

## ORIGINAL ARTICLE

## EPIDEMIOLOGY, CLINICAL PRACTICE AND HEALTH

# Association of self-rated health with type and frequency of social interaction during the declaration of COVID-19 state of emergency among Japanese community-dwelling oldest-old adults

Shoma Akaida,<sup>1,2</sup> Yuki Nakai,<sup>3</sup> Daijo Shiratsuchi,<sup>1,4</sup> Kazutoshi Tomioka,<sup>5</sup> Yoshiaki Taniguchi,<sup>1,6</sup> Nana Sato,<sup>7</sup> Ayumi Wada,<sup>8</sup> Yuto Kiuchi,<sup>1,9</sup> Saki Shono,<sup>1</sup> Ryuhei Shiiba,<sup>1,5</sup> Mana Tateishi<sup>1,2</sup> and Hyuma Makizako<sup>2</sup>

<sup>1</sup>Graduate School of Health Sciences, Kagoshima University, Kagoshima, Japan

<sup>2</sup>Department of Physical Therapy, School of Health Sciences, Faculty of Medicine, Kagoshima University, Kagoshima, Japan

<sup>3</sup>Department of Mechanical Systems Engineering, Faculty of Engineering, Daiichi Institute of Technology, Kagoshima, Japan

<sup>4</sup>Department of Rehabilitation, Japan Community Health Care Organization, Kumamoto General Hospital, Yatsushiro, Japan

<sup>5</sup>Department of Rehabilitation, Tarumizu Municipal Medical Center, Tarumizu Chuo Hospital, Kagoshima, Japan

<sup>6</sup>Department of Physical Therapy, Kagoshima Medical Professional College, Kagoshima, Japan

<sup>7</sup>Division of Rehabilitation, Kurume University Hospital, Kurume, Japan

<sup>8</sup>Department of Rehabilitation, National Hospital Organization, Osaka Toneyama Medical Center, Toyonaka, Japan

<sup>9</sup>Department of Preventive Gerontology, Center for Gerontology and Social Science, National Center for Geriatrics and Gerontology, Obu, Japan

## Correspondence

Hyuma Makizako PhD,  
Department of Physical Therapy,  
School of Health Sciences, Faculty  
of Medicine, Kagoshima University  
8-35-1 Sakuragaoka, Kagoshima

**Aim:** To investigate whether the type and frequency of social interaction during the state of emergency due to coronavirus disease were associated with self-rated health (SRH) after the state of emergency.

**Methods:** Data from a cross-sectional study were collected for 889 oldest-old adults in Bibai City, Hokkaido, Japan. In total, 612 participants (mean age: 83.0 ± 4.3 years; women: 51.8%) were included in the analysis, taking biological sex into account. The self-reported questionnaire included questions about demographic variables, SRH (July 2020, after the emergency), and the type and frequency of social interaction (March 2020, during the state of emergency).

**Results:** There was no significant association between social interaction and SRH in men ( $P > 0.05$ ). Women who had social interactions (both face-to-face and non-face-to-face) more than once a week during the state of emergency reported higher SRH after the emergency than those who did not (odds ratio 2.17, 95% confidence interval 1.07–4.41).

**Conclusions:** Having both types of interaction more than once a week during the state of emergency was related to higher SRH after the emergency among oldest-old women. It is suggested that having opportunities for both types of interaction at least once a week would potentially be beneficial for high SRH in women, even in situations where the declaration of a state of emergency restricts face-to-face interaction. *Geriatr Gerontol Int* 2022; 22: 405–411.

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890-8544, Japan.  
 Email: makizako@health.nop.  
 kagoshima-u.ac.jp

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## Introduction

Coronavirus disease (COVID-19), discovered in December 2019, has had a serious impact on society. In Japan, an emergency declaration was issued in Hokkaido for the first time. It forced people to practice a new way of life, which emphasized refraining from non-essential travel and reducing face-to-face contact.<sup>1</sup>

Governmental restrictions on activities led to a decrease in the frequency of social interactions, which had various negative effects, especially on the health of older adults. For example, the social isolation (an objective state of little or no social interaction) caused by the pandemic has been reported as a risk factor for anxiety, depression, poor sleep quality, and lack of exercise.<sup>2</sup> Furthermore, social isolation is more severe among older women in Japan than in other countries, and is associated with premature death.<sup>3,4</sup> In particular, people in the later stages of life have more difficulty adapting to non-face-to-face interactions (such as through information and communication technology, or ICT) than people in other age groups; thus, it can be inferred that they are at a higher risk of a lack of social interaction in an environment in which the government requires them to limit face-to-face social interaction.<sup>5</sup> Therefore, investigating the relationship between social interaction and health-related indicators, especially among oldest-old adults, will provide important insights into measures to improve their health.

Self-rated health (SRH) is a subjective reflection of health status. It has been studied worldwide as a powerful predictor of mortality,<sup>6</sup> especially because it is a simple, easily assessable indicator, which is an important consideration in geriatric medicine.<sup>7</sup> In older adults, SRH has been associated with functional and cognitive impairment, suggesting that maintaining high SRH plays an important role in healthy aging.<sup>8</sup> Furthermore, both SRH and social interaction show different characteristics according to sex.<sup>9</sup> Therefore, investigating the types and frequency of social interaction among oldest-old adults during the emergency period and their relationship with SRH regarding sex will provide important insights into geriatrics.

Currently, the world population is aging rapidly, and life expectancy is improving; thus, it has been estimated that by 2050 the number of people aged  $\geq 80$  years will nearly triple.<sup>10</sup> However, most respondents in previous SRH studies on older adults during the pandemic were  $< 80$ .<sup>11,12</sup> To the best of our knowledge, there is a lack of research focusing on oldest-old adults. Therefore, we surveyed oldest-old adults in this study.

We then examined the association between after-emergency SRH and social interaction status (face-to-face only, non-face-to-face only, both) during the emergency by sex. We aimed to investigate the relationship between social interaction status and SRH among community-dwelling oldest-old adults in the face of governmental restrictions on their activities.

## Methods

### Participants

We utilized a self-administered questionnaire that was mailed to 1112 community-dwelling oldest-old adults living in Bibai City, Hokkaido, Japan. The details of this study have been previously reported.<sup>13</sup> Older adults who participated in a health check for people aged  $\geq 75$  years in 2018 were sent a survey by mail in 2020. The first state of emergency in this location lasted from February 28, 2020, to March 19, 2020. The survey and questionnaire collection were conducted between July 15, 2020 and September 16, 2020.

Of the 1112 oldest-old adults in the study, 889 responded to the survey. The exclusion criteria were a history of diagnosis of dementia ( $n = 20$ ), depression ( $n = 10$ ), and a deficit in key data. Details of key data deficits included depression ( $n = 16$ ), SRH ( $n = 14$ ), polypharmacy ( $n = 9$ ), household's financial situation ( $n = 21$ ), living alone ( $n = 6$ ), and social interaction status: face-to-face ( $n = 81$ ) and non-face-to-face ( $n = 100$ ) social interactions. Finally, the data of 612 participants (mean age:  $83.0 \pm 4.3$  years, women: 51.8%) were analyzed.

This study was approved by the Ethics Committee of the Faculty of Medicine, Kagoshima University (No. 200065). Informed consent was obtained from all participants before their participation in this study, and adequate ethical considerations were made in accordance with the Declaration of Helsinki.

## Materials

### Self-rated health

SRH has been investigated in previous studies.<sup>9,14</sup> Participants were asked to answer the following questions about their situation at the time of the survey in July 2020 (after the emergency): "Would you normally consider yourself healthy?"— 1) very healthy, 2) fairly healthy, 3) fairly unhealthy, and 4) very unhealthy. Those who answered "1) very healthy" or "2) fairly healthy" to this question were classified as "high SRH," and those who answered "3) fairly unhealthy" or "4) very unhealthy," were classified as "low SRH."

### Type and frequency of social interaction

The type and frequency of social interaction were investigated during the state of emergency, with reference to previous studies.<sup>15</sup> The participants were asked to answer the following questions: 1) "In March 2020, how often did you interact with your family and relatives? (excluding family members living with you)," and 2) "In March 2020, how often did you interact with your neighbors and friends?"

Regarding type, respondents were asked to answer with "meet face-to-face (including by chance)," "talking on the telephone,"

and “exchanging letters (including e-mails).” Regarding the definition of type, those who answered “meet face-to-face (including by chance)” were defined as having a “face-to-face interaction.” Those who answered “talking on the telephone” or “exchanging letters (including e-mails)” were defined as having a “non-face-to-face interaction.”

Regarding frequency, respondents were asked to answer 1) “3 times a week or more,” 2) “1–2 times a week,” 3) “1–2 times a month,” and 4) “once a few months or less.” Considering the definition of frequency in previous studies,<sup>16</sup> those who answered 1) or 2) were defined as “once a week or more,” whereas those who answered 3) or 4) were defined as “less than once a week.” When categorizing the frequency of each interaction, we chose the one with the highest frequency in the “family/relatives” and “neighbors/friends” categories.

Considering the above definitions, we categorized participants into the following four social interaction groups: “No interaction (less than once a week, both face-to-face and non-face-to-face),” “face-to-face interaction only (more than once a week),” “non-face-to-face interaction only (more than once a week)” and “both types of interaction (more than once a week, both face-to-face and non-face-to-face).”<sup>17</sup>

### Demographic variables and covariates

Regarding demographic variables and covariates, age, sex, living alone, household’s financial situation, chronic disease (cancer, musculoskeletal manifestations, heart disease, respiratory diseases, hypertension, diabetes) and polypharmacy were collected. Polypharmacy was defined as the use of at least five different drugs.<sup>18</sup> Those with two or more chronic diseases were defined as having multimorbidity.<sup>19</sup> Participants were asked to answer the following questions regarding the household’s financial situation. “Please choose one answer that best describes your current household financial situation.” 1) “I have very comfortable household finances and live without much worries,” 2) “I have no comfortable household finances but live without much worries,” 3) “I have no comfortable household finances and am somewhat worried,” and 4) “I have difficult household finances and am very worried.” If respondents answered with 1) or 2), they were categorized as “No worries about household finances.” If respondents answered with 3) or 4), they were categorized as “Worry about household finances.”

### Statistical analysis

Participant characteristics were described using the mean  $\pm$  SD and count (%). The trend in the differences between individuals who perceived high and low SRH was examined as a whole and

by the sex of the participants using *t*-tests, Pearson’s  $\chi^2$ -tests and Mantel–Haenszel tests. Multivariate logistic regression analysis was used to examine the independent associations between social interaction status during the state of emergency and SRH after the emergency, with SRH as the dependent variable as a whole and by sex. We used a multi-model adjusted for age, sex, polypharmacy, household’s financial situation, living alone, and multimorbidity. Sex was excluded from the covariates in the multi-model by sex.

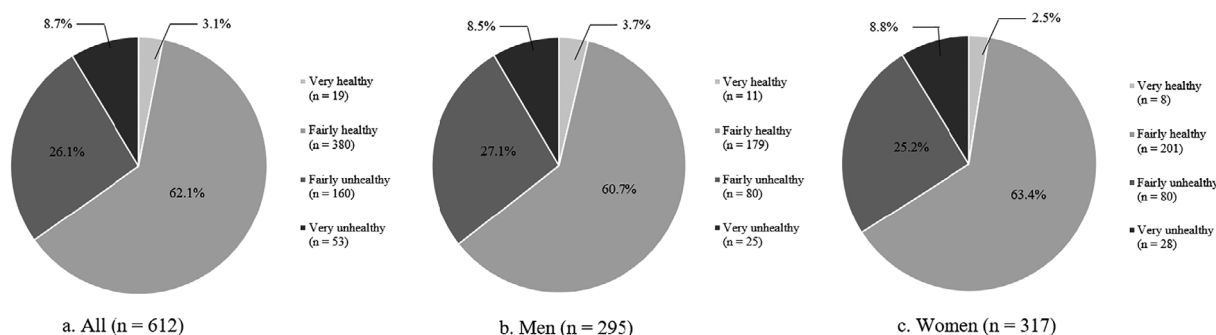
Crude and adjusted odds ratios (OR) were calculated for social interaction status, with 95% confidence intervals (CI). All analyses were performed using IBM SPSS Statistics 26.0 (IBM Japan, Tokyo, Japan). The level of statistical significance was set at  $P < 0.05$ .

## Results

Figure 1 shows the distribution of SRH after the emergency. In all SRH, 3.1% were very healthy, 62.1% were fairly healthy, 26.1% were fairly unhealthy, and 8.7% were very unhealthy. In men SRH, 3.7% were very healthy, 60.7% were fairly healthy, 27.1% were fairly unhealthy, and 8.5% were very unhealthy. In women SRH, 2.5% were very healthy, 63.4% were fairly healthy, 25.2% were fairly unhealthy, and 8.8% were very unhealthy.

Table 1 compares the characteristics of oldest-old adults with high and low SRH for the whole. We found that 65.2% had high SRH after the emergency. Regarding social interaction status during the state of emergency, 26.6% of the respondents had no interaction, 16.8% had face-to-face interaction only, 11.9% had non-face-to-face interaction only, and 44.6% had both types of interaction. Participants with low SRH tended to have a significantly higher rate of no interaction and less social interaction than those with high SRH ( $P = 0.021$ ).

Table 2 compares the characteristics of oldest-old adults with high and low SRH by sex. We found that 64.4% had high SRH after the emergency among men and 66.0% among women. Regarding social interaction status during the state of emergency, 32.9% of the respondents had no interaction, 18.6% had face-to-face interaction only, 12.2% had non-face-to-face interaction only, and 36.3% had both types of interaction in men. There was no significant association between the social interaction status and SRH in men ( $P = 0.422$ ). Regarding social interaction status during the state of emergency, 20.8% of the respondents had no interaction, 15.1% had face-to-face interaction only, 11.7% had non-face-to-face interaction only, and 52.4% had both types of interaction in women. Women with low SRH tended to have a significantly higher rate of no interaction and less social interaction than those with high SRH ( $P = 0.015$ ).



**Figure 1** Percentage of self-rated health (after the emergency).

**Table 1** Characteristics of the participants

	All ( <i>n</i> = 612)	High SRH ( <i>n</i> = 399)	Low SRH ( <i>n</i> = 213)	<i>P</i> -value
Age, mean ± SD	83.0 ± 4.3	82.6 ± 4.2	83.8 ± 4.4	0.001 <sup>†</sup>
Sex, women, <i>n</i> (%)	317 (51.8)	209 (52.4)	108 (50.7)	0.693 <sup>‡</sup>
Polypharmacy, <i>n</i> (%) (5 or more medications)	255 (41.7)	115 (28.8)	140 (65.7)	<0.001 <sup>‡</sup>
Worries about household finances, <i>n</i> (%)	156 (25.5)	70 (17.5)	86 (40.4)	<0.001 <sup>‡</sup>
Living alone, <i>n</i> (%)	146 (23.9)	99 (24.8)	47 (22.1)	0.448 <sup>‡</sup>
Multimorbidity, <i>n</i> (%) (2 or more chronic disease)	235 (38.4)	111 (27.8)	124 (58.2)	<0.001 <sup>‡</sup>
Chronic disease, <i>n</i> (%)				
Cancer	36 (5.9)	9 (2.3)	27 (12.7)	<0.001 <sup>‡</sup>
Musculoskeletal manifestations	131 (21.4)	73 (18.3)	58 (27.2)	0.010 <sup>‡</sup>
Heart disease	123 (20.1)	48 (12.0)	75 (35.2)	<0.001 <sup>‡</sup>
Respiratory diseases	61 (10.0)	24 (6.0)	37 (17.4)	<0.001 <sup>‡</sup>
Hypertension	363 (59.3)	225 (56.4)	138 (64.8)	0.044 <sup>‡</sup>
Diabetes	109 (17.8)	65 (16.3)	44 (20.7)	0.179 <sup>‡</sup>
Social interaction status, <i>n</i> (%) (more than once a week)				0.021 <sup>§</sup>
No interactions	163 (26.6)	92 (23.1)	71 (33.3)	
Face-to-face interaction only	103 (16.8)	71 (17.8)	32 (15.0)	
Non-face-to-face interaction only	73 (11.9)	48 (12.0)	25 (11.7)	
Both types of interaction	273 (44.6)	188 (47.1)	85 (39.9)	

SD, standard deviation.

<sup>†</sup>Student's *t*-test.

<sup>‡</sup>Pearson's  $\chi^2$ -test.

<sup>§</sup>Mantel–Haenszel tests for trend.

Table 3 shows the results of the multivariate logistic regression model. In the crude model, the social interaction status at the time of the emergency was significantly associated with SRH after the emergency; however, after adjusting for potential covariates, no significant association was found.

Table 4 shows the results of the multivariate logistic regression model by sex. Social interaction status during the state of emergency was not significantly associated with SRH after the emergency in men. In the crude and adjusted models, both types of interactions during the state of emergency were significantly associated with SRH after the emergency in women (adjusted model: odds ratio 2.17; 95% CI 1.07–4.41).

## Discussion

This study, one of the few focusing on community-dwelling oldest-old adults in Japan, investigated the association between SRH after the emergency and the type (e.g., no interaction, face-to-face interaction only, non-face-to-face interaction only, or both types of interactions) and frequency of social interaction during the state of emergency by sex. Multivariate analysis, adjusting for potential covariates, revealed that having both types of interaction more than once a week was significantly associated with higher SRH after the emergency in women. However, there was no significant association found in men.

In this study, the percentage of low SRH during the emergency was found to be 35.6% in men and 34.0% in women, indicating that the percentage of low SRH was 5.0%–7.0% higher in individuals >80 years than in the Japanese survey conducted before the COVID-19 pandemic.<sup>20</sup> This can be inferred from the fact that unprecedented public health measures such as social and physical distancing due to COVID-19 cause adverse health effects (depression, anxiety, insomnia,

psychological distress, etc.) in many populations, as reported in the COVID-19 meta-analysis.<sup>21</sup>

This study suggests that both types of interaction jointly may play a positive role in SRH in oldest-old women. Previous studies have reported that social interactions contribute to health. As part of the government's policy to improve the health of older adults (Health Japan 21), the promotion of opportunities for social interaction has long been recommended.<sup>22</sup> One way to achieve this is through community-based salons, and previous studies have reported that such social participation is associated with improvements in SRH.<sup>23</sup> In addition, as face-to-face interaction is limited, attention is paid to the health benefits of non-face-to-face interactions among older adults. Thus, during the pandemic, non-face-to-face interaction (calling family and friends) among older adults was recommended to improve psychosocial functioning and quality of life.<sup>24</sup> However, in this study, one type of social interaction only was not significantly associated with SRH.

It is generally believed that older adults, without exception, have built-in processes allowing them to adapt well when faced with stressful situations.<sup>25</sup> Considering the circumstances of the COVID-19 pandemic, it can be inferred that they avoided face-to-face interactions that posed a high infection risk. This can be explained by the results of this study: the number of participants who do not have social interaction is increasing compared with that before the pandemic.<sup>17</sup> Recently, the introduction of mobile technologies (e.g., ICT) has been attracting attention as a way to provide opportunities for continuous social interaction among older adults.<sup>5</sup> However, it has been suggested that oldest-old adults have more difficulty actively adopting to new features such as ICT than other age groups.<sup>26</sup> These factors explain why the contribution to SRH was not recognized by either social interaction only. Furthermore, previous studies have shown that having both face-to-face and non-face-to-face social interactions shows a

**Table 2** Characteristics of the participants by sex

	Men				Women			
	All (n = 295)	High SRH (n = 190)	Low SRH (n = 105)	P-value	All (n = 317)	High SRH (n = 209)	Low SRH (n = 108)	P-value
Age, mean ± SD	83.0 ± 4.2	82.6 ± 4.0	83.8 ± 4.3	0.018 <sup>†</sup>	83.0 ± 4.4	82.6 ± 4.3	83.8 ± 4.6	0.025 <sup>†</sup>
Polypharmacy, n (%) (5 or more medications)	135 (45.8)	66 (34.7)	69 (65.7)	<0.001 <sup>‡</sup>	120 (37.9)	49 (23.4)	71 (65.7)	<0.001 <sup>‡</sup>
Worries about household finances, n (%)	82 (27.8)	35 (18.4)	47 (44.8)	<0.001 <sup>‡</sup>	74 (23.3)	35 (16.7)	39 (36.1)	<0.001 <sup>‡</sup>
Living Alone, n (%)	39 (13.2)	24 (12.6)	15 (14.3)	0.688 <sup>‡</sup>	107 (33.8)	75 (35.9)	32 (29.6)	0.264 <sup>‡</sup>
Multimorbidity, n (%) (2 or more chronic disease)	102 (34.6)	45 (23.7)	57 (54.3)	<0.001 <sup>‡</sup>	133 (42.0)	66 (31.6)	67 (62.0)	<0.001 <sup>‡</sup>
Chronic disease, n (%)								
Cancer	19 (6.4)	4 (2.1)	15 (14.3)	<0.001 <sup>‡</sup>	17 (5.4)	5 (2.4)	12 (11.1)	0.001 <sup>‡</sup>
Musculoskeletal manifestations	21 (7.1)	7 (3.7)	14 (13.3)	0.002 <sup>‡</sup>	110 (34.7)	66 (31.6)	44 (40.7)	0.104 <sup>‡</sup>
Heart disease	76 (25.8)	31 (16.3)	45 (42.9)	<0.001 <sup>‡</sup>	47 (14.8)	17 (8.1)	30 (27.8)	<0.001 <sup>‡</sup>
Respiratory diseases	23 (7.8)	8 (4.2)	15 (14.3)	0.002 <sup>‡</sup>	38 (12.0)	16 (7.7)	22 (20.4)	<0.001 <sup>‡</sup>
Hypertension	173 (58.6)	108 (56.8)	65 (61.9)	0.398 <sup>‡</sup>	190 (59.9)	117 (56.0)	73 (67.6)	0.046 <sup>‡</sup>
Diabetes	63 (21.4)	38 (20.0)	25 (23.8)	0.445 <sup>‡</sup>	46 (14.5)	27 (12.9)	19 (17.6)	0.263 <sup>‡</sup>
Social interaction status, n (%) (vs. more than once a week)				0.422 <sup>§</sup>				0.015 <sup>§</sup>
No interactions	97 (32.9)	57 (30.0)	40 (38.1)		66 (20.8)	35 (16.7)	31 (28.7)	
Face-to-face interaction only	55 (18.6)	38 (20.0)	17 (16.2)		48 (15.1)	33 (15.8)	15 (13.9)	
Non-face-to-face interaction only	36 (12.2)	26 (13.7)	10 (9.5)		37 (11.7)	22 (10.5)	15 (13.9)	
Both types of interactions	107 (36.3)	69 (36.3)	38 (36.2)		166 (52.4)	119 (56.9)	47 (43.5)	

SD, standard deviation.

<sup>†</sup>Student's *t*-test.<sup>‡</sup>Pearson's  $\chi^2$ -test.<sup>§</sup>Mantel-Haenszel tests for trend.

more positive relationship with frailty and depression than either one alone.<sup>17</sup> Thus, it can be inferred that continuing both face-to-face and non-face-to-face social interactions, rather than just one, is important for the health of oldest-old adults. For them, it may be important to provide help in adjusting to ICT. Moreover, interventions that focus on an individual's activity and engagement in known social interactions (e.g., face-to-face, telephone) that are being experienced may be effective in maintaining and improving health.<sup>27</sup>

We found no significant association between social interaction status and SRH among oldest-old men. This result can be inferred from previous studies. For example, a study that examined the

relationship between SRH and social activities among middle-aged and older adults showed that a decrease in household income for men and a decrease in social involvement for women were significantly associated with low SRH.<sup>9</sup> In addition, loneliness, which reflects social interaction, was more strongly associated with physical and mental health in oldest-old women than in oldest-old men.<sup>28</sup> It has been speculated that differences in social interactions between men and women in Japan are due to differences in traditional roles.<sup>14</sup> According to previous studies, men work away from home, while women do housework. Therefore, women are more likely to rely on fellowship, while men are more likely to rely on formal jobs and activities. Therefore, it is reported that women

**Table 3** Association between self-rated health and social interaction status

	Crude model			Adjusted model		
	OR	95%CI	P-value	OR	95%CI	P-value
Social interaction status						
No interactions	ref			ref		
Face-to-face interaction only	1.71	1.02–2.88	0.042	1.55	0.85–2.81	0.151
Non-face-to-face interaction only	1.48	0.84–2.63	0.179	1.43	0.73–2.77	0.295
Both types of interaction	1.71	1.14–2.55	0.009	1.40	0.87–2.26	0.167
Age				0.93	0.89–0.98	0.002
Sex				0.92	0.62–1.37	0.688
Polypharmacy				0.25	0.17–0.37	<0.001
Worries about household finances				0.31	0.20–0.48	<0.001
Living alone				1.25	0.78–2.01	0.361
Multimorbidity				0.39	0.26–0.57	<0.001

OR, odds ratio; CI, confidence interval. In each model: presence of self-rated health was set as a dependent variable; Crude model: independent variables are social interaction status; Adjusted model: independent variables are social interaction status. The covariates are age, sex, polypharmacy, financial situation of household, living alone, and multimorbidity.

**Table 4** Association between self-rated health and social interaction status by sex

	Men						Women					
	Crude model			Adjusted model			Crude model			Adjusted model		
	OR	95%CI	P-value	OR	95%CI	P-value	OR	95%CI	P-value	OR	95%CI	P-value
Social interaction status												
No interactions	ref			ref			ref			ref		
Face-to-face interaction only	1.57	0.78–3.16	0.208	1.26	0.56–2.84	0.581	1.95	0.90–4.25	0.093	2.14	0.87–5.26	0.096
Non-face-to-face interaction only	1.83	0.79–4.20	0.158	1.33	0.50–3.52	0.566	1.30	0.58–2.94	0.529	1.52	0.59–3.93	0.389
Both types of interactions	1.27	0.72–2.24	0.401	1.02	0.52–1.98	0.958	2.24	1.24–4.04	0.007	2.17	1.07–4.41	0.033
Age				0.90	0.84–0.96	0.001				0.98	0.92–1.04	0.503
Polypharmacy				0.29	0.16–0.52	<0.001				0.20	0.11–0.34	<0.001
Worries about household finances				0.24	0.13–0.44	<0.001				0.40	0.22–0.73	0.003
Living Alone				0.85	0.38–1.93	0.699				1.41	0.78–2.56	0.256
Multimorbidity				0.32	0.18–0.57	<0.001				0.45	0.26–0.79	0.005

OR, odds ratio; CI, confidence interval. In each model: presence of self-rated health was set as a dependent variable; Crude model: independent variables are social interaction status; Adjusted model: independent variables are social interaction status. The covariates are age, polypharmacy, financial situation of household, living alone, and multimorbidity.

may be more likely to participate in various activities in general.<sup>14</sup> The percentage of no interactions in this study was 32.9% for men and 20.8% for women, so it was approximately 10% higher for men. Considering that the average age of participants in this study was 83.0 years, many men were retired from formal work and activities, which may explain why the percentage of no interactions among them.<sup>29</sup> Moreover, in this study, low SRH tended to have a higher percentage of no interaction than high SRH in both sexes and all participants. We consider that these results explain why social interaction contributes to SRH in women but not in men.

This study has several limitations. First, it was conducted in a specific city. Pandemic policies vary by region, and their impact may also vary depending on the pandemic situation. Second, this sample was not randomly selected. Therefore, it is difficult to generalize these findings to other regions and situations. Furthermore, it is expected that the population is relatively health-conscious and willing to participate in this study, as they participated in a health check-up for people aged 75 years and older in 2018. In addition, given that this survey was a self-administered questionnaire, and that the participants were older adults who could complete and respond to these questions, we believe that they may be in a healthier situation (e.g., a low number of dementia cases) than the average oldest-old adults. Third, the responses were based on the participants' memories and may have been under- or over-estimated. Fourth, there were a lot of missing data. The mean age of the participants in this study was 83.0 years, with 34.8% of low SRH, and 23.9% living alone, which are related to an increase in the missing value rate.<sup>30</sup> A lot of missing data could affect statistical power. Fifth, because this survey was conducted at a certain point in time, we cannot assert a direct relationship between SRH after the emergency and social interactions during the state of emergency. Finally, because this was a cross-sectional study, causality is unknown, so longitudinal analyses must be considered in the future. Given these limitations, the study results should be interpreted with caution.

In conclusion, we found a significant association between both types of social interaction with others more than once a week during the state of emergency and high SRH after the emergency among community-dwelling oldest-old women during the COVID-19 pandemic. In contrast, these factors were not significantly associated in men. This finding may provide valuable

insights for health assistance for oldest-old adults during emergencies, such as infectious disease outbreaks.

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The authors declare no conflict of interest.

## Data Availability Statement

Research data are not shared.

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