

# Long-term association of society under COVID-19 pandemic on health-related outcomes: Outcome-wide Study

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## What is already known

Lower frequencies of physical activity, social participation, going out, and interacting with others increase the various health risks

→ Daily life under restricted society due to pandemic has potential long-term impacts on health

## Key message

Various health risks increased during the COVID-19 pandemic

→ There is concern that these increased risks might persist over an extended period

## BACK GROUND & OBJECTIVE

To control the COVID-19 pandemic, many countries had imposed restrictions on social activities, including lockdowns

→ These restricted activities are risk factors for various diseases, particularly in older people

The study examined the long-term association of society under the COVID-19 pandemic on various health-related outcomes in older people

## STATISTICAL ANALYSIS

- Baseline characteristics in the 2016-2019 panel were standardized to those in the 2019-2022 panel using stabilized inverse probability weighting
- To address selection bias due to loss to follow-up, an inverse probability of censoring weighting was also applied
- Weight was truncated at 1 % and 99 % of their distribution
- Missing information was imputed using a random forest imputation (missForest)
- Weighted binomial, logistic, or linear regression analyses were conducted
- All analyses were stratified by sex

## STUDY POPULATION

### Eligible population<sup>\*1</sup>

2016 year n=279,661  
2019 year n=376,649  
2022 year n=338,163

### Study entrants

n=196,438 (70.2 %)  
n=261,428 (69.4 %)  
n=227,731 (67.3 %)

### Panel data<sup>\*2</sup>

2016-2019 year n=78,863  
2019-2022 year n=70,607

### Study participants<sup>\*3</sup>

2016-2019 year n=75,552  
2019-2022 year n=67,423

### Pooled data

n=142,975

#### \*1 Eligible population

• Since 2010, we have conducted the Japan Gerontological Evaluation Study, a triennial survey, among people aged ≥65 years in all over Japan. The data of 3 waves was obtained from self-reported questionnaires mailed to residents in 39 municipalities between October 2016 and January 2017, those in 64 municipalities between November 2019 and January 2020, just before the pandemic, and those in 75 municipalities between November and December 2022. The participants recruited a random sample or all residents, depending on the policy of each municipality.

#### \*2 Panel data

• We included participants living in 18 municipalities who participated in all 3 waves and were followed up for their mortality or migration.  
• Datasets were individually merged for each participant.

#### \*3 Study participants

• We excluded 123 and 73 participants with invalid IDs or lacking sex/age information, and 3,188 and 2,780 participants who died before conducting latter survey in 2016-2019 and 2019-2022, respectively.

Table 1. Characteristics of study participants after weighting

	Pre-pandemic (2016)	Pandemic (2019)	Standardized mean difference
<b>Men</b>			
No. of participants	33,442.2	31,609.1	
Mean age (years) (SD)	74.1 (7.4)	74.5 (7.0)	0.055
Depression (%) <sup>‡1</sup>	22.5	23.2	0.017
Poor subjective health (%) <sup>‡1</sup>	14.1	13.8	-0.007
Laughing almost every day (%)	35.3	34.4	-0.019
Dependent (%) <sup>‡1</sup>	14.1	13.6	-0.016
Need for assistance (%) <sup>‡1</sup>	4.3	4.4	0.004
History of a fall in the past year (%)	20.8	21.1	0.006
Anxiety about falling (%)	27.7	28.0	0.006
Don't stand up from a chair (%)	3.6	4.0	0.017
Sitting ≥8 hours/day (%)	7.9	8.4	0.020
Walking <30 minutes/day (%)	27.9	28.5	0.014
Going out <4 times/week (%)	22.9	21.4	-0.036
Going out less than last year (%) <sup>‡1</sup>	14.1	14.7	0.019
Don't meet with friends (%)	10.8	10.9	0.003
Weight lost ≥2 kg in the past 6 months (%)	12.8	12.0	-0.022
Mean body mass index (kg/m <sup>2</sup> )	23.3 (3.6)	23.4 (3.5)	0.023
Mean subjective happiness (range: 1-10)	7.1 (2.3)	7.1 (2.2)	-0.006
Mean civic participation (range: 0-5) <sup>‡1</sup>	0.8 (1.4)	0.8 (1.3)	-0.034
Mean social cohesion (range: 0-3) <sup>‡1</sup>	2.0 (1.3)	2.0 (1.3)	-0.001
Mean reciprocity (range: 0-3) <sup>‡1</sup>	2.8 (0.8)	2.8 (0.7)	-0.002
<b>Women</b>			
No. of participants	40,779.7	35,556.1	
Mean age (years) (SD <sup>‡</sup> )	74.3 (7.9)	74.6 (7.2)	0.046
Depression (%)	23.3	24.1	0.018
Poor subjective health (%)	13.3	12.8	-0.016
Laughing almost every day (%)	45.0	44.0	-0.020
Dependent (%)	5.3	5.3	0.002
Need for assistance (%)	5.9	5.8	-0.002
History of a fall in the past year (%)	25.9	25.6	-0.007
Anxiety about falling (%)	49.8	49.5	-0.006
Don't stand up from a chair (%)	8.2	8.3	0.003
Sitting ≥8 hours/day (%)	5.9	6.3	0.018
Walking <30 minutes/day (%)	28.9	29.8	0.020
Going out <4 times/week (%)	25.7	24.3	-0.033
Going out less than last year (%)	16.4	16.9	0.013
Don't meet with friends (%)	6.1	6.4	0.013
Weight lost ≥2 kg in the past 6 months (%)	12.0	11.1	-0.027
Mean body mass index (kg/m <sup>2</sup> )	22.7 (4.3)	22.7 (4.0)	0.007
Mean subjective happiness (range: 1-10)	7.4 (2.4)	7.4 (2.2)	-0.008
Mean civic participation (range: 0-5)	1.1 (1.7)	1.1 (1.5)	-0.025
Mean social cohesion (range: 0-3)	2.0 (1.4)	2.0 (1.3)	0.005
Mean reciprocity (range: 0-3)	2.9 (0.5)	2.9 (0.5)	0.003

<sup>‡1</sup>Depression, Geriatric Depression Scale ≥5 points; Poor subjective health, participants who answered "poor" or "very poor"; Dependent, instrumental activities of daily living by the Tokyo Metropolitan Institute of Gerontology Index of Competence <5 points; Need for assistance, participants who answered "need some kind of care/assistance but do not currently receive it" or "need of care/assistance and receiving care/assistance"; Going out less than last year, participants who answered "less" or "very less"; Rarely have a meal with someone, participants who answered "several times a year" or "almost never"; Civic participation, the total number of activities (volunteer group, sports group, hobby activity, study or cultural group, or skills teaching) participated in ≥1 time/month; Social cohesion, the total number of items for which participants answered "fairly trustworthy (or attached)" or "very trustworthy (or attached)" in generally trustworthy in own community, trying helpful to others in own community, or attachment to the living community; Reciprocity, the total number of items for which participants have someone who listens to your worries and complaints, talks to you about their worries and complaints, or can take care of you when you are sick in bed for a few days.

## RESULTS

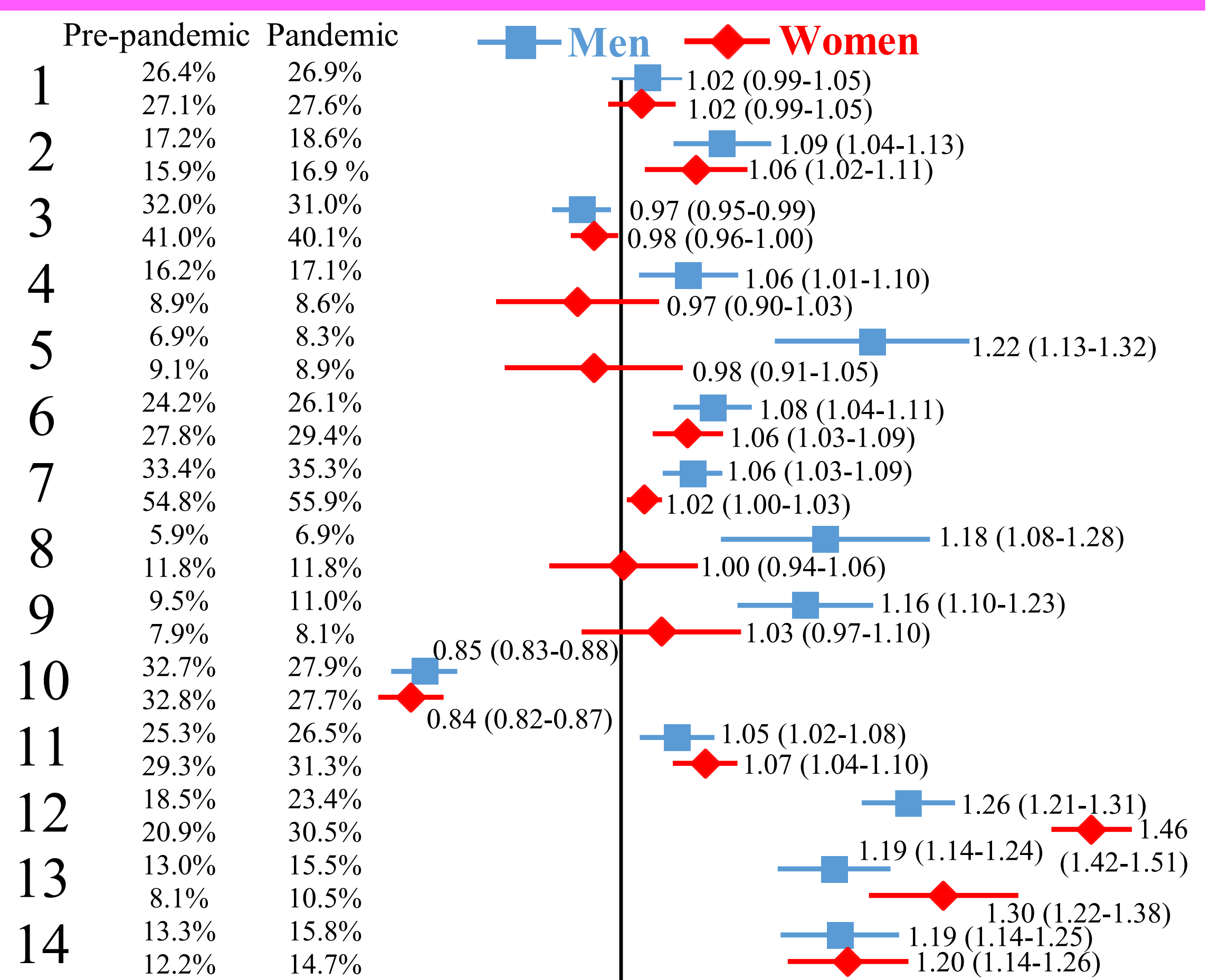


Fig 1. Prevalence ratio or odds ratio of health related-outcomes after 3 years with or without pandemic

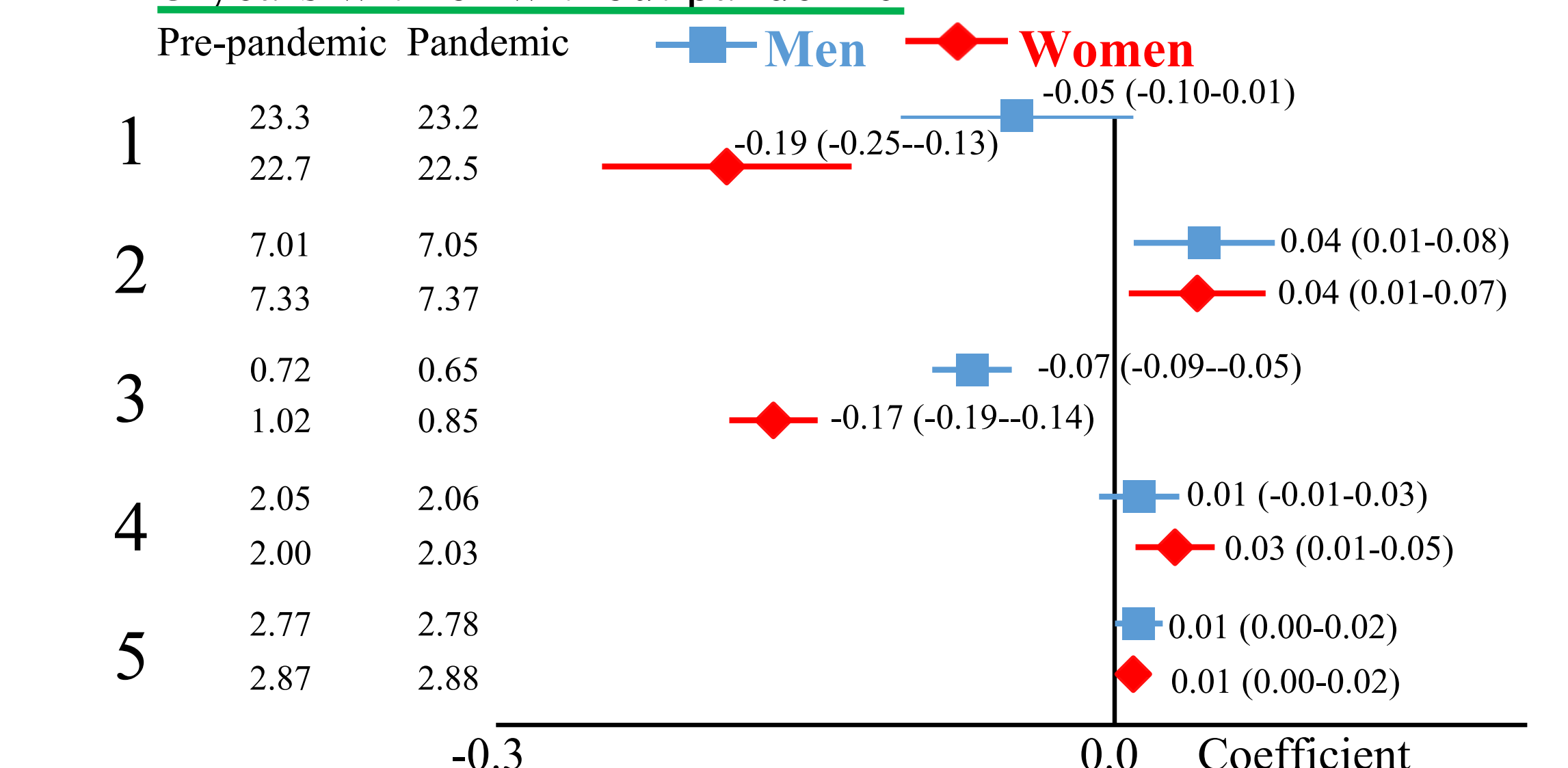


Fig 2. Coefficient of health related-outcomes after 3 years with or without pandemic

## EXPOSURE & OUTCOMES

### Exposure: Year of baseline

→ Pre-pandemic (2016, reference)  
Pandemic (2019)

### Outcomes: Nineteen outcomes

→ Physical health, mental health, physical activity, social activity

## STRENGTH & LIMITATION

### Strength

This is the first study to examine the long-term risk in a pandemic era using a counterfactual model

### Limitation

Infection control during the COVID-19 pandemic differed between countries, so present results may not be applicable to other countries

## CONCLUSION

Various health-related outcomes were worse at 3 years from baseline in the Japanese older population that experienced the COVID-19 pandemic