

# Effect of eating alone on dietary practice in community-dwelling elderly in Japan

Akira Ishida<sup>1</sup>, Emiko Ishida<sup>2</sup>

<sup>1</sup> Graduate School of Agricultural Science, Kobe University, Kobe, Japan; <sup>2</sup> Hyogo University of Health Sciences, Kobe, Japan

**Summary.** *Objective:* Our study aimed to examine whether eating alone has negative effects on dietary practices among community-dwelling elderly in Japan, while considering gender and cohabitation status differences. *Methodology:* Individual data for adults  $\geq 65$  years old was obtained from two nationwide Surveys of Attitudes towards Food and Nutrition Education (*Shokuiku*) conducted by the Ministry of Agriculture, Forestry and Fisheries in 2016 and 2017. Ordered logit models with various dietary practices as dependent variables were developed. *Findings:* Single men were least likely to attempt to adopt a healthy dietary lifestyle, actually eat a balanced diet, avoid too much salt, and eat many vegetables and fruit, followed by men living with their families and eating alone. Elderly individuals with higher self-reported financial means were more likely to attempt to adopt a healthy dietary lifestyle and actually eat balanced meals. However, the marginal effects at means were significantly smaller than those of the dummies for single men and men living with their families and eating alone. Additionally, knowledge of food safety was likely to increase consciousness about healthy dietary habits, but did not affect actual dietary practice among the elderly. Taken together, our data suggest that eating alone may be a stronger determinant of actual dietary practices than living alone. *Originality:* To our knowledge, the gender- and cohabitation status-dependent effect of eating alone on dietary practices among community-dwelling elderly has so far attracted little attention. Our study attempted to examine whether eating alone has a negative effect on dietary practices among community-dwelling elderly, while considering gender and cohabitation status differences.

**Key words:** cohabitation, community-dwelling elderly, dietary practice, eating alone, balanced meals, Japan

## Introduction

Many developed and upper middle-income countries, particularly Japan, are witnessing population aging due to the steadily declining birth rates and extended longevity. As this demographic change advocates the governments to curb the increase in public healthcare expenditures for the elderly without decreasing their quality of life (QOL) as far as possible, extending healthy life years — especially among community-dwelling elderly — becomes an important policy agenda. Many evidence-based studies show that

health-related QOL is determined by daily nutrition or dietary intake.

Several geriatric studies indicate that eating alone is associated with depression (1-5), unhealthy eating practice such as low food diversity (2, 6), lower vegetable and fruit intake (7), meal skipping (7), higher prevalence of obesity and underweight (7), higher nutritional risk (8), food insecurity (9), lower energy intake (10), lower QOL (2), cognitive decline (11), and higher mortality (12) among the elderly. However, to the best of our knowledge, the gender- and cohabitation status-dependent effect of eating alone on dietary

practices among community-dwelling elderly has not been studied intensively. Although an exceptional study (7) found a significant gender- and cohabitation status-dependent association between eating alone and dietary practice, it was based on a survey conducted in a specific region in Japan. Therefore, using individual data combined from the 2016 and 2017 Surveys of Attitudes toward Food and Nutrition Education (*Shokuiku*), carried out by the Ministry of Agriculture, Forestry and Fisheries of Japan nationwide, our study aims to examine the effect of eating alone on dietary practices among community-dwelling elderly, while considering gender and cohabitation status differences.

## Materials and Methods

We combined individual data for adults, aged 65 years old or above, from the two independent Surveys of Attitudes toward Food and Nutrition Education (*Shokuiku*), conducted by the Ministry of Agriculture, Forestry and Fisheries in November 2016 and November/December 2017. For each nationwide survey, a two-stage stratified random sampling was used to select 3,000 people aged 20 or older; thus, 3,000 people were selected for each survey. Trained staff members conducted face-to-face interviews with those who agreed to participate. Of the 714 and 697 participants aged 65 and above for 2016 and 2017, respectively, 676 and 660 respondents provided adequate data for further

analyses. Ethics approval was not required for this secondary analysis of data publicly available through the University of Tokyo's Center for Social Research and Data Archives, Institute of Social Science.

As shown in Table 1, we used the following questions regarding dietary practices, all of which were the same for the 2016 and 2017 surveys: "To what extent do you usually try to lead a healthy dietary lifestyle?" (4 = very high, 3 = high, 2 = low, 1 = very low); "How many days in an average week do you eat a main dish (an energy source of carbohydrates such as rice, bread, or noodles), main side dishes (main source of protein and fat such as fish, meat, eggs, or soybean products), and sub-side dishes (source of vitamins, minerals, and fiber, which are limited in main dishes and main side dishes) simultaneously more than twice a day?" (4 = almost every day, 3 = four to five days per week, 2 = two to three days per week, 1 = less than one day per week); "For the prevention and improvement of lifestyle diseases, to what extent do you actually..." "...avoid taking too much salt?," "...eat many vegetables?," and "...eat many fruits?" (4 = very high, 3 = high, 2 = low, 1 = very low).

Given that all responses regarding dietary practices were ordinal in nature, ordered logistic regression was used to examine the association between eating alone and dietary practices after adjusting for all other potential factors. In the ordered logistic model, the observed ordinal variable  $Y_i$  regarding dietary practice is a function of unobservable latent continuous variable  $Y_i^*$  which has various cut points or thresholds. The value

**Table 1.** Questions and the scales used to measure various dimensions of dietary practices

Questionnaire sentences	Scales of alternatives	Dependent variables
To what extent do you usually try to lead a healthy dietary lifestyle?	4 = very high, 3 = high, 2 = low, 1 = very low	Y1
How many days in an average week do you eat a main dish (an energy source of carbohydrates such as rice, bread, or noodles), main side dishes (main source of protein and fat such as fish, meat, eggs, or soybean products), and sub-side dishes (source of vitamins, minerals, and fiber, which are limited in main dishes and main side dishes) simultaneously more than twice a day?	4 = almost every day, 3 = four to five days per week, 2 = two to three days per week, 1 = less than one day per week	Y2
For the prevention and improvement of lifestyle diseases, to what extent do you actually avoid taking too much salt?	4 = very high, 3 = high, 2 = low, 1 = very low	Y3
For the prevention and improvement of lifestyle diseases, to what extent do you actually eat many vegetables?	4 = very high, 3 = high, 2 = low, 1 = very low	Y4
For the prevention and improvement of lifestyle diseases, to what extent do you actually eat many fruits?	4 = very high, 3 = high, 2 = low, 1 = very low	Y5

of  $Y_i$  depends on whether or not the latent variable  $Y_i^*$  has crossed a particular threshold  $\mu$  as shown below:

$$Y_i = \begin{cases} 1 & \text{if } Y_i^* \leq \mu_1 \\ 2 & \text{if } \mu_1 < Y_i^* \leq \mu_2 \\ 3 & \text{if } \mu_2 < Y_i^* \leq \mu_3 \\ 4 & \text{if } \mu_3 < Y_i^* \end{cases} \quad (1)$$

The ordered logit model is defined as follows:

$$Y_i^* = X' \beta + \varepsilon \quad (2)$$

where  $X$  is the vector of independent variables,  $\beta$  the vector of regression coefficients to be estimated, and the error term normally distributed with a mean of 0.

All data were analyzed using STATA version 16.0, with a significance level of 0.05.

The main independent variable was created by multiplying three dummy-coded variables for gender (male or female), cohabitation status (living alone or living with family), and the presence of eating companion(s) (eating alone or eating with someone else) to clarify the synergetic effect of three factors on dietary practice. The practice of eating alone was assessed using the following question: "How often do you eat all meals in a day alone?" Using the responses to the question, we categorized respondents who answered "almost every day," "four to five days per week," or "two to three days per week" into the "eating alone" category and respondents who answered "less than one day a week" or "rarely" into the "eating with someone" category. All respondents were divided into eight categories: single women eating

with someone, single women eating alone, women living with family and eating with someone, women living with family and eating alone, single men eating with someone, single men eating alone, men living with family and eating with someone, and men living with family and eating alone. However, since only four of the 62 single men and 11 of the 131 single women ate meals with someone (Table 2), "single men (women) eating alone" and "single men (women) eating with someone" were combined together to make new variables denoted as "single men" and "single women," respectively. Therefore, the dummy-coded independent variables created by multiplying three variables for gender, cohabitation status, and the presence of eating companion(s) included single women ( $n = 131$ ), women living with family and eating with someone ( $n = 494$ ), women living with family and eating alone ( $n = 71$ ), single men ( $n = 62$ ), men living with family and eating with someone ( $n = 509$ ), and men living with family and eating alone ( $n = 69$ ).

Considering the findings of previous study (13) and the limitations of the survey questions, we also used the following independent variables: a dummy-coded age variable (65-69, 70-74, and 75-79 years old, and 80 years old or above), a self-reported financial means variable measured on a four-point Likert scale (4 = very good, 3 = fairly good, 2 = neither good nor bad, and 1 = not good at all), a self-reported variable for the extent of knowledge of food safety, which results in a healthy dietary lifestyle (4 = to a large extent, 3 = to some extent, 2 = to a small extent, 1 = not at all), and a dummy-coded variable for residence (Tokyo metropoli-

**Table 2.** Number of subjects by gender, cohabitation status, and habit of eating alone

	Number of subjects	Percentage (%)
Single women eating with someone	120	9.0
Single women eating alone	11	0.8
Women living with family and eating with someone	494	37.0
Women living with family and eating alone	71	5.3
Single men eating with someone	58	4.3
Single men eating alone	4	0.3
Men living with family and eating with someone	509	38.1
Men living with family and eating alone	69	5.2
Total	1,336	100.0

Notes: Authors' calculation.

tan area, ordinance-designated city, city with more than 100,000 people, city with less than 100,000 people, and village/town). The reasons why we used age variable as a dummy for every 5-year age group rather than continuous variable are as follows: 1) it is not clear whether dietary practices are monotonically and linearly related with age; 2) the elderly population is divided into the young-old (65-69 years), the middle-old (70-74 years), and the old-old (75 years and over) in the medical and healthcare system; and, 3) the prevalence of dementia increases particularly after the age of 80 years.

## Results

Of the 1,336 elderly individuals, although 962 (72.0%) ate with companions almost every day, 217 (16.2%) ate all meals alone almost daily, 41 (3.1%) ate alone four or five days a week, 60 (4.5%) ate alone two or three days a week, and 56 (4.2%) ate alone one day a week. This implied that 23.8% of the elderly in the study population ate all meals alone more than two days a week. Even among the 1,143 elderly persons living with family, 140 (12.2%) ate alone.

The mean values for the five dependent variables with the cross-term variable for gender, cohabitation status, and presence of eating companion(s) are shown in Table 3. A Kruskal-Wallis test was conducted to

determine whether each dietary practice was different for the six respondent's categories. The test statistics that follow a chi-squared distribution with 5 degrees of freedom are 55.232, 101.665, 23.788, 46.253, and 53.848 for each dependent variable, suggesting that there are statistically significant differences in dietary practice among the categories. All mean values were lowest for single men, followed by men living with family and eating alone. This implies that these individuals are less likely to attempt to lead a healthy dietary lifestyle, actually eat balanced meals, avoid too much salt, and eat many vegetables and fruits.

The estimated coefficients and their t-values for the ordered logit models on attempting to practice a healthy dietary lifestyle (Y1), actual frequency of a well-balanced dietary intake pattern (Y2), extent of avoiding excess salt intake (Y3), actual vegetable intake (Y4), and actual fruit intake (Y5) are presented in Table 4. The null hypothesis that all coefficients except the constant term are zero was rejected by the likelihood ratio (LR) test at the 1% significance level in each estimation (the values of test statistics following the chi-squared distribution with 14 degrees of freedom, ranging from 50.33 to 143.40, all of which were larger than the 1% critical value of 29.14). All null hypotheses of  $\mu_1=\mu_2$  or  $\mu_2=\mu_3$  are rejected at the 1% significant level and estimated values of  $\mu_1$ ,  $\mu_2$ , and  $\mu_3$  are in ascending order ( $\mu_1<\mu_2<\mu_3$ ) in all equations in Table 4, indicating that

**Table 3.** Mean values of dependent variables by gender, cohabitation status, and habit of eating alone

Set of alternative categories	Y1	Y2	Y3	Y4	Y5
Single women	3.282	3.382	3.206	3.221	3.046
Women living with family and eating with someone	3.366	3.634	3.128	3.383	3.162
Women living with family and eating alone	3.225	3.606	3.070	3.234	2.986
Single men	2.806	2.468	2.774	2.855	2.613
Men living with family and eating with someone	3.118	3.544	3.002	3.173	2.929
Men living with family and eating alone	2.986	3.000	2.913	3.014	2.696
Total	3.210	3.489	3.057	3.236	3.003

Notes: Y1 = extent of attempting to practice a healthy dietary lifestyle (4 = very high, 3 = high, 2 = low, 1 = very low)

Y2 = actual frequency of a well-balanced dietary intake pattern (4 = almost every day, 3 = four to five days per week, 2 = two to three days per week, 1 = less than one day per week)

Y3 = extent of avoiding excess intake of salt (4 = very high, 3 = high, 2 = low, 1 = very low)

Y4 = extent of actual intake of vegetables (4 = very high, 3 = high, 2 = low, 1 = very low)

Y5 = extent of actual intake of fruit (4 = very high, 3 = high, 2 = low, 1 = very low)

Table 4. Results from the ordered logit models

	Y1	Y2	Y3	Y4	Y5
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	z-values	z-values	z-values	z-values	z-values
Gender × cohabitation status × eating alone (Reference: Single women)					
Women living with family and eating with someone	0.224	0.761	-0.251	0.327	0.268
	1.151	3.565**	-1.325	1.693	1.422
Women living with family and eating alone	-0.247	0.431	-0.346	-0.044	-0.160
	-0.863	1.333	-1.224	-0.153	-0.574
Single men	-1.053	-1.483	-0.963	-0.926	-1.004
	-3.480**	-4.933**	-3.272**	-3.066**	-3.410**
Men living with family and eating with someone	-0.450	0.440	-0.555	-0.220	-0.286
	-2.326*	2.124*	-2.944**	-1.150	-1.527
Men living with family and eating alone	-0.798	-0.629	-0.847	-0.641	-0.889
	-2.729**	-2.092*	-2.977**	-2.216*	-3.183**
Age (Reference: 65-69 years)					
70-74 years		0.194	0.317	0.185	
		1.228	2.292*	1.326	
75-79 years	0.437				0.103
	3.111**				0.754
80 years and above	0.714	0.309	0.254	0.280	0.378
	4.774**	1.787	1.726	1.898	2.612**
Self-reported economic condition	0.375	0.547	0.018	-0.040	0.046
	2.486*	3.041**	0.121	-0.040	0.314
Knowledge with respect to food safety	0.285	0.252	0.170	0.195	0.179
	5.419**	4.291**	3.317**	3.799**	3.537**
Residence (Reference: Village/Town)	0.141	0.055	0.080	0.041	0.034
	2.793**	0.979	1.623	0.821	0.702
Tokyo metropolitan area		-0.104	0.016	0.206	
		-0.302	0.053	0.656	
Ordinance-designated city	0.189	0.245	-0.285	-0.066	0.416
	0.615	1.037	-1.417	-0.324	1.347
City with more than 100,000 people	0.186	-0.174	-0.219	0.085	0.266
	0.927	-0.839	-1.213	0.461	1.323
City with less than 100,000 people	0.029	0.386	-0.057	0.124	0.195
	0.161	1.687	-0.293	0.635	1.075
Threshold between Y=1 and Y=2	-2.303	-1.573	-2.966	-3.158	-2.829
	-0.127	0.055	-0.994	-0.957	-7.433
Threshold between Y=2 and Y=3	2.381	0.801	1.402	1.415	-0.222
	-1,340.865	-1,132.721	-1,455.920	-1,364.434	-0.641
Log likelihood	127.89**	143.4**	50.33**	71.84**	1.936
					-1,481.654
Log likelihood test- $\chi^2(14)$					78.36**

Notes: For Models 1-5, see notes from Table 2.

\*\* and \* denote significance levels of 1% and 5%, respectively.



the imposed cut points of the observable categories of each dependent variables are not equal and the Likert scales used in the study are reliable. Moreover, since the variance inflation factor was below the threshold of 10, with the highest value at 3.10 and lowest at 1.01, there is no multicollinearity apparent among the independent variables in the ordered logit models. Therefore, the estimation results based on the ordered logit models in Table 4 are likely reliable.

Estimation results from Y1 in Table 4 indicated that older men were less likely to attempt to lead a healthy dietary lifestyle than single older women, irrespective of whether they lived with their family and ate meals alone. Moreover, individuals who were 70 years old or above, whose self-reported financial condition was good, or who had more knowledge of food safety, were more likely to attempt to lead a healthy dietary lifestyle. The marginal effects at means (MEM) reported in Table 5 show that the probability to which the elderly attempted to practice a healthy dietary lifestyle (“very high”) decreased by 21.3% for single men, 10.2% for men living with family and eating with someone, and 17.0% for men living with family and eating alone, when compared to single women. This clearly suggests that eating alone and single living lead to the least attempt to practice a healthy dietary lifestyle in community-dwelling elderly.

Estimation results from Y2 in Table 4 indicated that single men and men living with family and eating alone were less probable to actually eat a well-balanced diet, and men living with family and eating with someone were more likely to do so, compared with single women. Individuals, 80 years or above, whose self-reported financial condition was good were more likely to eat a well-balanced diet. The marginal effects reported in Table 5 show that the probability of the actual frequency of a well-balanced dietary intake pattern of “almost every day” decreased by 35.2% for single men and 15.3% for men living with family and eating alone, and increased by 15.2% for women living with family and eating with someone and 9.4% for men living with family and eating with someone, when compared to single women. However, this clearly suggests that it is single men that are most reluctant to actually eat a well-balanced diet, followed by men living with family and eating alone.

Estimation results from Y3 in Table 4 indicate that older men less frequently avoid too much salt than single older women, irrespective of whether they lived with their family and ate meals alone. Individuals 70-74 years old whose self-reported financial condition was good were more likely to avoid too much salt. The marginal effects reported in Table 5 show that the probability to which they usually avoid eating too much salt (“very high”) decreased by 18.7% for single men, 11.8% for men living with family and eating with someone, and 16.9% for men living with family and eating alone compared to single women. This clearly suggests that community-dwelling elderly who least frequently avoid taking too much salt were single men, followed by men living with family and eating alone.

Estimation results of Y4 in Table 4 indicate that single men and men living with family and eating alone are less probable to actually eat many vegetables compared to single women. On the contrary, older individuals whose self-reported financial condition is better are more likely to eat many vegetables. The marginal effects reported in Table 5 show that the probability to which they usually eat much vegetable “very high” decreased by 18.9% for single men and 13.9% for men living with family and eating alone, when compared to single women. This clearly suggests that eating alone has a negative impact on vegetable intake in older men.

Estimation results from Y5 in Table 4 indicated that single men and men living with family and eating alone were less likely to actually eat many fruits than single women. On the contrary, older individuals whose self-reported financial condition was better were more likely to eat more fruit. The marginal effects reported in Table 5 show that the probability to which they usually eat many fruits “very high” decreased by 16.0% for single men and 14.6% for men living with family and eating alone, when compared to single women. This clearly suggests that eating alone has a negative impact on fruit intake in older men.

## Discussion

The coefficients and marginal effects shown in Tables 3 and 4 suggest that single men, of whom 93.5% (58 of 62 individuals) usually eat alone, are least

**Table 5.** Changes in the predicted probability (marginal effect at means) for a subject to maintain the most favorable dietary behavior

	Y1		Y2		Y3		Y4		Y5	
	MEM	z-values	MEM	z-values	MEM	z-values	MEM	z-values	MEM	z-values
Gender cohabitation status x eating alone (Reference: Single women)										
Women living with family and eating with someone	0.055	1.164	0.152	3.3191	-0.056	-1.298	0.080	1.722	0.058	1.466
Women living with family and eating alone	-0.058	-0.872	0.092	1.376	-0.076	-1.248	-0.010	-0.153	-0.032	-0.580
Single men	-0.213	-3.776 **	-0.352	-5.477 **	-0.187	-3.526 **	-0.189	-3.297 **	-0.160	-3.651 **
Men living with family and eating with someone	-0.102	-2.250 *	0.094	2.040*	-0.118	-2.790 **	-0.051	-1.132	-0.055	-1.468
Men living with family and eating alone	-0.170	-2.874 **	-0.153	-2.100*	-0.169	-3.149**	-0.139	-2.305 **	-0.146	-3.327 **
Age (in years) (Reference: 65-69)										
70-74	0.097	3.087 **	0.041	1.237	0.065	2.272 *	0.044	1.323	0.020	0.751
75-79	0.164	4.737 **	0.064	1.825	0.051	1.705	0.067	1.890	0.076	2.567*
80 and above	0.082	2.452 *	0.108	3.180**	0.003	0.121	-0.009	-0.274	0.009	0.313
Self-reported economic condition	0.066	5.419**	0.051	4.316**	0.034	3.318**	0.046	3.799 **	0.035	3.538 **
Knowledge with respect to food safety	0.032	2.793 *	0.011	0.979	0.016	1.623	0.010	0.821	0.007	0.702
Residence (Reference: Village/Town)										
Tokyo metropolitan area	0.043	0.608	-0.022	-0.300	0.004	0.053	0.049	0.651	0.083	1.294
Ordinance-designated city	0.042	0.935	0.048	1.023	-0.058	-1.393	-0.015	-0.323	0.051	1.349
City with more than 100,000 people	0.006	0.162	-0.037	-0.856	-0.045	-1.181	0.020	0.464	0.037	1.108
City with less than 100,000 people	0.069	1.574	0.073	1.635	-0.012	-0.292	0.029	0.639	0.019	0.550

Notes: For Models 1-5, see notes from Table 2.

\*\* and \* denote significance levels of 1% and 5%, respectively.

Marginal effect at means (MEM) shows the extent to which a change in a particular independent variable has an effect on the predicted probability of selecting an alternative  $j$  of the dependent variable, given that all other variables are constant at their means. For example, the MEM for single men in Model 1 is -0.213, implying that the probability that they usually attempt to practice a healthy dietary life ("very high" category; dependent variable takes alternative 4) is 21.3 percentage points lower than that for the reference category (single women).

likely to attempt and actually practice a favorable dietary lifestyle, followed by men living with family and eating alone. This clearly indicates that eating alone is significantly associated with unfavorable dietary practices among elderly, consistent with the findings of Kimura et al. (2) demonstrating that eating alone is related to a less varied diet. However, this conclusion is only applicable to male elderly individuals in the present study, consistent with results from Tani et al. (7) showing that the effects of eating alone on unhealthy dietary practices were more prominent among men. The negative effect of eating alone on depression was also found only for men (4). Irrespective of whether they lived alone or with family, no significant association between eating alone and dietary practices was found among female elderly individuals. This is probably because elderly women are generally much better at cooking than men and have more experience with cooking, as is the case with housewives in Japan. Considering that Tani et al. (12) showed that the association between eating alone and risk for mortality is much more apparent in men, eating alone seems to be an alarming practice for men from the public health viewpoint.

Although men living with family and eating with someone tend to be careless about a healthy dietary lifestyle and avoiding too much salt, they are not less likely to eat vegetables and fruits and eat balanced meals more often. Many empirical studies showed that older men do not consider a healthy dietary lifestyle important, and their dietary intake tends to be more unfavorable than that of older women. However, our estimation results suggest that eating with companion(s) prevents older men living with family from eating unhealthy and nutritionally unbalanced meals. It appears that most older men living with family seldom cook, and their meals are usually prepared by their wives, children, or children's spouses, who are more conscious of nutritional choice than them. Therefore, they are less likely to eat unhealthy and nutritionally unbalanced meals, irrespective of whether they are attempting to eat healthy and nutritionally balanced meals. Our findings regarding eating alone and cohabitation suggest that eating alone might be a stronger determinant of actual dietary practice than living alone. This is consistent with Wang et al. (5)

who demonstrated that among Chinese elderly individuals, the negative effects of eating alone on depressive symptoms are stronger than those of living alone.

Older individuals with higher self-reported income were more likely to attempt to practice a healthy dietary lifestyle and actually eat balanced meals. However, absolute values of the marginal effects of choosing "4=very high" (Y1, Y3-Y5) or "4=almost every day" (Y2) ranged from 0.034 to 0.066 for self-reported financial conditions. These values were significantly smaller than those of the dummy values for single men (0.160-0.352) and men living with family and eating alone (0.139-0.170). Additionally, the estimation results suggested that knowledge of food safety was likely to increase consciousness of a healthy dietary lifestyle, but did not affect actual dietary practice among older individuals. Therefore, it appears that gender (male) and eating alone are the main determinants of the extent of eating healthy and nutritionally balanced meals among community-dwelling older individuals in Japan.

From the public health viewpoint, elderly individuals can be encouraged to pay more attention to healthy and nutritionally balanced meals through participation in community meals. The "social facilitation of eating" shows that people increase food intake when they eat with companions or in a group (14). Tani et al. (4) also suggested that shared meal services at community centers may be beneficial for older adults. However, our study found that male elderly individuals eating alone tended to be more reluctant to utilize community meal services. All subjects were asked to answer the question, "To what extent do you want to participate in community meals?" (5-Likert scale, strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree). The proportion of individuals answering "strongly agree" was 26.7% for single women, 22.7% for women living with family and eating with companion(s), 21.1% for women living with family and eating alone, 9.7% for single men, 16.5% for men living with family and eating with companion(s), and 10.1% for men living with family and eating alone. This implies that men living alone and/or eating alone are most reluctant to participate in community meals. In addition to single elderly men, men living with family and eating alone are also reluctant to participate in



community activities. Kuroda et al. (3) showed that elderly individuals living with family yet eating alone had the poorest social ties with family and friends, and current community meals are not effective in encouraging them into creating social ties. The proportion of elderly living alone has been increasing steadily and if this trend continues, along with rapid aging of the Japanese population, once the most dependable social safety net provided by family and/or relatives for elderly will weaken further over time. In addition, countermeasures for so-called *Kaimono-Nanmin* (meaning shopping refugees, who have no easy access to stores for daily necessities) are urgent issues in rapidly aging Japan. To effectively prevent community-dwelling elderly in general and single living elderly in particular from social exclusion, detailed evaluation of current social security measures such as community meals, food and daily necessities sales by mobile vehicle stall, and home delivery service of food and beverage remain to be analyzed in the future.

## Acknowledgements

The authors thank the Japan Social Science Data Archive, Center for Social Research and Data Archives, Institute of Social Science, University of Tokyo; and the Consumer Affairs and *Shokuiku* (Food and Nutrition Education) Division, Food Safety and Consumer Affairs Bureau, the Ministry of Agriculture, Forestry and Fisheries of Japan, for providing data from individuals who participated the 2016 and 2017 Surveys of Attitudes toward *Shokuiku*.

## References

1. Kang Y, Kang S, Kim KJ, Ko H, Shin J, Song YM. The association between family mealtime and depression in elderly Koreans. *Korean J Fam Med* 2018; 39(6): 340–346.
2. Kimura Y, Wada T, Okumiya K, et al. Eating alone among community-dwelling Japanese elderly: association with depression and food diversity. *J Nutr Health Aging* 2012; 16(8): 728–731.
3. Kuroda A, Tanaka T, Hirano H, et al. Eating alone as social disengagement is strongly associated with depressive symptoms in Japanese community-dwelling older adults. *J Am Med Dir Assoc* 2015; 16(7): 578–585.
4. Tani Y, Sasaki Y, Haseda M, Kondo K, Kondo N. Eating alone and depression in older men and women by cohabitation status: The JAGES longitudinal survey. *Age Ageing* 2015; 44(6): 1019–1026.
5. Wang X, Shen W, Wang C, et al. Association between eating alone and depressive symptom in elders: a cross-sectional study. *BMC Geriatr* 2016; 16: 19.
6. Tanaka I, Kitamura A, Seino S, et al. Relationship between eating alone and dietary variety among urban older Japanese adults. *Nihon Kosho Eisei Zasshi* 2018; 65(12): 744–754. [in Japanese, English abstract]
7. Tani Y, Kondo N, Takagi D, et al. Combined effects of eating alone and living alone on unhealthy dietary behaviors, obesity and underweight in older Japanese adults: Results of the JAGES. *Appetite* 2015; 95(1): 1–8.
8. Sheean P, Farrar IC, Sulo S, Partridge J, Schiffer L, Fitzgibbon M. Nutrition risk among an ethnically diverse sample of community-dwelling older adults. *Pub Health Nutr* 2019; 22(5): 894–902.
9. Quandt SA, Rao P. Hunger and food security among older adults in a rural community. *Human Organ* 1999; 58(1): 28–35.
10. Shahar D, Shai I, Vardi H, Fraser D. Dietary intake and eating patterns of elderly people in Israel: who is at nutritional risk? *Eur J Clin Nutr* 2003; 57: 18–25.
11. Li CL, Tung HJ, Yeh MC. Combined effect of eating alone and a poor nutritional status on cognitive decline among older adults in Taiwan. *Asia Pac J Clin Nutr* 2018; 27(3): 686–694.
12. Tani Y, Kondo N, Noma H, Miyaguni Y, Saito M, Kondo K. Eating alone yet living with others is associated with mortality in older men: the JAGES cohort survey. *J Gerontol B Psychol Sci Soc Sci* 2018; 73(7): 1330–1334.
13. Ishida A., Ishida E. Which Japanese older adults are least likely to enjoy favorable dietary practices? *Int J Gerontol* 2019; 13(4): 330–334.
14. Herman CP. The social facilitation of eating. A review. *Appetite* 2015; 86: 61–73.

### Correspondence

Prof Emiko Ishida, Assistant Professor at Hyogo University of Health Science, Kobe, Japan  
Email: akira\_ishida@people.kobe-u.ac.jp