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Loneliness during the COVID-19 Pandemic: A Comparison of Urban and Rural Areas

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Abstract: Although studies have explored how loneliness varies between rural and urban areas during the COVID-19 pandemic, the results have been inconsistent, and most studies are observational. Therefore, it remains unclear how urban–rural differences affected loneliness in a pandemic. Our study uses nationwide data to clarify this, covering periods before and during the pandemic. We analyze a longitudinal dataset from Hiroshima University’s Household Behavior and Finance Survey, which collected demographic, socioeconomic, and psychological characteristics of Japanese adults in 2020, 2021, and 2022, thus reflecting the COVID-19 pandemic timeline. The results show that approximately 50% of those surveyed experienced long-term loneliness, while about 6.5% developed loneliness during the pandemic. Although our weighted logit regression models showed few differences in loneliness during the pandemic between urban and rural areas, socioeconomic changes, such as beginning to live alone, leaving full-time employment, and decreased financial satisfaction, were identified as high-risk factors for loneliness, and their impact varied between rural and urban areas. Our results reflect that rural–urban differences have an effect on people’s loneliness during a pandemic but need to be considered together with socioeconomic changes. This knowledge can aid governments and healthcare providers in identifying those most at risk of loneliness within urban–rural regional boundaries.

Keywords: rural–urban; socioeconomic changes; COVID-19; Japan; loneliness; pandemics



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1. Introduction

The study of loneliness by region has gained traction in recent years. In light of the COVID-19 pandemic, which has intensified differences in community composition by region, understanding nuanced variations in loneliness in different regions has become more crucial. Notably, the results in the literature investigating how loneliness differs by urban/rural area both before and during the pandemic have been inconsistent. In the pre-pandemic period, Beere et al. [1] found that people in rural areas tended to be less lonely than city dwellers. In contrast, according to Byrne et al. [2], rural older adults, particularly those with limited use of social technologies, reported higher levels of loneliness than their urban peers. There are fewer studies on urban–rural differences in loneliness during the pandemic, but those studies also report conflicting results. For example, Hane-saka and Hirano [3], Henning-Smith [4], and van Beek and Patulny [5] all indicated that people living in rural areas experienced relatively higher levels of loneliness during the pandemic. In contrast, Mayuzumi [6] stated that people who grew up in urban areas experienced loneliness more frequently during the pandemic. Meanwhile, Abshire et al. [7] and Henning-Smith et al. [8] reported no significant differences in loneliness based on geographic location during the pandemic. Therefore, more concrete empirical evidence on the differences in loneliness levels between urban and rural areas is needed.

The inconsistent findings on differences in loneliness can be attributed to three main factors. First, several studies investigating this have used modest sample sizes, typically consisting of fewer than 1000 observations. For example, Abshire et al. [7] examined loneliness levels among 616 adult residents across the rural–urban continuum, while Pretty et al. [9] explored the dimensions of loneliness and locality among 934 participants. Such modest sample sizes may limit our ability to capture the nuanced interaction between loneliness and geographic location. Second, sampling bias is another significant factor that contributes to the inconsistency in the results of previous studies. Some studies have focused on loneliness in urban or rural areas within a specific region rather than on a national scale. For example, one study [7] targeted participants from a single state, while another study [3] included individuals from only one city. This localized sampling approach can limit the generalizability of the findings to broader populations. Third, it should be noted that most studies that highlight regional differences in loneliness have used cross-sectional designs [3,7,10]. Consequently, it becomes challenging to draw definitive conclusions about any causal relationships, such as whether lonely individuals tend to choose urban or rural areas.

Given the conflicting results in the literature before and during the pandemic, our study aims to provide more insight into urban–rural differences in loneliness in Japan. Using panel data, we aim to gain a better understanding of how loneliness varies by region and how these differences change over time. We used a sample of more than 2000 adults from different regions of Japan from a nationwide dataset from 2020 to 2022. We analyzed panel data to strengthen our results and shed light on possible differences in loneliness across regional areas.

The pandemic has had a significant impact on various aspects of life, making it crucial to examine how socioeconomic and demographic characteristics influence loneliness as well and how these impacts vary by region. Our study contributes to the literature by examining not only urban–rural differences in loneliness before and during the pandemic but also the impact of socioeconomic and demographic characteristics as risk factors for loneliness at the area level.

2. Literature Review

Several studies examining loneliness in rural and urban areas have looked at the associated risk factors. The influence of factors such as social isolation, poor health, and socioeconomic disadvantage on loneliness varies by region [11–14]. Rural areas face greater physical and social isolation due to population decline, reduced local services, limited transportation, and less access to technology [12]. Consequently, this may lead to the dispersion of families, reduced intergenerational living, less cohesive communities, and higher chances of living alone, particularly among elderly residents [15,16]. These changes are likely to contribute to an increase in social isolation and feelings of loneliness among rural residents. Furthermore, rural residents are more likely to report poor health than urban residents are [11] as well as chronic health issues [13,14]. Urban residents who have greater access to and use of health information because of higher socioeconomic status and higher technological intensity report better self-rated health statuses [17]. Relatively poor health may restrict residents' ability to participate in social activities [18] and therefore contribute to their loneliness [19]. Rural areas also experience higher levels of poverty and limited access to markets, education, employment, and healthcare, which all contribute to higher loneliness among socioeconomically disadvantaged individuals [20,21].

The prolonged COVID-19 pandemic has amplified the disparity in these risk factors in urban and rural areas and altered their impact on loneliness [22]. The contagious nature of the pandemic highlights the impact of population density, as the virus spreads more easily in densely populated areas such as urban centers [23,24]. Therefore, COVID-19 preventative measures, such as social distancing and lockdowns, vary by region. Stricter measures in urban areas have limited social interaction and community engagement, leading to anxiety and isolation [1,6,25]. Although the use of technology and other communication devices

have mitigated such feelings of isolation to some extent [8], they have not completely diminished the pre-existing social isolation and loneliness experienced in rural areas [3,5]. Moreover, the pandemic has strained healthcare systems in both rural and urban areas, disrupting testing and healthcare capacities [26]. The concentrated residences in urban areas have expedited the transmission of COVID-19 and have left many people untested or untreated, exposing them to lower health status and loneliness [27]. Moreover, the pandemic has exacerbated socioeconomic vulnerabilities in both rural and urban areas, including job loss and inflation, contributing to financial dissatisfaction, depression, and loneliness [28–30]. The complex impact of the COVID-19 pandemic on loneliness risk factors makes it unclear which residents are most affected by loneliness. Consequently, our study aims to fully understand urban–rural differences in loneliness during the pandemic by considering changes in sociodemographic characteristics over time.

We contribute to the literature in at least three ways. First, to the best of our knowledge, ours is the first study in Japan to conduct a longitudinal analysis of the rural–urban differences in loneliness throughout the country. We investigate disparities in loneliness across the rural–urban continuum of Japanese adults using a representative panel dataset, thus strengthening the generalizability of our findings. Second, we examine regional effects on various loneliness conditions along the timeline of the COVID-19 pandemic (from 2020 to 2022), namely, long-term loneliness, post-pandemic loneliness, and fresh loneliness. This temporal perspective provides a deeper understanding of the complexity of the issue. Finally, our study offers longitudinal evidence of how individual sociodemographic changes during the crisis have impacted loneliness in rural and urban areas. The results of our study can provide valuable implications for policymakers in designing targeted interventions and support systems for people suffering from loneliness in both urban and rural areas before and during a pandemic.

3. Data and Methods

3.1. Data

We analyzed a longitudinal dataset from Hiroshima University’s Household Behavior and Finance Survey. This survey was conducted online using the dataset collected by Nikkei Research, a prominent research firm in Japan. To ensure the representativeness of the database, participants were selected using a random sampling procedure and questionnaires were distributed nationwide. Japanese adults were asked questions regarding their demographic, socioeconomic, and psychological characteristics in 2020, 2021, and 2022, reflecting the COVID-19 pandemic timeline. The sample sizes for the three waves were 17,463, 6103, and 4281. For our objective, we analyzed the panel data for loneliness, stratified by region, using data from all three waves. The total number of observations in our final merged dataset was 2630, after excluding observations with missing variables. We assumed that the missing values were random and did not interfere with our overall findings.

To examine how loneliness varied by region, we divided respondents into those living in urban and rural areas based on the question “Which prefecture do you live in?” for the 2020 Household Survey data. Urban and rural area classification was based on the Local Autonomy Law of the Cabinet Office, which designates 20 cities and 23 special wards in Tokyo as urban zones [31]. Accordingly, survey participants were grouped as living in rural areas (rural = 1) if they did not live in Tokyo special wards or government-designated city areas and as living in urban areas (rural = 0) otherwise.

3.2. Variables

3.2.1. Dependent Variables

Loneliness was the dependent variable in our study, which we categorized into three loneliness conditions: long-term loneliness, post-pandemic loneliness, and fresh loneliness. Following Lal et al. [32] who raised the importance of the loneliness categorization, we believe that using different loneliness conditions adds further dimensions to our research of loneliness by region. Loneliness in 2020, 2021, and 2022 was assessed using the UCLA

scale [32], which consists of three items: “How often do you feel you lack companionship?”, “How often do you feel left out”, and “How often do you feel isolated from others?” Based on the responses of “Hardly ever or never”, “Some of the time”, and “Often”, we classified participants as lonely (Loneliness = 1) if they felt a lack of companionship, left out, and isolated at least some of the time, and as not lonely otherwise (Loneliness = 0). Subsequently, we created binary variables for three types of loneliness, based on the loneliness conditions in each surveyed year. Detailed descriptions of the three types of loneliness, long-term, post-pandemic, and fresh loneliness, are provided in Table 1.

Table 1. Variable definitions.

Variables	Definition
	Dependent Variables
Long-term loneliness	Binary variable: 1 = feeling lonely in all three years (2020, 2021, 2022), and 0 = otherwise
Post-pandemic loneliness	Binary variable: 1 = not feeling lonely in 2020 but became lonely in 2021 and remaining in that condition in 2022, and 0 = otherwise
Fresh loneliness	Binary variable: 1 = not feeling lonely in 2020 and 2021 but became lonely in 2022, and 0 = otherwise
	Explanatory variables
Living in rural areas *	Binary variable: 1 = live in a rural area (not in Tokyo special wards or government-designated city areas), and 0 = otherwise
Male *	Binary variable: 1 = male and 0 = female
Age *	Continuous variable: participants' age in 2022
Recently divorced	Binary variable: 1 = divorced in 2022, and 0 = otherwise
Children *	Binary variable: 1 = at least one child, and 0 = otherwise
Started living alone	Binary variable: 1 = recently started living alone in 2022, and 0 = otherwise
Education *	Discrete variable: years of education
Left full-time employment	Binary variable: 1 = recently left a full-time job, and 0 = otherwise
Household income	Continuous variable: annual earned income before taxes and with bonuses of the entire household (unit: JPY)
Log of change in household income	Log (change in household income from 2020 to 2022)
Household assets	Continuous variable: balance of financial assets (savings, stocks, bonds, insurance, etc.) of the entire household (unit: JPY)
Log of change in household assets	Log (change in household assets from 2020 to 2022)
Financial literacy *	Continuous variable: average scores of answers for the three financial literacy questions
Subjective health status	Ordinal variable: 1 = not true at all, 2 = not so true, 3 = neutral, 4 = somewhat true, and 5 = true with the statement “I am now healthy and was generally healthy in the last year”
Change in health status	Binary variable: 1 = experiencing worsening health conditions, and 0 = otherwise
Future anxiety	Ordinal variable: 1 = not true at all, 2 = not so true, 3 = neutral, 4 = somewhat true, and 5 = true for the statement “I have anxieties about life after 65 years of age (for those who were already aged 65 years or above, life in the future)”
Change in future anxiety	Binary variable: 1 = becoming more anxious about the future, and 0 = otherwise
Financial satisfaction	Ordinal variable: 1 = completely disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = completely agree with the statement “I am happy with my financial status”
Change in financial satisfaction	Binary variable: 1 = having lower financial satisfaction levels, and 0 = otherwise
Depression	Ordinal variable: 1 = not true at all, 2 = not so true, 3 = neutral, 4 = somewhat true, and 5 = true for the statement “I often feel depressed or felt depressed in the last year”
Change in depression	Binary variable: 1 = having worsening depression, and 0 = otherwise
Myopic view of the future	Ordinal variable: 1 = completely disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = completely agree with the statement “Since the future is uncertain, it is a waste to think about it”
Change in myopic view of the future	Binary variable: 1 = having a more myopic view towards the future, and 0 = otherwise

Note: * indicates data from the 2020 wave.

3.2.2. Independent Variables

We adjusted for multiple sociodemographic variables that could affect the association between rurality and loneliness. These variables were similar to those in earlier studies [32–35], including demographic factors (gender, age, marital status, etc.) and other

psychological characteristics (future anxiety, depression, and myopic view of the future). The detailed definitions of these variables are presented in Table 1.

3.3. Descriptive Statistics

Figure 1 shows the descriptive results for the dependent variables. We found that approximately 51% of the urban residents and 53% of the rural residents experienced long-term loneliness. In addition, approximately 7% of the urban population and 6% of the rural population experienced post-pandemic loneliness. Furthermore, more than 2.4% of the regional subsamples experienced fresh loneliness. The widespread evidence in loneliness, particularly during the pandemic, is consistent with previous studies that found an increasing presence of mental health conditions, such as depression, anxiety, and loneliness [36–38].

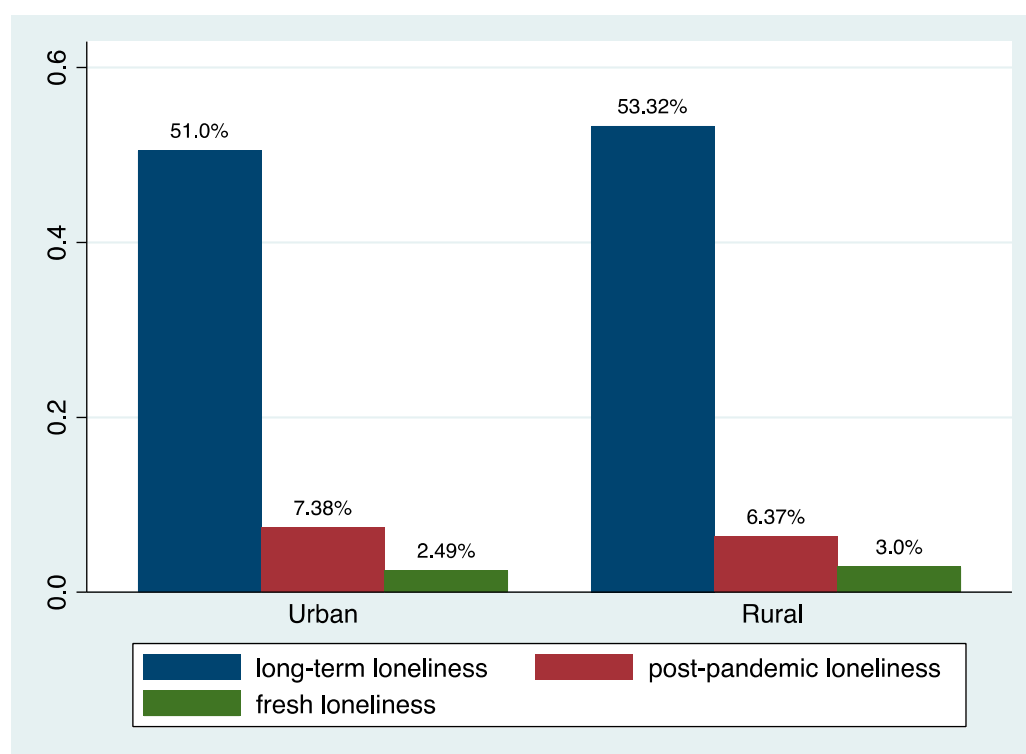


Figure 1. Different loneliness conditions by region.

The descriptive statistics for the explanatory variables are presented in Table 2. Regarding demographic variables, our study revealed the proportions of male residents in urban and rural areas to be approximately 67% and 72%, respectively. The average age in both areas was 54 years. Approximately 1% of those living in these regions have recently divorced. In addition, 57% of the urban residents had at least one child, while the figure for rural dwellers was 61%. Approximately 2% of those living in both areas began living alone between 2020 and 2022. Regarding socioeconomic variables, on average, the number of years of education was 15 in both the urban and rural areas. Furthermore, both regions had relatively similar rates of people leaving full-time jobs: 4% in urban regions and 3% in rural regions. Household income decreased in both areas, while household assets increased. However, the average financial literacy score of urban and rural residents was 0.71. For other psychological variables, there were few differences between urban and rural areas, with average rates of worsening health status, higher future anxiety, lower financial satisfaction, worsening depression, and increased myopic views of the future of 25%, 26%, 19%, 25%, and 24%, respectively, for urban residents. For rural residents, values of approximately 25%, 26%, 21%, 27%, and 25% were observed, respectively, for the same psychological variables.

Table 2. Descriptive statistics.

Variables	URBAN				RURAL			
	Mean	Standard Dev	Min	Max	Mean	Standard Dev	Min	Max
Long-Term Loneliness	0.505	(0.500)	0	1	0.533	(0.499)	0	1
Post-Pandemic Loneliness	0.074	(0.262)	0	1	0.064	(0.244)	0	1
Fresh Loneliness	0.025	(0.156)	0	1	0.029	(0.168)	0	1
Male	0.670	(0.470)	0	1	0.717	(0.451)	0	1
Age	53.762	(12.477)	23	85	53.875	(12.896)	22	87
Recently divorced	0.012	(0.111)	0	1	0.014	(0.117)	0	1
Child(ren)	0.569	(0.496)	0	1	0.609	(0.488)	0	1
Started living alone	0.020	(0.142)	0	1	0.019	(0.135)	0	1
Education	15.169	(1.994)	9	21	14.904	(2.163)	9	21
Left full-time employment	0.041	(0.198)	0	1	0.029	(0.167)	0	1
Log of change in HH income	−0.016	(0.484)	−3.637	3.091	−0.036	(0.436)	−3.401	2.890
Log of change in HH assets	0.117	(0.618)	−3.507	3.466	0.091	(0.639)	−4.605	4.09
Financial literacy	0.714	(0.325)	0	1	0.707	(0.335)	0	1
Change in health status (worse)	0.253	(0.435)	0	1	0.252	(0.434)	0	1
Change in future anxiety (high)	0.263	(0.441)	0	1	0.257	(0.437)	0	1
Change in financial satisfaction (low)	0.186	(0.389)	0	1	0.210	(0.407)	0	1
Change in depression (worse)	0.253	(0.435)	0	1	0.267	(0.443)	0	1
Myopic view of the future (low)	0.238	(0.426)	0	1	0.252	(0.434)	0	1
Observation	1124				1506			

Additional information on the variance in loneliness type by region is presented in Table 3. We found no significant mean differences between regional location and long-term, post-pandemic, or fresh loneliness. On average, the proportion of people who experienced loneliness in rural areas was much higher than that in urban areas. The largest gap between the two regions was among those who were not lonely in 2020 and 2021 but became lonely in 2022, with loneliness rates of 38.89% and 61.11% in urban and rural areas, respectively.

Table 3. Distribution of different loneliness types by region.

Regional Factors	Long-Term Loneliness		Post-Pandemic Loneliness		Fresh Loneliness	
	No	Yes	No	Yes	No	Yes
Urban	556 44.160%	568 41.430%	1041 42.470%	83 46.370%	1096 42.850%	28 38.891%
Rural	703 55.840%	803 58.570%	1410 57.530%	96 53.630%	1462 57.150%	44 61.110%
Total	1259 100%	1371 100%	2451 100%	179 100%	2558 100%	72 100%
Mean difference	t = −1.4150		t = 1.0171		t = −0.6692	

3.4. Methods

We used the following equation to examine the association between different types of loneliness and socioeconomic factors under the effects of geographical location:

$$Y_{1i} = f(X_i, \Delta X_i, \varepsilon_i) \quad (1)$$

$$Y_{2i} = f(X_i, \Delta X_i, \varepsilon_i) \quad (2)$$

$$Y_{3i} = f(X_i, \Delta X_i, \varepsilon_i) \quad (3)$$

where Y_{1i} , Y_{2i} , and Y_{3i} are the measures of long-term loneliness, post-pandemic loneliness, and fresh loneliness, respectively; X is a vector of an individual's demographic, socioeco-

nomic, psychological, and health-related characteristics; and ΔX is a vector of changes in personal attributes between 2020 and 2022. ε was the error term.

As our dependent variables were binary, we applied weighted logit regression models to estimate the equations. Weighted regression analysis was used to maintain the representativeness of the results. To do so, we first obtained sampling weights by dividing the total population [39] into sampling populations adjusted by age and gender. We then performed a weighted logit regression by incorporating sampling weights into the above equations.

We tested all the models for correlation and multicollinearity to avoid independent variable intercorrelations (the results are available upon request). The explanatory variables had weak correlation (<0.7) and no multicollinearity was found in any of the models (variance inflation factor < 2). The full specifications of Equations (1)–(3) are as follows.

$$\begin{aligned} \text{Long-term loneliness}_i = & \beta_0 + \beta_1 \text{male}_i + \beta_2 \text{age}_i + \beta_3 \text{recently divorced}_i + \beta_4 \text{children}_i \\ & + \beta_5 \text{becoming alone}_i + \beta_6 \text{education}_i + \beta_7 \text{leaving full-time employment}_i + \\ & \beta_8 \log \text{ of change in household income}_i + \beta_9 \log \text{ of change in household assets}_i + \beta_{10} \text{financial literacy}_i + \\ & \beta_{11} \text{change in health status}_i + \beta_{12} \text{change in future anxiety}_i + \beta_{13} \text{change in financial satisfaction}_i \\ & + \beta_{14} \text{change in depression}_i + \beta_{15} \text{change in myopic view of the future}_i + \varepsilon_i \end{aligned} \quad (4)$$

$$\begin{aligned} \text{Post-pandemic loneliness}_i = & \beta_0 + \beta_1 \text{male}_i + \beta_2 \text{age}_i + \beta_3 \text{recently divorced}_i + \beta_4 \text{children}_i \\ & + \beta_5 \text{becoming alone}_i + \beta_6 \text{education}_i + \beta_7 \text{leaving full-time employment}_i + \\ & \beta_8 \log \text{ of change in household income}_i + \beta_9 \log \text{ of change in household assets}_i + \beta_{10} \text{financial literacy}_i \\ & + \beta_{11} \text{change in health status}_i + \beta_{12} \text{change in future anxiety}_i + \beta_{13} \text{change in financial satisfaction}_i \\ & + \beta_{14} \text{change in depression}_i + \beta_{15} \text{myopic view of the future}_i + \varepsilon_i \end{aligned} \quad (5)$$

$$\begin{aligned} \text{Fresh loneliness}_i = & \beta_0 + \beta_1 \text{male}_i + \beta_2 \text{age}_i + \beta_3 \text{recently divorced}_i + \beta_4 \text{children}_i + \beta_5 \text{becoming alone}_i + \\ & \beta_6 \text{education}_i + \beta_7 \text{leaving full-time employment}_i + \beta_8 \log \text{ of change in household income}_i \\ & + \beta_9 \log \text{ of change in household assets}_i + \beta_{10} \text{financial literacy}_i + \beta_{11} \text{change in health status}_i \\ & + \beta_{12} \text{change in future anxiety}_i + \beta_{13} \text{change in financial satisfaction}_i + \beta_{14} \text{change in depression}_i \\ & + \beta_{15} \text{myopic view of the future}_i + \varepsilon_i \end{aligned} \quad (6)$$

4. Results

Table 4 presents the logit regression results for various types of loneliness. Data with missing values for beginning to live alone were excluded from the regression analysis for fresh loneliness.

Table 4. Logit regression results of different loneliness conditions by region.

Variables	Long-Term Loneliness		Post-Pandemic Loneliness		Fresh Loneliness	
	Urban	Rural	Urban	Rural	Urban	Rural
Male	0.030 (0.186)	0.134 (0.198)	−0.317 (0.314)	−0.376 (0.325)	−0.055 (0.480)	0.034 (0.385)
Age	−0.017 ** (0.008)	−0.027 *** (0.007)	0.002 (0.012)	−0.038 *** (0.014)	−0.020 (0.016)	−0.001 (0.016)
Recently divorced	−0.150 (0.742)	−0.120 (0.572)	0.748 (1.064)	−1.416 (1.255)	2.137 (1.470)	0.063 (1.131)
Children	−0.643 *** (0.173)	−0.325 ** (0.144)	0.300 (0.322)	0.385 (0.271)	0.700 (0.580)	0.169 (0.478)
Started living alone	1.757 * (0.904)	−0.930 (0.649)	−1.239 (1.104)	0.323 (0.921)	− (−)	1.109 (1.055)
Education	0.093 * (0.054)	−0.009 (0.038)	0.041 (0.089)	−0.062 (0.080)	0.131 (0.084)	0.149 (0.107)
Left full-time employment	−0.093 (0.381)	0.031 (0.395)	−0.334 (0.825)	−1.217 (1.088)	0.211 (0.784)	1.893 *** (0.632)

Table 4. Cont.

Variables	Long-Term Loneliness		Post-Pandemic Loneliness		Fresh Loneliness	
	Urban	Rural	Urban	Rural	Urban	Rural
Log of change in HH income	0.294 (0.224)	−0.515 * (0.265)	−0.016 (0.234)	0.423 (0.529)	0.268 (0.277)	−0.136 (0.312)
Log of change in HH assets	−0.331 ** (0.148)	0.181 (0.116)	0.180 (0.260)	−0.331 (0.259)	0.193 (0.287)	0.424 (0.295)
Financial literacy	0.003 (0.260)	0.168 (0.276)	−0.200 (0.414)	0.656 (0.424)	−0.197 (0.727)	0.683 (0.631)
Change in health status	−0.093 (0.190)	−0.019 (0.221)	0.216 (0.346)	−0.493 (0.339)	0.064 (0.531)	−0.378 (0.455)
Change in future anxiety	−0.162 (0.209)	−0.062 (0.218)	0.508 (0.341)	0.030 (0.342)	0.282 (0.433)	−0.153 (0.433)
Change in financial satisfaction	0.512 ** (0.232)	0.207 (0.258)	−0.150 (0.381)	−0.168 (0.525)	−1.470 * (0.872)	0.238 (0.406)
Change in depression	−0.228 (0.229)	−0.100 (0.204)	−0.265 (0.318)	−0.022 (0.367)	0.076 (0.479)	0.567 (0.448)
Change in myopic view of the future	0.123 (0.200)	0.171 (0.184)	−0.216 (0.379)	0.022 (0.410)	0.735 (0.451)	0.057 (0.426)
Constant	−0.307 (1.013)	1.320 ** (0.648)	−3.288 ** (1.383)	−0.050 (1.174)	−5.354 *** (1.407)	−6.906 *** (1.879)
Observations	1124	1506	1124	1506	1101	1506
Log pseudolikelihood	-2.630×10^7	-3.600×10^7	-1.050×10^7	-1.350×10^7	-3.794×10^6	-5.854×10^6
Chi ² statistics	50.46	38.39	8.915	22.76	16.73	23.95
p-value	1.01×10^{-5}	0.000791	0.882	0.0893	0.271	0.0659

Standard errors of each coefficient in brackets. Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.1. Different Loneliness Conditions and Associated Risk Factors in Urban Areas

Our study revealed that an increase in age, having at least one child, and increasing household assets were negatively associated with long-term loneliness among urban residents. In contrast, beginning to live alone and higher education levels were positively associated with long-term loneliness among urban residents at a 10% significance level. However, we found various relationships between low subjective financial satisfaction and loneliness among urban respondents. Specifically, a change in financial satisfaction was positively associated with long-term loneliness at a 5% significance level, whereas it was negatively associated with fresh loneliness at a 10% significance level.

4.2. Different Loneliness Conditions and Associated Risk Factors in Rural Areas

We found that an increase in age among rural residents was negatively associated with long-term and post-pandemic loneliness at a 1% significance level. Having at least one child and a change in household income were also negatively associated with long-term loneliness among rural respondents. In contrast, leaving full-time employment was positively associated with fresh loneliness among rural dwellers at a 1% significance level.

5. Discussion

Our study has three main findings. First, we found loneliness of a similar magnitude in rural and urban areas. Second, we found that the risk factors associated with loneliness differed in rural and urban areas. Third, we discovered that the development of loneliness conditions over time (long-term loneliness, post-pandemic loneliness, and fresh loneliness) also differed by region, mainly under the influence of the financial satisfaction factor.

The first finding that area typology was not significantly associated with loneliness, both before and during the pandemic, coincides with the results of two observational studies [7,8]. One main reason for the indifference of loneliness to geographical location is derived from levels of emotional connection and social circles. This includes both rural and urban residents because of the lockdown scenarios during the pandemic. For example,

feeling closer to other family members, living with children and grandchildren, staying in touch with friends using social media, and fostering good relationships with neighbors strengthened social connections and a sense of community [7,8]. To some extent, these factors place rural and urban residents at a similar risk of experiencing loneliness.

However, our longitudinal study identified several socioeconomic risk factors that differed significantly between rural and urban locations. We found that being younger, living alone, and leaving employment were key sociodemographic factors that had significant effects on area-based loneliness. Younger people were more likely to feel lonely during the pandemic, regardless of their geographical location. The findings here are comparable with those of previous studies [40–42]. Our results indicate that younger people may experience more loneliness due to interruptions in frequent and diverse social interactions during a pandemic [42]. Furthermore, younger adults place more value on the size and quantity of their social network and interaction compared with older adults, leading to less meaningful relationships and exposure to loneliness [43].

Furthermore, urban residents who began living alone were lonelier during the pandemic than their rural counterparts, which is consistent with the findings of Beere et al. [1], Mayuzumi [6], and Greteman et al. [44]. This further explains why people living alone tend to experience more disruptions in their daily activities due to COVID-19 restrictions. Van Beek and Patulny [5] and Lal et al. [31] indicate that it is mainly people who reside in urban areas who live alone. According to Khan and Kadoya [35], when people live alone, their desire for social relationships is severely impaired; thus, they become lonely. In contrast, rural residents who left full-time employment were more likely to develop loneliness during the pandemic than urban residents were because of increased socioeconomic disadvantages and a higher financial burden. Our findings are consistent with those of Bethea et al. [11], Jensen et al. [12], O'Connor and Wellenius [13], and Singh [14] who found that the differences in social isolation and socioeconomic disadvantage affected loneliness differently in rural and urban areas.

For the third finding, we discovered that lower financial satisfaction throughout the pandemic had different effects on long-term and fresh loneliness among urban inhabitants compared with their rural counterparts. Urban residents with worsening financial satisfaction were less likely to experience loneliness during the pandemic because of their ability to adapt to the changes caused by the pandemic, such as maintaining social connections through technology [45]. However, worsening financial satisfaction may have placed urban dwellers, who were already lonely before the pandemic, under greater pressure of financial responsibility [29]. This may have limited their participation in social networks and, with that, increased their long-term risk of loneliness [30,46,47].

Overall, our study shows that long-term, post-pandemic, and fresh loneliness are present both in urban and rural areas. Moreover, regardless of geographical location, younger people were reported to be more prone to experiencing loneliness during the pandemic. Thus, loneliness should not be considered an urban phenomenon caused by a lack of connectivity in urban lifestyle [1,6]. Rather, the phenomenon is consistent with the findings that depression, anxiety, and loneliness are increasing everywhere, including in rural areas [2–5,36–38]. Greater physical and social isolation due to population decline, reduced local services, limited transportation, and access to technology could be the reason for loneliness in rural areas [12]. However, our study provides further evidence that the risk factors associated with urban and rural loneliness are somewhat different. In particular, living alone and reducing household assets had a more detrimental impact on long-term loneliness in urban regions while reducing household income had a major impact on long-term loneliness in rural areas. Furthermore, reducing financial satisfaction had a major impact on loneliness in urban areas, while leaving full-time employment had a greater impact on loneliness in rural areas during the pandemic. Thus, the results of our study suggest that loneliness should not only be observed from the viewpoint of social isolation and lack of connectedness, but it also has socioeconomic dimensions. Reducing financial soundness and satisfaction, losing employment, and lack of employment opportunities

for young people could also be responsible for widespread loneliness both in urban and rural areas.

Even though our study contributes to the literature, it still has several limitations. The first relates to possible self-reporting bias, as the survey was conducted online; however, online surveys also ensure anonymity, which, to some extent, enables respondents to answer survey questions more honestly, thus improving the validity of the data. The second limitation is the marginal lack of data inclusion, as the loneliest individuals may not have participated in the survey. This should not seriously affect the results of our study because we used weighted samples in estimating the regressions. Third, we used a simple classification of urban–rural areas. Future research should address this by testing the model in specified settings with varied population densities, thus providing a more differentiated understanding of regional impacts on loneliness. Finally, the representativeness of the data in this study is not known because the data were collected through an online survey. Data could be biased due to the differential online access of the population, and respondents with biases could be included in the sample. However, possible bias should not significantly affect the results due to the sufficiency of the sample size and the similarity of the distribution of the data to national statistics.

6. Conclusions

In light of the conflicting results on the impact of the rural–urban divide and the long-standing COVID-19 pandemic on loneliness, we investigated urban–rural differences in loneliness during the COVID-19 pandemic using a nationwide panel survey in Japan. Our study contributed to the existing literature in at least two areas: our panel data analysis and the use of a nationwide dataset, which contribute to the validity and better generalizability of our findings. According to our results, people living in both urban and rural areas experienced loneliness throughout the pandemic, but in different ways. We found that different socioeconomic changes had different significant regional impacts on loneliness. In particular, starting to live alone had a more detrimental impact on loneliness in urban regions, while leaving full-time employment had a greater impact on loneliness in rural areas. Regardless of geographical location, younger people were reportedly more prone to experiencing loneliness during the pandemic.

The findings of our study can help researchers and policymakers in devising public health interventions against the loneliness caused by COVID-19. In particular, area-based loneliness stratified by socioeconomic changes can help governments and public healthcare providers identify those most at risk of loneliness within urban–rural regional boundaries.

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