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Health-Related Quality of Life during COVID-19 Pandemic: Assessing Impacts of Job Loss and Financial Support Programs in Japan

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Abstract

This cross-sectional study examined the association between job loss during the coronavirus disease 2019 (COVID-19) pandemic and health-related quality of life (HRQOL) in the Japanese working population and whether universal financial support program has a protective influence on the HRQOL. Two self-reported internet surveys were used to determine job loss during the pandemic: one was conducted between February and March 2020, just before the COVID-19 emergency declaration by the Japanese government (April 2020), and the other was conducted between August and September 2020. For the dependent variable, we used the EQ-5D-5L utility score (QOL utility score), which was assessed between August and September 2020. The independent variables were job loss after the state of emergency was declared and two types of government financial support (either universal support or support targeting child-raising households). The Tobit regression model was applied, adjusting for covariates. Job loss during the pandemic was negatively associated with the QOL utility score in the fully adjusted model; the coefficient (95% confidence interval [CI]) for job loss during the pandemic was −0.07 (−0.11 to −0.03). For the government financial support variables, the universal financial support program was associated with a better QOL utility score of the coefficient (95% CI), 0.05 (0.03 to 0.08). Job loss during the COVID-19 pandemic is negatively associated with HRQOL, while universal financial support is positively associated with HRQOL. Our study results imply that universal financial support during the COVID-19 era has a protective influence on an individual's HRQOL.

Keywords Allowance · Euro-QoL · EQ-5D · SARS-CoV-2 · Socioeconomic status · Subsidy

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Introduction

A novel coronavirus, called severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2,) was identified in December 2019. As a result, the entire world has been affected by the coronavirus 2019 (COVID-19) pandemic. Effective cures or vaccines are not in sufficient supply, and many countries have introduced restrictive measures to control the infection, including avoiding social interactions, banning international travel, and refraining from nonessential activities. These restrictive measures have been effective in reducing the incidence of COVID-19 (Islam et al. 2020; Kucharski et al. 2020); however, there have been negative impacts on social and economic activities (Hensher 2020; Kawohl and Nordt 2020; Pieh et al. 2020; Twenge and Joiner 2020) with over 1 billion jobs lost globally (Luca Ventura 2020).

The World Health Organization declared COVID-19 a pandemic on March 11, 2020. In Japan, a nationwide state of emergency was declared on April 16, 2020, and the government requested individuals to refrain from performing nonessential activities and maintain physical distancing. Japan's state of emergency was lifted on May 31, 2020. As of this writing (December 19, 2020), the state of emergency has not been reimposed in Japan; the country has recorded 192,418 COVID-19 cases and 2827 deaths, which is far lower than those in other Western countries (Ministry of Health, Labour, and Welfare 2020).

However, during the "COVID-19 era," Japan has been hit with an economic decline, as have other countries worldwide. By April 2020, approximately 300,000 jobs had been lost compared with those lost in January 2020, with the unemployment rate rising from 2.4% in January to 3.0% in April (Ministry of Internal Affairs and Communications 2020).

To assist Japanese citizens, the government implemented several additional financial support programs: (1) the Special Cash Payment program provided a one-time payment of 100,000 yen (100 yen roughly equals one US dollar) to every resident registered with the Basic Resident Registration System as of April 27, 2020; (2) Temporary Special Benefit for Child-raising Households offered a one-time payment of 10,000 yen for each eligible child; (3) Subsidy Program for Sustaining Business offered up to 2 million yen for corporations and 1 million yen for sole proprietors, including freelancers, who had seen their earnings drop due to the outbreak; and (4) Employment Adjustment Subsidy was provided so that employers who were forced to curtail their business activities due to the effects of the pandemic could keep their staff members employed.

The Special Cash Payment is a universal financial support program provided to every resident regardless of financial status. The Temporary Special Benefit for Child-raising Households provides a one-time payment benefit of 10,000 yen for each eligible child born from April 2, 2005, to March 31, 2020 (children under the third grade of junior high school in 2020). The Subsidy Program for Sustaining Business and Employment Adjustment Subsidy programs are for employers or freelancers rather than for individuals.

Economic recessions can affect an individuals' overall health. A recent study described negative health effects during the economic recession of 2008–2009, including poor self-rated health, psychological distress, and mortality (Margerison-Zilko et al. 2016). Recession also reduces an individuals' use of health care (Madureira-Lima et al.

2018; McInerney and Mellor 2012; Sánchez-Recio et al. 2020). Although it could be hypothesized that job loss during the COVID-19 pandemic is also accompanied by a self-perceived health decline, or health-related quality of life (HRQOL), in the working population, no studies have demonstrated this possibility. Besides, it is not certain whether financial support has a protective effect on HRQOL. Therefore, this cross-sectional study examines the data on employment status before and after Japan's state of emergency was declared, types of government financial supports (targeted or universal), and the influence of different types of support on HRQOL.

Methods

Data

To determine job loss before and after Japan's emergency declaration, we used data from two prospective cohort studies: the Japan Society and New Tobacco Internet Survey (JASTIS) and the Japan COVID-19 and the Society Internet Survey (JACSIS). JASTIS was an internet survey focusing on the socioeconomic factors and use of heated tobacco products in Japan (Tabuchi et al. 2017, 2019). JACSIS (internet survey) was designed to investigate the social and health situation related to the COVID-19 pandemic.

The JASTIS survey was conducted between February and March 2020, just before the emergency declaration by the Japanese government; the JACSIS survey was conducted between August and September 2020 (Supplementary Fig. 1). Participants were enrolled into a self-reported internet survey managed by a nationwide internet research agency, Rakuten Insight; the national, 2.3-million person pool encompassed a range of demographic characteristics: occupation, education level achieved, income level, and marital status (Tabuchi et al. 2017, 2019). Participants in both JASTIS and JACSIS were recruited via an e-mail invitation from individuals who had been registered with Rakuten Insight. Candidates were invited to enroll in the study after being randomly selected from approximately 2.3 million participants using a computer algorithm; the selected participants were consistent with the Japanese demographic composition. Candidates responded to the web-based questionnaire if they agreed to provide web-based informed consent and intended to participate both in JASTIS and JACSIS. Eleven thousand participants were invited and responded to the JASTIS survey, and 8686 participants completed the JACSIS survey (79.0%, Supplementary Fig. 1).

To validate data quality, we excluded respondents who had discrepancies or unusual responses (Tabuchi et al. 2017, 2019), e.g., selecting "all" in questions listing drugs used or chronic diseases (n = 629, remaining n = 7994).

Variables

For the dependent variable, we used the EuroQol 5-dimension 5-level (EQ-5D-5L), which is an internationally developed HRQOL questionnaire, used in previous studies (Devlin et al. 2020). In the present study, this dependent variable was only assessed at follow-up. This index comprises five items on a 1-to-5 scale (no problems to extreme

problems): mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each health state is defined by one QOL "utility" 0-to-1 score (death to full health), which can be transformed by using the interim scoring for the Japanese EQ-5D-5L (Ikeda et al. 2015).

We used three independent variables: (1) job loss that occurred after the Japanese government declared a state of emergency, (2) universal financial support programs from the government (the Special Cash Payment), and (3) financial support for families with children (the Temporary Special Benefit for Child-raising Households). The detailed information for each type of government financial support has been previously summarized in the Introduction section. Job loss was determined if participants answered "unemployed" to the question regarding the current job situation or answered "yes" to the question "job loss because of the COVID-19 issue (including nonrenewal of contract or other conditions)."

Control Variables

Control variables, which were assessed before Japan's emergency declaration, were as follows: age, gender, education level achieved, equivalized household income (annual household divided by the square root of the number of household members), occupation (manager, self-employed, permanent worker other than manager, non-permanent worker, or internal worker), health care insurance type (Employee Health Insurance or National Health Insurance), and presence of morbidities (hypertension, diabetes, cancer, angina, asthma, chronic obstructive pulmonary disease, bronchitis/pneumonia, periodontal disease, caries, chronic pain, depression, or psychological disorder other than depression). Further, we considered the following control variables based on the survey conducted after the emergency declaration: onset of morbidity (previously mentioned morbidity) and changes in the equivalized household income from the time of pre-declaration survey and to the post-declaration survey.

Statistical Analyses

Although no missing variables were observed in both independent and dependent variables, 0.2%–28.8% of the nine control variables were missing (Supplementary Table 1). As a result, we first imputed these missing variables using the random forest imputation procedure, which has been recommended for data with mixed continuous and categorical variables (Stekhoven and Bühlmann 2012). Incomplete variables were imputed as factors with missing variables not greater than 30% as explanatory variables (Stekhoven and Bühlmann 2012).

After the imputation procedure, we excluded participants not meeting the following criteria in the survey conducted *before* the declaration: (1) age less than 18 years and over 60 years (n = 2278), (2) public assistance recipients (n = 1), (3) non-insurer (n = 36), (4) retired (n = 7), (5) students (n = 679), (6) domestic workers (n = 491), and (7) unemployed (n = 325). The final analysis had 4177 respondents. After conducting descriptive analysis, we constructed regression models to examine the associations of job loss during the pandemic and government financial support variables with the QOL utility score, as calculated using EQ-5D-5L.

In our data, QOL utility scores had a ceiling effect with 56.3% of respondents reporting full health. To detect appropriate models for the censored outcome, we

compared model fit between ordinary least square (OLS) and Tobit using models with no control variables. For model fit, the root mean squared error (RMSE) in the OLS model and sigma in the Tobit model were calculated (Austin 2002; Austin et al. 2000). Coefficients calculated by the Tobit model can be interpreted in a similar manner to those calculated by the OLS model; however, the linear effect is on the uncensored latent variable, not the observed outcome (Austin 2002; Austin et al. 2000).

First, we constructed a univariate regression model in which job loss and financial support variables (i.e., Special Cash Payment and Temporary Special Benefit for Child-raising Households) were separately included in the regression model (Model 1). Second, all variables assessed before the declaration (e.g., gender, age, socioeconomic status) were added in addition to three independent variables (multivariate regression model, Model 2). Third, the onset of morbidities and change in the equivalized household income between the time before and after the declaration were added to Model 2 (multivariate regression model, Model 3).

All analyses, other than the random forest imputation were conducted using Stata, version 16.0 (StataCorp LLC, College Station, Texas, US). Random forest imputation was conducted using Python, version 3.8.3.

Results

Tables 1 and 2 show demographic characteristics, job loss during the pandemic, and government financial support variables with QOL utility scores calculated using EQ-5D-5L; those respondents who did not experience or did experience job loss were 0.92 (standard deviation [SD] = 0.12) and 0.83 (SD = 0.18), respectively (also see Supplementary Figs. 2 and 3). 3.5% of the respondents reported that they experienced job loss during the declaration. The proportion of respondents who received Special Cash Payment and Temporary Special Benefit for Child-raising Households were 89.4% and 11.0%, respectively. Those respondents who received the Special Cash Payment were more likely to have better QOL utility scores (Table 2); the score was more likely to be lower in men gender, in those with lower socioeconomic status, or in those having a morbidity before the declaration. Table 3 presents job loss after the declaration and responses to each EQ-5D-5L question. Overall, respondents who experienced job loss during the pandemic were more likely to choose adverse responses in each domain. This trend was particularly observed for pain/discomfort and anxiety/depression domains.

The RMSE in the OLS model and sigma in the Tobit model were 0.13 and 0.06, respectively, indicating that the Tobit model is more accurate than the OLS model. Therefore, we used the Tobit model for subsequent analyses. Table 4 presents the results of the Tobit models. Job loss during the pandemic was negatively associated with the QOL utility score, adjusting for characteristics before the declaration of the coefficient (95% confidence interval [CI], −0.11 [−0.15 to −0.07]) (Model 2).

This association was attenuated but remained significant when additional control variables were added to Model 2 (Model 3): the coefficient (95% CI) for job loss during the pandemic was −0.07 (−0.11 to −0.03). These results suggest that the QOL utility score was 0.07 lower in those respondents who lost their jobs during the declaration compared with those who did not. The results of the associations between government

Table 1 Characteristics before the declaration and quality of life utility score (n = 4177)

	Total number of respondents	Quality of life utility score		
		Mean	SD	25th–75th percentile
Age group (years)				
18–30	865	0.91	0.16	0.85–1.00
31–40	858	0.92	0.13	0.87–1.00
41–46	785	0.92	0.11	0.87–1.00
47–53	889	0.92	0.12	0.83–1.00
54–59	780	0.92	0.10	0.87–1.00
Gender				
Men	2639	0.92	0.13	0.87–1.00
Women	1538	0.91	0.12	0.83–1.00
Highest education level (years)				
≤9	29	0.79	0.23	0.69–1.00
10–12	873	0.91	0.13	0.82–1.00
≥13	3275	0.92	0.12	0.87–1.00
Quintile of income level				
1st (lowest)	903	0.88	0.16	0.82–1.00
2nd	809	0.92	0.12	0.87–1.00
3rd	801	0.92	0.12	0.87–1.00
4th	858	0.93	0.11	0.87–1.00
5th (highest)	806	0.93	0.11	0.87–1.00
Occupation				
Manager	168	0.91	0.17	0.83–1.00
Permanent	2814	0.92	0.12	0.87–1.00
Self-owned	334	0.89	0.15	0.82–1.00
Non-permanent	835	0.90	0.12	0.83–1.00
Internal	26	0.84	0.13	0.76–1.00
Hypertension				
No	3668	0.92	0.12	0.87–1.00
Yes	509	0.88	0.16	0.82–1.00
Diabetes				
No	3652	0.92	0.12	0.87–1.00
Yes	525	0.89	0.17	0.82–1.00
Cancer				
No	3771	0.92	0.12	0.87–1.00
Yes	406	0.88	0.17	0.82–1.00
Angina				
No	4108	0.92	0.12	0.87–1.00
Yes	69	0.78	0.25	0.85–1.00
Chronic obstructive pulmonary disease				
No	3796	0.92	0.12	0.87–1.00
Yes	381	0.88	0.17	0.82–1.00

Table 1 (continued)

	Total number of respondents	Quality of life utility score		
		Mean	SD	25th–75th percentile
Bronchitis/pneumonia				
No	4061	0.92	0.12	0.87–1.00
Yes	116	0.79	0.24	0.83–1.00
Asthma				
No	3959	0.92	0.12	0.87–1.00
Yes	218	0.86	0.19	0.82–1.00
Periodontal disease				
No	3733	0.92	0.12	0.87–1.00
Yes	444	0.87	0.16	0.82–1.00
Caries				
No	3785	0.92	0.12	0.87–1.00
Yes	392	0.87	0.16	0.82–1.00
Chronic pain				
No	4096	0.92	0.12	0.87–1.00
Yes	81	0.75	0.25	0.82–1.00
Psychological disorder other than depression				
No	3657	0.92	0.12	0.87–1.00
Yes	520	0.86	0.17	0.81–1.00

Depression before the declaration was omitted as none of the respondents answered "yes" to the question

financial support variables and the QOL utility scores are also shown in Table 3 (Model 3); the Special Cash Payment was associated with better QOL utility score of the coefficient (95% CI): 0.05 (0.03 to 0.08). Meanwhile, the Temporary Special Benefit for Child-raising Households was not associated with the QOL utility score.

We showed that a poor QOL utility score in the fully adjusted model was associated with low educational attainment and a low income level: the coefficients (95% CI) were −0.16 (−0.24 to −0.08) and −0.07 (−0.10 to −0.05), respectively (Table 4). The onset of several morbidities (depression, hypertension, caries, and chronic pain) was also associated with poor HRQOL: the coefficients of depression, −0.16 (−0.20 to −0.13); hypertension, −0.05 (−0.09 to −0.01); caries, −0.04 (−0.07 to −0.01); and chronic pain, −0.15 (−0.17 to −0.12).

Discussion

This study examined the association between job loss during the COVID-19 pandemic with HRQOL in the working population in Japan. We showed that respondents who experienced job loss had a poor HRQOL. Further, we also found that universal financial support had a positive effect on an individual's HRQOL.

Table 2 Characteristics after the emergency declaration and quality of life utility score (n = 4177)

	Total number of respondents	Quality of life utility score		
		Mean	SD	25th–75th percentile
Job loss during the pandemic				
No	4031	0.92	0.12	0.87–1.00
Yes	146	0.83	0.18	0.78–1.00
Special Cash Payment				
Not received	442	0.87	0.23	0.81–1.00
Received	3735	0.92	0.11	0.87–1.00
Temporary Special Benefit for Child-raising Households				
Not received	3718	0.92	0.13	0.87–1.00
Received	459	0.91	0.12	0.87–1.00
Onset of hypertension				
No	4046	0.92	0.13	0.87–1.00
Yes	131	0.89	0.14	0.82–1.00
Onset of diabetes				
No	4133	0.92	0.12	0.87–1.00
Yes	44	0.76	0.22	0.54–1.00
Onset of cancer				
No	4158	0.92	0.12	0.87–1.00
Yes	19	0.78	0.28	0.57–1.00
Onset of angina				
No	4153	0.92	0.12	0.87–1.00
Yes	24	0.74	0.28	0.55–1.00
Onset of chronic obstructive pulmonary disease				
No	4153	0.92	0.12	0.87–1.00
Yes	24	0.78	0.23	0.56–1.00
Onset of bronchitis/pneumonia				
No	4139	0.92	0.12	0.87–1.00
Yes	38	0.84	0.21	0.72–1.00
Onset of periodontal disease				
No	3995	0.92	0.13	0.87–1.00
Yes	182	0.89	0.13	0.82–1.00
Onset of caries				
No	3936	0.92	0.13	0.87–1.00
Yes	241	0.89	0.13	0.82–1.00
Onset of chronic pain				
No	3850	0.92	0.12	0.87–1.00
Yes	327	0.84	0.13	0.78–1.00
Onset of depression				
No	3976	0.92	0.12	0.87–1.00
Yes	201	0.76	0.18	0.68–1.00

Table 2 (continued)

	Total number of respondents	Quality of life utility score		
		Mean	SD	25th–75th percentile
Onset of psychological disorder other than depression				
No	4114	0.92	0.13	0.87–1.00
Yes	63	0.84	0.15	0.78–1.00

Onset of asthma was omitted as none of the respondents answered "yes" to the question

To date, two cross-sectional studies from Sweden and Japan have reported that job loss is associated with a poor HRQOL (measured by EQ-5D-5L); these findings are in line with those of our study (Fujikawa et al. 2011; Norström et al. 2019). However, because the earlier studies had cross-sectional designs, they did not consider whether job loss caused by mental health disorders or onset of disability could result in a reverse association. However, in our study, we assessed health status before the emergency declaration, socioeconomic conditions, and changes in conditions before and after the declaration. Moreover, job loss resulting from the COVID-19 pandemic is exogenous; thus, the present study has found that job loss leads to poor HRQOL (Albuquerque et al. 2020).

Table 3 Unemployment status at follow-up and responses to each EQ-5D-5L question (n = 4177)

	5 level items in each question									
	1 (no problems)		2 (slight problems)		3 (moderate problems)		4 (severe problems)		5 (unable to/ extreme problems)	
	N	%	N	%	N	%	N	%	N	%
Mobility										
Did not experience job loss	3813	94.6	144	3.6	34	0.8	20	0.5	20	0.5
Experienced job loss	120	82.2	11	7.5	8	5.5	4	2.7	3	2.1
Self-care										
Did not experience job loss	3913	97.1	60	1.5	29	0.7	13	0.3	16	0.4
Experienced job loss	127	87.0	7	4.8	6	4.1	5	3.4	1	0.7
Usual activities										
Did not experience job loss	3811	94.5	139	3.5	49	1.2	13	0.3	19	0.5
Experienced job loss	118	80.8	11	7.5	10	6.9	4	2.7	3	2.1
Pain/discomfort										
Did not experience job loss	2780	69.0	978	24.3	201	5.0	52	0.3	20	0.5
Experienced job loss	82	56.2	47	32.2	11	7.5	5	3.4	1	0.7
Anxiety/depression										
Did not experience job loss	2871	71.2	803	19.9	220	5.5	83	2.1	54	1.3
Experienced job loss	60	41.1	54	37.0	18	12.3	8	5.5	6	4.1

Table 4 Associations of job loss during the pandemic, characteristics, and government financial support variables with quality of life utility score (n = 4177)

	Model 1 Univariate model			Model 2 Baseline adjustment model			Model 3 Fully adjustment model		
	Coef.	95% CIs		Coef.	95% CIs		Coef.	95% CIs	
Job loss (ref. no)	**−0.16**	**−0.20**	**−0.12**	**−0.11**	**−0.15**	**−0.07**	**−0.07**	**−0.11**	**−0.03**
Special Cash Payment (ref. no)	**0.06**	**0.04**	**0.09**	**0.05**	**0.03**	**0.08**	**0.05**	**0.03**	**0.08**
Temporary Special Benefit for Child-raising Households (ref. no)	−0.001	−0.03	0.03	0.00	−0.02	0.03	0.00	−0.02	0.03
Age				−0.0002	−0.001	0.001	0.0003	−0.0004	0.001
Sex (ref. women)				**0.03**	**0.02**	**0.05**	**0.03**	**0.02**	**0.05**
Occupation (ref. manager)									
Permanent				0.01	−0.03	0.05	0.00	−0.04	0.04
Self-employer				−0.04	−0.09	0.01	−0.03	−0.08	0.02
Non-permanent				0.01	−0.04	0.05	0.00	−0.04	0.05
Internal				−0.09	−0.19	0.01	−0.08	−0.18	0.02
Education (ref. 13 years)									
10–12 years				**−0.02**	**−0.04**	**−0.001**	−0.02	−0.03	0.002
≤9 years				**−0.17**	**−0.26**	**−0.08**	**−0.16**	**−0.24**	**−0.08**
Income (ref. highest)									
4th				−0.02	−0.05	0.005	−0.02	−0.04	0.01
3rd				−0.02	−0.05	0.006	−0.02	−0.05	0.00
2nd				−0.02	−0.05	0.004	−0.02	−0.05	0.01
1st (lowest)				**−0.07**	**−0.10**	**−0.05**	**−0.07**	**−0.10**	**−0.05**
Insurance type (ref. Employee Health Insurance)									
National Health Insurance				0.00	−0.02	0.02	0.00	−0.02	0.02

Table 4 (continued)

	Model 1 Univariate model		Model 2 Baseline adjustment model			Model 3 Fully adjustment model		
	Coef.	95% CIs	Coef.	95% CIs		Coef.	95% CIs	
Diabetes at baseline (ref. no)			−0.01	−0.05	0.02	−0.02	−0.06	0.02
Cancer at baseline (ref. no)			0.00	−0.06	0.07	0.01	−0.05	0.07
Psychological disorder other than depression at baseline (ref. no)			**−0.13**	**−0.17**	**−0.10**	**−0.08**	**−0.12**	**−0.05**
Chronic obstructive pulmonary disease at baseline (ref. no)			0.09	0.02	0.15	0.06	−0.01	0.12
Hypertension at baseline (ref. no)			**−0.04**	**−0.07**	**−0.02**	**−0.04**	**−0.07**	**−0.02**
Asthma at baseline (ref. no)			0.00	−0.04	0.04	0.00	−0.04	0.04
Bronchitis/pneumonia at baseline (ref. no)			**−0.08**	**−0.14**	**−0.03**	**−0.07**	**−0.13**	**−0.02**
Periodontal disease at baseline (ref. no)			**−0.05**	**−0.07**	**−0.02**	**−0.03**	**−0.06**	**−0.01**
Caries at baseline (ref. no)			**−0.04**	**−0.07**	**−0.01**	**−0.03**	**−0.06**	**−0.001**
Angina at baseline (ref. no)			0.04	−0.04	0.11	0.04	−0.03	0.11
Chronic pain at baseline (ref. no)			**−0.11**	**−0.17**	**−0.04**	**−0.13**	**−0.19**	**−0.07**
Changes in income						0.00005	−0.00002	0.0001
Onset of Diabetes (ref. no)						−0.07	−0.15	0.00
Onset of Cancer (ref. no)						0.06	−0.07	0.19
Onset of depression (ref. no)						**−0.16**	**−0.20**	**−0.13**
Onset of psychological disorder other than depression (ref. no)						−0.01	−0.08	0.05
Onset of chronic obstructive pulmonary disease (ref. no)						0.05	−0.07	0.16
Onset of hypertension (ref. no)						**−0.05**	**−0.09**	**−0.01**
Onset of bronchitis/pneumonia (ref. no)						0.04	−0.05	0.12
Onset of periodontal disease (ref. no)						−0.03	−0.07	0.00
Onset of caries (ref. no)						**−0.04**	**−0.07**	**−0.01**

Table 4 (continued)

	Model 1 Univariate model		Model 2 Baseline adjustment model			Model 3 Fully adjustment model		
	Coef.	95% CIs	Coef.	95% CIs		Coef.	95% CIs	
Onset of angina (ref. no)						−0.05	−0.16	0.06
Onset of chronic pain (ref. no)						**−0.15**	**−0.17**	**−0.12**
Constant			**1.03**	**0.97**	**1.09**	**1.02**	**0.97**	**1.08**
AIC	–		2740.92			2479.06		
BIC	–		2924.70			2738.89		

Coef., coefficient; 95% CIs, 95% confidence intervals; AIC, Akaike information criterion; BIC, Bayesian information criterion

Depression assessed before the declaration and onset of asthma were omitted as none of the respondents answered "yes" to the questions

Statistical significance at $P < 0.05$ is indicated in **bold**

The Special Cash Payment might have a protective influence on HRQOL; as mentioned in the Introduction section, this payment is 100,000 yen of the universal financial support that is not reduced by income level. According to national data from Japan, the household savings rate for the April–June period of 2020 was 23.1%, the highest rate since 1994 (Economic and Social Research Institute 2020). This result suggests that the Special Cash Payment had a positive influence on an individual's HRQOL, even if they placed the payment into savings.

Although this was a universal financial support program, approximately 10% of the respondents answered that they did not receive support. Therefore, future studies are warranted to clarify the characteristics and determine how to provide support to these people. On the other hand, the Temporary Special Benefit for Child-raising Households was not associated with HRQOL. This discrepancy might be explained by the following reasons: the amount of financial support was totally different and the amount of the Special Cash Payment was larger than that of the Temporary Special Benefit for Child-raising Households.

In Japan, 100,000 yen is equivalent to 47.6% of the median monthly wage for individuals 20–24 years old and to 26.1% of those who are 55–59 years old (Ministry of Health, Labour, and Welfare 2019). The two types of financial support were different: the Special Cash Payment was a universal support program, whereas the Temporary Special Benefit for Child-raising Households was only given to families who had children. Although further studies are warranted, our data suggest that providing universal financial support may improve HRQOL in the working population.

We found that groups with lower socioeconomic status (education and income) had poorer HRQOL scores. Similar to our study, many previous studies have reported that lower educational attainment and lower-income levels are associated with poorer HRQOL scores (Fujikawa et al. 2011; Janssen et al. 2019; Yang et al. 2018). In the current study, a change in the income level was not associated with HRQOL. Previous studies before the COVID-19 era have reported that a change in income level is not associated with changes in health status (Adams et al. 2003; Smith 2005); these findings imply that health has an adverse effect on income, rather than vice versa.

In the current study, the health of 1%–8% of respondents deteriorated after the state of emergency was declared. Hence, additional support programs may be important as further unemployment and loss of income are expected in the future (Luca Ventura 2020). We also found that men gender was associated with better QOL utility scores compared with the women gender. This result is in line with that of a recent systematic review that investigated the impact of the COVID-19 pandemic on mental health in the general population (Xiong et al. 2020). Therefore, tackling gender inequalities might be essential during the COVID-19 era.

The possible mechanisms underlying the association between job loss and poor HRQOL could be due to a worsening in mental health and somatic symptoms. Our study saw that an increase in depression, caries, and chronic pain was associated with poor HRQOLs and that the association of job loss with HRQOL decreased when these variables were added. Moreover, respondents who experienced job loss during the pandemic were more likely to choose adverse responses in the pain/discomfort and anxiety/depression domains (Table 3).

The increase in morbidity has been observed in earlier studies; the 2008–2009 recession led to a reduction in health visits (Madureira-Lima et al. 2018; McInerney

and Mellor 2012; Sánchez-Recio et al. 2020), even if the visit might be essential for an individual (Czeisler et al. 2020). A recent cross-sectional study from Bangladesh targeted university students and found that COVID-19 induced fear and depression was significantly associated with career anxiety of this future workforce (Mahmud et al. 2020). Thus, the fear of COVID-19 itself possibly impacts on an individual's HRQOL.

As stated earlier, the COVID-19 pandemic has had a large impact on individuals' careers. Although the pandemic is difficult to control and adds to global uncertainty, career competency and resilience might play an important role in mitigating the career shock caused by the pandemic (Akkermans et al. 2020; Hite and McDonald 2020). After the Japanese state of emergency was declared on April 16, 2020, another concern was a decrease in healthy physical and social routines such as walking (Tison et al. 2020) and common social interactions (Banerjee and Rai 2020). Hence, establishing multifaceted prevention strategies are essential to tackle adverse health impacts resulting from pandemic restrictions.

This study has both strengths and limitations. One strength was the timing of the surveys, which allowed the demonstration of the influence of the COVID-19 pandemic, with the baseline survey that was conducted 1 month before the declaration, and the follow-up survey conducted 4 months after the declaration. We used internet survey data, possibly reducing the influence of recall bias, but an internet survey might be particularly effective during the COVID-19 period. In addition, we had socioeconomic status and health data before the declaration, adjusted in the regression model; thus, we considered possible confounders.

Our study has several limitations. First, we could not examine the QOL utility scores due to a lack of baseline information; however, job loss resulting from the COVID-19 pandemic is exogenous, and studies have found that job loss leads to poor HRQOL (Albuquerque et al. 2020). Second, some of our study results might not be applicable to other countries; the influence of universal financial support on HRQOL might be different depending on the amount.

By far, the Japanese government has not introduced additional "lockdown measures" that have been imposed in other countries; the Japanese government asked people to refrain from nonessential activities and maintain a healthy physical distance *without* penalties. Thus, the influence of the economic impact as a result of the declaration in Japan would be different than in other countries. Indeed, the unemployment rate in Japan as of April 2020 (3.0%) was lower than that of other countries at the same time (e.g., United States with a 14.3% rate [Australian Bureau of Statistics 2020; US Bureau of Labor Statistics 2020]). Third, our results might be influenced by selection bias because we used internet survey data, indicating that individuals who did not have smartphone or access to internet might not be covered in our analysis.

Conclusions

Job loss during the COVID-19 pandemic is negatively associated with HRQOL, whereas universal financial support program is positively associated with HRQOL. Although the impact of job loss on HRQOL is enormous, universal financial support program might have a positive impact on a larger number of residents.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11482-021-09918-6.

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Data Availability The data used in this study are not available in a public repository because they contain personally identifiable or potentially sensitive patient information. Based on the regulations for ethical guidelines in Japan, the Research Ethics Committee of the Osaka International Cancer Institute has imposed restrictions on the dissemination of the data collected in this study. All data enquiries should be addressed to the person responsible for data management, Dr. Takahiro Tabuchi at the following e-mail address: tabuchitak@gmail.com.

Declarations

Ethical Approval This study was reviewed and approved by the Research Ethics Committee of the Osaka International Cancer Institute (no. 20084).

Consent to Participate All participants provided web-based informed consent before responding to the online questionnaire. A credit point known as "Epoints," which could be used for internet shopping and cash conversion, was provided to the participants as an incentive.

Competing Interests None

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