for two key attributes—demographics (gender and age)

[3] The 95% confidence interval is calculated as [0.848, 0.996]

and household income (income classes 2–5)—and selected additional controls from among other attributes: family relations (marital status, number of children and its squared value), educational attainment, occupational status, and relations with social capital. Prefecture-level covariates were included. There are 16 sets of individual attributes that are to be controlled for, which also includes the case in which there was no attribute included other than demographics and household income.

Table 4 reports how the coefficient on the Gini coefficient and its p-value are affected by the choice of individual attributes to be controlled for. As is evident from this table, the coefficient on the Gini coefficient varies from –3.14 (with a full set of attributes included) to –2.74 (with no attributes other than the two key attributes included). This implies that the odds ratio for reporting "happy" as against "not happy" in response to a one-standard-deviation increase in the Gini coefficient is in the range of 0.919 and 0.929, which is relatively narrow. It must also be noted that the p-value varies from 3.8%–8.6%, thereby indicating that the Gini coefficient is modestly significant regardless of the choice of individual attributes to be controlled for.

Another interesting result is that the inclusion of social capital, which is the collective attribute of social relations, tends to increase both the sensitivity to inequality and its statistical significance. Kawachi and Berkman (2000) argued that social cohesion and collective social pathways may mediate in the relationship between inequality and health. If this is also the case for happiness, the opposite results would have been obtained, thereby reflecting a close relationship between the Gini coefficient and trust. Although social capital has a positive and significant association with happiness, as is evident from Tables 2 and 3, it does not appear to mediate between inequality and happiness judging by the results presented in Table 4.

4.4 Cross-level interactions and independent estimations

Another significant difficulty in the estimations based on Model 1 is that the estimated inequality sensitivity, which is based on the entire sample, only indicates the average across different attributes. It is likely that individual attributes modify the association between inequality and happiness, or that only a certain portion of the respondents with certain attributes are sensitive to inequality. The left portion of Table 5 compares the coefficients on the Gini coefficient and its cross-term(s) estimated for the entire sample. The right portion of the table compares the coefficients on the Gini coefficient obtained from the independently estimated Model 1 by each category of individual attributes.[4]

There are two results that are commonly observed from the two portions of this table in terms of implication and statistical significance. First, unstable occupational status significantly enhances inequality sensitivity.[5] It is plausible that non-regular employees and

[4] Comparisons of the estimated coefficients on the Gini coefficient do not make sense if the Gini coefficient is distributed differently among categories. In order to verify this, we applied the Kolmogorov-Smirnov tests for each category and the remaining one or two categories in each category group. We found that the null hypothesis that the Gini coefficient is distributed differently between categories cannot be rejected at the 5% significance level for 2 cases: between individuals who graduated from college or higher institutions and others, and between low income-individuals and others.

[5] The coefficient on the cross term with "out of labor force" is also significantly negative; however, the coefficient on the Gini coefficient is positive and insignificant in the independent estimation.

the unemployed, who tend to face more uncertainty regarding employment and income than others, are more cautious with regard to inequality. Another possible explanation is that these individuals tend to believe that mobility in society is low and that they are likely to remain in their current unfavorable status, which causes them to become more negatively affected by inequality.

Second, politically neutral individuals are more sensitive to inequality than others.[6] Alesina et al. (2004) indicated that the poor and left-wingers are sensitive to inequality in Europe, while in the United States, the happiness of these groups is not correlated with inequality. It is difficult to interpret the result from our study in this regard. It is possible to argue against the view that in Japan the association between inequality and happiness is not based on value orientations; however, we cannot rule out the case that political views are not closely related with any value orientations for Japanese people.

Another significant finding is that the independent estimations indicate that females are much more sensitive to inequality than males, although the cross term with females is negative but not significant (p-value = 0.125) in the estimation for the entire sample. This result is consistent with the results from preceding studies of behavioral economics that have indicated that females are more inequality-averse (Selten and Ockenfels 1998; Andreoni and Vesterlund 2001; Dufwenberg and Muren 2006). Given that inequality-aversion is closely linked to risk-aversion, this result is also consistent with the view that females are more risk-averse (Croson and Gneezy, 2009).

It could be argued that the individual's actual position—and thus his/her relative position to others—generally affects inequality sensitivity, given the result with regard to occupational status. However, the results of our estimation are generally mixed. To confirm, Tables 2 and 3 reveal that marital status and household income significantly affect happiness; however, Table 5 does not indicate that they modify the sensitivity to inequality consistently or significantly. The independent estimations indicate that divorced/widowed individuals are much more sensitive to inequality; however, their sample size is too small to provide reliable results and the estimations for the entire sample cannot reject the hypothesis of no difference in the sensitivity across marital status. For household income, five out of six estimated coefficients are not significant and the remaining one (high income in the separate estimations) is significant only at the 10% level.

5. Conclusion

In this study, we examined how area-level income inequality is associated with individual assessment of happiness based on micro data from nationwide surveys in Japan. Our analysis used logit models to confirm that individuals who live in areas of high inequality tend to report themselves as being less happy, even after controlling for various individual and area-level factors. This result is parallel to that obtained in many empirical studies of social epidemiology that observed a negative association between area-level inequality and self-rated health, which

[6] The absolute value of the coefficient on the Gini coefficient is slightly larger for conservative individuals than for the neutral ones in independent estimations; however, the former is not significant.

is one of the key subjective outcomes of individual well-being. The observed association between inequality and happiness observed in this study is also reasonable, considering the close relationship of inequality with happiness and health.[7]

We obtained three additional results. First, any association between inequality and happiness is not uniform across different levels of happiness. We found a significant association between these two factors only when we estimated logit models that placed the threshold of happiness at a relatively low level of happiness. This indicates that unhappy people tend to be more sensitive to inequality than happy people.

Second, the sensitivity to inequality and its statistical significance depends on the choice of individual attributes to be controlled for. However, the estimated value of the sensitivity to inequality sensitivity lies within a relatively narrow range and is modestly significant. These facts confirm that individual attributes do not completely account for the observed association between area-level inequality and individual happiness.

Third, the sensitivity to inequality differs substantially according to certain individual attributes. The most important implication for social policy is that those of unstable occupational status are more sensitive to inequality. Given the fact that they tend to be less happy than others, this result indicates the risk that inequality further reduces the well-being of those experiencing unfavorable employment conditions.

We recognize that this analysis has various limitations. Most importantly, it deals with happiness only as a single item based on the survey results of its subjective assessment. Given the multi-dimensional feature of happiness, the validity of perceived happiness observed from surveys must be addressed further. Second, as is often the case with a analysis of this type, pathways or a mediation process from area-level inequality with respect to happiness at an individual level must be investigated further. Third, we disregarded the possibility that perceived happiness changes individual characteristics, which we assumed to be exogenous. These issues must be researched in the future.

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[7] For example, Perneger, Hudelson, and Bovier (2004) reported that healthier individuals tend to feel happier, while Pettit and Kline (2001) indicated that a better assessment of happiness can lead to a higher level of self-rated health.

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Table 1. Selected descriptive statistics (pooled data for 2000, 2003, 2006)

		Mean	S.D.	Min.	Max.
(1) Prefecture-level variables: N = 141 (47 prefectures × 3 years, not weighted)					
Gini coefficient		0.370	0.027	0.308	0.436
Mean household income (million yen)[a]		3.104	0.496	1.677	4.437
Per capita budget expenditure (million yen)[b]		0.451	0.128	0.195	0.873
Proportion of people aged 65 and above (%)		20.8	3.1	12.8	27.6
(2) Individual-level variables: N = 4,393 (1,833 in 2000; 1,221 in 2003; 1,339 in 2006)					
Household income (thousand yen)[a]		3,673	2,527	0	32,200
Age		53.0	14.2	26	80
Number of children		1.85	1.07	0	10
Categorical variables		Percentage			
Gender	Males	49.4	(reference)[d]		
	Females	50.6			
Age group	Young (aged 26-39)	21.8			
	Middle (aged 40-59)	41.7	(reference)		
	Old (aged 60-80)	36.5			
Marital status	Married	81.7	(reference)		
	Unmarried	7.9			
	Divorced/widowed	10.4			
Educational attainment	Junior high school or lower	21.4			
	High school	48.6	(reference)		
	College or higher	30.1			
Occupational status	Regular employee[c]	37.1	(reference)		
	Non-regular employee	14.1			
	Self-employed	9.4			
	Family worker	2.9			
	Unemployed	1.3			
	Retired	9.9			
	Homemaker	20.9			
	Other	4.5			
Household income	Class 1 (= lowest)	17.6	(reference)		
	Class 2	15.8			
	Class 3	17.1			
	Class 4	15.9			
	Class 5	16.9			
	Class 6 (= highest)	16.7			
Social capital	Trust in people	22.4			
(3) Regional blocks	Hokkaido, Tohoku, Kanto 1 & 2, Hokuriku, Tokai, Kinki 1 & 2, Chugoku, Shikoku, Kyushu 1 & 2				

Note: a. Household size adjusted, pre-tax, and evaluated at 2005 prices.

b. Evaluated at 2005 prices.

c. Includes management executives.

d. Indicates the reference group for each category group in regression models.

Table 2. Means and standard deviations of happiness (five-point scale)

Happiness (happy = 5, 4, 3, 2, 1 = unhappy)	Mean	S.D.	Number of obs.
Total	3.86	(0.95)	4,393
Gender			
Male	3.84	(0.94)	2,171
Female	3.88	(0.95)	2,222
Age			
Young	3.95	(0.93)	959
Middle	3.82	(0.94)	1,831
Old	3.85	(0.96)	1,603
Marital status			
Married	3.94	(0.90)	3,590
Unmarried	3.38	(1.01)	348
Divorced/widowed	3.56	(1.10)	455
Educational attainment			
Junior high school or lower	3.76	(1.02)	938
High school	3.84	(0.96)	2,133
College or higher	3.96	(0.87)	1,322
Occupational status			
Stable[a]	3.88	(0.89)	1,630
Unstable[b]	3.78	(1.01)	1,453
Out of the labor force[c]	3.92	(0.94)	1,310
Household income			
Low	3.72	(1.03)	1,468
Middle	3.82	(0.90)	1,449
High	4.03	(0.87)	1,476
Social capital			
Trust in people	4.10	(0.87)	983
No trust in people	3.79	(0.96)	3,410
Political view			
Progressive	3.83	(0.93)	980
Neutral	3.81	(0.95)	2,131
Conservative	3.97	(0.93)	1,216

Note: a = regular employee; b = self-employed + family worker + unemployed + other; c = retired + homemaker.

Table 3. Estimation results from logit regressions

Dependent variable: happiness (happy = 3, 2, 1 = unhappy)		Model 1 (3, 2) vs. (1) Coef.	S.E.	Model 2 (3) vs. (2, 1) Coef.	S.E.
Gini coefficient		–3.14	(1.51)**	–0.96	(1.86)
Gender:	Female	0.05	(0.09)	0.16	(0.09)*
Age group:	Young	0.55	(0.11)***	0.53	(0.08)***
	Old	0.22	(0.09)**	0.22	(0.10)**
Marital status:	Unmarried	–1.05	(0.19)***	–0.84	(0.17)***
	Divorced/widowed	–0.46	(0.12)***	–0.34	(0.11)***
Number of children		0.12	(0.11)	0.13	(0.08)
Number of children squared		–0.02	(0.02)	–0.02	(0.02)
Educational attainment:	Junior high school or lower	–0.02	(0.11)	0.10	(0.07)
	College or higher	0.27	(0.07)***	–0.12	(0.08)
Occupational status:	Non-regular employee	–0.13	(0.10)	0.01	(0.08)
	Self-employed	0.01	(0.14)	0.18	(0.12)
	Family worker	–0.22	(0.19)	–0.14	(0.19)
	Unemployed	–0.33	(0.27)	–0.25	(0.30)
	Retired	–0.04	(0.14)	0.20	(0.13)
	Homemaker	0.19	(0.12)	0.22	(0.11)**
	Other	–0.02	(0.18)	0.13	(0.17)
Household income:	class 2	0.55	(0.11)***	0.35	(0.14)**
	class 3	0.29	(0.11)**	0.12	(0.16)
	class 4	0.49	(0.12)***	0.10	(0.16)
	class 5	0.79	(0.14)***	0.51	(0.16)***
	class 6 (= highest)	1.03	(0.13)***	0.68	(0.15)***
Social capital:	Trust in people	0.61	(0.09)***	0.52	(0.06)***
Log of mean household income		0.09	(0.56)	–0.11	(0.56)
Per capita budget expenditure		1.42	(0.50)***	1.02	(0.52)**
Proportion of people aged 65 and above		–0.05	(0.02)**	–0.03	(0.02)
Number of observations		4,393		4,393	
Wald χ^2 (38)		2238.55		1801.95	

Note: 1. Italics denote the category. See Table 1 for the reference group of each category.

2. Dummy variables for regional blocks and survey years are included in both models.

3. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 4. Comparing the coefficients on the Gini coefficient estimated with a selected set of covariates

Individual attributes controlled for in Model 1						Coefficient on the Gini coefficient	*p*-value
Demographics	Household income	Family relations	Educational attainment	Occupational status	Social capital		
*	*	*	*	*	*	–3.14	0.038
*	*	*	*		*	–3.17	0.039
*	*		*	*	*	–3.09	0.045
*	*	*		*	*	–3.00	0.045
*	*	*			*	–3.04	0.046
*	*			*	*	–2.96	0.052
*	*		*		*	–3.03	0.052
*	*	*	*			–3.04	0.058
*	*	*	*	*		–3.00	0.059
*	*				*	–2.90	0.060
*	*		*	*		–2.94	0.067
*	*	*				–2.89	0.068
*	*	*		*		–2.84	0.070
*	*		*			–2.89	0.074
*	*			*		–2.78	0.080
*	*					–2.74	0.086

Note: All prefecture-level covariates are controlled for and dummy variables for regional blocks and survey years are included in all models

Table 5. Comparing the inequality sensitivities by key individual attributes

Coefficients on the Gini coefficient and its cross terms in Model 1 estimated for the entire sample			Coefficient on the Gini coefficient in Model 1 estimated independently by category			
	Coef.	S.E.		Coef.	S.E.	No. of obs.
Total						
No cross term	−3.14	(1.51)*	Entire sample	−3.14	(1.51)*	4,393
Gender						
Gini	−1.36	(1.92)	Male	−0.76	(2.05)	2,171
Gini× Female	−3.53	(2.30)	Female	−5.41	(2.01)***	2,222
Age						
Gini × Young	1.01	(0.88)	Young	−2.59	(4.08)	959
Gini	−2.68	(1.82)	Middle	−3.58	(2.47)	1,831
Gini × Old	−1.67	(3.18)	Old	−3.72	(2.97)	1,603
Marital status						
Gini × Unmarried	1.43	(3.72)	Unmarried	−13.06	(8.36)	348
Gini	−2.79	(1.56)*	Married	−1.53	(1.59)	3,590
Gini × Divorced/widowed	−4.32	(4.48)	Divorced/widowed	−16.47	(6.26)***	455
Educational attainment						
Gini × Junior high school or lower	−0.78	(3.74)	Junior high school or lower	−7.71	(4.44)*	938
Gini	−2.53	(1.91)	High school	−2.68	(1.99)	2,133
Gini × College or higher	−1.62	(2.91)	College or higher+	−1.18	(3.49)	1,322
Occupational status						
Gini × Unstable[b]	−7.48	(2.66)***	Unstable[b]	−9.54	(3.20)***	1,453
Gini	1.53	(2.10)	Stable[a]	−2.49	(3.25)	1,630
Gini × Out of the labor force[c]	−7.32	(2.75)***	Out of the labor force[c+]	1.60	(2.51)	1,310
Household income						
Gini × Low[d]	0.58	(2.86)	Low[d+]	−1.92	(2.49)	1,468
Gini	−2.96	(2.43)	Middle[e]	−2.69	(3.42)	1,449
Gini × High[f]	−1.34	(3.28)	High[f]	−4.55	(2.65)*	1,476
Social capital						
Gini	−2.83	(1.51)*	No trust in people	−5.73	(5.25)	983
Gini × Trust	−1.71	(3.71)	Trust in people	−2.60	(1.54)*	3,410
Political view						
Gini × Progressive	0.36	(0.20)*	Progressive	2.04	(3.91)	980
Gini	−3.57	(2.31)**	Neutral	−4.33	(1.99)**	2,131
Gini × Conservative	1.18	(0.18)***	Conservative	−4.78	(3.43)	1,216

Note: 1. a = regular employee; b = self-employed + family worker + unemployed + other; c = retired + homemaker; d = income classes 1 and 2; e = income classes 3 and 4; f = income classes 5 and 6.

2. The null hypothesis that the distribution of the Gini coefficient differs between the category with + and the other two categories in the same category group cannot be rejected at the 5% significance level.

3. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

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社会保障の給付と負担の在り方に関する研究」
分担研究報告書

「Income inequality, perceived happiness, and self-rated health: Evidence from nationwide surveys in Japan」

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研究要旨

本研究では，個人レベルの健康に関する主観的評価（SRH：self-rated health）及び幸福度（perceived happiness）が都道府県レベルの所得格差とどのような関係にあるかを，「国民生活基礎調査」及び「日本版総合的社会調査」の個票データを用いて実証的に分析した。SRH と幸福度の相互関係を明示的に踏まえた，2 変数順序プロビット分析によると，所得格差の程度が大きい地域に住む個人ほど，SRH や幸福度がともに低くなる傾向が確認された。なお，非正規労働者など不安定な就業形態に置かれている者ほど，所得格差に敏感であることも明らかとなった。

A. 研究目的

地域レベルの所得格差と個人レベルの健康に関する主観的評価（SRH：self-rated health）の関係に関する実証研究と，同じく地域レベルの所得格差と個人レベルの幸福度（perceived happiness）の関係に関する実証研究が，同時平行する形で進められている。しかし，SRH と幸福度はいずれも個人の主観的厚生(subjective well-being)の構成要素であり，互いに深い関係にあるはずである。そこで，本稿では，SRH 及び幸福度と所得格差の関係を統一的な枠組みの下で同時に推計することを目的としている。

B. 研究方法

「国民生活基礎調査」（2001 年，04 年，07 年）〔所得データはそれぞれ前年〕及び「日本版総合的社会調査」（2000 年，03 年，06 年）をそれぞれマッチングさせて，個人レベルの SRH と都道府県レベルの所得格差や貧困との関係を同時に分析する。すなわち，地域格差については「国民生活基礎調査」から都道府県別ジニ係数を計算し，SRH と幸福度については「日本版総合的社会調査」から得られる 5 値のカテゴリー変数を分析に用いる。

（倫理面への配慮）

個票データの扱いについては，細心の注意を払った。特に，「国民生活基礎調査」については，本研究における実証分析及びその基礎となったデータ処理は小塩だけが排他的に行った。さらに，再集計した同調査のデータは回帰計算にのみ用い，その値は一切公表していない。

C. 研究結果

SRH と幸福度の相互関係を明示的に踏まえた 2 変量順序プロビット式を推計した結果，SRH と幸福度はいずれも都道府県別ジニ係数と有意のマイナスの相関関係にあることが分かった。また，その相関関係は，非正規労働者など不安定な就業形態にある者ほど明確になることも明らかとなった。

D. 考察

本研究の結果は，地域レベルの所得格差と個人レベルのSRHや幸福度との関係を分析してきた，これまでの社会疫学や幸福研究の結果と整合的である。

E. 結論

所得格差がSRHや幸福度にいずれもマイナスの相関をもっていることは，個人の主観的 well-being にとっての所得格差の重要性を改めて確認するものといえる。さらに，非正規労働者など不安定な就業形態にある者ほど所得格差に敏感であることは，もともと低い彼らの主観的 well-being を所得格差がさらに引き下げていることを意味する。これは，低所得層向けの再分配政策が，所得水準の向上だけでなく格差是正という面からも彼らの主観的 well-being の改善に寄与することを示唆するものである。

F. 健康危険情報

なし

G. 研究発表

1.論文発表

"Income inequality, perceived happiness, and self-rated health: Evidence from nationwide surveys in Japan," *Social Science & Medicine*, in press.

2.学会発表

なし

H. 知的所有権の取得状況の出願・登録状況

1.特許取得

なし

2.実用新案登録

なし

3.その他

なし

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Income inequality, perceived happiness, and self-rated health: Evidence from nationwide surveys in Japan

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1. Introduction

Perceived happiness and good health are the key elements of individual well-being, but they tend to be discussed separately. Many studies on social epidemiology have investigated the association between health and socioeconomic factors. It is now widely recognized that inequalities in health status associated with socioeconomic status are substantial (Kawachi & Kennedy, 1997; Subramainan, Kawachi, & Kennedy, 2001). In particular, evidence suggesting that income and educational attainment significantly affect health has important implications on economic and educational policies (Smith, 1999; Lleras-Muney, 2005). In recent years, the association between income distribution in society and individual health has been increasingly focused upon. As surveyed by Subramanian and Kawachi (2004), many attempts of multilevel analyses indicated a significant correlation between regional income inequality and health.

Meanwhile, many economists have been examining the factors that determine perceived happiness, given that individual well-being and social welfare are central issues to be addressed in economics. Since the late 1990s, economists have started to contribute large-scale empirical analyses of the determinants of perceived happiness in different countries and periods, as surveyed by Frey and Stutzer (2002). For example, Blanchflower and Oswald (2004) and Easterlin (2001) showed that income increases the level of perceived happiness. More recently, Alesina, Di Tell, and MacCulloch (2004) observed that higher inequality in society tends to reduce individual happiness as in the case of self-rated health, by using micro data of the United States and European countries.

In general, happiness is a more complicated and multidimensional concept than health, because the former covers physical, mental, socioeconomic, and many other aspects of individual well-being. It is, however, incorrect to view the relation between the two subjective outcomes in a unidirectional manner; although health is considered to be a key component of happiness, it is likely to affect health or its subjective assessment. Indeed, some empirical studies have reported that healthier individuals tend to feel happier (Perneger, Hudelson, &

Bovier, 2004), while a better assessment of happiness can lead to a higher level of self-rated health (Pettit & Kline, 2001). Further, it is possible that perceived happiness and self-assessed health reflect the different facets of a common underlying construct such as the general physical and mental well-being, as emphasized by Subramanian, Kim, and Kawachi (2005). The common socioeconomic factors—including income, age, gender, educational attainment, and relations with family members and neighbors—may affect both outcomes, albeit not in a uniform manner.

Following these previous studies on social epidemiology and happiness, we attempt to examine how regional inequality is associated with both perceived happiness and self-rated health at an individual level by using the micro data obtained from nationwide surveys in Japan. Our analysis has three distinctive features as compared to the existing studies. First, we explicitly took into account a possible correlation between perceived happiness and self-rated health. To this end, we estimated the ordered probit models of happiness and health simultaneously, rather than separately estimating them. This attempt was inspired by a multilevel analysis conducted by Subramanian et al. (2005), who investigated (i) the individual determinants of perceived happiness and self-rated health and (ii) the correlations between the two outcomes at the community and individual levels. However, they did not explore the impact of regional inequality on the two subjective outcomes.

Second, our analysis extended the existing empirical analyses of social epidemiology, which have concentrated largely on the impact of regional inequality on health, by investigating the impact on perceived happiness as well. Alesina et al. (2004) was an early example that analyzed the impact of regional inequality on perceived happiness, but it did not examine the impact on self-rated health. We examined how regional inequality affects both outcomes based on a common dataset and the simultaneous equation system.

Finally, we evaluated effect modification to sensitivities to regional inequality of perceived happiness and self-rated health using the categories of key individual attributes. It is widely recognized that these attributes influence the individual assessment of well-being, but the manner in which they modify the associations of regional inequality remains virtually unexplored. The observed correlations between regional inequality and subjective outcomes for the society as a whole may be misleading, if the associations differ substantially across individuals with different characteristics. Alesina et al. (2004) pointed out that the poor and left-wingers are sensitive to inequality in Europe, while in the United States, the perceived happiness of these groups is uncorrelated with inequality. It is also relevant to compare the sensitivities of self-rated health.

Our analysis was based on the data collected from nationwide surveys in Japan. There have been a growing number of empirical analyses on happiness and self-rated health in Japan in recent years, against the background of rising concerns for the risk of widening income inequality and rising poverty (Tachibanaki, 2005). Indeed, multilevel analyses of the association between regional inequality and self-rated health at a nationwide level has been initiated by Shibuya, Hashimoto, and Yano (2002) and recently followed by Oshio and

Kobayashi (2009). Ichida et al. (2009) is another recent example that discussed this issue using a multilevel model in Japan.

With respect to happiness, Ohtake (2004) and Sano and Ohtake (2007) in their original survey observed that unemployment reduces happiness. Based on the same survey, Ohtake and Tomioka (2004) provides tentative evidence that the Gini coefficient and the perception of rising inequality have a weak but positive correlation with happiness, a result that appears to be counter-intuitive. Our analysis in this paper is expected to add something new to the findings from these preceding studies and make the case in Japan comparable with those in other advanced countries.

2. Methods

Source of data

We utilized the micro data obtained from the following two nationwide surveys in Japan, following Oshio and Kobayashi (2009): (i) the Comprehensive Survey of Living Conditions of People on Health and Welfare (CSLCPHW), which was compiled by the Ministry of Health, Labour, and Welfare, and (ii) the Japanese General Social Survey (JGSS), which was compiled and conducted by the Institute of Regional Studies at the Osaka University of Commerce in collaboration with the Institute of Social Science at the University of Tokyo.

We used the CSLCPHW to construct prefecture-level variables and the JGSS to construct individual-level variables, following Oshio and Kobayashi (2009). The CSLCPHW had sufficiently large samples to obtain the reliable estimates of the Gini coefficient and the mean household income in each prefecture, but it had limited information about demographic and socioeconomic factors at the individual level. In contrast, the JGSS had rich individual-level information, but its sample size was not large enough to calculate prefecture-level variables. By matching these data from the two datasets depending on where each respondent resided, we conducted a multilevel analysis based on the three-year pooled data.

More specifically, we collected micro data from 2001, 2004, and 2007 CSLCPHWs, which include household income data of 2000, 2003, and 2006, respectively. We ascertained the pre-tax income of each household. Further, to obtain detailed information about the socioeconomic background of each respondent, we collected data from 2000, 2003, and 2006 JGSSs. Next, we matched these data for each year depending on where each respondent resided.

The CSLCPHW randomly selected 2,000 districts from the Population Census divisions, which were stratified in each of the 47 prefectures according to the population size. Next, all the households in each district were interviewed. The original sample size was 30,386, 25,091, and 24,578 households (with a response rate of 79.5, 70.1, and 67.7 percent) in 2000, 2003, and 2006, respectively. In this survey, we collected information about household income in order to calculate the income inequality measures and the mean income for each of the 47 prefectures. While both pre-tax and post-tax household incomes were available from the CSLCPHW, we focused on pre-tax household, following Shibuya et al. (2002) and Oshio and

Kobayashi (2009). Like most previous studies, we equivalized household income by dividing it by the root of the number of household members.

The JGSS divided Japan into six blocks and subdivided them according to the population size into three (in 2000 and 2003) or four (in 2006) groups. Next, the JGSS selected 300 (in 2000) or 489 (in 2003 and 2006) locations from each stratum using the Population Census divisions and randomly selected 12 to 15 individuals aged between 20 and 89 from each survey location. Data were collected through a combination of interviews and self-administered questionnaires. The number of respondents was 2,893, 1,957, and 2,124 (with a response rate of 63.9, 55.0, and 59.8 percent) in 2000, 2003, and 2006 surveys, respectively. From these surveys, we obtained perceived happiness, self-rated health, educational background, and subjective assessments about individuals' relationships with the community and other people. In this empirical analysis, we eliminated the respondents aged below 25 and above 80 whose sample sizes were limited, students, and those whose key variables were missing. As a result, in our estimation, a total of 4,466 individuals (aged between 25 and 80) responded (1,872 in 2000, 1,237 in 2003, and 1,357 in 2006). The summary statistics of all variables are presented in Table 1. We briefly explain the dependent and independent variables used in our empirical analysis in what follows.

Perceived happiness and self-rated health. With respect to perceived happiness, the JGSS asked the respondents to choose from among 1 (= happy), 2, 3, 4, and 5 (= unhappy) in response to the question, "How happy are you?" With respect to self-rated health, it asked them to choose from among 1 (= excellent), 2, 3, 4, and 5 (= poor) in response to the question, "How would you rate your health condition?" We reversed the order of choices such that "unhappy" and "poor" equaled 1 and "happy" and "excellent" equaled 5.

Individual-level predictors. We considered both individual- and prefecture-level factors as predictors in our analysis, following various preceding studies (Subramanian and Kawachi, 2004). The former factors were divided into two groups. The first group comprised factors used as predictors for both perceived happiness and self-rated health. The second group comprised those used only for perceived happiness models, because they appeared to be at least partly affected by or simultaneously determined by the status of health or self-rated health.

To begin with the first group, household income is one of the most important variables and is expected to substantially affect both perceived happiness and self-rated health. The JGSS asked respondents to choose their household annual income for the previous year from among 19 categories. We took the median value of each category, equivalized it, and evaluated it at the 2005 consumer prices. Next, we divided income groups into three classes of almost the same size as "low" (with equivalized household income below 2,309 thousand yen), "middle" (2,309 to 4,041 thousand yen), and "high" (above 4,041 thousand yen). In addition to household income, we considered educational attainment, that is, whether the respondents completed their education at "junior high school or lower," "high school," or "college or higher" level. With respect to demographic factors, we considered gender, age, and marital status (married,