Original article

What lifestyles are risk factors for low well-being of healthy elderlies dwelled in a local city in super-aging Japan? —Kizugawa cohort study—

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Abstract

The purpose of this cohort study is to clarify the risk factors of low well-being of elderly people who residing in a local city of a super-aging country, Japan.

Subjects are people, who have selected randomly from healthy elderly people resided in Kizugawa City, Kyoto Prefecture, in 2010, followed until 2015. Question survey was conducted in both year, and questionnaire consisted of items such as basic attributes, lifestyles (health practices, consultation behaviors, social activities and so on) and well-being (WHO-5). In analysis we made multi-logistic regression analysis using lifestyle variables as an independent variable and well-being as a dependent variable.

The results were as follows.
1. Risk factors were not to exercise, knowledge of appropriate diet, subjective feeling of stress for at least a month, not to participate in voluntary activities, age and bad subjective feeling of health.
2. Risk factors in regard to changes of lifestyles using good-good lifestyles as a reference were sustainment of having no time for hobby or relaxation, sustainment or deterioration of subject feeling of stress for at least a month, sustainment or deterioration of having no time for relaxation and deterioration of having no activities with pleasure or aim. A factor promoting well-being is to have more frequencies for going out home.

This study shows that in a longevity society it is important for community-dwelling elderly Japanese to have good health practices, appropriate consultation behaviors and good social activities for the purpose of keeping good well-being, and that these results are contributed to health promotion policy for community-dwelling elderly people.

Key words: well-being, risk factors, elderly, health practices, cohort study

Introduction

As Japan faces a super-aging society unmatched in the world, the country also faces other complex problems such as a low birth rate, decreasing population, economic stagnation, and environmental changes. Therefore, achieving a sustainable society has become an urgent issue. In particular, population density in large cities has accelerated the aging of populations in rural areas. Since the declining birth rate has also led to decreases in populations in these areas, the emergence of marginal settlements has become a cause for concern. Thus, correcting the social disparities in both urban and rural areas and maintaining the standard and quality of living of residents are important issues for community development; additionally, the development of a multi-faceted approach focused on society as a whole is also important. The World Health Organization (WHO) points out that a comprehensive approach is essential for sustainable development. For example, in a super-aging society with a low birth rate, emphasis is placed on the need for a comprehensive and sustainable strategy that aims for happi-
ness, quality of life (QOL), and the well-being of its members\(^5\). These aims are also goals of health promotion.

The Organisation for Economic Co-operation (OECD) also recommends well-being as a goal of regional policy appropriate for a mature society\(^6\). This international trend provides a strategic perspective on what Japan should set as a goal for attaining a vibrant local community in preparation for a mature society. In other words, to solve the problems associated with the local population decline, health issues, etc., and achieve a sustainable mature society, it is essential to identify the characteristics of well-being for people from diverse backgrounds and devise creative strategies for maintaining well-being according to these various aspects\(^4\).

Therefore, the purpose of this study was to clarify the risk factors for poor levels of well-being among the elderly residing in a regional area in Japan based on a cohort study. The results will be useful for developing a strategic design for maintaining the well-being of the elderly.

## Methods

Located about 30 km from the centers of the major cities of Kyoto and Osaka, Kizugawa City is blessed with an abundant natural environment and a long history. Recently, it has also become a regional core city with cutting-edge research institutes. Its total population was 70,415 as of October 1, 2010, and the percentage of minors under age 15 was 17%. Further, the percentage of residents in the productive age range of 15–64 was 64.3%, and the percentage of the elderly (over age 65) was 18.6\(^\%\). The city’s population increased during the five years devoted to this study, and there has been a large social population influx along with the development of new housing areas.

We devise a health promotion plan of Kizugawa City and aim at improving the quality of life of inhabitants based on an idea of the health promotion. Therefore Kizugawa was a study field in this study.

### Survey targets and methods

1) Survey 1 (Baseline)

Regarding the survey method, a self-administered questionnaire with a request to reply was mailed to 2,500 randomly elected citizens aged 65 and over. Of these, 1,003 valid responses were obtained (40.1\%). The survey was conducted by Kizugawa City’s Health Promotion Division, Health and Welfare Department, December 14–27, 2010.

2) Survey 2

Beginning October 1, 2015, another survey was sent to 2,473 randomly selected citizens aged 65 and above, including respondents from the previous survey. Subsequently, 1,769 valid responses were obtained (71.5\%). The survey period was November 27–December 2015, and the survey method was the same as that used for the baseline survey. Out of the baseline of 1,003 respondents, 706 were valid (70.4\%).

### Survey details

1) Basic attributes

Attributes included were gender, age, family construction, and occupation.

2) Health

(1) Physical health

Questions on physical health included subjective health views, medical history, BMI, physical and dental examinations, etc. Subjective health view is an index\(^14\) associated with the life prognosis of the elderly; a 4-point scale ranging from “I think I am very healthy” to “I am not healthy” was used.

(2) Lifestyle

Lifestyle includes routine habits such as exercise, nutrition, smoking, drinking, and resting. It also includes social activities, social participation, social networks, behavioral consultations, etc.

(3) Well-being

Well-being is defined by the Japanese version of WHO-5\(^6\), a scale consisting of five items for assessing an individual’s mental health status for the past two weeks. A person who scores a total of 13 or more points (from 0–25) is considered to have a “good” level of well-being, whereas someone who scores less than 13 has a “poor” level\(^6\).

Health perceptions and current medical history were also examined.

### Analysis method

In this study, the risk factors for “poor” well-being among elderly people dwelling in a regional community were analyzed.

First, a univariate analysis was performed to examine the distribution of well-being and the relationship between baseline lifestyle habits and the endpoint for well-being. The relationship between changes in lifestyle habits from the baseline to within five years of the endpoint for well-being was also examined. The chi-squared test and Fisher’s exact test were analytical methods employed.

Next, a multivariate analysis was conducted, and a logistic regression analysis was performed with the endpoint for well-being designated as the objective variable (WHO-5: poor/good) and the baseline lifestyle habits as explanatory variables. A similar analysis was conducted with the endpoint for well-being as the objective variable and changes in lifestyle habits within five years of that point as the explanatory variables.
Ethical considerations

This study was conducted with the approval of the Ethics Committee of the Graduate School of Medicine and Faculty of Medicine, Kyoto University, and Kyoto University Hospital (R1262-2).

Results

The subjects were 706 elderly people who provided valid responses at the baseline, and among them were those who provided valid responses after five years (Fig. 1).

Well-being of the elderly in the regional community

The distribution of those evaluated with “poor” well-being levels is shown in Table 1.

Lifestyle as a risk factor for “poor” well-being

1) Results of the univariate analysis

Relationships between good and poor lifestyles and “good” and “poor” well-being are shown in Table 2.

Regarding lifestyle and health, subjective health perceptions, exercise, time for hobbies and recreation, attention to nutritional intake, knowledge about a balanced diet, a regular routine, regular health check-ups and early visits to the doctor when symptomatic, daily tooth brushing, dental check-ups, adequate rest during the past month, outdoor activities, participation in district events, relationships with non-work friends and neighbors more than once a week, enjoyable goal-oriented activities, and participation in regional and volunteer activities were more characteristic of individuals evaluated with “good” well-being compared to those with “poor” well-being. On the other hand, during treatment for liver disease or diabetes, eating dinner within two hours of bedtime contributed significantly to lowering stress within the past month for those whose well-being was “good” compared to those whose well-being was “poor.”

2) Results of the multivariate analysis

Risk factors for “poor” well-being are shown in Table 3.

Risk factors include age (OR 1.08), poor subjective health perceptions (OR 3.16), no exercise (OR 1.95), inadequate knowledge regarding a balanced diet (OR 2.39), stress within the past month (OR 2.93), and no participation in community or volunteer activities (OR 2.57). On the other hand, a well-being promotion factor is the non-use of an interdental cleaning device (OR 0.03).

Lifestyle changes as a risk factor for “poor” well-being

1) Results of the univariate analysis

The relationship between good and bad lifestyle changes with well-being is shown in Table 4.

| Table 1 Well-being |
|--------------------|
|                     | Good well-being n (%) | Poor well-being n (%) | P     |
| Male                | 179 (71.6)             | 71 (28.4)              | ns    |
| Female              | 169 (73.8)             | 60 (26.2)              |       |
| Overall             | 348 (72.7)             | 131 (27.3)             |       |

Table 1: Well-being

Subjective health perceptions, exercise, time for hobbies and recreation, attention to nutritional intake, a regular routine, regular health check-ups, liver disease, diabetes, attention to food amounts and ingredients, knowledge regarding a balanced diet, daily exercise, dental check-ups, stress levels within the past month, adequate rest within the past month, seven to nine hours of sleep per night, outdoor activities, participation in district events, interaction with non-work friends and neighbors more than once a week, activities that are fun and goal-oriented, and participation in regional and volunteer activities were observed as being significantly associated with “good” and “poor” well-being.

2) Results of the multivariate analysis

Risk factors for “poor” well-being are shown in Table 5.

Overall, based on the continuation of a healthy lifestyle, the risk factors include the following: few hobbies or recreational outlets (OR 5.53), ongoing stress within the past month (OR 21.88) or worsening stress levels (OR 31.94), continuous, inadequate rest within the past month (OR 29.94) or a worsening of this situation (OR 8.85), and deteriorating participation in goal-oriented activities that are pleasurable.
Table 2  Relationships between lifestyles and well-being in 2010

| Lifestyles                                                                 | Category | Well-being | \( P \) value |
|---------------------------------------------------------------------------|----------|------------|----------------|
| Do you have good subjective feeling of health?                           | good     | 287 (83.4) | 71 (55.5) | 0.000  |
|                                                                           | poor     | 57 (16.6)  | 71 (44.5) |
| Do you take an exercise?                                                  | yes      | 185 (53.8) | 37 (28.5) | 0.000  |
|                                                                           | no       | 159 (46.2) | 93 (71.5) |
| Do you have a time for hobbies or recreation?                             | yes      | 229 (66.6) | 57 (43.8) | 0.000  |
|                                                                           | no       | 115 (33.4) | 73 (56.2) |
| Do you pay attention to the amount and content of meals?                 | yes      | 236 (68.6) | 74 (56.9) | 0.018  |
|                                                                           | no       | 108 (31.4) | 56 (43.1) |
| Do you keep a regular routine?                                            | yes      | 241 (70.1) | 67 (51.5) | 0.000  |
|                                                                           | no       | 103 (29.9) | 63 (48.5) |
| Do you have regular health check-ups?                                    | yes      | 224 (65.1) | 71 (54.6) | 0.043  |
|                                                                           | no       | 120 (34.9) | 59 (45.4) |
| Do you try to consult a doctor early if you have symptoms?               | yes      | 170 (49.4) | 47 (36.2) | 0.010  |
|                                                                           | no       | 174 (50.6) | 83 (63.8) |
| Do you have hypertension?                                                | yes      | 142 (40.8) | 58 (44.3) | 0.533  |
|                                                                           | no       | 206 (59.2) | 73 (55.7) |
| Do you have heart disease?                                                | yes      | 38 (10.9)  | 18 (13.7) | 0.426  |
|                                                                           | no       | 310 (91.1) | 113 (86.3)|
| Do you have cerebrovascular disease?                                      | yes      | 9 (2.6)    | 3 (2.3)   | 1.000  |
|                                                                           | no       | 339 (97.4) | 128 (97.7)|
| Do you have liver disease?                                                | yes      | 7 (2.0)    | 10 (7.6)  | 0.009  |
|                                                                           | no       | 341 (98.0) | 121 (92.4)|
| Do you have diabetes?                                                    | yes      | 38 (10.9)  | 24 (18.3) | 0.034  |
|                                                                           | no       | 310 (89.1) | 107 (81.7)|
| Do you have dyslipidemia?                                                 | yes      | 57 (16.4)  | 17 (13.0) | 0.397  |
|                                                                           | no       | 291 (83.6) | 114 (87.0)|
| Do you have kidney disease?                                               | yes      | 8 (2.3)    | 6 (4.6)   | 0.223  |
|                                                                           | no       | 340 (97.7) | 125 (95.4)|
| Do you have osteoporpsis?                                                 | yes      | 25 (7.2)   | 14 (10.7) | 0.260  |
|                                                                           | no       | 323 (92.8) | 117 (89.3)|
| Do you have periodontal disease?                                          | yes      | 34 (9.8)   | 11 (8.4)  | 0.728  |
|                                                                           | no       | 314 (92.8) | 120 (91.6)|
| Do you pay attention to the amount and content of meals?                 | yes      | 312 (89.7) | 113 (86.9)| 0.415  |
|                                                                           | no       | 36 (10.3)  | 17 (13.1) |
| Do you have knowledge about a right balance of diet?                      | yes      | 269 (77.5) | 84 (64.6) | 0.005  |
|                                                                           | no       | 78 (22.5)  | 46 (35.4) |
| Do you have meals regularly?                                              | yes      | 334 (96.0) | 121 (93.8)| 0.329  |
|                                                                           | no       | 14 (4.0)   | 8 (6.2)   |
| Do you eat breakfast?                                                     | yes      | 329 (94.5) | 120 (92.3)| 0.391  |
|                                                                           | no       | 19 (5.5)   | 10 (7.7)  |
| Do you have meals together with family?                                   | yes      | 285 (81.9) | 98 (75.4) | 0.123  |
|                                                                           | no       | 63 (18.1)  | 32 (24.6) |
| Do you eat at fast speed?                                                 | yes      | 89 (25.6)  | 37 (28.5) | 0.560  |
|                                                                           | no       | 259 (74.4) | 93 (71.5) |
(OR 6.82). Improvement in actively engaging in outdoor activities (OR 0.06) was a factor for enhanced well-being.

### Discussion

In anticipation of depopulation in the future, the Japanese government has presented a model for community and city planning that envisions a revitalization strategy for sustainable regional development in rural areas. The new strategy is aimed at the realization of a society in which everyone can live out their lives with dignity and take on challenges with a sense of fulfillment as members of society. Well-being is not only a goal established by the government for the realization of a sustainable society in Japan, despite its super-aging society and low birth rate, with an ultimate goal of extending the healthy lives of citizens and employing health promotion measures.
Lifestyles and lifestyle changes that are risk factors for “poor” well-being

There are very few cohort studies in Japan examining the lifestyles of elderly people who live in regional communities that are risk factors for decreased well-being. The results of this study suggest that a healthy lifestyle, proper medical consultation, and healthy and ongoing social participation are important factors for the well-being of these individuals. According to previous research, well-being and QOL are associated with a survival prognosis in cases of the onset or present medical history of cancer, cardiovascular disease, diabetes, etc., and also with the decline in vital functions and physical fitness. Based on the results of the present study, disease prevention and health promotion are considered as contributors to the well-being of the elderly.

Other risk factors for “poor” well-being include poor psychosocial health conditions such as depression, loneliness, social isolation, decreases in conversations with people, socialization with friends, and the frequency of participation in local activities. This finding is consistent with those of some previous studies that cite social isolation, depression, and the absence of relationships with neighbors as risks for “poor” well-being and death. In addition to subjective stress and a lack of social participation, the emergence and persistence of stress increases the risk for a decline in well-being. The elderly have more time to enjoy their hobbies, lessons, and volunteer activities. For men, work is significantly related to the basic activities of daily living (BADL). Hence, the maintenance of social functions is essential for the well-being of the elderly. The fact that Japan has the highest incidence of socially isolated elderly people among the 20 OECD

Table 3 Risk factors for “poor” well-being

| Factors                                           | Categories                        | Well-being | OR            | 95% CI       | P value |
|---------------------------------------------------|-----------------------------------|------------|---------------|--------------|---------|
| Age                                               | (add 1 year)                      |            | 1.085        | 1.022 1.152  | 0.007   |
| Gender                                            | male (ref. female)                |            | 1.611        | 0.755 3.437  | 0.217   |
| I have good subjective feeling of health          | bad (ref. good)                  |            | 3.166        | 1.579 6.348  | 0.001   |
| I take an exercise                                | bad (ref. good)                  |            | 1.956        | 1.021 3.745  | 0.043   |
| I have a time for hobbies or recreation           | bad (ref. good)                  |            | 1.616        | 0.785 3.325  | 0.192   |
| I pay attention to the amount and content of meals| bad (ref. good)                  |            | 1.724        | 0.866 3.434  | 0.121   |
| I keep a regular routine                          | bad (ref. good)                  |            | 0.895        | 0.443 1.807  | 0.757   |
| I have regular health check-ups                   | bad (ref. good)                  |            | 1.154        | 0.601 2.215  | 0.667   |
| I try to consult a doctor early if I have symptoms| bad (ref. good)                  |            | 1.043        | 0.537 2.025  | 0.901   |
| I pay attention to the amount and content of meals| bad (ref. good)                  |            | 1.282        | 0.413 3.985  | 0.667   |
| I have knowledge about a right balance of diet    | bad (ref. good)                  |            | 2.399        | 1.216 4.734  | 0.012   |
| I have meals regularly                            | bad (ref. good)                  |            | 1.154        | 0.288 4.628  | 0.840   |
| I eat breakfast                                    | bad (ref. good)                  |            | 2.182        | 0.600 7.938  | 0.236   |
| I have meals with family                          | bad (ref. good)                  |            | 1.756        | 0.824 3.742  | 0.144   |
| I eat at fast speed                               | bad (ref. good)                  |            | 0.795        | 0.376 1.680  | 0.547   |
| I have dinner within two hours before bedtime     | bad (ref. good)                  |            | 1.580        | 0.769 3.245  | 0.213   |
| I eat snacks after dinner                         | bad (ref. good)                  |            | 0.734        | 0.375 1.437  | 0.367   |
| I always try to take an exercise                  | bad (ref. good)                  |            | 0.331        | 0.108 1.014  | 0.053   |
| I smoke                                           | bad (ref. good)                  |            | 0.805        | 0.229 2.832  | 0.736   |
| I drink more than appropriate amount              | bad (ref. good)                  |            | 1.044        | 0.464 2.351  | 0.917   |
| I brush my teeth every day                        | bad (ref. good)                  |            | 0.969        | 0.047 19.853 | 0.983   |
| I use an interdental toothbrush                   | bad (ref. good)                  |            | 0.473        | 0.237 0.944  | 0.034   |
| I have dental check-ups                           | bad (ref. good)                  |            | 1.398        | 0.698 2.799  | 0.344   |
| I have been stressed within the last month        | bad (ref. good)                  |            | 2.937        | 1.497 5.761  | 0.002   |
| I have had enough rest in the last month          | bad (ref. good)                  |            | 4.347        | 1.291 14.633 | 0.018   |
| I have a sleep for 7–9 hours                      | bad (ref. good)                  |            | 1.360        | 0.728 2.542  | 0.335   |
| I actively go out                                 | bad (ref. good)                  |            | 0.803        | 0.370 1.741  | 0.578   |
| I participate in district events                  | bad (ref. good)                  |            | 2.008        | 0.989 4.078  | 0.054   |
| I have friendship with non-work friends or neighbors more than once a week | bad (ref. good)                  |            | 0.750        | 0.372 1.511  | 0.420   |
| I lead a life with fun and goals                  | bad (ref. good)                  |            | 1.722        | 0.809 3.666  | 0.158   |
| I participate in local or volunteer activities    | bad (ref. good)                  |            | 2.577        | 1.149 5.780  | 0.022   |

OR: Odds Ratio; ref.: reference=1.000; 95%CI: 95% Confidence Interval. Well-being: Good (WHO-5 ≥13), Poor (WHO-5 <13).
Table 4  Relationship between changes of lifestyle and well-being

| Lifestyles | Categories       | Well-being | P value |
|------------|-----------------|------------|---------|
|            |                 | Good       | Poor    |         |
| I have good subjective feeling of health | bad→bad        | 31 (9.2)   | 43 (33.6) | 0.000   |
|            | good→bad        | 23 (6.8)   | 22 (17.2) |         |
|            | bad→good        | 23 (6.8)   | 14 (10.9) |         |
|            | good→good       | 260 (77.2) | 49 (38.3) |         |
| I take an exercise | bad→bad        | 115 (33.4) | 76 (58.0) | 0.000   |
|            | good→bad        | 52 (15.1)  | 14 (10.7) |         |
|            | bad→good        | 44 (12.8)  | 17 (13.0) |         |
|            | good→good       | 133 (38.7) | 24 (18.3) |         |
| I have a time for hobbies or recreation | bad→bad        | 59 (17.2)  | 64 (48.9) | 0.000   |
|            | good→bad        | 44 (12.8)  | 24 (18.3) |         |
|            | bad→good        | 55 (16.0)  | 9 (6.9)   |         |
|            | good→good       | 186 (54.1) | 34 (26.0) |         |
| I pay attention to the amount and content of meals | bad→bad        | 65 (18.9)  | 32 (24.4) | 0.005   |
|            | good→bad        | 40 (11.6)  | 24 (18.3) |         |
|            | bad→good        | 43 (12.5)  | 24 (18.3) |         |
|            | good→good       | 196 (57.0) | 51 (38.9) |         |
| I keep a regular routine | bad→bad        | 53 (15.4)  | 47 (35.9) | 0.000   |
|            | good→bad        | 45 (13.1)  | 30 (22.9) |         |
|            | bad→good        | 51 (14.8)  | 16 (12.2) |         |
|            | good→good       | 195 (56.7) | 38 (29.0) |         |
| I have regular health check-ups | bad→bad        | 81 (23.5)  | 40 (30.5) | 0.000   |
|            | good→bad        | 33 (9.6)   | 27 (20.6) |         |
|            | bad→good        | 40 (11.6)  | 19 (14.5) |         |
|            | good→good       | 190 (55.2) | 45 (34.4) |         |
| I try to consult a doctor early if I have symptoms | bad→bad        | 119 (34.6) | 57 (43.5) | 0.099   |
|            | good→bad        | 56 (16.3)  | 15 (11.5) |         |
|            | bad→good        | 55 (16.0)  | 26 (19.8) |         |
|            | good→good       | 114 (33.1) | 33 (25.2) |         |
| I have hypertension | bad→bad        | 123 (35.3) | 49 (37.4) | 0.656   |
|            | good→bad        | 45 (12.9)  | 12 (9.2)  |         |
|            | bad→good        | 19 (5.5)   | 9 (6.9)   |         |
|            | good→good       | 161 (46.3) | 61 (46.6) |         |
| I have heart disease | bad→bad        | 23 (6.6)   | 13 (9.9)  | 0.582   |
|            | good→bad        | 25 (7.2)   | 11 (8.4)  |         |
|            | bad→good        | 15 (4.3)   | 5 (3.8)   |         |
|            | good→good       | 285 (81.9) | 102 (77.9)|         |
| I have cerebrovascular disease | bad→bad        | 3 (0.9)    | 0 (0.0)   | 0.658   |
|            | good→bad        | 13 (3.7)   | 7 (5.3)   |         |
|            | bad→good        | 6 (1.7)    | 3 (2.3)   |         |
|            | good→good       | 326 (93.7) | 121 (92.4)|         |
| I have liver disease | bad→bad        | 3 (0.9)    | 3 (2.3)   | 0.019   |
|            | good→bad        | 4 (1.1)    | 2 (1.5)   |         |
|            | bad→good        | 4 (1.1)    | 7 (5.3)   |         |
|            | good→good       | 337 (96.8) | 119 (90.8)|         |
| I have diabetes | bad→bad        | 29 (8.3)   | 21 (16.0) | 0.031   |
|            | good→bad        | 9 (2.6)    | 7 (5.3)   |         |
|            | bad→good        | 9 (2.6)    | 3 (2.3)   |         |
|            | good→good       | 301 (86.5) | 100 (76.3)|         |
| I have dyslipidemia | bad→bad        | 34 (9.8)   | 7 (5.3)   | 0.464   |
|            | good→bad        | 23 (6.6)   | 10 (7.6)  |         |
|            | bad→good        | 23 (6.6)   | 10 (7.6)  |         |
|            | good→good       | 268 (77.0) | 104 (79.4)|         |
| Lifestyles                        | Categories | Well-being | \( P \) value |
|----------------------------------|------------|------------|---------------|
|                                  |            | Good       | Poor          |
| I have kidney disease            | bad→bad    | 6 (1.7)    | 3 (2.3)       | 0.084 |
|                                  | good→bad   | 6 (1.7)    | 6 (4.6)       |      |
|                                  | bad→good   | 2 (0.6)    | 3 (2.3)       |      |
|                                  | good→good  | 334 (96.0)| 119 (90.8)    |      |
| I have osteoporosis              | bad→bad    | 15 (4.3)   | 7 (5.3)       | 0.440 |
|                                  | good→bad   | 17 (4.9)   | 8 (6.1)       |      |
|                                  | bad→good   | 1 (2.9)    | 7 (5.3)       |      |
|                                  | good→good  | 306 (87.9)| 109 (83.2)    |      |
| I have periodontal disease       | bad→bad    | 10 (2.9)   | 5 (3.8)       | 0.054 |
|                                  | good→bad   | 13 (3.7)   | 13 (9.9)      |      |
|                                  | bad→good   | 24 (6.9)   | 6 (4.6)       |      |
|                                  | good→good  | 301 (86.5)| 107 (81.7)    |      |
| I pay attention to the amount and content of meals | bad→bad    | 17 (5.0)   | 8 (6.2)       | 0.003 |
|                                  | good→bad   | 11 (3.2)   | 15 (11.6)     |      |
|                                  | bad→good   | 17 (5.0)   | 9 (7.0)       |      |
|                                  | good→good  | 297 (86.8)| 97 (75.2)     |      |
| I have knowledge about a right balance of diet | bad→bad    | 31 (9.1)   | 30 (23.1)     | 0.000 |
|                                  | good→bad   | 30 (8.8)   | 25 (19.2)     |      |
|                                  | bad→good   | 46 (13.5)  | 16 (12.3)     |      |
|                                  | good→good  | 235 (68.7)| 59 (45.4)     |      |
| I have meals regularly           | bad→bad    | 4 (1.2)    | 3 (2.3)       | 0.648 |
|                                  | good→bad   | 7 (2.0)    | 3 (2.3)       |      |
|                                  | bad→good   | 10 (2.9)   | 5 (3.9)       |      |
|                                  | good→good  | 321 (93.9)| 118 (91.5)    |      |
| I eat breakfast                  | bad→bad    | 8 (2.3)    | 7 (5.4)       | 0.369 |
|                                  | good→bad   | 7 (2.0)    | 3 (2.3)       |      |
|                                  | bad→good   | 10 (2.9)   | 3 (2.3)       |      |
|                                  | good→good  | 318 (92.7)| 117 (90.0)    |      |
| I have meals together with family| bad→bad    | 40 (11.8)  | 18 (14.0)     | 0.058 |
|                                  | good→bad   | 30 (8.8)   | 16 (12.4)     |      |
|                                  | bad→good   | 18 (5.3)   | 14 (10.9)     |      |
|                                  | good→good  | 251 (74.0)| 81 (62.8)     |      |
| I eat at fast speed              | bad→bad    | 61 (17.7)  | 28 (21.5)     | 0.086 |
|                                  | good→bad   | 24 (7.0)   | 2 (1.5)       |      |
|                                  | bad→good   | 28 (8.1)   | 9 (6.9)       |      |
|                                  | good→good  | 231 (67.2)| 91 (70.0)     |      |
| I have dinner within two hours before bedtime | bad→bad    | 30 (8.8)   | 13 (10.2)     | 0.067 |
|                                  | good→bad   | 36 (10.6)  | 14 (11.0)     |      |
|                                  | bad→good   | 35 (10.3)  | 24 (18.9)     |      |
|                                  | good→good  | 239 (70.3)| 76 (59.8)     |      |
| I eat snacks after dinner        | bad→bad    | 98 (28.8)  | 38 (29.5)     | 0.352 |
|                                  | good→bad   | 19 (5.6)   | 13 (10.1)     |      |
|                                  | bad→good   | 53 (15.6)  | 17 (13.2)     |      |
|                                  | good→good  | 170 (50.0)| 61 (47.3)     |      |
| I smoke                          | bad→bad    | 23 (7.2)   | 9 (7.2)       | 1.000 |
|                                  | good→bad   | 0 (0.0)    | 0 (0.0)       |      |
|                                  | bad→good   | 0 (0.0)    | 0 (0.0)       |      |
|                                  | good→good  | 295 (92.8)| 116 (92.8)    |      |
| I drink more than appropriate amount | bad→bad    | 22 (6.7)   | 6 (5.0)       | 0.651 |
|                                  | good→bad   | 13 (4.0)   | 2 (1.7)       |      |
|                                  | bad→good   | 63 (19.3)  | 24 (20.0)     |      |
|                                  | good→good  | 228 (69.9)| 88 (73.3)     |      |
| Lifestyles                                           | Categories          | Well-being | P value |
|-----------------------------------------------------|---------------------|------------|---------|
|                                                     |                     | Good       | Poor    |
| I always try to take an exercise                   | bad→bad             | 13 (3.8)   | 9 (7.2) | 0.000   |
|                                                     | good→bad            | 15 (4.4)   | 21 (16.8)|         |
|                                                     | bad→good            | 19 (5.5)   | 8 (6.4)  |         |
|                                                     | good→good           | 296 (86.3) | 87 (69.6)|         |
| I brush my teeth every day                          | bad→bad             | 0 (0.0)    | 3 (2.5)  | 0.059   |
|                                                     | good→bad            | 8 (2.4)    | 3 (2.5)  |         |
|                                                     | bad→good            | 2 (0.6)    | 1 (0.8)  |         |
|                                                     | good→good           | 320 (97.0) | 115 (94.3)|        |
| I use an interdental toothbrush                     | bad→bad             | 110 (34.4) | 52 (42.6)| 0.224   |
|                                                     | good→bad            | 21 (6.6)   | 11 (9.0) |         |
|                                                     | bad→good            | 51 (15.9)  | 14 (11.5)|         |
|                                                     | good→good           | 138 (43.1) | 45 (36.9)|         |
| I have dental check-ups                             | bad→bad             | 72 (22.2)  | 47 (39.8)| 0.004   |
|                                                     | good→bad            | 27 (8.4)   | 7 (5.9)  |         |
|                                                     | bad→good            | 41 (12.8)  | 14 (11.9)|         |
|                                                     | good→good           | 181 (56.4) | 50 (42.4)|         |
| I have been stressed during the last month          | bad→bad             | 101 (29.6) | 78 (61.9)| 0.000   |
|                                                     | good→bad            | 42 (12.3)  | 17 (13.5)|         |
|                                                     | bad→good            | 51 (15.0)  | 12 (9.5) |         |
|                                                     | good→good           | 147 (43.1) | 19 (15.1)|         |
| I have had enough rest during the last month        | bad→bad             | 5 (1.5)    | 6 (4.8)  | 0.000   |
|                                                     | good→bad            | 8 (2.4)    | 9 (7.3)  |         |
|                                                     | bad→good            | 8 (2.4)    | 13 (10.5)|         |
|                                                     | good→good           | 319 (93.8) | 96 (77.4)|         |
| I have a sleep for 7–9 hours                        | bad→bad             | 96 (28.2)  | 50 (39.4)| 0.012   |
|                                                     | good→bad            | 47 (13.8)  | 25 (19.7)|         |
|                                                     | bad→good            | 62 (18.2)  | 17 (13.4)|         |
|                                                     | good→good           | 136 (39.9) | 35 (27.6)|         |
| I actively go out                                   | bad→bad             | 32 (9.4)   | 38 (30.2)| 0.000   |
|                                                     | good→bad            | 25 (7.3)   | 18 (14.3)|         |
|                                                     | bad→good            | 31 (9.1)   | 7 (5.6)  |         |
|                                                     | good→good           | 253 (74.2) | 63 (50.0)|         |
| I participate in district events                    | bad→bad             | 49 (14.2)  | 51 (40.2)| 0.000   |
|                                                     | good→bad            | 27 (7.8)   | 22 (17.3)|         |
|                                                     | bad→good            | 31 (9.0)   | 10 (7.9) |         |
|                                                     | good→good           | 237 (68.9) | 44 (34.6)|         |
| I have friendship with non-work friends or neighbors more than once a week | bad→bad             | 73 (22.6)  | 48 (40.0)| 0.000   |
|                                                     | good→bad            | 24 (7.4)   | 22 (18.3)|         |
|                                                     | bad→good            | 44 (13.6)  | 15 (12.5)|         |
|                                                     | good→good           | 182 (56.3) | 35 (29.2)|         |
| I lead a life with fun and goals                    | bad→bad             | 45 (14.2)  | 57 (49.1)| 0.000   |
|                                                     | good→bad            | 27 (8.5)   | 18 (15.5)|         |
|                                                     | bad→good            | 43 (13.6)  | 8 (6.9)  |         |
|                                                     | good→good           | 201 (63.6) | 33 (28.4)|         |
| I participate in local or volunteer activities      | bad→bad             | 168 (51.5) | 95 (79.2)| 0.000   |
|                                                     | good→bad            | 41 (12.6)  | 12 (10.0)|         |
|                                                     | bad→good            | 30 (9.2)   | 4 (3.3)  |         |
|                                                     | good→good           | 87 (26.7)  | 9 (7.5)  |         |

\( \chi^2 \) test or Fisher’s exact test. Well-being: Good (WHO-5 \( \geq 13 \)), Poor (WHO-5 <13).
### Table 5  Risk factors for “poor” well-being

| Factors                                      | Categories                      | Well-being | 95% CI        | P value |
|----------------------------------------------|---------------------------------|------------|---------------|---------|
|                                              |                                 | OR         | Lowest        | Highest |         |
| Age                                           | 1.056                           | 0.961      | 1.159         | 0.256   |         |
| Gender male (ref. female)                     | 1.636                           | 0.609      | 4.394         | 0.329   |         |
| I take an exercise                           | bad→bad (ref. good→good)       | 3.328      | 0.941         | 11.772  | 0.062   |
|                                              | good→bad (ref. good→good)      | 1.464      | 0.326         | 6.567   | 0.619   |
|                                              | bad→good (ref. good→good)      | 2.259      | 0.437         | 11.681  | 0.331   |
| I lead a life with fun and goals             | bad→bad (ref. good→good)       | 5.531      | 1.478         | 20.689  | 0.011   |
|                                              | good→bad (ref. good→good)      | 1.366      | 0.335         | 5.562   | 0.664   |
|                                              | bad→good (ref. good→good)      | 0.307      | 0.064         | 1.478   | 0.141   |
| I pay attention to the amount and content of meals | bad→bad (ref. good→good)       | 0.249      | 0.056         | 1.115   | 0.069   |
|                                              | good→bad (ref. good→good)      | 0.463      | 0.099         | 2.177   | 0.330   |
|                                              | bad→good (ref. good→good)      | 2.653      | 0.663         | 10.615  | 0.168   |
| I keep a regular routine                     | bad→bad (ref. good→good)       | 1.731      | 0.407         | 7.354   | 0.457   |
|                                              | good→bad (ref. good→good)      | 2.622      | 0.651         | 10.551  | 0.175   |
|                                              | bad→good (ref. good→good)      | 0.249      | 0.051         | 1.215   | 0.086   |
| I have regular health check-ups              | bad→bad (ref. good→good)       | 0.986      | 0.296         | 3.284   | 0.981   |
|                                              | good→bad (ref. good→good)      | 0.562      | 0.089         | 3.548   | 0.540   |
|                                              | bad→good (ref. good→good)      | 1.493      | 0.300         | 7.436   | 0.624   |
| I try to consult a doctor early if I have symptoms | bad→bad (ref. good→good)       | 1.005      | 0.314         | 3.213   | 0.993   |
|                                              | good→bad (ref. good→good)      | 0.636      | 0.127         | 3.186   | 0.582   |
|                                              | bad→good (ref. good→good)      | 1.023      | 0.233         | 4.486   | 0.976   |
| I pay attention to the amount and content of meals | bad→bad (ref. good→good)       | 3.469      | 0.398         | 30.254  | 0.260   |
|                                              | good→bad (ref. good→good)      | 2.757      | 0.412         | 18.450  | 0.296   |
|                                              | bad→good (ref. good→good)      | 3.129      | 0.376         | 26.008  | 0.291   |
| I have knowledge about a right balance of diet | bad→bad (ref. good→good)       | 3.245      | 0.826         | 12.757  | 0.092   |
|                                              | good→bad (ref. good→good)      | 2.442      | 0.530         | 11.256  | 0.252   |
|                                              | bad→good (ref. good→good)      | 1.811      | 0.465         | 7.056   | 0.392   |
| I have meals with family                     | bad→bad (ref. good→good)       | 1.187      | 0.256         | 5.498   | 0.826   |
|                                              | good→bad (ref. good→good)      | 1.112      | 0.257         | 4.798   | 0.887   |
|                                              | bad→good (ref. good→good)      | 5.460      | 0.903         | 33.017  | 0.065   |
| I have dinner within two hours before bedtime | bad→bad (ref. good→good)       | 1.594      | 0.286         | 8.870   | 0.595   |
|                                              | good→bad (ref. good→good)      | 1.314      | 0.268         | 6.450   | 0.737   |
|                                              | bad→good (ref. good→good)      | 1.987      | 0.454         | 8.695   | 0.362   |
| I eat snacks after dinner                    | bad→bad (ref. good→good)       | 0.709      | 0.253         | 1.983   | 0.512   |
|                                              | good→bad (ref. good→good)      | 3.929      | 0.361         | 42.808  | 0.262   |
|                                              | bad→good (ref. good→good)      | 0.998      | 0.244         | 4.082   | 0.998   |
| I always try to take an exercise             | bad→bad (ref. good→good)       | 0.443      | 0.053         | 3.712   | 0.453   |
|                                              | good→bad (ref. good→good)      | 3.587      | 0.610         | 21.104  | 0.158   |
|                                              | bad→good (ref. good→good)      | 0.201      | 0.025         | 1.629   | 0.133   |
| I use an interdental toothbrush              | bad→bad (ref. good→good)       | 0.790      | 0.233         | 2.687   | 0.706   |
|                                              | good→bad (ref. good→good)      | 0.376      | 0.045         | 3.151   | 0.367   |
|                                              | bad→good (ref. good→good)      | 0.554      | 0.129         | 2.373   | 0.426   |
| I have dental check-ups                      | bad→bad (ref. good→good)       | 3.020      | 0.849         | 10.740  | 0.088   |
|                                              | good→bad (ref. good→good)      | 0.320      | 0.045         | 2.285   | 0.256   |
|                                              | bad→good (ref. good→good)      | 2.171      | 0.392         | 12.034  | 0.375   |
member countries points to the importance of social participation for the well-being of this population.

On the other hand, according to a study examining the influence of regional characteristics on health, in Japan, elderly people in administrative districts with greater social capital have less depression and weakness; further, their physical health and mental health are better. According to Sumida et al., Kizugawa City’s social and environmental factors and sense of community are related to people’s QOL; thus, regional characteristics are also important elements affecting the well-being of the elderly. The city has many social inflows and is one of the few cities in Japan with a growing population. Local governments, based on their autonomy, need to create regionally inclusive care systems according to regional characteristics and encourage social participation. Regarding general support projects, particularly for the elderly, a support system that promotes seamless social participation based on the functions of living is also necessary (in addition to health check-ups, health guidance and consultation, etc.). In emerging housing areas where there are few land boundaries, creating a community that promotes social participation and interaction, new activities, and which includes a mechanism for preventing the decline of social functions with multi-generational and multi-disciplinary collaboration is also necessary.

**Limitations of this study**

The subjects of this study were considered to have a selective bias because they are local government residents. Moreover, although lifestyle change was used as an explanatory variable, there was hardly any change observed at all. Since lifestyle changes are likely to occur with aging of the elderly, it may be necessary to consider increasing the number of subjects for a more comprehensive analysis.

Another limitation is lower effective response rate. It is thought that this bias influenced results.

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**Table 5 (Continued)**

| Factors | Categories | Well-being | OR | 95% CI | P value |
|---------|------------|------------|----|--------|---------|
| I have been stressed during the last month | bad→bad (ref. good→good) | 21.886 | 5.501 | 87.067 | 0.000 |
| | good→bad (ref. good→good) | 31.940 | 5.603 | 182.078 | 0.000 |
| | bad→good (ref. good→good) | 4.372 | 0.767 | 24.924 | 0.097 |
| I have had enough rest in the last month | bad→bad (ref. good→good) | 29.943 | 2.003 | 447.603 | 0.014 |
| | good→bad (ref. good→good) | 8.851 | 1.056 | 74.213 | 0.044 |
| | bad→good (ref. good→good) | 4.628 | 0.561 | 38.148 | 0.155 |
| I have a sleep for 7–9 hours | bad→bad (ref. good→good) | 1.670 | 0.487 | 5.729 | 0.415 |
| | good→bad (ref. good→good) | 1.287 | 0.323 | 5.122 | 0.720 |
| | bad→good (ref. good→good) | 1.519 | 0.386 | 5.977 | 0.550 |
| I actively go out | bad→bad (ref. good→good) | 1.750 | 0.434 | 7.059 | 0.432 |
| | good→bad (ref. good→good) | 0.270 | 0.051 | 1.419 | 0.122 |
| | bad→good (ref. good→good) | 0.063 | 0.006 | 0.666 | 0.022 |
| I participate in district events | bad→bad (ref. good→good) | 2.455 | 0.682 | 8.841 | 0.170 |
| | good→bad (ref. good→good) | 3.452 | 0.750 | 15.883 | 0.112 |
| | bad→good (ref. good→good) | 0.981 | 0.148 | 6.499 | 0.984 |
| I have friendship with non-work friends or neighbors more than once a week | bad→bad (ref. good→good) | 0.512 | 0.123 | 2.141 | 0.359 |
| | good→bad (ref. good→good) | 2.337 | 0.449 | 12.168 | 0.313 |
| | bad→good (ref. good→good) | 1.417 | 0.330 | 6.089 | 0.640 |
| I lead a life with fun and goals | bad→bad (ref. good→good) | 1.552 | 0.355 | 6.777 | 0.559 |
| | good→bad (ref. good→good) | 6.820 | 1.225 | 37.973 | 0.028 |
| | bad→good (ref. good→good) | 0.472 | 0.076 | 2.955 | 0.423 |
| I participate in local or volunteer activities | bad→bad (ref. good→good) | 2.375 | 0.554 | 10.183 | 0.244 |
| | good→bad (ref. good→good) | 0.741 | 0.118 | 4.668 | 0.749 |
| | bad→good (ref. good→good) | 1.017 | 0.069 | 14.981 | 0.990 |

OR: Odds Ratio; ref.: reference=1.000; 95% CI: 95% Confidence Interval. Logistic regression analysis.

Well-being: Good (WHO-5 ≥13), Poor (WHO-5 <13).
Conclusion

This study examined the risk factors related to “poor” well-being of community elderly cohorts residing in a rural city with an increasing population. Our study results suggest that for the elderly, a healthy lifestyle, disease prevention, and medical consultations are not only required to prevent a decline in well-being, but also for low levels of stress, rest, as well as the pursuit of hobbies, participation in social activities, and the maintenance of social roles. To maintain the well-being of elderly people in the regional community, it is necessary to create a place for relaxation which promotes and active social exchanges and encourages them to engage in pleasurable and goal-oriented activities.

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