

Altruism and Health Status During the COVID-19 Pandemic

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1. Introduction

Traditional economics assumes that individuals are selfish and rational. However, altruism has gained increasing prominence in the field of behavioral economics. This study focuses on the relationship between individual behavior and altruism during the COVID-19 pandemic. The hypotheses of this study are twofold. First, individuals with higher levels of altruism may be more willing to exert effort or make sacrifices to take socially better actions or those deemed desirable (Lagarde and Blaauw, 2014). Thus, individuals with higher levels of altruism are speculated to have implemented more infection-prevention behaviors during the COVID-19 pandemic. Second, previous studies have indicated that altruistic behaviors, such as volunteering, can lead to better health (Schwartz et al., 2003; Borgonovi, 2008). However, individuals with high levels of altruism, such as nurses, tend to sacrifice their mental health to support others (Sasaki et al., 2016; Dill et al., 2016). It is thus hypothesized that individuals with higher levels of altruism who cared for others during the COVID-19 pandemic may have experienced a negative impact on their health.

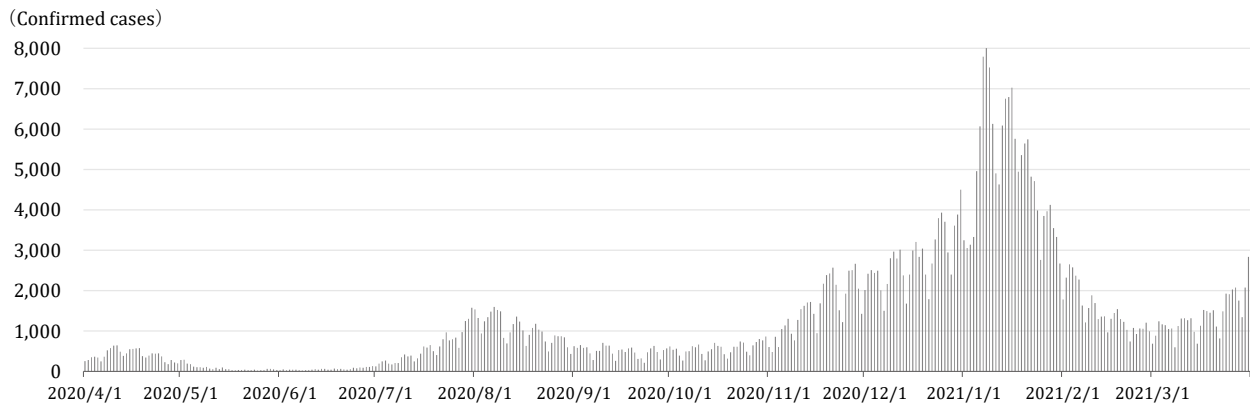
In public economics, infection-prevention measures are considered public goods, similar to police and fire services. Public goods are non-excludable, meaning that it is not possible to provide services only to those who have paid for them. Consequently, when someone bears the cost of providing a public good, there is a free-rider problem, because those who have not paid can still benefit from it. Therefore, if the supply of such public goods is left to the market, a problem may arise in which many individuals attempt to free-ride, resulting in significant undersupply (market failure). During the COVID-19 pandemic, individuals with low levels of altruism who did not take infection-prevention measures may have become free riders, potentially reducing the utility of individuals with higher levels of altruism who did take more preventive measures. This study focuses on health status as an aspect of utility and uses the results of an original questionnaire survey

to conduct a preliminary analysis of the relationship between altruism and health status.

2. Methods

This study utilizes the results of the "Survey on Individual Behavior and Preferences during the COVID-19 Pandemic" conducted by Okaniwa and Yoshida (2020). This survey aimed to understand the relationship between individual preferences and changes in lifestyle and behavior before and after the spread of COVID-19. The survey covered a wide range of topics related to people's behavior during the pandemic, including the use of the "Go To Travel" campaign, the use of the 100,000 yen cash handout, measures taken to prevent infection, preferred sources of information, and individual preferences such as altruism, risk aversion, and time preference. The survey was conducted online through an Internet survey company and took place over a two-day period from December 18 to 19, 2020. The survey targeted 1,036 respondents selected based on the population structure of the national census. The survey design and implementation were conducted in accordance with the regulations of the Ethics Review Committee of the Graduate School of Economics, Tohoku University, and were approved in December 2020. The survey was conducted as part of the Advanced Graduate Program for Future Medicine and Health Care at Tohoku University.

The survey was conducted during the third wave of the pandemic in Japan, when the number of domestic cases increased (Figure 1). On December 3, Osaka Prefecture declared a "state of medical emergency" owing to the surge in severely ill patients; the decision to dispatch the Self-Defense Forces to Hokkaido, where the medical system was under severe strain, was made on December 8th, rendering the domestic situation tense. On December 11, the US Food and Drug Administration issued an emergency authorization for the vaccine, and mass vaccinations began in earnest in Europe and the United States. It is important to note that these social circumstances significantly influenced the survey results.



Source: Prepared by the author based on the Ministry of Health, Labour and Welfare (2023).

Figure 1: Number of New Positive Cases in Japan (April 2020–March 2021)

Ordinary least squares (OLS) and ordered probit models were used to statistically verify that individuals with high levels of altruism were more likely to (1) practice infection-prevention behaviors and (2) have potentially worse health conditions or lifestyles during the pandemic.

3. Data

3.1 Altruism

Altruism refers to a concern for the interest and happiness of others over one's own. There are two incentives that act when people engage in altruistic behavior (Margolis, 1982). First, purely altruistic behavior is motivated by the innate desire to experience joy from others' happiness. Second, altruistic behavior is driven by selfish motives such as expecting future rewards or anticipating an increase in one's evaluation by acting on behalf of others. It is difficult to strictly distinguish between these motivations, so this study focuses on "altruistic behavior" that encompasses both motives. The analysis was based on the premise that individual preferences did not change over time.

Altruism was measured based on ten questions derived from Rushton et al. (1981) and Oda et al. (2013) (Table 1). Each question is answered on a 5-point scale (1 = never, 2 = once, 3 = a few times, 4 = often, and 5 = very often). The numerical values of the responses were directly used to calculate the total score for the ten questions (hereafter, the "total altruism score"), which ranged from a minimum of 10 points to a maximum of 50 points. A higher total altruism score indicates a greater tendency to engage in altruistic behavior.

Table 1 shows the descriptive statistics for each question (A1–A10) related to the total altruism scores. Although all questions were collected to measure altruism, slight differences in the nature of the questions resulted in slight variations in the average response values. For example, for question A3, "I have opened and closed the door for a stranger when I was near the elevator button," the average value was 3.39, and many participants responded that they had performed this action several times. However, for question A5, "I have lent something to a stranger," the average value was low, at 1.58, and more than half of the respondents answered "never."

The correlations among the altruism-related questionnaire items are presented in Table 2. The correlation coefficients between each item (A1 to A10) range from 0.15 to 0.47, indicating no strong relationships between them. However, correlations between the total altruism score and each item (A1 to A10) reveal high values ranging from 0.55 to 0.72. Altruistic behaviors exhibited various levels and characteristics, and the mean values differed between the individual items. However, note that the total altruism score could capture an individual's behavioral tendencies as an indicator that integrates these various factors. Therefore, the total score was chosen as an indicator of altruism rather than relying on specific questionnaire items.

3.2 Infection-Prevention Measures

Table 3 shows the data on infection-prevention measures. The questionnaire included eight items (B1-

Table 1. Altruism Questionnaire and Statistics

In your daily life, please choose one applicable answer from "1. never" to "5. very often".	Obs	Mean	S.D.	Min	Max
A1 I have given directions to a stranger.	1,036	2.87	1.00	1	5
A2 I have donated money.	1,036	2.47	1.07	1	5
A3 I have opened and closed the door for a stranger when I was near the elevator button.	1,036	3.39	1.10	1	5
A4 I have told a clerk the correct amount of money when the clerk gave me extra change by mistake.	1,036	2.38	1.18	1	5
A5 I have lent something to a stranger.	1,036	1.58	0.94	1	5
A6 I have given strangers information or knowledge that only I know.	1,036	1.98	1.13	1	5
A7 I have done volunteer work.	1,036	2.03	1.20	1	5
A8 I have helped an unacquainted person with disabilities or elderly people to cross a pedestrian crossing.	1,036	1.76	1.06	1	5
A9 I have given up my seat to a handicapped or elderly person on a train or bus.	1,036	2.70	1.12	1	5
A10 I have helped a stranger's bicycle to get up when it was on the ground.	1,036	1.90	1.07	1	5
Total Altruism Score	1,036	23.06	6.77	10	48

Source: Prepared by the author based on Okaniwa and Yoshida (2020).

Table 2. Correlation Matrix of Altruism Questionnaire

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Total Altruism Score	Altruism9
A1	1.00										0.66	0.56
A2	0.42	1.00									0.60	0.48
A3	0.46	0.28	1.00								0.59	0.47
A4	0.35	0.28	0.39	1.00							0.64	0.52
A5	0.24	0.21	0.15	0.28	1.00						0.55	0.44
A6	0.35	0.26	0.28	0.33	0.43	1.00					0.62	0.50
A7	0.23	0.37	0.18	0.23	0.24	0.26	1.00				0.57	0.43
A8	0.34	0.27	0.20	0.32	0.31	0.29	0.39	1.00			0.63	0.52
A9	0.44	0.35	0.47	0.42	0.27	0.35	0.30	0.42	1.00		0.72	0.63
A10	0.30	0.27	0.28	0.32	0.37	0.29	0.28	0.41	0.45	1.00	0.64	0.53

Source: Prepared by the author based on Okaniwa and Yoshida (2020).

Note: Altruism9 examines the correlation between the total scores of the other nine items and eliminates the influence of self-correlation. For example, the Altruism9 score for A1 was 0.56, indicating a correlation coefficient of 0.56 between the total scores of items A2–A10 and A1.

Table 3: Questionnaires and Statistics about Infection-Prevention-Measures Implemented

Which of the following measures have you implemented to prevent COVID-19 infection? (Multiple answers)	Obs	Mean	S.D.	Min	Max
B1 Always wear a mask when going out.	1,036	0.93	0.25	0	1
B2 Wash hands and sanitize hands.	1,036	0.87	0.34	0	1
B3 Practice good cough etiquette.	1,036	0.64	0.48	0	1
B4 Avoid crowds and crowded places.	1,036	0.66	0.47	0	1
B5 Keep a distance of at least 2 meters from people.	1,036	0.31	0.46	0	1
B6 Use indoor ventilation.	1,036	0.44	0.50	0	1
B7 Use a contact-confirming application.	1,036	0.15	0.36	0	1
B8 Avoid going outside.	1,036	0.50	0.50	0	1
Number of Infection Prevention Measures Implemented	1,036	4.50	1.96	0	8

Source: Prepared by the author based on Okaniwa and Yoshida (2020).

Table 4. Descriptive Statistics by Total Altruism Score

		Obs	Mean	S.D.	Min	Max
Number of Infection Prevention Measures Implemented						
Total Altruism Score	0-50	1,036	4.50	1.96	0	8
	0-19	311	4.11	1.99	0	8
	20-29	562	4.54	1.87	0	8
	30-39	149	5.05	1.96	0	8
	40-50	14	6.21	2.08	0	8
Better Physical Health						
Total Altruism Score	0-50	1,036	-0.05	0.57	-3	4
	0-19	311	-0.04	0.53	-2	2
	20-29	562	-0.07	0.54	-3	2
	30-39	149	0.03	0.73	-3	4
	40-50	14	-0.29	0.61	-2	0
Better Mental Health						
Total Altruism Score	0-50	1,036	-0.18	0.81	-4	4
	0-19	311	-0.13	0.69	-3	4
	20-29	562	-0.20	0.83	-3	3
	30-39	149	-0.16	0.89	-4	4
	40-50	14	-0.71	1.49	-4	1
Alcohol Consumption						
Total Altruism Score	0-50	740	2.84	0.94	1	5
	0-19	219	2.80	0.87	1	5
	20-29	400	2.87	0.96	1	5
	30-39	110	2.82	0.96	1	5
	40-50	11	3.18	1.25	1	5
SNS Usage						
Total Altruism Score	0-50	768	3.34	0.79	1	5
	0-19	200	3.22	0.70	1	5
	20-29	434	3.37	0.79	1	5
	30-39	120	3.40	0.81	1	5
	40-50	14	3.50	1.51	1	5

Source: Prepared by the author based on Okaniwa and Yoshida (2020).

B8). Nearly 90% of the respondents reported wearing masks and washing their hands. Additionally, more than 60% reported avoiding crowded places. However, approximately 15% reported using contact-confirming applications. Table 4 displays the relationship between the altruism scores and independent variables. The number of infection-prevention measures indicates how many of the eight items (B1–B8 in Table 3) were implemented. As the total altruism score increased, the number of infection-prevention measures also increased. This finding suggests that individuals with higher altruism tended to implement more infection-prevention measures.

3.3 Health status

Changes in health between the present (as of December 2020, the time of the survey) and the previous year were examined. Respondents were asked to select one of five options (1 = good to 5 = poor) for their current health status and that of the previous year. These numeric values were inverted (5 = good to 1 = poor) to create a variable (better physical and mental health) that subtracts the one-year-ago health status response from the current response, thus indicating the change in health status over the past year. Positive

values indicate an improvement in health over the past year, whereas negative values indicate a decline in health. Table 4 provides the descriptive statistics for the changes in health. The average value for all samples was -0.05, indicating a deterioration in physical health over the past year. Table 4 shows the changes in mental health, with an average value of -0.18 for all samples, indicating a greater degree of deterioration in mental health than in physical health. The group with the highest total altruism scores had the lowest mean values for physical and mental health.

3.4 Lifestyle

This study examined changes in lifestyle habits between the present (December 2020) and the previous year with a particular focus on changes in alcohol consumption and social networking service (SNS) usage. Participants were asked to select one of five options ("1. increased," "2. slightly increased," "3. no change," "4. slightly decreased," or "5. decreased") for their current and past behaviors. These responses were then reversed ("5. increased," "4. slightly increased," "3. no change," "2. slightly decreased," or "1. decreased") to assess changes in the past year. A mean of this variable greater than 3 indicates an increase in alcohol

Table 5. Descriptive Statistics

Variable	Obs	Mean	S.D.	Min	Max
Number of Infection Prevention Measures Implemented	1,036	4.50	1.96	0	8
Better Physical Health	1,036	-0.05	0.57	-3	4
Better Mental Health	1,036	-0.18	0.81	-4	4
Increased Alcohole Consumption Dummy (=1)	740	0.16	0.37	0	1
Increased SNS Using Dummy (=1)	768	0.31	0.46	0	1
Total Altruism Score	1,036	23.06	6.77	10	48
Male Dummy (=1)	1,036	0.48	0.50	0	1
Age	1,036	52.47	16.81	20	89
Marital Status Dummy (married=1)	1,036	0.64	0.48	0	1
University Graduate Dummy (=1)	1,036	0.44	0.50	0	1
Household Annual Income (JPY 10 thousand)	841	509.5	413.6	100	2,438
Regular Employment Dummy (=1)	1,036	0.31	0.46	0	1
Non-Regular Employment Dummy (=1)	1,036	0.19	0.40	0	1
Increased Work-From-Home Dummy (=1)	289	0.39	0.49	0	1

Source: Prepared by the author based on Okaniwa and Yoshida (2020).

Table 6: Effect of Altruism on the Number of Prevention Measures Implemented

	Number of Infection Prevention Measures Implemented			
	Coef.	Std. Err.	t	P>t
Total Altruism Score	0.063	0.01	6.51	***
Male Dummy	-0.502	0.14	-3.66	***
Age	0.021	0.00	4.87	***
Marital Status Dummy	0.284	0.14	2.06	**
University Graduate Dummy	-0.328	0.13	-2.45	**
Household Annual Income	0.000	0.00	0.48	
Regular Employment Dummy	-0.299	0.17	-1.74	*
Non-Regular Employment Dummy	-0.443	0.18	-2.52	**
Constant	2.268	0.38	6.04	***
Observations	841			
Adjusted R-squared	0.13			

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

consumption or social media usage over the past year, whereas a mean below 3 indicates a decrease.

The average alcohol consumption score was 2.84, indicating a decreasing trend. However, the group with a total altruism score of 40 or higher had an average score of 3.18, indicating an increase in alcohol consumption. For SNS use, the average score for the entire sample was 3.34, indicating an increasing trend. The higher the total altruism score, the greater the usage time. A dummy variable, with 1 representing those who increased their alcohol consumption or SNS usage and 0 representing others, was used for the estimation.

3.5 Other Control Variables

Other control variables were sex (male=1), age, marital status (married=1), university graduation

(college degree or higher=1), annual household income, and employment status, including dummy variables for regular and non-regular employment. To control for the impact of changes in work style on health status and lifestyle, a dummy variable for increased work from home as the explanatory variable was included. The small sample size for the increased work-from-home dummy is due to the exclusion of workers who did not work at home because of COVID-19. Table 5 presents the descriptive statistics of the entire dataset used for the estimation.

4. Results

The impact of altruism on the number of preventive behaviors is shown in Table 6. As the total altruism score increased, there was a statistically significant

Table 7: Effects of Altruism on Workers' Health Status

	Better Physical Health				Better Mental Health			
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t
Total Altruism Score	-0.008	0.01	-1.67	*	-0.015	0.01	-1.83	*
Male Dummy	0.004	0.08	0.06		-0.240	0.13	-1.85	*
Age	0.002	0.00	0.62		0.001	0.00	0.31	
Marital Status Dummy	-0.052	0.08	-0.68		-0.075	0.13	-0.58	
University Graduate Dummy	0.044	0.07	0.62		0.105	0.12	0.89	
Household Annual Income	0.000	0.00	-1.23		0.000	0.00	0.06	
Regular Employment Dummy	0.112	0.10	1.10		0.195	0.17	1.15	
Non-Regular Employment Dummy	-0.062	0.11	-0.56		-0.034	0.18	-0.18	
Increased Work-From-Home Dummy	0.017	0.07	0.24		0.011	0.12	0.09	
Constant	0.132	0.22	0.61		0.169	0.36	0.47	
Observations	248				248			
Adjusted R-squared	0.04				0.04			

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Effects of Altruism on Workers' Lifestyle

	Increased Alcohol Consumption Dummy				Increased SNS using Dummy			
	Coef.	Std. Err.	z	P>t	Coef.	Std. Err.	z	P>t
Total Altruism Score	0.039	0.02	2.55	**	0.044	0.01	3.01	***
Male Dummy	0.268	0.26	1.05		-0.502	0.22	-2.23	**
Age	0.010	0.01	1.14		-0.019	0.01	-2.32	**
Marital Status Dummy	0.288	0.24	1.19		0.171	0.24	0.72	
University Graduate Dummy	-0.251	0.21	-1.17		0.215	0.21	1.01	
Household Annual Income	-0.001	0.00	-2.18	**	0.000	0.00	-0.42	
Regular Employment Dummy	0.379	0.32	1.18		0.432	0.34	1.27	
Non-Regular Employment Dummy	-0.186	0.37	-0.51		0.486	0.37	1.31	
Increased Work-From-Home Dummy	0.390	0.21	1.82	*	0.181	0.21	0.86	
Observations	214				214			
Pseud R-squared	0.10				0.12			

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

increase in the number of preventive measures taken against infection.

Table 7 presents the estimated results of the impact of altruism on health status. Regression analysis was conducted for changes in physical and mental health, and the sign of the partial regression coefficient for the total altruism score was significantly negative for both. This suggests that individuals with higher levels of altruism experienced worsening physical and mental health compared with the year before the outbreak. The magnitude of the partial regression coefficient indicates a high level of mental health deterioration.

Table 8 presents the estimated results of the impact of altruism on lifestyle changes during the one-year period before and after the outbreak. First, regarding changes in alcohol consumption, as the total altruism

score increased, alcohol consumption also significantly increased. Second, with respect to SNS usage, as the total altruism score increased, SNS usage time significantly increased.

5. Conclusion

Based on a survey conducted by Okaniwa and Yoshida (2020), this study examined the relationship between changes in individuals' lifestyles and behaviors before and after the spread of the COVID-19 pandemic and their preferences. Specifically, the focus was to statistically clarify whether individuals with higher altruism levels implemented (1) more preventive measures, (2) experienced deteriorating health conditions, and (3) experienced changes in their daily habits. The estimation method was either OLS or

ordered probit models.

The analysis revealed that differences in behavior during the pandemic were influenced by individual preferences. On the one hand, individuals with higher levels of altruism tended to implement more infection-prevention measures. By contrast, higher levels of altruism were associated with a decline in health conditions, particularly mental health, before and after the pandemic.

According to the theory of public economics, infection-prevention measures can be considered a public good and free riders may arise because of their non-excludable nature. During the current COVID-19 pandemic, it is possible that individuals with low levels of altruism who did not take preventive measures against infection may have become free riders, thereby reducing the utility of individuals with high levels of altruism who did take preventive measures. However, this study could not establish a direct causal relationship with decreased utility. However, statistically significant evidence suggests the possibility of these effects through significant adverse health effects. Government intervention is necessary to address the existence of free-riders. Bonuses or other forms of relief may be necessary to reduce the burden on individuals exhibiting high levels of altruistic behavior.

Acknowledgements

This study summarizes a presentation by Fusae Okaniwa titled "Individual Behavior and Preferences during the COVID-19 Pandemic" at the Symposium on Impactful Research in Society (organized by the Center for Research on Aging and Society, Tohoku University) in March 2021, based on Okaniwa (2021). I also received valuable comments from Professors Hiroshi Yoshida, Midori Wakabayashi, Michio Yuda, and Fengming Chen of the Faculty of Economics at Tohoku University. I would like to express my gratitude to them for their contributions.

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岡庭 英重

本稿の目的は、新型コロナウイルス感染拡大下における、個人の利他性と健康状態との関係を検証することにある。これまで伝統的な経済学は利己的な個人を前提としてきたが、行動経済学などの分野において、利他的な個人の存在が注目されるようになってきた。いくつかの研究では、利他性の高い個人は、社会的に求められる行動や望ましいとされる行動をとるために多少の努力や犠牲を払うことを許容する傾向があり、他人に寄り添うがあまり自身の健康状態を悪化させる可能性があることが指摘されている。本稿では、今般の新型コロナウイルス感染拡大前後において、利他性が高い個人ほど、(1)感染予防行動を多く実施したか、(2)健康状態が悪化したか、(3)生活習慣が変化したか、について統計的に検証することに焦点を当てた。本稿では、2020年12月に実施した「コロナ禍における個人の行動と選好に関するアンケート調査」(岡庭・吉田, 2020)の調査結果を利用し、最小二乗法及び順序プロビットモデルにより、これらの関係性に関する予備的な分析を試みた。

分析の結果、(1)他人のために行動する利他性が高い個人ほど、感染予防対策を多く実施する傾向にあることが示された。また、感染拡大前後の比較において、(2)利他性の高い個人ほど自身の健康状態を悪化させており、特に精神的健康への悪影響がより大きいことが明らかとなった。加えて、(3)利他性の高い個人は飲酒量やソーシャルネットワーキングサービス利用時間が増加しており、このような生活習慣の変化が健康状態の悪化に影響している可能性も示唆された。感染予防対策は公共財の一種であり、排除性を持たないことから、その費用を負担せず便益のみを受け取るフリーライダーが生じうる。今般のコロナ禍において、感染予防対策を講じないフリーライダーの存在によって、感染予防対策を多く講じた利他性の高い人々の効用が低下した可能性がある。これらの直接的な因果関係やメカニズムの解明については、本稿の限界であり今後の研究課題である。