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Factors that Hinder the Use of Medical Services among Foreign Residents in Japan: An Analysis from a Comprehensive Web-based Survey

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Factors that Hinder the Use of Medical Services among Foreign Residents in Japan: An Analysis from a Comprehensive Web-based Survey*

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Abstract

The COVID-19 pandemic has underscored the challenges in accessing healthcare services for foreign residents in Japan. However, a comprehensive understanding of these obstacles remains limited due to a scarcity of publicly accessible, government-led survey data. To bridge this knowledge gap, this study uses individual data from a 2020 comprehensive survey of foreigners in Japan, which was publicly released by the Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo. Using binomial logistic regression analysis, we identify the key demographics of those who face significant barriers to healthcare, including Thai nationals, part-time workers, those living in shared accommodations, individuals residing in the Chubu region of Japan, holders of designated activities visas, or those who are ineligible for healthcare insurance. In addition, we speculate that international students who do not reside in student dormitories may be another group facing difficulties in accessing medical services. Our study further suggests that aside from economic considerations, a limited understanding of the Japanese insurance system may be a primary factor behind some foreign residents' loss of insurance eligibility. We propose measures to alleviate these barriers, including directing resources that enhance healthcare accessibility toward areas with lower healthcare resource density, encouraging foreign residents' active participation in local neighborhood associations, enhancing the dissemination of basic information about Japanese health insurance, and advocating for the use of simplified language by medical institutions when interacting with foreign patients. The implementation of these measures could potentially enhance healthcare accessibility for foreign residents and facilitate their integration into Japanese society.

Keywords: Foreign residents, Health care utilization, Illness behavior, Multicultural coexistence society

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1　Background

　　Labor shortages due to decreasing birthrates and an aging population have become a widespread challenge across various industries in Japan, particularly in labor-intensive sectors, such as food services, construction, and retail (MHLWJ, 2019). These industries often experience persistent labor shortages (MHLWJ, 2021). To address this critical social issue, the previous Abe administration relaxed the conditions for accepting foreign laborers and called on various industries in Japan to provide a more welcoming employment environment for foreign workers. The current Kishida administration has also indicated its intention to more actively welcome international students. The aim of these policies is to retain the existing foreign workforce and attract additional talent to work and study in Japan, supplementing the foreign labor force to ensure the sustained development of the Japanese economy and the stability of its social security system (Japan's Immigration Services Agency of Japan (ISA), 2023). In the decade following the 2011 East Japan Earthquake, the accelerated growth of foreign-born resident populations, including foreign laborers, has been driven by an increased labor demand stemming from post-earthquake reconstruction and population imbalances. Prior to the global outbreak of COVID-19, the number of foreign-born individuals in Japan reached approximately 2.9 million in 2019 (Figure 1). As the foreign population expands rapidly, the issue of policy formulation regarding the protection of social rights and interests for foreign residents in Japan has surfaced. The most representative example of this is in the publicly-oriented healthcare sector, where the basic healthcare needs of foreign residents in Japan remain unmet. The trade-off between personal finances and health is considered a significant factor leading to a reduction in healthcare service use among foreign residents in Japan. Language barriers may result in severe information asymmetry, which can lead to overtreatment, further exacerbating the financial situation of patients (e.g., Mori and Mizutani, 2022). Despite the predominance of public insurance in Japan's healthcare system, which exhibits characteristics of universal health coverage (UHC), substantial health disparities still exist among different population groups (e.g., Watanabe and Hashimoto, 2012). Among these, foreign residents in Japan with lower socioeconomic statuses often experience harsh living or working conditions and increased health risks. For instance, tuberculosis has a higher incidence rate among the foreign population in Japan, and the proportion of non-Japanese patients experiencing treatment interruptions is notably higher than that of Japanese patients (e.g., Yoshiyama et al., 1999; Ota et al., 2021). Yasukawa et al. (2019) have publicly called for the allocation of

more healthcare resources to foreign residents, particularly undocumented overstayers or refugees.

Figure 1: Population of foreign-born residents in Japan
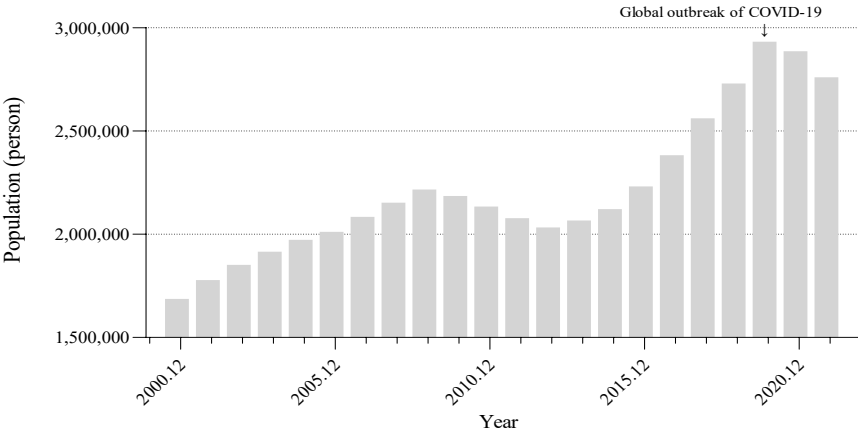
Note: Foreign-born residents are foreigners who are expected to stay or have stayed in Japan for more than 90 days.
Source: Immigration Services Agency of Japan

The COVID-19 pandemic, which began in 2020, has had a significant impact on healthcare systems and international population mobility in various countries (e.g., Blumenthal et al., 2020; Nicola et al., 2020; Cascella et al., 2021). Simultaneously, exacerbated imbalances between the supply and demand of healthcare services during the COVID-19 pandemic may further constrain the access and use of healthcare services for immigrant populations (e.g., Lebano et al., 2020; OECD, 2020). Consequently, some scholars have urged governments to ensure healthcare access for immigrants during the pandemic and to collect data on immigrants' health status and healthcare use (e.g., Rechel et al., 2013). Even in European countries with relatively high proportions of immigrants, most health statistic surveys do not strictly differentiate between immigrant and nonimmigrant status during design and implementation, resulting in fragmented data on immigrant healthcare use (Rechel et al., 2013). Although Japan is experiencing a rapid increase in its foreign-born population, the proportion of foreign-born residents in the total population remains relatively low. Even in Tokyo, a city with nearly 500,000 foreign residents, the proportion of foreigners is only 3.44%, and it is even lower in areas outside Tokyo (Figure 2). At present, there is no official, comprehensive healthcare survey that specifically targets foreign residents in Japan. In addition to delays in government surveys, privately funded or individually conducted research also faces challenges due to the relatively high cost of surveying

such a minority group. In this context, research conducted by private entities or individuals is often limited in terms of sample size and regional coverage. Area-based studies indicate that a high proportion of foreign individuals within the foreign population lack public insurance. Among foreigners with health insurance, a large proportion does not seek treatment at formal medical institutions when health risks increase, while uninsured foreigners' healthcare use and health status tend to be worse (e.g., Suguimoto et al., 2012; Higuchi et al., 2021). However, due to the considerable heterogeneity in the geographical distribution of foreign individuals across Japan and the inherent imbalance in the allocation of healthcare resources among different regions, the insights gleaned from these studies remain limited. For instance, Suguimoto et al. (2012) conducted a study investigating health insurance coverage among Latin American foreign residents in Nagahama City in Japan and found that the uninsured rate was as high as 19.8%, significantly exceeding the national average of 1.3%. However, other studies have suggested that Latin American groups tend to have less medical insurance coverage than Asian and other ethnic groups (e.g., The Assistant Secretary for Planning and Evaluation and U.S. Department of Health & Human Services, 2021). Moreover, a substantial portion of the existing research has focused on the Kanto region of Japan and Aichi Prefecture, areas with a higher concentration of foreign residents (e.g., Kunii and Nomiyama, 1993; Morita et al., 2021). These two regions boast of leading positions in terms of physician density and healthcare facility density across Japan (e.g., Kato, 2021). On the other hand, understanding the use of healthcare services by foreign residents living in areas with relatively lower healthcare resource density remains unexplored.

Figure 2: Proportion of foreigners in Japan
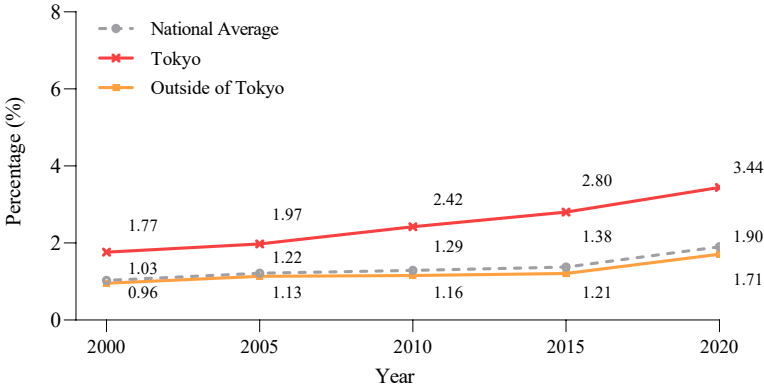
Note: Made by the author based on Census 2000-2020

As the imbalance in the population structure intensifies, it is predicted that the foreign population in Japan will continue to grow for an extended period. Research has shown that improving the quality of medical services for the immigrant population contributes to their integration into local communities and enhances their ability to engage in productive activities (e.g., Kirmayer et al., 2011; Lebrun, 2012). Conversely, engaging in self-medication resulting from the inability to access timely healthcare services may result in delayed treatment and may intensify the likelihood of individuals developing severe illnesses (e.g., Yamamura and Sawada, 2000; Chautrakarn et al., 2021). From both a humanistic and economic perspective, addressing the challenges faced by foreign residents in accessing healthcare services and improving their medical experience should become a new task for Japanese society in the post-COVID-19 era. Although the Japanese government has already begun encouraging specific medical institutions to establish dedicated foreign patient service departments and promote multilingual services in healthcare facilities (MHLWJ, 2022), skeptics argue that the target population of these measures primarily consists of affluent foreign tourists and medical visitors (e.g., Yasukawa et al., 2019). The healthcare-related situation for foreign residents in Japan has undergone drastic changes over time (Higuchi et al., 2021). Furthermore, the continuation of COVID-19 may reinforce the socioeconomic and healthcare inequalities faced by the immigrant population (e.g., Đoàn et al., 2021). Therefore, this study considers it necessary to use the most recent survey data from the COVID-19 era to discuss in detail the factors that hinder foreign residents from accessing public medical services, providing a reference for the targeted implementation of future healthcare support policies for foreign residents.

2   Data and Methods

Acquiring accurate survey data on foreign-born residents, who are considered ethnic minorities, proves challenging due to their relatively low representation and the absence of official survey data concerning their use of medical services. Furthermore, the ongoing spread of COVID-19 has heightened awareness around minimizing external contact among Japan's citizens, complicating the execution of face-to-face interviews or paper-based surveys (MLIT, 2022). Concurrently, the widespread adoption of information technology and the internet has led to a steady increase in the number of online surveys featured in published research (Wu et al., 2022). Web-based surveys are also gaining traction in health research (Hu et al., 2015). Although their

response rates are generally lower compared to paper-based surveys, web-based surveys often have advantages in terms of data completeness and cost-effectiveness (e.g., Hardigan et al., 2012; Ebert et al., 2018). For samples that are typically difficult to reach, such as foreign-born residents, web-based surveys have proved feasible and effective in gathering data (Regmi et al., 2016).

This study uses data from a survey titled "Survey on Foreigners in Japan, 2020" provided by the Social Science Japan Data Archive (SSJDA). The SSJDA, a division within the Center for Social Research and Data Archives (CSRDA) at the Institute of Social Science, The University of Tokyo, aims to promote empirical research in the social sciences and has been disseminating archival data since April 1998 (Center for Social Research and Data Archives (CSRDA), n.d.). This survey was conducted online, using a sample database consisting of approximately 15,000 foreign nationals aged 20 and above residing in Japan but originating from 105 other countries and regions. The survey was conducted in March and April 2020 by Survey Research Center Co., Ltd., a company that collaborates closely with national and local government offices, private sector organizations, universities, and NPOs/NGOs in Japan in various domains of social research (Survey Research Center, n.d.). The survey encompasses six sections: personal attributes, employment, living, medical care and insurance, disaster response, and children's education, making it one of the most comprehensive surveys targeting foreigners in Japan (Figure 3). The questionnaire consists exclusively of choice-based questions (single or multiple choice) and is administered in Japanese. Conditional branching is employed in the survey; for instance, respondents who selected "looking for work" or "not working" in the employment status question would not be asked about their form of employment, average hours of work per day, days of work per week, average monthly employment income (AMEI), and industry. To approximate the characteristics of the entire foreign population in Japan, Survey Research Center Co., Ltd. employed a proportional quota sampling strategy, focusing on the nationality ratio based on the "Statistics of Foreign Residents (End of Dec 2019)" published by the Immigration Services Agency of Japan. The survey yielded 1,037 valid responses. Given that this study utilized publicly available anonymized data and did not involve any form of human or animal experimentation, it was deemed unnecessary to obtain ethical approval and informed consent.

Figure 3: Composition of the questionnaire survey

Personal attributes	→	gender, age , country of birth, residence area
		length of stay, type of visa
Employment	→	employment status, employment type
		working hours, number of working days
		individual income, industry, etc.
Living	→	living arrangements, socializing with Japanese residents
		Japanese learning, etc.
Medical care and insurance	→	health insurance coverage, pension enrollment
		illness behavior, health checkups, etc.
Disaster response	→	disaster preparedness
Children's education	→	schooling of children, Japanese language level of children
		whether children are treated unfairly at school, etc.
Others	→	car ownership and status, troubles while living in Japan, etc.

Note: Made by the author

The primary focus of this study is to examine the utilization of public medical services by foreigners in Japan and the factors that impede their access to such services. Hence, this study was piqued by a single-choice question in the medical and insurance section of the survey questionnaire, which inquired about how the respondents manage their own illnesses or injuries. The question and options are as follows:

How do you handle your illness or injury? (Single-choice question)

1. Go to a clinic or hospital that I visit regularly

2. Go to a clinic or hospital anyway

3. Buy over-the-counter medicines and take them

4. Suffer

5. No experience of being sick

6. Other

As the question did not specify a particular time or timeframe, the responses could be construed as the respondents' usual illness behavior (UIB). Options 1 and 2 denote the use of public health services. In contrast, Option 3, along with Option 4, can be considered not using healthcare services since it does not involve

receiving compensated medical activities provided by healthcare professionals in medical institutions. As most patients lack adequate medical expertise, illness behaviors corresponding to options 3 and 4 are likely to result in missed opportunities for optimal diagnosis and treatment, thereby increasing health risks and potentially leading to life-threatening conditions (e.g., Ruiz, 2010; Dulal et al., 2020; Khatony et al., 2020).

We categorized the options for this single-choice question while preserving the original intent. Specifically, options 1 and 2 were grouped as appearing at a medical facility (i.e., using medical services), while options 3 and 4 were regarded as not using medical services. Notably, respondents who selected option 5 or 6, indicating that they have not experienced illness in Japan or other illness behaviors, will be excluded from the analysis. Concerning the explanatory variables, this study incorporated not only commonly used variables such as health insurance enrollment status, nationality, household composition, and variables that reflect socioeconomic statuses, such as gender, age, employment status, and AMEI (e.g., Dias et al., 2008), but also variables that may influence healthcare service use that have rarely been included in existing studies on foreign residents in Japan, such as length of stay, type of visa, place of residence, and accessing medical follow up services.

Table 1a and b present a summary of the socioeconomic and sociodemographic characteristics of the respondents. Of the 1,037 respondents, 522 were female and 515 were male, with the slightly higher proportion of female respondents aligning with the current gender ratio of foreigners residing in Japan. In terms of age distribution, approximately 90% of respondents belonged to the 20-29 and 30-39 age groups, while a smaller proportion comprised middle-aged and older respondents aged 50 and above. The majority of respondents originated from Asian countries or regions, with nearly half hailing from China, Vietnam, and the Philippines. Considering previous studies that analyzed factors inhibiting medical service use for foreigners living in the Kanto region (e.g., Morita et al., 2021) and the potential lack of medical care access for foreigners residing outside the Kanto region due to the relatively small foreigner ratio in this region, this study categorized respondents' residence areas into five divisions, Hokkaido/Tohoku Region, Kanto Region, Chubu Region, Kinki/Chugoku/Shikoku Region, and Kyushu/Okinawa Region, to investigate potential significant differences among regions. Regarding the duration of respondents' residence in Japan, approximately 30% reported they had lived there less than three years, while the proportion of respondents who resided there for four to nine years exceeded 60%, and approximately 12% indicated they had lived

there ten years or more. Regarding employment, the questionnaire asked respondents about their employment status, and those who reported being employed were also required to answer questions about their type of employment. A mere 54 respondents indicated that they were not currently employed or engaged in work as laborers. Most respondents reported being engaged in some type of labor, with the most responding that they were employed in regular jobs. Those not employed were exempt from answering questions about AMEI, resulting in default zero-income responses. The data reveal that nearly half of the respondents earned less than 200,000 yen per month, while fewer than 20% reported earning more than 300,000 yen per month.

The questionnaire explored respondents' living arrangements, asking whether they lived alone or with others and whether children were part of their households. The study divided this multiple-choice question into two categorical variables: one for household composition and another for the presence of children. Previous research suggests that household size and membership composition may influence an individual's self-regulation of health behaviors (e.g., Umberson, 1987). Approximately 35% of respondents reported living alone, and over 80% indicated that they did not have children. Moreover, more than 75% of respondents stated that they did not participate in a neighborhood association near their residence. In Japan, neighborhood associations are nonadministrative entities established and managed by resident representatives to foster communication on disaster prevention and living (e.g., Baba, 2021). Regarding medical checkups, approximately 60% of survey respondents reported having access to regular, free medical checkups, while over 20% said they could not access such services. Approximately 14% of respondents would obtain regular medical checkups at their own expense. Regarding enrollment in health insurance in Japan, approximately 85% of the respondents explicitly stated that they had enrolled in either NHI or EHI. Among the remaining 15% of the respondents, 111 individuals reported being enrolled in health insurance but were unsure of the specific type, 13 individuals indicated being enrolled in other types of health insurance, and 7 individuals reported being enrolled in private travel insurance. Twenty-four individuals explicitly stated that they had not enrolled in any health insurance, and 7 individuals indicated that they were unsure. Additionally, given the overlap between the survey period and the onset of the rapid COVID-19 outbreak in Japan, which led to the government's first declaration of a state of emergency, and the potential influence of fear of COVID-19 on illness behavior (e.g., Smolić et al., 2022), this study incorporated the level of anxiety toward COVID-19 as an explanatory variable.

Table 1a. Characteristics of survey respondents (part 1)

| Characteristics	n	Ratio
Gender		
Male	515	49.66%
Female	522	50.34%
Age		
20 - 29	417	40.21%
30 - 39	519	50.05%
40 - 49	74	7.14%
50 or more	27	2.60%
Country of birth		
China (including Hong Kong, etc.)	272	26.23%
Vietnam	183	17.65%
Philippines	117	11.28%
Brazil	89	8.58%
Taiwan	55	5.30%
South Korea / North Korea	49	4.73%
United States	40	3.86%
Indonesia	38	3.67%
Thailand	17	1.64%
Others	177	17.07%
Residence area		
Hokkaido/Tohoku Region	54	5.21 %
Kanto Region	744	71.75%
Chubu Region	76	7.33%
Kinki/Chugoku/Shikoku Region	97	9.35%
Kyushu/Okinawa Region	66	6.36%
Length of stay		
Less than 3 years	281	27.10%
4 - 9 years	627	60.46%
10 years or more	129	12.44%
Employment status		
Regular employee (full-time)	562	54.19%
Part-time worker	256	24.69%
Temporary staff / contract worker	122	11.76%
Other forms of employment[a]	43	4.15%
Seeking employment/ Not in employment	54	5.21%
Average monthly employment income		
No employment income or less than 99,999 yen	247	23.82%
100,000 - 199,999 yen	267	25.75%
200,000 - 299,999 yen	347	33.46%
300,000 - 399,999 yen	123	11.86%
more than 400,000 yen	53	5.11%
Household composition		
Single-person household	358	34.69%
Multi-person household	674	65.31%

Note: [a]Other types of employment include family workers, trainees and interns, self-employed individuals, and other unclassifiable forms of employment.

Table 1b. Characteristics of survey respondents (part 2)

Characteristics	n	Ratio
With/Without children		
No child	837	80.71%
Having child(ren)	200	19.29%
Housing		
Company housing or an apartment contracted by the company	151	14.56%
Private apartments or rented condominiums	539	51.98%
Public housing	63	6.08%
Student dormitory or an apartment contracted by the school	114	10.99%
Shared housing such as share houses	56	5.40%
Friend or acquaintance's house	14	1.35%
Owned house (including condominiums)	91	8.78%
Others	9	0.87%
Membership in neighborhood associations		
Yes	238	22.95%
No	799	77.05%
Physical checkups status		
Undergoing regular health check-ups provided by the company	535	51.59%
Attending free health screenings	224	12.73%
Undergoing health check-ups individually	132	14.08%
Not undergoing any health check-ups	146	21.60%
Type of visa		
Special Permanent Resident	16	1.54%
Permanent Resident	107	10.32%
Student	221	21.31%
Technical Intern Training	32	3.09%
Spouse or Child of Japanese National	51	4.92%
Dependent (Family Stay)	23	2.22%
E.S.I	363	35.00%
Skilled Labor	97	9.35%
Designated Activities	9	0.87%
Spouse or Child of Permanent Resident	16	1.54%
Others	102	9.84%
Health Insurance Coverage		
NHI	436	42.04%
EHI	439	42.33%
Travel insurance	7	0.68%
Other health insurance	13	1.25%
Have health insurance but do not know its type	111	10.70%
Not enrolled	24	2.31%
Don't know	7	0.68%
Level of unease about COVID-19		
Very anxious	410	39.54%
A little anxious	474	45.71%
Normal	78	7.52%
Almost no anxiety	55	5.30%
No anxiety at all	20	1.93%

In Japan, enrollment in public health insurance is mandatory by law, and meeting eligibility for public insurance can be viewed as a prerequisite for accessing formal healthcare services with a lower out-of-pocket burden. In cases where health insurance eligibility is invalid, the out-of-pocket burden is 100%. Therefore, the validity of health insurance eligibility has long been regarded as a key factor in determining whether foreign residents access healthcare services. In this study, regression analysis was initially conducted on all valid samples (ASV). Subsequently, the scope of the study was narrowed to include respondents who reported having valid public health insurance eligibility (samples covered by public health insurance, SCPHI) to explore whether the presence or absence of valid health insurance eligibility, a strong predictor, may diminish the explanatory power of other noteworthy independent variables and factors that influence healthcare service use among the population of foreign individuals with public insurance eligibility (Figure 4). In this study, respondents who chose either NHI or EHI in response to the question about health insurance enrollment status in Japan were defined as SCPHI.

Figure 4: Analytical framework diagram
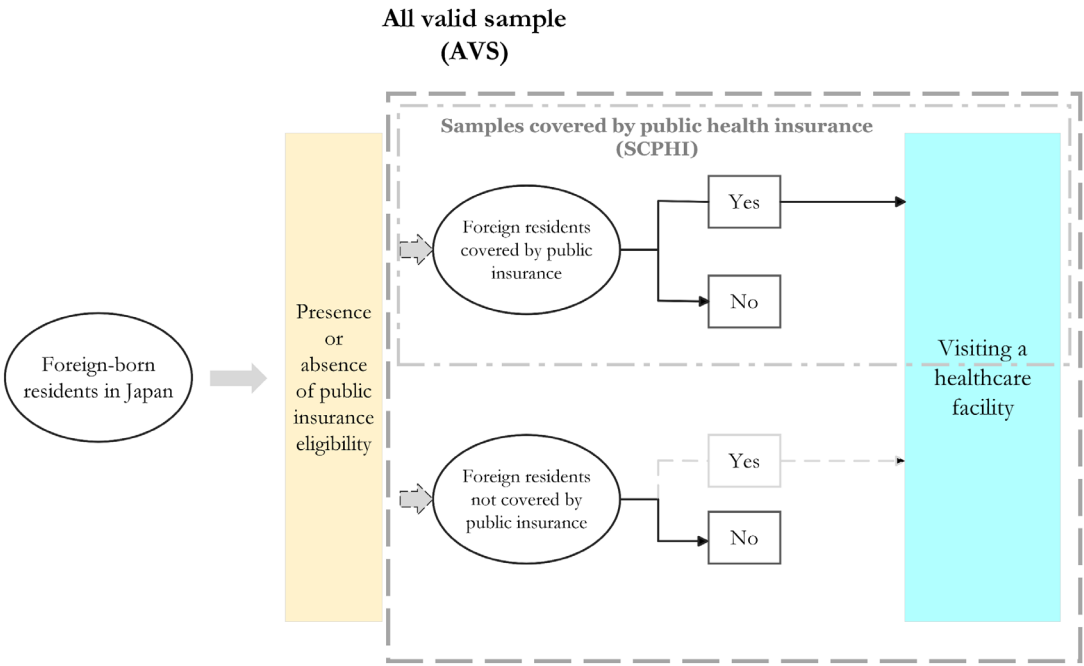
Note: Made by the author

However, it was not possible to determine the specific type of insurance for respondents reporting unclear health insurance type (SUHIT) (those who answered that they had other health insurance or that they were enrolled in health insurance but were unsure of the type). However, the possibility that they are enrolled in Japanese public insurance cannot be completely negated. Therefore, this study collectively refers to SUHIT and SCPHI as samples covered by health insurance (SCHI). The analysis of insured-eligible samples will be conducted within both SCHI and SCPHI (Figure 5).

Figure 5: About SCHI
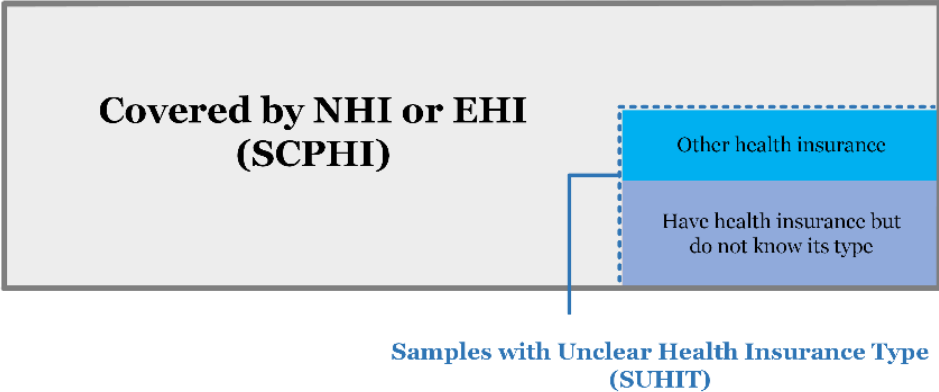
Note: Made by the author

The survey further questioned the reasons for the interruption of health insurance qualifications among 24 respondents who were not insured and 7 respondents who were uncertain about their insurance status (Figure 6). The option "I do not fully comprehend the health insurance system in Japan" was chosen the most by 11 respondents. The next two most frequently selected reasons were "Too much of a financial burden" and "Because no one tells me about Japan's health insurance system".

Figure 6: Reasons for not being covered by public health insurance (multiple choice)
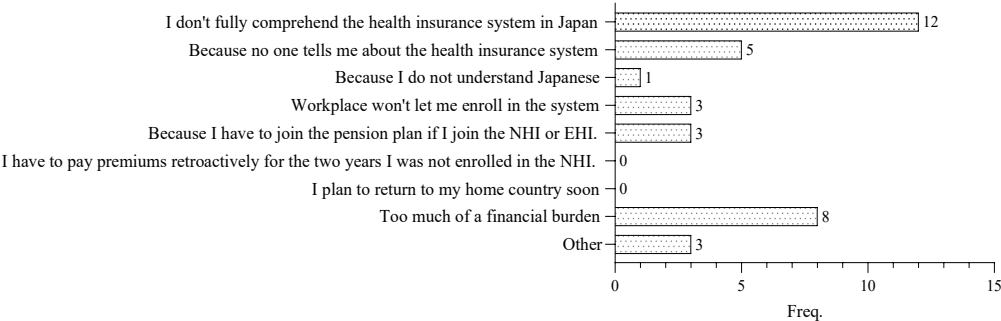
Note: Made by the author

In conducting the regression analysis, we employed dummy coding to transform the categorical variables in Table 2 into dummy variables. A categorical variable comprising U levels (or categories) necessitates U - 1 dummy variables (Wissmann et al., 2011). To preclude collinearity, the number of dummy variables is consistently one less than the categorical variable's levels. To identify the u-th (u∈[1,2,…,U]) level within a categorical variable, the subsequent configuration can be applied: allocate a value of 1 to the u-th level and a value of 0 to all remaining levels. This configuration permits the generation of a maximum of U - 1 dummy variables.

$$D_q(q<\text{U})=\begin{cases} 1 & \text{if in the } u\text{-th category} \\ 0 & \text{else} \end{cases} \tag{1}$$

Consider a categorical variable with five levels (where c_1 represents the first category, and so forth); the fifth category has a value of 0 for all four dummy variables, designating it as the reference category (e.g., Yun, 2003).

$$\begin{array}{c|cccc} & D_1 & D_2 & D_3 & D_4 \\ \hline c_1 & 1 & 0 & 0 & 0 \\ c_2 & 0 & 1 & 0 & 0 \\ c_3 & 0 & 0 & 1 & 0 \\ c_4 & 0 & 0 & 0 & 1 \\ c_5 & 0 & 0 & 0 & 0 \end{array} \tag{2}$$

3 The model and Results

As discussed previously, the observed value y for the response variable Y in this study is a binary variable that is coded as one if the medical service is chosen to be used at the onset of the illness or injury; otherwise, it is zero.

$$y^{(i)}=\begin{cases} 1 \\ 0 \end{cases} \tag{3}$$

The distribution of Y follows the Bernoulli distribution (Hilbe, 2015: 4):

$$\Pr(Y^{(i)}=y^{(i)}|x_1^{(i)},x_2^{(i)},...,x_j^{(i)})=p^{y^{(i)}}(1\text{-}p)^{1\text{-}y^{(i)}} \tag{4}$$

p represents the likelihood of the response variable corresponding to a particular case, while $\{x_1^{(i)},x_2^{(i)},...,x_j^{(i)}\}$ constitutes a linear combination of the predictor variables. Consequently, the probability of $y^{(i)} = 1$ can be expressed as p, and conversely, the probability of $y^{(i)} = 0$ is represented by 1 - p. From this, it can be logically

deduced that the expected value of $Y^{(i)}$ is

$$E[Y^{(i)}]=\Pr[y^{(i)}=1]=p \tag{5}$$

In the logistic regression model, when incorporating multiple explanatory variables, the underlying probability p is defined through the following equation:

$$p(y^{(i)}=1|\mathbf{X})=\frac{1}{1+\exp(-(\beta_0+\beta_1 x_1^{(i)}+\beta_2 x_2^{(i)}+...+\beta_j x_j^{(i)}))} \tag{6}$$

$$\text{where } \mathbf{X}=\left\{x_1^{(i)},x_2^{(i)},...,x_j^{(i)}\right\}$$

$\mathbf{X}$ represents a vector of covariates, comprised of j variables that are independent of one another. Building upon Equation (6), a standard linear equation can be derived through the application of the logit transformation as follows:

$$\text{logit}\left[p(y=1)\right]=\log\left[\frac{p(y=1)}{1-p(y=1)}\right]=\beta_0+\beta_1 x_1+\beta_2 x_2+...+\beta_j x_j=\beta\mathbf{X}'$$

$$\text{where odds}=\frac{p(y=1)}{1-p(y=1)}=\frac{p(y=1)}{p(y=0)}=\frac{\dfrac{1}{1+\exp(-\beta\mathbf{X}')}}{1-\dfrac{1}{1+\exp(-\beta\mathbf{X}')}}=\exp(\beta\mathbf{X}') \tag{7}$$

odds denotes the ratio of the likelihood of an event transpiring to the probability of it not taking place. In the present study, it refers to the ratio of the probability of medical service utilization upon the onset of illness or injury compared to the probability of this event not occurring.

In instances where the m-th explanatory variable is a nominal variable consisting of U levels and can be substituted by discrete variables such as dummy variables, the logistic regression model can be reformulated as follows (e.g., Hosmer et al., 2013: 36):

$$\text{logit}\left[p(y=1)\right]=\beta_0+\beta_1 x_1+\beta_2 x_2+...+\sum_{u=1}^{U-1}\beta_{m(u)}D_{m(u)}+...+\beta_j x_j \tag{8}$$

It is crucial to acknowledge that, in contrast to the coefficients in an ordinary linear model, which elucidate the marginal effect of the explanatory variable on the response variable, the coefficients in a logistic regression model exhibit a distinct interpretation due to the binary discrete nature of the response variable employed in the logistic model. In this context, the coefficients in the logistic regression delineate the impact of a unit change in one explanatory variable on the natural logarithm of the probability of the response

occurrence while keeping the other explanatory variables constant.

$$\begin{cases} \text{logit}\left[p(y{=}1)\right]_{(x_m+1)} = \beta_0 + \beta_1 x_1 + ... + \beta_m(x_m+1) + ... + \beta_j x_j \\ \text{logit}\left[p(y{=}1)\right]_{(x_m)} = \beta_0 + \beta_1 x_1 + + \beta_m x_m + ... + \beta_j x_j \end{cases} \qquad (9)$$

$$\beta_m = \text{logit}_{(x_m+1)} - \text{logit}_{(x_m)} = \log\left[\text{odds}_{(x_m+1)}\right] - \log\left[\text{odds}_{(x_m)}\right] \qquad (10)$$

Although accurate, the coefficient measure's expression is less intuitive for practical utilization when interpreting the influence of unit changes in the explanatory variables on the probability of the outcome (Hilbe, 2015: 16). A further derivation of Equation (10) reveals such a relationship, in which the ratio of odds (odds ratio, O.R.) is equal to the exponent raised to the power of the coefficient β_m.

$$\text{O.R.} = \frac{\text{odds}_{(x_m+1)}}{\text{odds}_{(x_m)}} = \exp(\beta_m) \qquad (11)$$

As explicated in equation (11), the odds ratio serves as a metric that furnishes a cogent depiction of the variation in the probability of an outcome in response to a unit alteration in the explanatory variable. Additionally, through the utilization of dummy variables as a substitute for nominal variables in the analysis, the odds ratio can articulate the distinction in the likelihood of an outcome between the "experimental group" of interest and the reference group.

Table 2a and b present the results of multivariate logistic regression analyses using robust standard errors applied to the AVS. Our analysis indicates that, in terms of the likelihood of seeking medical services as a UIB, the O.R. for categories including being born in Taiwan (O.R. = 0.377, p < 0.01) or Thailand (O.R. = 0.249, p < 0.05), residing in the Chubu region (O.R. = 0.496, p < 0.05), part-time worker (O.R. = 0.529, p < 0.10), having an AMEI between 300,000 to 400,000 yen (O.R. = 0.456, P < 0.01), living in shared housing (O.R. = 0.376, p < 0.01) or owned house (O.R. = 0.452, p < 0.05), possessing a designated activities visa (O.R. = 0.110, p < 0.01), and not being enrolled in any health insurance plan (O.R. = 0.175, p < 0.01) are significantly lower compared to their respective reference groups. In contrast, the categories of being a member of a neighborhood association (O.R. = 1.710, p < 0.1) and holding a skilled labor visa (O.R. = 2.424, p < 0.1) have significantly higher odds ratios.

Table 3a-c present the results on SCHI and SCPHI. Consistent with the regression results for the AVS, the odds ratios for individuals born in Taiwan (SCHI: O.R. = 0.368, p < 0.01 for; SCPHI: O.R. = 0.361, p <

0.01) or Thailand (SCHI: O.R. = 0.255, p < 0.05; SCPHI: O.R. = 0.209, p < 0.05), residing in the Chubu region (SCHI: O.R. = 0.501, p < 0.05; SCPHI: O.R. = 0.494, p < 0.10), having a monthly average income of 300,000 to 400,000 yen (SCHI: O.R. = 0.448, p < 0.01; SCPHI: O.R. = 0.419, p < 0.01), living in shared housing (SCHI: O.R. = 0.394, p < 0.05; SCPHI: O.R. = 0.399, p < 0.05), or owning a house (SCHI: O.R. = 0.433, p < 0.05; SCPHI: O.R. = 0.460, p < 0.05), holding a designated activities visa (SCHI: O.R. = 0.112, p < 0.01; SCPHI: O.R. = 0.137, p < 0.05), joining a neighborhood association (SCHI: O.R. = 1.809, p < 0.05; SCPHI: O.R. = 1.739, p < 0.10) remained statistically significant. In contrast with the results from the AVS, the odds ratios of categories such as single-person household (SCPHI: O.R. = 0.684, p < 0.10), stay duration of 10 years or more in Japan (SCHI: O.R. = 2.077, p < 0.10; SCPHI: O.R. = 1.950, p < 0.10), and residing in student dormitories (SCPHI: O.R. = 3.122, p < 0.05) are also significant.

Table 2a. Multivariate logistic regression results on the AVS (part 1)

Explanatory Variables	O.R.	Robust S.E.	z	P value	O.R. [95% CI]
Gender					
Male	1.087	0.209	0.43	0.667	[0.745, 1.585]
Female	1.000				
Age					
20 - 29	1.164	0.276	0.64	0.520	[0.732, 1.852]
30 - 39	1.000				
40 - 49	0.775	0.272	-0.73	0.468	[0.390, 1.543]
50 or more	0.713	0.413	-0.58	0.560	[0.229, 2.220]
Country of birth					
China (including Hong Kong, etc.)	1.000				
Vietnam	1.168	0.387	0.47	0.639	[0.610, 2.237]
Philippines	0.826	0.280	-0.57	0.572	[0.425, 1.603]
Brazil	1.594	0.642	1.16	0.247	[0.724, 3.510]
Taiwan	0.377***	0.139	-2.65	0.008	[0.184, 0.775]
South Korea / North Korea	1.126	0.565	0.24	0.813	[0.421, 3.010]
United States	0.563	0.274	-1.18	0.238	[0.217, 1.463]
Indonesia	0.549	0.282	-1.17	0.242	[0.201, 1.500]
Thailand	0.249**	0.161	-2.16	0.031	[0.071, 0.882]
Others	0.752	0.226	-0.95	0.343	[0.417, 1.356]
Residence area					
Hokkaido/Tohoku Region	0.669	0.319	-0.84	0.399	[0.262, 1.705]
Kanto Region	1.000				
Chubu Region	0.496**	0.168	-2.07	0.038	[0.255, 0.962]
Kinki/Chugoku/Shikoku Region	0.686	0.197	-1.32	0.189	[0.391, 1.203]
Kyushu/Okinawa Region	1.451	0.872	0.62	0.536	[0.447, 4.712]
Length of stay					
Less than 3 years	0.771	0.180	-1.11	0.266	[0.488, 1.219]
4 - 9 years	1.000				
10 years or more	1.702	0.623	1.45	0.146	[0.831, 3.487]
Employment status					
Regular employee (full-time)	1.000				
Part-time worker	0.529*	0.201	-1.67	0.094	[0.251, 1.115]
Temporary staff or contract worker	1.110	0.350	0.33	0.740	[0.598, 2.060]
Other forms of employment[a]	1.111	0.550	0.21	0.831	[0.421, 2.933]
Seeking employment or not in employment	0.745	0.390	-0.56	0.574	[0.267, 2.077]
Average monthly employment income					
No employment income or less than 99,999 yen	1.426	0.607	0.84	0.404	[0.620, 3.282]
100,000 - 199,999 yen	1.442	0.470	1.12	0.262	[0.761, 2.731]
200,000 - 299,999 yen	1.000				
300,000 - 399,999 yen	0.456***	0.136	-2.64	0.008	[0.254, 0.817]
More than 400,000 yen	0.980	0.440	-0.05	0.964	[0.407, 2.362]
Household composition					
Single-person household	0.825	0.173	-0.91	0.361	[0.546, 1.246]
Multi-person household	1.000				
With/Without children					
No child	1.000				
Having child(ren)	1.132	0.323	0.43	0.664	[0.647, 1.981]

Note: ***p<0.01, **p<0.05, *p<0.1. [a]Other forms of employment include family workers, trainees and interns, self-employed individuals, and other unclassifiable forms of employment.

Table 2b. Multivariate logistic regression results on the AVS (part 2)

Explanatory Variables	O.R.	Robust S.E.	z	P value	O.R. [95% CI]
Housing					
Company housing or an apartment contracted by the company	0.900	0.245	-0.39	0.697	[0.528, 1.533]
Private apartments or rented condominiums	1.000				
Public housing	1.598	0.777	0.96	0.336	[0.616, 4.146]
Student dormitory or an apartment contracted by the school	1.718	0.626	1.48	0.138	[0.841, 3.511]
Shared housing such as share houses	0.376***	0.135	-2.72	0.007	[0.186, 0.760]
Friend or acquaintance's house	0.380	0.248	-1.48	0.138	[0.106, 1.364]
Owned house (Including condominiums)	0.452**	0.452	-2.49	0.013	[0.242, 0.844]
Others	0.451	0.340	-1.06	0.290	[0.103, 1.973]
Membership in neighborhood associations					
Yes	1.710*	0.487	1.88	0.060	[0.978, 2.990]
No	1.000				
Physical checkups status					
Undergoing regular health check-ups provided by the company	1.000				
Attending free health screenings	0.944	0.232	-0.23	0.816	[0.583, 1.529]
Undergoing health check-ups individually	0.922	0.276	-0.27	0.785	[0.512, 1.658]
Not undergoing any health check-ups	0.676	0.191	-1.38	0.166	[0.388, 1.177]
Type of visa					
Special Permanent Resident	0.602	0.499	-0.61	0.540	[0.119, 3.052]
Permanent Resident	0.889	0.359	-0.29	0.771	[0.403, 1.961]
Student	0.738	0.305	-0.74	0.461	[0.328, 1.658]
Technical Intern Training	0.895	0.529	-0.19	0.851	[0.281, 2.853]
Spouse or Child of Japanese National	1.453	0.666	0.82	0.414	[0.592, 3.566]
Dependent (Family Stay)	0.837	0.507	-0.29	0.770	[0.256, 2.745]
E.S.I	1.000				
Skilled Labor	2.424*	1.191	1.80	0.072	[0.925, 6.350]
Designated Activities	0.110***	0.086	-2.81	0.005	[0.024, 0.512]
Spouse or Child of Permanent Resident	0.975	0.680	-0.04	0.971	[0.249, 3.826]
Others	1.163	0.478	0.37	0.714	[0.519, 2.604]
Health Insurance Coverage					
NHI	0.831	0.207	-0.74	0.459	[0.510, 1.355]
EHI	1.000				
Travel insurance	0.399	0.418	-0.88	0.381	[0.051, 3.117]
Other health insurance	1.184	0.927	0.22	0.829	[0.255, 5.494]
Have health insurance but do not know its type	0.871	0.275	-0.44	0.662	[0.468, 1.619]
Not enrolled	0.175***	0.096	-3.19	0.001	[0.060, 0.511]
Do not know	0.361	0.378	-0.97	0.330	[0.046, 2.812]
Level of unease about COVID-19					
Very anxious	1.003	0.192	0.02	0.987	[0.689, 1.461]
A little anxious	1.000				
Normal	0.823	0.297	-0.54	0.590	[0.406, 1.669]
Almost no anxiety	0.881	0.347	-0.32	0.747	[0.407, 1.906]
No anxiety at all	0.687	0.481	-0.54	0.592	[0.174, 2.711]
Constant	7.422***	2.714	5.48	0.000	[3.625, 15.197]

Number of Obs. = 992

Wald chi2(60) = 131.66

Prob > chi2 = 0.000

Log pseudo likelihood = -441.458

Pseudo R^2 = 0.131

Pearson chi2(875) = 933.88 Hosmer-Lemeshow test: p = 0.082

Mean VIF = 1.59 (Max = 4.58, Min =1.07)

Note: ***p<0.01, **p<0.05, *p<0.1.

Table 3a. Multivariate logistic regression results on SCHI and SCPHI (part 1)

Explanatory Variables	SCHI (SUHIT+SCPHI)		SCPHI	
	O.R. (Robust S.E.)	O.R. [95% CI]	O.R. (Robust S.E.)	O.R. [95% CI]
Gender				
Male	0.975 (0.191)	[0.664, 1.432]	0.986 (0.209)	[0.651, 1.495]
Female	1.000		1.000	
Age				
20 - 29	1.194 (0.285)	[0.748, 1.906]	1.236 (0.306)	[0.762, 2.007]
30 - 39	1.000		1.000	
40 - 49	0.931 (0.355)	[0.441, 1.964]	0.838 (0.347)	[0.372, 1.888]
50 or more	0.708 (0.412)	[0.226, 2.213]	0.713 (0.470)	[0.196, 2.595]
Country of birth				
China (including Hong Kong, etc.)	1.000		1.000	
Vietnam	1.181 (0.396)	[0.613, 2.279]	0.948 (0.334)	[0.476, 1.889]
Philippines	0.828 (0.286)	[0.421, 1.630]	0.877 (0.323)	[0.426, 1.804]
Brazil	1.703 (0.715)	[0.747, 3.879]	1.472 (0.666)	[0.607, 3.571]
Taiwan	0.368*** (0.139)	[0.175, 0.772]	0.361*** (0.139)	[0.170, 0.766]
South Korea / North Korea	1.113 (0.566)	[0.411, 3.017]	1.173 (0.620)	[0.417, 3.304]
United States	0.559 (0.277)	[0.212, 1.476]	1.163 (0.712)	[0.350, 3.863]
Indonesia	0.554 (0.283)	[0.203, 1.507]	0.758 (0.410)	[0.262, 2.190]
Thailand	0.255** (0.166)	[0.071, 0.913]	0.209** (0.149)	[0.052, 0.842]
Others	0.876 (0.276)	[0.472, 1.624]	0.952 (0.331)	[0.482, 1.881]
Residence area				
Hokkaido / Tohoku Region	0.691 (0.327)	[0.273, 1.746]	0.716 (0.373)	[0.258, 1.990]
Kanto Region	1.000		1.000	
Chubu Region	0.501** (0.174)	[0.253, 0.991]	0.494* (0.195)	[0.228, 1.069]
Kinki/Chugoku / Shikoku Region	0.732 (0.216)	[0.411, 1.305]	0.613 (0.190)	[0.333, 1.127]
Kyushu / Okinawa Region	1.457 (0.919)	[0.423, 5.018]	1.504 (0.948)	[0.437, 5.174]
Length of stay				
Less than 3 years	0.743 (0.178)	[0.465, 1.188]	0.859 (0.228)	[0.511, 1.446]
4 - 9 years	1.000		1.000	
10 years or more	2.077* (0.811)	[0.966, 4.465]	1.950* (0.769)	[0.901, 4.222]

Note: ***p<0.01, **p<0.05, *p<0.1.

Table 3b. Multivariate logistic regression results on SCHI and SCPHI (part 2)

| Explanatory Variables	SCHI (SUHIT+SCPHI)		SCPHI	
	O.R. (Robust S.E.)	O.R. [95% CI]	O.R. (Robust S.E.)	O.R. [95% CI]
Employment status				
Regular employee (full-time)	1.000		1.000	
Part-time worker	0.524 (0.213)	[0.236, 1.164]	0.571 (0.245)	[0.246, 1.323]
Temporary staff or contract worker	1.003 (0.317)	[0.540, 1.865]	0.797 (0.264)	[0.417, 1.524]
Other forms of employment[a]	0.902 (0.454)	[0.337, 2.417]	0.583 (0.304)	[0.210, 1.622]
Seeking employment or not in employment	0.783 (0.437)	[0.262, 2.340]	0.858 (0.803)	[0.258, 2.854]
Average monthly employment income				
No employment income or less than 99,999 yen	1.528 (0.709)	[0.616, 3.793]	1.389 (0.684)	[0.529, 3.646]
100,000 - 199,999 yen	1.560 (0.548)	[0.784, 3.105]	1.522 (0.587)	[0.715, 3.240]
200,000 - 299,999 yen	1.000		1.000	
300,000 - 399,999 yen	0.448*** (0.135)	[0.247, 0.810]	0.419*** (0.134)	[0.223, 0.785]
More than 400,000 yen	1.007 (0.457)	[0.414, 2.449]	0.857 (0.393)	[0.349, 2.104]
Household composition				
Single-person household	0.833 (0.178)	[0.548, 1.265]	0.684* (0.157)	[0.435, 1.074]
Multi-person household	1.000		1.000	
With/Without children				
No child	1.000		1.000	
Having child(ren)	1.106 (0.335)	[0.611, 2.001]	1.030 (0.335)	[0.545, 1.950]
Housing				
Company housing or an apartment contracted by the company	0.936 (0.263)	[0.540, 1.622]	0.866 (0.247)	[0.495, 1.516]
Private apartments or rented condominiums	1.000		1.000	
Public housing	1.659 (0.879)	[0.588, 4.685]	1.787 (0.974)	[0.614, 5.201]
Student dormitory or an apartment contracted by the school	1.752 (0.642)	[0.854, 3.595]	3.122** (1.423)	[1.278, 7.626]
Shared housing such as share houses	0.394** (0.144)	[0.193, 0.807]	0.399** (0.154)	[0.187, 0.849]
Friend or acquaintance's house	0.360 (0.243)	[0.095, 1.354]	0.462 (0.378)	[0.093, 2.295]
Owned house (Including condominiums)	0.433** (0.141)	[0.229, 0.820]	0.460** (0.158)	[0.235, 0.901]
Others	0.432 (0.346)	[0.090, 2.075]	0.745 (0.764)	[0.100, 5.557]
Membership in neighborhood associations				
Yes	1.809** (0.535)	[1.013, 3.230]	1.739* (0.552)	[0.934, 3.239]
No	1.000		1.000	

Note: ***p<0.01, **p<0.05, *p<0.1.

Table 3c. Multivariate logistic regression results on SCHI and SCPHI (part 3)

Explanatory Variables	SCHI (SUHIT+SCPHI)		SCPHI	
	O.R. (Robust S.E.)	O.R. [95% CI]	O.R. (Robust S.E.)	O.R. [95% CI]
Physical checkups status				
Undergoing regular health check-ups provided by the company	1.000		1.000	
Attending free health screenings	0.991 (0.247)	[0.608, 1.614]	1.186 (0.334)	[0.683, 2.060]
Undergoing health check-ups individually	0.984 (0.310)	[0.531, 1.824]	1.029 (0.357)	[0.522, 2.030]
Not undergoing any health check-ups	0.705 (0.207)	[0.396, 1.253]	0.715 (0.226)	[0.385, 1.331]
Type of visa				
Special Permanent Resident	0.566 (0.476)	[0.109, 2.945]	0.467 (0.401)	[0.087, 2.511]
Permanent Resident	0.764 (0.313)	[0.342, 1.707]	0.838 (0.357)	[0.363, 1.933]
Student	0.661 (0.285)	[0.284, 1.539]	0.574 (0.256)	[0.239, 1.378]
Technical Intern Training	0.794 (0.462)	[0.254, 2.482]	0.635 (0.386)	[0.193, 2.092]
Spouse or Child of Japanese National	1.520 (0.733)	[0.590, 3.914]	1.247 (0.667)	[0.437, 3.556]
Dependent (Family Stay)	1.089 (0.755)	[0.280, 4.236]	1.164 (0.927)	[0.244, 5.541]
E.S.I	1.000		1.000	
Skilled Labor	2.560* (1.359)	[0.904, 7.248]	2.427 (1.471)	[0.740, 7.963]
Designated Activities	0.112*** (0.092)	[0.022, 0.557]	0.137** (0.113)	[0.027, 0.692]
Spouse or Child of Permanent Resident	1.001 (0.690)	[0.260, 3.864]	0.903 (0.630)	[0.230, 3.547]
Others	1.177 (0.493)	[0.517, 2.676]	1.000 (0.438)	[0.424, 2.360]
Health Insurance Coverage				
NHI	0.826 (0.211)	[0.501, 1.363]	0.748 (0.198)	[0.445, 1.256]
EHI	1.000		1.000	
Other health insurance	1.028 (0.793)	[0.227, 4.662]	–	–
Have health insurance but do not know its type	0.891 (0.288)	[0.473, 1.677]	–	–
Level of unease about COVID-19				
Very anxious	0.991 (0.193)	[0.676, 1.453]	0.993 (0.213)	[0.653, 1.511]
A little anxious	1.000		1.000	
Normal	0.799 (0.298)	[0.385, 1.661]	0.794 (0.322)	[0.358, 1.759]
Almost no anxiety	0.894 (0.367)	[0.400, 1.999]	0.953 (0.418)	[0.403, 2.254]
No anxiety at all	0.622 (0.433)	[0.159, 2.435]	0.526 (0.376)	[0.130, 2.137]
Constant	7.180*** (2.658)	[3.475, 14.834]	8.307*** (3.338)	[3.779, 18.261]

Note: ***$p<0.01$, **$p<0.05$, *$p<0.1$. For SCHI: Number of Obs. = 958, Wald chi2(57) = 118.15, Prob > chi2 = 0.000, Log pseudo likelihood = -418.848, Pseudo R2 = 0.125, Pearson chi2(844) = 909.90 Hosmer-Lemeshow test: p = 0.057, Mean VIF = 1.62 (Max = 4.65, Min =1.08). For SCPHI: Number of Obs. = 835, Wald chi2(55) = 117.42, Prob > chi2 = 0.000, Log pseudo likelihood = -361.448, Pseudo R2 = 0.135, Pearson chi2(727) = 779.83 Hosmer-Lemeshow test: p = 0.085, Mean VIF = 1.62 (Max = 4.35, Min =1.07).

Respondents who had accessed healthcare at medical institutions for health issues were questioned about their experiences of maladaptation during diagnosis and treatment using multiple-choice questions (Figure 7). Of the 785 respondents who chose to visit healthcare institutions when they were sick or injured, only 133 reported they felt no discomfort or unease during the process. Among the remaining 652 respondents who reported some form of discomfort or unease during their visit, 288 believed that their inability to clearly express their symptoms was one of the factors contributing to their discomfort. In addition, the most frequent complaint centered around healthcare providers, such as doctors and nurses, a lack of simple and comprehensible language during communications lead to perceptions of overly complex and hard-to-understand explanations of health issues. In addition to the direct difficulties caused by language barriers, other associated hurdles, such as a lack of understanding regarding treatment measures or procedures, as well as unfamiliarity with the content and proper usage of prescribed medications, also posed a certain degree of distress for the respondents who reported that they had accessed medical care at institutions in Japan.

Figure 7: Reasons for discomfort or incongruity during medical consultations
(Multiple choice)
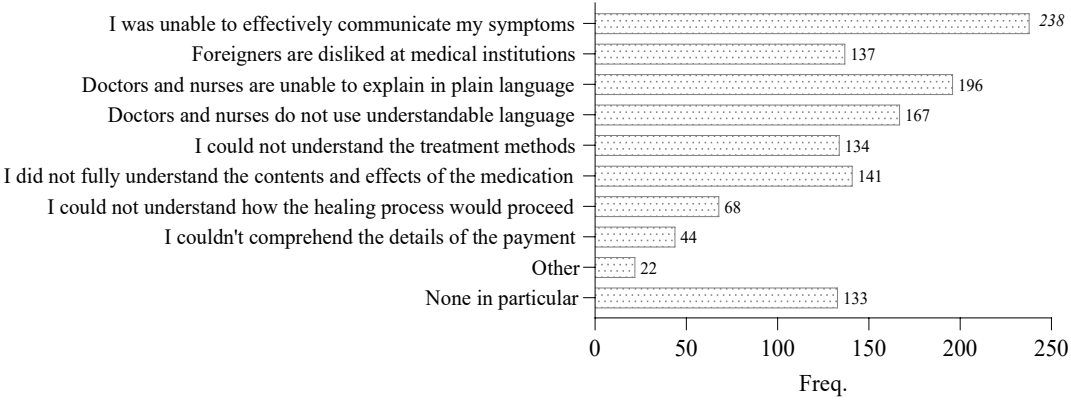
Note: made by the author

4 Discussion

This study applied multivariate logistic regression analysis, using common illness behavior as the dependent variable, to investigate potential factors that hinder the use of medical services by foreign residents in Japan. The analysis was based on microdata from a comprehensive online survey conducted with foreign residents in Japan in 2020. The data used in this study are publicly available to researchers through the CSRDA's SSJDA and were collected by the Survey Research Center Co., Ltd., which collaborates closely with research institutions, local governments, and NPOs/NGOs in conducting social surveys. Compared to previous domestic studies in Japan, this research uses a more extensive range of survey items, a larger sample size, and includes respondents from across the nation. Notably, the dependent variable in this study is the UIB, which refers to whether medical services are used when an individual was sick or injured under general circumstances. Therefore, a significant reduction in the odds ratio does not necessarily imply difficulties in accessing healthcare services. The interpretation of the odds ratio should be carefully considered in conjunction with existing evidence.

Our research confirms that foreigners without valid health insurance are significantly less likely to use public healthcare services. This lack of eligibility often imposes significant barriers to accessing healthcare, resulting in difficulties in obtaining timely and effective treatments when faced with health risks. This finding aligns with previous studies (Reshad and Maesato, 2008; Shimizu, 2021). Additionally, our study reveals that foreign residents in Japan, particularly those born in Thailand or Taiwan, may have a lower likelihood of using medical services. Tschirhart et al. (2019) proposed that immigrants may have a psychological threshold for accessing medical services, and once this threshold is exceeded, they may resort to self-treatment or seek treatment in their home country. Thai immigrants, in particular, may have a lower threshold due to cultural conflicts, language barriers, and challenges with medical interpreters, leading to a higher likelihood of forgoing medical services in the host country. Regarding Taiwanese residents in Japan, it is noteworthy that the medical service systems and insurance schemes in Taiwan and Japan share similarities (Nakamura, 2016). Furthermore, a survey conducted by the ISA in 2021 revealed that a significant proportion (71.3%) of Taiwanese respondents reported understanding the language of medical service providers during their visits (ISA, 2022: 66). These factors suggest that the lower likelihood of Taiwanese residents in Japan to use medical services during illness may not necessarily reflect difficulties in accessing public medical services

in Japan.

The lower likelihood of seeking medical care among foreign residents in the Chubu region compared to those in the Kanto region may be attributed to the distribution of healthcare resources. The Chubu region, excluding Aichi Prefecture, has relatively fewer healthcare facilities per 100,000 people or per square kilometer, as well as a lower density of medical institutions per square kilometer (e.g., Kato, 2021). This may suggest that foreign residents in the Chubu region face challenges in accessing healthcare services, possibly due to increased travel distance and associated costs resulting from the limited availability of healthcare facilities. Additionally, factors such as an inadequate multilanguage service system and the socioeconomic status of the resident foreigners in the area may also inhibit the use of healthcare services by foreigners in the region. Regarding the disparities in healthcare service use between part-time workers and full-time employees, some research findings suggest that part-time workers, despite the potential benefits of work-life balance, may experience increased psychological stress due to lower income compared to the higher incomes of full-time employees (Rosenthal et al., 2012; Kim et al., 2020). Additionally, the evidence indicates that part-time workers have significantly poorer self-rated health than full-time workers (Donnelly and Schoenbachler, 2021). Therefore, it is reasonable to suspect that foreign residents in Japan employed in part-time positions may face poorer health conditions while also lacking access to adequate healthcare services. Furthermore, in the analysis of SCHI and SCPHI, the odds ratios for part-time workers changed from significant to nonsignificant. This change may imply that among the population of foreign residents who do not fall within SCHI, which includes those who are ineligible for public insurance or unsure of their health insurance status, part-time foreign workers may face more profound challenges in accessing healthcare services.

Regarding the influence of income, an increase in income may indirectly aid in reducing the demand for healthcare services by improving individuals' dietary patterns, meal quality, or lifestyle (e.g., Phillips, 2002; Blumberg et al., 2017; Cowan et al., 2018). This could potentially explain why, compared to the group with an AMEI between 200,000 and 300,000 yen, the group with an AMEI between 300,000 and 400,000 yen has a significantly lower likelihood of using healthcare services. It cannot be ruled out that this result may also be attributable to other factors, such as the reduction in discretionary time due to increased work intensity. Several studies have indicated that as work hours increase, the use of medical services and complementary

and alternative medical services significantly decreases. Conversely, with an increase in work hours, the consumption of supplements and over-the-counter medications tends to rise (e.g., Sato et al., 2011).

In terms of the influence of living conditions on the likelihood of accessing medical services, our findings indicate that foreign residents living in shared rental accommodations or their own properties have significantly lower probabilities of using medical services when injured or ill compared to those residing in private apartments or rented condominiums. However, these two groups may face unique circumstances. Residents of shared housing generally have lower income levels (Ishikawa, 2019). Additionally, within shared houses where residents frequently interact, behaviors such as sharing items other than food are common (e.g., Shima et al., 2019). Therefore, we speculate that foreign residents living in shared housing may face difficulties in accessing medical services, which are possibly influenced by economic factors and living conditions. On the other hand, considering that Japanese financial institutions do not approve housing loan applications from foreign nationals in Japan without permanent residency, foreign residents in Japan are typically either long-term residents or in good economic standing. Consequently, this segment of the population is less likely to face difficulties in accessing medical services. The lower likelihood of using medical services may be associated with a correspondingly lower demand.

In the regression analysis conducted for SCPHI, we observed that single-person households exhibit a markedly lower tendency to use medical services, a phenomenon that might be linked to the diminished health consciousness associated with living alone. Furthermore, lower socioeconomic status could serve as one of the barriers that prevents foreign individuals who live alone from accessing medical services. Certain studies have shown that individuals in single-person households tend to have lower income and educational levels than those in multiperson households (e.g., Cho et al., 2019). The combination of weakened health awareness and the payment of public health insurance premiums may act as inhibiting factors for the utilization of medical services among foreign residents living alone who are covered by public insurance. In addition, the odds ratio for those residing in student dormitories is significantly greater than 1, while we concurrently observe that the odds ratio for those holding student visas, although not significant, is consistently less than 1. Morita et al. (2021) indicate that international students in Japan may face healthcare access difficulties. This study, however, posits that those likely to face medical challenges are international students who choose to reside off campus rather than in student dormitories. The more hygienic and

standardized living conditions in student dormitories, along with health monitoring measures, may perhaps enhance the health awareness and utilization of medical services among the students residing therein.

Foreign residents holding a designated activities visa are significantly less likely to use medical services, and this finding could be associated with their status as refugee applicants (e.g., Morita et al., 2021). According to Sakanashi (2019), there has been an increase in the instances where asylum seekers are barred from employment. Even if granted work authorization, individuals holding designated activities visas face the obligation of regular visa renewal. This may place them at a distinct disadvantage in the labor market, and the resultant economic difficulties could significantly impede their access to healthcare services.

In addition to the above findings, our study has uncovered an intriguing phenomenon: foreign residents who are members of local neighborhood associations are more likely to use healthcare services than those who are not members. Given the role of neighborhood associations in promoting knowledge about daily life and disaster preparedness in Japan, foreign residents who join these associations are more likely to acquire systematic knowledge about the distribution of local amenities and facilities, as well as strategies for coping with natural disasters. This information may include the geographical distribution of healthcare institutions and guidelines on how to access medical services. Encouraging the active participation of foreign residents in activities that are organized by local neighborhood associations could potentially facilitate a quicker adaptation to the local living environment and enhance their understanding of the essential knowledge needed for life in Japan.

Regarding the reasons for nonenrollment in public health insurance and the difficulties experienced during the medical treatment process, the survey also included questions for relevant respondents. This study then conducted statistical analysis on the survey results. The findings revealed that, apart from the economic burden associated with insurance premiums, a lack of a basic understanding of Japan's public insurance emerged as the primary reason for nonenrollment or the loss of insurance eligibility. Furthermore, over 80% of the respondents who had experienced medical visits in Japan reported feeling a sense of unease during the process. In addition to the primary factor of limited proficiency in the Japanese language, which hindered their ability to adequately describe their symptoms, another frequently cited reason for a sense of unease during visits was the use of vocabulary by doctors and nurses that often surpassed the respondents' comprehension. Other factors, beyond these two, also appeared to be related to communication barriers. In

light of these findings, actively disseminating fundamental knowledge about Japan's public insurance and healthcare system among foreign residents in Japan, along with promoting the benefits of reduced out-of-pocket expenses after enrolling in insurance, may potentially contribute to mitigating the risk of these individuals falling into an uninsured state. Regarding the issue of communication difficulties during medical visits, some medical interpreters also acknowledged that even when patients, medical interpreters, and attending physicians were all present, some doctors would still communicate using their accustomed manner and speed, posing a challenge to medical interpreters with limited expertise in medical knowledge and interpretation experience (e.g., Ito et al., 2012; Tanaka and Yanagisawa, 2013).

However, several limitations and topics remain to be addressed in this study. First, the survey that was used did not inquire about chronic diseases or educational backgrounds, factors that may also influence the use of medical services. Second, the usual illness behavior has limitations in gauging the utilization of medical services. We remain uninformed with regard to the expenditures on medical services by foreign residents in Japan, their frequency of use of these services, and their dietary supplement consumption patterns. Exploring these facets could substantially enhance our comprehensive understanding of the specific circumstances of medical service use by foreign residents in Japan. Third, while certain attributes such as gender ratio and nationality distribution align with the overall demographic of foreign residents in Japan for the year of the survey, and regression results for some attributes, such as uninsured or holding a designated activities visa, remain consistent with preceding studies, achieving full representativeness in the sample remains a challenge.

5   Implications

With the growing proportion of foreign residents in Japan, ensuring their medical rights, reducing the difficulties they face in accessing medical services, and improving their satisfaction with healthcare use will become increasingly critical. Based on the findings of our study, we propose the following policy recommendations. First, it is crucial to heighten the awareness of foreign residents in Japan regarding the importance of enrollment in public health insurance plans, as well as the increase in medical service affordability that can be realized upon enrollment. Second, for foreigners who have only recently arrived in Japan, proactive encouragement to join local community associations and participate in community events

can foster rapid integration into Japanese society. Third, regarding the allocation of resources such as medical interpreters and multilingual healthcare services that can enhance the accessibility of medical services, it might be beneficial to moderately direct these resources toward areas with a sparse distribution of healthcare resources. This could potentially improve the use of healthcare resources among the local foreign population. Last, there is a need to advocate for healthcare providers to adopt a more concise and comprehensible form of the Japanese language, which is more easily understood by both foreign patients and medical interpreters.

6 Conclusion

This study employs publicly available data from the SSJDA, which was collected in an online survey conducted by Survey Research Center Co., Ltd. from March to April 2020, targeting foreign residents in Japan, to investigate the potential barriers hindering foreigners from using public healthcare services. The public data have been anonymized by the survey implementing organization. The results of binomial logistic regression based on robust standard errors reveal that foreign residents in Japan possessing attributes, such as Thai nationality, part-time workers, shared housing conditions, residency in the Chubu region, holding a designated activities visa, or lacking health insurance eligibility, may face difficulties in accessing medical services. In addition, among respondents without insurance, or who have lost insurance eligibility, a lack of a basic understanding of the Japanese insurance system is a major reason for their lack of or loss of insurance eligibility, apart from economic factors. Respondents who had experience using medical services in Japan commonly reported unpleasant experiences during medical visits, primarily due to their limited ability to describe symptoms in Japanese and secondarily due to difficulties in understanding the language used by healthcare providers, which was also noted in prior research involving medical translators. Encouraging foreign residents to actively participate in neighborhood associations, intensifying the dissemination of basic knowledge about Japanese medical insurance to foreign residents, and urging healthcare institutions to simplify vocabulary when communicating with foreign patients could alleviate the existing difficulties foreign residents in Japan face in accessing medical services, aiding a better integration into Japanese society.

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