fortune Journals

Original Report

FORTUNE JOURNAL OF HEALTH SCIENCES

ISSN: 2644-2906

Married Annual Income Threshold for Survival Days among Both Elderly Suburban and Rural Dwellers

TANJI Hoshi*[,1], SAYURI Kodama[2], SUGAKO Kurimori[3], KOJI Fujita[4]

Abstract

Objective: The purpose of this study was to make clear the relationship the survival days and the threshold of yearly marital income for both the suburban and rural elderly dwellers.

Method: A total number of 13,195(response rate of 80.2%) living the suburban city of Tokyo. On the either hand a total number of 5,320(response rate of 89.2%) living the rural town located in the middle of Kyusyu Island. Data were collected through self-administered questionnaires, with informed consent including marital yearly income. All of participants were followed and checked their survival status for 2,160 days. Data were analyzed by using SPSS28.0J for Windows.

Results: In results of this analyses, survival days are significantly correlated with yearly marital income for both fields and sexes. 2.5 million yen for both sexes may be pointed out as a threshold marital yearly income for the rural elderly dwellers. On the other hand, 4.5 million yen may be pointed out as a threshold marital yearly income for the suburban elderly dwellers for both sexes. Elderly living in the rural area had a lower annual family income of about 0.83 to 1.5 million yen lower than those in the suburbs, but the length of survival day was almost similar.

Conclusion: In results of this analyses, survival days are significantly correlated with yearly marital income for both fields and sexes. Future research is needed to make clear the relationships between equivalent income and survival days for both another areas and generations and also make clear the causal structure relationship.

Keywords: Survival days, married annual income, threshold, suburban and rural, elderly individuals

Preface

The average life expectancy of Japanese people has continued to improve for both men and women since World War II. In 2018, Japanese men's average life expectancy was 81.3 years, and Japanese women's average life expectancy was 87.3 years, which is one of the highest in the world [2], reported that individual socioeconomic factors are indicators of mortality and risk factors, based on a review of previous studies published in MEDLINE from 1990 to 2007 [3] tracked 11,281 60-year-olds as survivors until 2009 and reported that 5-year life prognosis disparities were seen due to disparities in socioeconomic status for the average age of 60 years.

On the other hand, Montano [4] tracked the survival of 55,000 people and reported that satisfaction with health was a stronger predictor than income,

Affiliation:

[1]Tokyo Metropolitan University, Japan

[2]Sagami Women University, Japan

[3]Seitoku University, Japan

[4]Tokyo Metropolitan Institute of Gerontology, Japan

***Corresponding author:**
Tanji Hoshi, Tokyo Metropolitan University, Japan

Citation: Tanji Hoshi, SAYURI Kodama, SUGAKO Kurimori, KOJI Fujita. Married Annual Income threshold for Survival Days among Both Elderly Suburban and Rural Dwellers. Fortune Journal of Health Sciences 5 (2022): 544-552.

Received: August 23, 2022
Accepted: August 30, 2022
Published: September 21, 2022

Hoshi T et al., Fortune J Health Sci 2022
DOI:10.26502/fjhs.082

and that educational attainment was more predictive of longevity than income. It has become clear that in order to maintain survival, it is important to live satisfactorily in terms of health, as well as in terms of the amount of annual income that is influenced by individual educational background.

What is the income threshold required to maintain survival? The relationship between per capita national product and average life expectancy for each country in the world and its threshold have been reported. Here, a relationship is shown in which the higher the per capita national product of a country, the longer the average life expectancy. When the per capita national product is exceeded, almost no extension of life expectancy is seen and it maintains an almost constant level. The average life expectancy of Costa Rica, which has less than 10% of the per capita national product of the United States of America, is almost the same as that of the United States. However, there have been no studies in Japan or overseas that clarified the annual income and income threshold for maintaining a certain number of survival days for each individual, except for a 13-year survival follow-up study of community-dwelling elderly Japanese people. In our study, to maintain a certain level of survival for community-dwelling elderly individuals, annual family income should not be less than 2 million yen. However, no studies have been reported that clarify the amount of revenue stamps required to ensure a certain number of days of survival for elderly people living in urban areas, as well as in rural areas.

Therefore, the purpose of this study was to clarify the relationship between couples' annual income and the length of life of elderly people living at home by comparing the relationship between urban pollution and local city residence and sex. Another purpose of this study was to clarify the annual income threshold for couples to ensure a certain number of days of survival. If this study provides scientific evidence, it will become a reference for living support in Japan's social security system by city and region.

Research Method

The survey area of this study was two municipalities, one located in the suburbs of the city and the other in a rural area. All elderly people were analyzed. First, all residents aged 65 and over in the suburbs of the city were included. In September 2000, we conducted a survey using self-administered questionnaires distributed by mail based on the consent of the subjects. There were 13,195 participants and the response rate was 80.2%. In addition, we tracked the respondents and confirmed living status and death dates for 2,160 days from the start of the survey to August 31, 2000, for 11,257 people, excluding those who moved to other municipalities and those aged 85 and over. City A is located in a new suburban town about 30 minutes by train from the city center. As of 2000, the population was 142,000 and the aging rate was 11.1%. City A is one of the municipalities that does not accept locally allocated tax grants from the national government.

In February 1999, health promoters distributed self-rated questionnaire surveys to the survey subjects of local governments located in the central part of Kyushu. The survey response rate was 89.2% and we received responses from 5,320 people. A total of 4,108 subjects under 65 years of age and 85 years old or older at the time of the survey were excluded, and those who had moved to other areas were tracked for 2,160 days until January 31, 2005. This follow-up confirmed survival and death dates. Town B is a municipality located in a mountainous rural area about an hour's drive from the prefectural capital, with a population of 18,988 in 2000 and an aging rate of 17.4%. The number of follow-up subjects in the two municipalities analyzed is shown in Table 1.

An agreement was signed between the two governments and Tokyo Metropolitan University regarding the protection of individual privacy during the entire process of the survey. In this agreement, obligations regarding confidentiality were confirmed, and personal information handled by the university was limited to IDs. In September 2004 and September 2007, consent was obtained from the Tokyo Metropolitan University Graduate School Ethics Committee for a follow-up survey on manufacturing. A self-administered questionnaire survey was conducted for annual income. The questionnaire asked how much income the respondent or their spouse earned in the last year including pension and remittances. Answer options ranged from less than 1 million yen to 10 million yen or more, and none was also an option. At the same time, 12 options were provided, including one for those that did not want to answer. Selections of not wanting to answer were considered missing values in the analysis. In addition, since there were few responses of 8 million yen or more in Town B, they were included in the 7 million yen or more categories. In this paper, this income amount was regarded as the married annual income amount.

Table: 1 Analytic subject by sexes and region

	A City			B Town		
	65-74	75-84	Total	65-74	75-84	Total
Men	4016 (74.9%)	1343 (25.1%)	5359 (100%)	1390 (77.0%)	416 (23.0%)	1806 (100%)
Women	4054 (68.7%)	1844 (31.3%)	5898 (100%)	1658 (72.0%)	644 (28.0%)	2302 (100%)
Total	8070 (71.7%)	3187 (28.3%)	11257 (100%)	3048 (74.2%)	1060 (25.8%)	4108 (100%)

Citation: Tanji Hoshi, SAYURI Kodama, SUGAKO Kurimori, KOJI Fujita. Married Annual Income threshold for Survival Days among Both Elderly Suburban and Rural Dwellers. Fortune Journal of Health Sciences 5 (2022): 544-552.

Hoshi T et al., Fortune J Health Sci 2022
DOI:10.26502/fjhs.082

IBM SPSS statistics version 28 for Windows was used for analysis in this study. A t test was used to examine the differences in income between municipalities. One-way analysis of variance was used to clarify the annual income of couples to ensure a certain number of survival days. One-way ANOVA was analyzed by multiple comparisons assuming unequal variances by the Tamhane method. The statistical significance level was set at 1%.

Findings

The results of this survey are summarized in the following three sections. In 3-1 the annual income of married couples is evaluated by survey area. In 3-2, the relationship between average number of survival days and married annual income by survey area is discussed. In 3-3, the income threshold amount to ensure a certain number of survival days is discussed.

Annual income of married couples by survey area

As shown in Figure 1, we analyzed the distribution of the annual income of married couples by age and sex in two municipalities. The median value of each option was used for annual family income. If the annual family income was between 1 million and less than 2 million yen, is the annual family income was considered to be 1.5 million yen. Married annual income was 4.06 million yen (σ=223.7) for men aged 65 to 74 years. Among men aged 75 to 84 years, it was 3.63 million yen (σ=206.8). Similarly, among females aged 65 to 74, the annual family income was 3.2 million yen (σ=224.9), and among females aged 75 to 84 years, it was 2.47 million yen (σ=191.8).

On the other hand, 65- to 74-year-old males in Town B had 2.78 million yen (σ=163.1), and 75- to 84-year-old males had 2.13(σ=124.0). Women aged 65 to 74 in Town B received 2.29 million yen (σ=142.6), while those aged 75 to 84 received 1.64 million yen (σ=83.3). Compared to Town B, the annual income of City A was more than approximately 1.27 to 1.5 million yen for males and 0.83 to 0.92 million yen for females. In particular, the distribution of annual income showed that the annual income of both younger and older elderly people was concentrated between 1 million yen and less than 2 million yen. There were 543 male respondents (9.6%) and 312 female respondents (4.8%) with an annual income of more than 7 million yen. On the other hand, there were 57 (2.8%) men and 33 (2.8%) women in Town B, indicating that there were few high-income earners in Town B of either sex (Figure 1).

Similarly, the ratio of an income less than 1 million yen was 232 (4.1%) for males and 972 (15.0%) for females.

There were 25 (1.2%) men in Town B and 93 (3.3%) women in Town B, indicating that there were not only high-income earners but also low-income earners in Town B of either sex (Figure 1). In this way, income disparities were associated more with urban pollution than with region. The percentage of elderly males whose income was unknown was 8.2%, and 8.5% of older elderly males. Similarly, 13.4% of younger elderly females and 18.6% of older elderly females had unknown incomes. On the other hand, in the case of Town B, 23.0% of younger elderly males, 24.6% of older elderly males, 36.9% of younger elderly females, and 35.4% of older elderly females had unknown incomes. Therefore, the unknown rate in Town B was more than twice as high as in City A.

Relationship between mean survival days and annual family income by survey area

The median life expectancy for males was 1,960.2 days

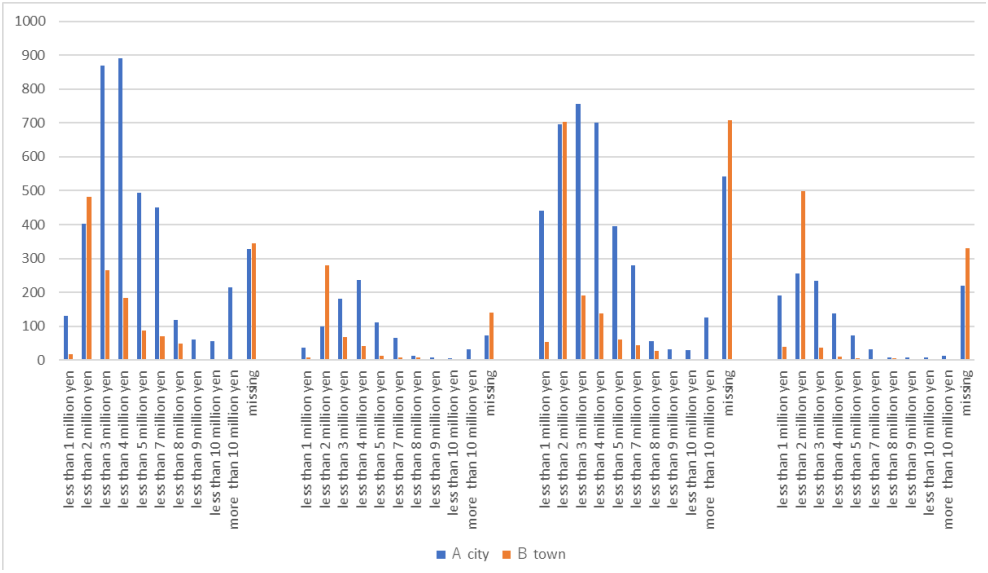
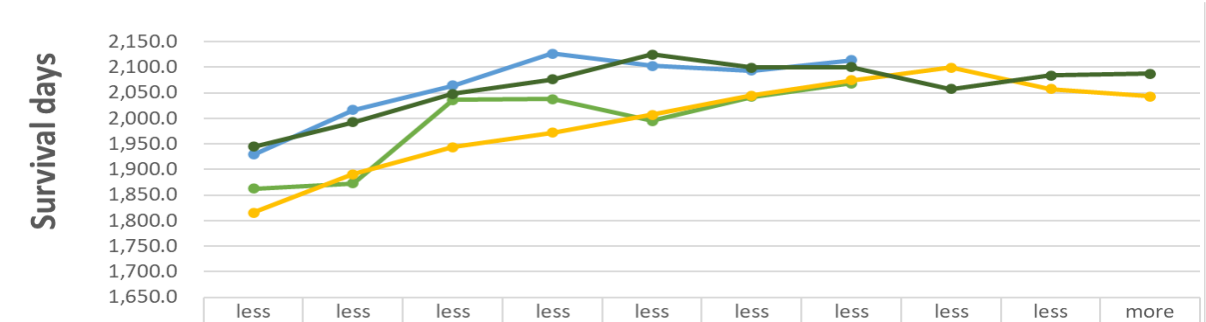


Figure 1: Married annual income by region, sex and age group

Citation: Tanji Hoshi, SAYURI Kodama, SUGAKO Kurimori, KOJI Fujita. Married Annual Income threshold for Survival Days among Both Elderly Suburban and Rural Dwellers. Fortune Journal of Health Sciences 5 (2022): 544-552.

Hoshi T et al., Fortune J Health Sci 2022
DOI:10.26502/fjhs.082



	less than 1 million yen	less than 2 million yen	less than 3 million yen	less than 4 million yen	less than 5 million yen	less than 7 million yen	less than 8 million yen	less than 9 million yen	less than 10 million yen	more than 10 million yen
B Town Male	1,862.1	1,872.5	2,036.0	2,037.5	1,995.1	2,041.7	2,068.6			
B Town Female	1,929.4	2,016.7	2,063.9	2,126.5	2,102.2	2,093.0	2,113.9			
A City Male	1,815.5	1,890.4	1,943.8	1,971.9	2,006.7	2,044.4	2,074.9	2,099.6	2,057.5	2,042.7
A City Female	1,944.5	1,992.6	2,048.0	2,076.2	2,125.2	2,099.4	2,100.4	2,057.0	2,083.8	2,087.2

Figure 2: 6-year average number of survival days by sex and municipality and annual income of married couples

(standard deviation s=495.5), and the median life expectancy for females was 2,027.8 days (s=409.4) in the case of City A. in Town B, the median life expectancy for males was 1,940.5 days (s=508.1) and 2,024.1 (s=411.5) days for females. Comparing the average number of days of survival for the two municipalities, men in City A lived 19.7 days longer, while women in Town B lived 3.7 days longer. However, no significant difference in the average number of days of survival was found between the two municipalities for either sex. Elderly males living in City A with an annual family income of less than 1 million yen lived for 1,815.5 days, while those with an annual income of less than 8 million to 9 million yen had the longest lifespan of 2,099.6 days. A difference in survival days was observed of approximately 284.1 days. On the other hand, elderly men in City A lived 206.5 days longer, indicating a gap of 77.6 days for City A. Similarly, among elderly women living in City A, those with a married annual income of less than 1 million yen lived for 1,944.5 days, while those with an annual income of less than 3 million to 4 million yen lived the longest, 2,125.2 days. A disparity of about 180.7 days was seen. On the other hand, the same disparity for women in Town B was 197.1, which was 16.4 days longer than that of City A.

The regression line with the number of survival days of elderly males living in City A as the dependent variable and annual family income as the explanatory variable was $y=26.3x + 1,850.1$, $r^2=78.5\%$, with an explanatory power of 78.5%. Similarly, for elderly females living in City A, the regression line was $y=12.2x + 1,994.3$ with an explanatory power of 45.5%. Similarly, the regression line $y=32.7x + 1,856.7$ was for elderly men living in Town B, and $y=26.6x + 1,957.3$ for elderly women living in Town B, with an explanatory power of 68.1%. The coefficient of X for females living in Town B was more than twice as large as that for elderly females living in City A.

Income threshold amount to ensure a certain number of survival days

We visually examined the married annual income threshold to ensure a certain number of survival days. As a result, the income threshold for men living in Town B was between 2 million yen and less than 3 million yen, whereas the income threshold for men living in City A was between 8 million yen and less than 9 million yen. In addition, women living in Town B had an income of 3 million yen or more and less than 4 million yen, whereas women living in the city had an income of 4 million yen or more and less than 5 million yen.

Next, we used one-way analysis of variance to analyze the threshold married annual income to ensure a certain number of survival days. A significant difference was tested for all combinations of annual income classes by Tamhane's test, which does not assume equal variances.

Annual income of 3 million yen or more and less than 4 million yen compared to the group with a married annual income of 5 million yen or more and less than 6 million yen. On the other hand, there was no significant difference in survival days between the group with a married annual income of 4 million yen or more and less than 5 million yen and the group with a married annual income of 5 million yen or more and less than 7 million yen (Table 2). Therefore, the married annual income threshold that can ensure a certain number of survival days in City A was considered to be 4.5 million yen, which is the middle ground between 4 million yen and less than 5 million yen for both men and women.

In the case of Town B, there was a significant difference in the number of survival days for both males and females with married annual incomes of 1 million yen or more and less than 2 million yen compared to the group with an annual income of more than 2 million yen or more and less than 3 million

Hoshi T et al., Fortune J Health Sci 2022
DOI:10.26502/fjhs.082

Table 2: One-way ANOVA of survival days by married annual income Left, City A; right, Town B

Sex	(I) Marital Annual Income	(J) Marital Annual Income	(I-J)	Standard Error	P Value	95% Confidential Interval		(I-J)	Standard Error	P Value	95% Confidential Interval	
						Upper	Upper				Upper	Upper
Men	Less than 1 Million	Less than 2 Million	-74.9	47	0.917	-218.3	68.4	-10.4	121.7	1	-419.7	398.9
		Less than 3 Million	-128.3	44	0.078	-262.9	6.3	-173.9	121.8	0.978	-583.5	235.7
		Less than 4 Million	-156.4	43.5	0.008	-289.5	-23.3	-175.4	122.5	0.977	-586.3	235.5
		Less than 5 Million	-191.2	44.7	0.001	-327.9	-54.5	-133	129.5	1	-558.6	292.6
		More than 7 Million	-228.9	44.7	0	-365.5	-92.3	-179.5	127.6	0.98	-600.9	241.9
		More than 7 Million	-245.2	44	0	-379.8	-110.6	-206.4	129	0.931	-631.2	218.4
	Less than 2 Million	Less than 3 Million	-53.4	26.6	0.62	-134.1	27.4	-163.5	29.7	0	-253.7	-73.2
		Less than 4 Million	-81.5	25.7	0.33	-159.7	-3.3	-165	32.3	0	-263.4	-66.6
		Less than 5 Million	-116.3	27.8	0.001	-200.6	-32	-122.6	53	0.375	-286.1	41
		Less than 7 Million	-154	27.7	0	-238.2	-69.7	-169.1	48.1	0.013	-318.1	-20.1
		More than 7 Million	-170.3	26.6	0	-251.1	-89.5	-196	51.9	0.006	-358.7	-33.4
	Less than 3 Million	Less than 4 Million	-28.1	19.8	0.972	-88.3	32	-1.5	32.9	1	-101.7	98.7
		Less than 5 Million	-62.9	22.4	0.1	-130.8	5	40.9	53.3	1	-123.7	205.5
		Less than 7 Million	-100	22.3	0	-168.4	-32.7	-5.6	48.5	1	-155.8	144.5
		More than 7 Million	-116.9	20.9	0	-180.4	-53.4	-32.6	52.3	1	-196.2	131.1
	Less than 4 Million	Less than 5 Million	-34.8	21.4	0.899	-99.6	30	42.4	54.8	1	-126.5	211.4
		Less than 7 Million	-72.5	21.3	0.015	-137.2	-7.7	-4.1	50.1	1	-159	150.8
		More than 7 Million	-88.8	19.8	0	-149	-28.6	-31	53.8	1	-198.9	136.8
	Less than 5 Million	Less than 7 Million	-37.7	23.7	0.918	-109.7	34.3	-46.5	65.4	1	-247.6	154.5
		More than 7 Million	-54	22.4	0.287	-122	14	-73.5	68.2	0.999	-284	137
	Less than 7 Million	More than 7 Million	-16.3	22.3	1	-84.2	51.6	-26.9	64.5	1	-226.5	172.7
Female	Less than 1 Million	Less than 2 Million	-48.1	20.8	0.358	-111.2	15	-87.3	54.2	0.914	-255.6	81
		Less than 3 Million	-103.5	20	0	-164.3	-42.7	-134.5	57.5	0.358	-312.4	43.4
		Less than 4 Million	-131.8	19.7	0	-191.6	-72	-197.1	55.6	0.012	-369.5	-24.7
		Less than 5 Million	-180.7	18.9	0	-238.1	-123.3	-172.8	64	0.15	-370.1	24.4
		More than 7 Million	-155	22.4	0	-222.9	-87	-163.6	65.1	0.242	-364.6	37.3
		More than 7 Million	-140.9	24.3	0	-214.6	-67.1	-184.5	67.3	0.139	-393.1	24.2
	Less than 2 Million	Less than 3 Million	-55.4	16.8	0.021	-106.5	-4.4	-47.2	25.7	0.768	-125.8	31.3

Hoshi T et al., Fortune J Health Sci 2022
DOI:10.26502/fjhs.082

		Less than 4 Million	-83.7	16.4	0	-133.6	-33.8	-109.8	21.1	0	-174.2	-45.4
		Less than 5 Million	-132.6	15.5	0	-179.6	-85.6	-85.5	38.1	0.442	-204.7	33.6
		Less than 7 Million	-106.9	19.6	0	-166.3	-47.4	-76.3	39.9	0.732	-203	50.3
		More than 7 Million	-92.8	21.7	0	-158.8	-26.8	-97.2	43.4	0.486	-238.3	43.9
	Less than 3 Million	Less than 4 Million	-28.3	15.4	0.769	-75.1	18.6	-62.6	28.6	0.467	-150	24.8
		Less than 5 Million	-77.2	14.4	0	-120.9	-33.4	-38.3	42.7	1	-170.5	93.9
		Less than 7 Million	-51.5	18.7	0.121	-108.4	5.5	-29.1	44.3	1	-167.7	109.5
		More than 7 Million	-37.3	20.9	0.806	-101.1	26.4	-50	47.5	0.999	-201.3	101.3
	Less than 4 Million	Less than 5 Million	-48.9	14	0.01	-91.3	-6.5	24.3	40.1	1	-100.5	149.1
		Less than 7 Million	-23.2	18.4	0.992	-79.1	32.7	33.5	41.8	1	-98.3	165.2
		More than 7 Million	-9.1	20.6	1	-71.9	53.8	12.6	45.2	1	-132.8	158
	Less than 5 Million	Less than 7 Million	25.7	17.5	0.96	-27.6	79.1	9.2	52.5	1	-153.7	172.1
		More than 7 Million	39.8	19.9	0.625	-20.7	100.4	-11.7	55.2	1	-184.7	161.4
	Less than 7 Million	More than 7 Million	14.1	23.2	1	-56.5	84.7	-20.9	56.5	1	-198.2	156.5

yen. On the other hand, there was no significant difference in the number of survival days for either males or females with a married annual income of 2 million yen or more and less than 3 million yen compared to the group with a married annual income of more than 3 million yen. Therefore, the married annual income of couples that can ensure a certain number of survival days was 2.5 million yen for both men and women.

Discussion

Distribution of married annual income and number of survival days

Statistically, the 6-year number of survival days for elderly individuals living at home tended to increase as married annual income increased. This significant association trend was shown across both municipalities and sexes. At the same time, in this survey, although the married annual income of the men in City A was approximately 1.27 to 1.50 million yen higher than that of the men in Town B, the difference in the number of survival days was approximately 20 days in 6 years, which was not statistically significant. Similarly, women living in Town B had approximately 0.83 to 0.92 million yen less than women living in City A, and the number of survival days was 3.7 fewer over 6 years, but the difference was not statistically significant.

Thus, even though their income was 1.83 to 1.5 million yen lower than that of the individuals living in the suburbs, the average number of survival days of community-based elderly people remained at almost the same level as that of the suburban residents. The following three reasons serve as hypotheses. One reason is that the proportion of low-income earners, whose survival days are most likely to decline, was small in Town B. At the same time, there was a threshold between income and survival days, and it was presumed that a certain number of survival days could have been ensured in Town B even if there were few high-income earners.

The second reason is that the standard deviation of the annual income of couples living in Town B was 60.6 to 108.5 smaller than that of couples living in City A, indicating that elderly people living in Town B had less individual income disparity. In other words, it was possible that there were not only high-income earners but also low-income earners and that low overall poverty contributed to their survival. The third factor is related to securing disposable income in Town B. Regional cities have a higher proportion of homeowners than suburban areas, and prices are lower. Therefore, elderly people in local cities can secure disposable income and live a certain life even with a small married annual income. Therefore, the results of this survey clarified that when discussing the relationship between the annual income of a family and the number of survival days, it is necessary to consider not only the amount of income but also the characteristics of the distribution of income and living conditions as characteristics of residence. Follow-up studies are needed.

Granados[7] surveyed nine developed countries and reported the importance of reducing income disparities and poverty in order to maintain and ensure average life

Hoshi T et al., Fortune J Health Sci 2022
DOI:10.26502/fjhs.082

expectancy. According to this survey, the amount of regional income was significantly lower than that of the urban suburbs, but the standard deviation was small, and the proportion of low-income earners was particularly low. Therefore, the possibility that a certain number of days of survival could be ensured due to the low income disparity and low relative poverty, which was tested by Granados[7], was indicated. The average life expectancy in 2000, which was the closest to the survey year, was investigated separately for City A and Town B. The average life expectancies for males and females in City A were 79.0 years and 85.2 years, respectively. The average life expectancies for males and females in Town B were 77.4 years and 84.7 years, respectively. However, the number of survival days in City A and Town B was almost the same. The reason for this may be the lower infant mortality rate in urban areas.

Kim[8] reviewed 48 publications from around the world on the association between income inequality and mortality by country. As a result, they reported that an increase in mortality due to income disparity was observed for infants and children, but not for elderly people. In the results of this survey, there was no significant difference in the number of survival days for elderly people even if there were income disparities compared by region. Therefore, the findings of this study were similar to the results of Kim's research[8].

Income threshold amount to maintain survival by municipality

One of the main scientific findings revealed by this study was the annual family income threshold required to maintain the number of survival days. For elderly people living in the suburbs of the city, both males and females earn 4.5 million yen a year, and for elderly people living in communities, the annual family income required to maintain survival is 2.5 million yen for both sexes.

However, the method of surveying the annual income amount in this survey was based on the income category survey rather than the specific income amount. The calculation of the income threshold amount considered the median value of the income category as the income amount, which is an issue for future research. In previous research surveys conducted thus far, when the method of freely describing the specific annual income was adopted, there was an extremely large number of nonresponses. Therefore, this study adopted the option of categorized annual income. The purpose was to reduce the nonresponse rate. However, the nonresponse rate of older elderly women in Town B was still close to 40%. Substantial improvements are required in future research. In future research, it will be necessary to conduct an analysis based on equivalent income that takes family members into account, as some people live alone without a spouse. In addition, survey items such as living conditions were not implemented in this survey. This is a topic for future research.

Other than our previous study [5], no other study has been reported in Japan or overseas that has tracked survival with regard to the amount of annual income that determines the number of survival days an individual lives. There were also no previous research reports on comparisons between urban and regional areas. Therefore, in order to improve validity, additional reproducible tests are needed. According to the 2021 Basic Survey on Wage Structure [9] reported by Japan's Ministry of Health, Labor and Welfare, the average monthly income for full-time workers in 2021 was 0.37 million yen. Twenty years ago, in 2001, the average monthly salary was 0.36 million yen. In this way, changes in the amount of personal income in Japan over time have remained almost constant over the past 20 years, making it one of the countries with the smallest increase in income among the advanced G7 countries. Although the increase in average life expectancy in Japan has slowed down, it has continued to increase to the same level as developed countries where personal income has increased. This suggests that income alone cannot explain the factors that determine the extension in life expectancy. This fact is reflected in that Okinawa Prefecture, which has the lowest income in Japan, has the longest average life expectancy, and Tokyo, which has the highest income, does not have the longest average life expectancy. Our research theams [10] clarified that the average life expectancy of municipalities with a large population in Japan increases significantly with the elevation of the municipality location. This fact suggests that even if medical care in high-altitude provincial cities is not better than that in urban areas, unpolluted water sources are ensured and the natural environment surrounded by abundant greenery contributes to the extension of the lifespan of living organisms. Therefore, it is presumed that the natural environment and social networks in the community are favorable factors for extending average life expectancy, assuming that a constant income is ensured and relative poverty is low. It has been reported that other factors that determine survival days, along with heredity, are reflected in survival to old age approximately half a century later.

For example, this explains the causal relationship that growth is retarded and short stature increases the mortality rate in the period when height increases. Regarding the mechanism [11] reported that the socioeconomic factors of parents in childhood reflected the nutritional status of the family, and the child's major organs reached a level where they could fully function. [12] Reported on the causal relationship between socioeconomic factors and lifestyle habits on the survival rate of urban elderly people, following the survival of 8,285 people for 3 years. Socioeconomic factors provide indirect effects on healthy life maintenance via three health factors, and socioeconomic status is possibly the basis of survival. In addition, the authors [13] investigated the structure of relationships with other factors,

including income, that regulates healthy longevity among suburban elderly people three times over a six-year period. Socioeconomic factors, which were latent variables with income and educational background as observed variables, had no direct effect on healthy longevity, with the number of survival days and degree of nursing care required as observed variables. Indirectly determining healthy longevity after that, and the relationship between favorable lifestyle habits and healthy longevity, have suggested the possibility that socioeconomic factors are confounding factors. Reproducibility is needed. [14] Investigated the relationship between educational attainment, income, and health. Based on the follow-up survey, educational background had an effect on health, and educational background had a closely associated effect on income. Educational background was not investigated in this study. This is a topic for future research. The results of this research followed previous studies [2, 14] in that it is necessary to ensure a certain level of income in order to maintain survival. In the future, it will be necessary to verify the effects of social security policy interventions to correct health disparities.

This study suggests that there may be a threshold for the number of survival years and related annual income, and that the threshold may differ between urban and rural areas. However, the research method had limitations. In addition, many issues can be corrected to improve the validity of the research results. A specific research issue was the selection of target areas. This survey was conducted only for the two local governments with which we cooperated, and it was not a representative sample selected at random. In addition, although we were able to secure a response rate of more than 80% for the questionnaire, the ratio of responses regarding the couples' annual incomes was 37% in the rural area compared to the urban area. A more accurate follow-up test is needed. As for the annual income question, objective information such as equivalent income and whole life income should be added in addition to equivalent disposable income. Furthermore, the next research topic is to add survey items for subjective questions such as economic living conditions and health satisfaction[4], which are reported to be related to survival. In this survey, random errors could be easily controlled for because the number of survey subjects and the ratio of the number of surveys were relatively high [15]. However, it was a survey study with selection bias in that there were few responses from elderly people or hospitalized patients. A future research subject would be to increase the internal validity of the research results and increase the external validity by random sampling [16].

Acknowledgments

The research fund that enabled the continuation of the survey over the years came from the Ministry of Health, Labor and Welfare's Comprehensive Regional Health Research Fund. The author of this study is Tanji Hoshi, representative of a long-term intervention follow-up study that included a control group and studied the effects of comprehensive health prevention activities with index-type goal setting for local elderly people supported by public health centers. Subsequent follow-up and analysis received research grants from the Ministry of Education, Culture, Sports, Science and Technology, along with much research support (Grant-in-Aid for Scientific Research (B) from the Japanese Ministry of Education, Culture, Sports, Science and Technology (No. 1531012 & 14350327)). We would also like to express our heartfelt gratitude to the officials of the two local governments for their continuous and systematic support.

References

1. Overview of the 2018 Ministry of Health, Labor and Welfare Abridged Life Tables (2018).
2. Kagamimori S, Gaina A, Nasermoaddeli A. Socioeconomic status and health in the Japanese population. Soc Sci Med 68 (2009): 2152-60.
3. Lallo C,Raitano M.Life expectancy inequalities in the elderly by socioeconomic status: evidence from Italy. Popul Health Metr 16 (2018): 7.
4. Montano D.Socioeconomic status, well-being and mortality: a comprehensive life course analysis of panel data, Germany 1984-2016. Arch Public Health 79 (2021): 40.
5. World development report. Equity and Development. THE WORLD BANK OXDORD UNIVERSITY PRESS. WORLD BANK GROUP OPEN KOWLEDGE REPORSITORY (2006).
6. Hoshi T, Kurimori S, Kodama S. The amount of annual income stamps for married couples to maintain 13-year survival days in community-based home-dwelling elderly. Journal of health and welfare statistics 68 (2021): 18-24.
7. Granados JA. Health at advanced age: social inequality and other factors potentially impacting longevity in nine high-income countries.Maturitas 74 (2013): 137-47.
8. Kim T. The relationships between income inequality welfare regimes and aggregate health: a systematic review. Eur J Public Health 27 (2017): 397-404.
9. Wage Structure Basic Statistics Survey in Japan. Ministry of Health, Labor and Welfare (2021).
10. Hoshi T, Taniguchi R. A study on the relationship between average life expectancy and altitude in municipalities nationwide. Proceedings of the Annual Meeting of the Japanese Society of Public Health 62 (2003).
11. Davey Smith G, Hart C, Upton M, Hole D. Height and risk of death among men and women: aetiological implications

of associations with cardiorespiratory disease and cancer mortality. J Epidemiol Community Health 54 (2000): 97-113.

12. Hasegawa T, Takashi T, Hoshi T et al. The Effects of Socioeconomic Status and Lifestyle on Life Expectancy: A Structural Analysis of an Elderly Japanese Population. International Medical Journal 18 (2011): 261-264.
13. Hoshi T, Kodama,S. ed. The structure healthy life determinants - Lesson from Japanese aging cohort study-. Springer. Singapore (2018): 121-192.
14. Manoux SA, Clarke P. Marmot M. Multiple measures of socio-economic position and psychosocial health: proximal and distal measures. Int J Epidemiol 31 (2002): 1192-9.
15. Kawachi. Social capital, income inequality, and mortality. Am J Public Health 87 (1997): 1491-98.
16. Yusuf S, Collins R, Peto R. Why do we need some large, simple randomized trials?. Statistics in Medicine 3 (1984): 409-22.
17. Hoshi T, Kurimori S, Ino S. Relationships between green-related enjoyment and purpose in life and subjective health perceptions among the elderly living at home in urban areas. Journal of health and welfare statistics 56 (2009):16-21.