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Abstract: To alleviate the growing shortage of care workers, the recruitment of foreign labor has become an important strategy in the care sectors of many high-income countries. However, existing studies on the impacts of foreign care workers—an issue of major concern for host countries—remain limited and report mixed findings. Taking Japan as a case study, this paper empirically examines whether the employment of foreign care workers in the care sector affects the health outcomes of native residents. We use Japanese native mortality rate attributable to care institutions as a proxy for health outcomes and focus on the impact of the share of foreigners among Certified Care Workers (CCWs). Using prefecture-level panel data from 2012 to 2023 and fixed-effects models, we find a statistically significant and negative association between the share of foreigners among CCWs and the native mortality rate attributable to care institutions. However, when applying causal inference methods, the causal effect remains inconclusive. We further examine heterogeneous associations and obtain several noteworthy findings. In addition, pathway analyses suggest that the negative association between the share of foreigners among CCWs and native mortality rates is more likely driven by improvements in the quality, rather than the quantity, of care workforce human capital. Overall, our findings indicate that the employment of foreign CCWs is associated with improved health outcomes for native residents, thereby supporting the continuation of Japan's immigration policy of admitting foreign CCWs in the care sector—a field facing an increasingly severe labor shortage.

Keywords: Certificated care worker; Foreigner; Regional mortality rate; Elderly; Japan

1. Introduction

To alleviate the growing shortage of care workers, the recruitment of foreign labor has become an important strategy in the care sectors of many high-income countries. However, existing studies on the impacts of foreign care workers—an issue of major concern for host countries—remain limited and report mixed findings. Research to date has primarily focused on contexts such as the United States, Singapore

and Italy. Some causal analyses have found that immigrants positively influence care quality and health outcomes (Østbye et al., 2013; Furtado & Ortega, 2023; Capretti, et al., 2024; Jun & Grabowski, 2024), while others report insignificant effects (Dai, 2021). Given these mixed findings and the growing demand for foreign care workers in many aging societies, further investigation into this issue represents a critical practical and theoretical research agenda.

Japan, as one of the most aged societies in the world, faces an especially urgent need for foreign care workers. As of November 1, 2024, Japan's ageing rate, in terms of population ages 65 and above as a percentage of the total population, reaches 29.3% (SOJ, n.d.-b) and ranks second in the world (WBG, 2024). According to projections, by 2040 there will be an estimated shortfall of 570,000 workers in the care sector (MHLW, 2024). In response, immigration has been adopted as a key policy tool to address this labor shortage.

Japan first began systematically accepting foreigners in the care sector under *Designated Activities* (DA, "Tokutei Katsudo" in Japanese) visa in 2008. Subsequently, *Technical Intern Training* (TIT, "Gino Jishu" in Japanese) and *Specified Skilled Worker* (SSW, "Tokutei Gino" in Japanese) visa categories were revised or introduced to further expand care worker immigration. However, care workers in these visa categories faced multiple restrictions, including limited opportunities for visa renewals, an inability to bring family members, and constraints on their job responsibilities. Also, most of them are care worker candidates who are still in training or studying.

In 2017, Japan implemented a new visa category called the *Nursing Care* (NC, "Kaigo" in Japanese) visa, targeting foreign care workers who had passed the national care worker exam and were registered in Japan—referred to as *Certified Care Workers* (CCWs, "Kaigo Fukushi" in Japanese). Under this visa, many previous restrictions were lifted, allowing more foreign workers to work as CCWs with greater rights and job flexibility.

Given Japan's shrinking domestic labor force and persistent care worker shortage, the number of foreign care workers is expected to continue rising. However, the impact of the care worker immigration policy on native health outcomes remains uncertain. What effects do care worker immigration policies have on the host society? Specifically, how do foreign care workers affect health outcomes of natives? Given its high aging rate, ongoing shortage of care workers, and increasing reliance on foreign care labor, Japan presents a compelling case to explore such a question.

This study aims to examine the impact of foreign CCWs on the health outcomes of residents in care institutions in Japan. We utilize Japanese native mortality rate attributable to care institutions as a proxy for the health outcomes. Specifically, the indicator is calculated as the number of mortalities of Japanese natives occurring in care institutions divided by the total Japanese native population. Our key independent variable is number of foreign CCWs—approximated by the number of NC visa holders—relative to the number of all CCWs. Using a panel dataset at the prefecture level covering the period from 2012 to 2023, we estimate models with prefecture- and year-fixed effects. In addition, two-stage least squares (2SLS) regressions with instrumental variables (IVs) are employed to examine potential causal effects.

Our results reveal a significantly negative association between the share of foreigners among CCWs and the native mortality rate attributable to care institutions. However, the causality relationship remains uncertain. We also examine the heterogeneous associations and yield interesting findings. Additionally, our pathway analyses suggest that the negative association between the share of foreign CCWs and the native mortality rate is likely driven by improvements in the *quality*, rather than the *quantity*, of human capital. This study enriches the existing literature on population health and immigration by empirically examining the impact of immigration in the care sector on native health outcomes. It also contributes by providing evidence from an Asian context, where research on this issue is still emerging.

The remainder of this study is structured as follows: Section 2 reviews the practical and theoretical background. Section 3 presents the data, variables and methods. Section 4 reports the empirical results. Section 5 concludes with key findings, policy implications, limitations and research prospects.

2. Research Background

2.1 Current situation of care worker immigration in Japan

2.1.1 The "labor shortage" in care sector

Japan is facing growing concerns about a shortage of care workers, with the term "labor shortage" frequently mentioned in government reports and media discourse. In the 2022 fiscal year, the number of care workers stood at approximately 2.15 million. Projections indicate that by 2040, this demand will increase to 2.72 million, resulting in an estimated shortfall of 0.57 million workers in care sector (MHLW, 2024). Besides the projected gap between future demand and the current supply of care workers, care institutions are already reporting understaffing. According to the *FY2023 Fact-Finding Survey on Long-Term Care Work*, 64.7% of care institutions reported being understaffed (CWFJ, 2024). By care role, 81.4%

of institutions reported understaffing among visiting care workers, while 65.9% reported understaffing among direct care workers.

Meanwhile, the aging of population in Japan progress very fast. The aging rate—meaning the share of population aged 65 and over—has arisen from 17.1% in 2001 to 29.1% in 2023 (SOJ, n.d.-b).[1] During the same period, the number of individuals, who are insureds of Japan's Long-Term Care Insurance (LTCI) and certified as in the conditions of requiring care, has increased from 2.56 million in 2001 to 6.94 million in 2023 (MHLW, n.d.-a).[2] In Japan, eligibility for care services is determined through a public certification process, which classifies insureds who passed the certification process into two categories: those in the condition of *Need for Long-Term Care* (NLTC, "You-kaigo" in Japanese), and those in the condition of *Need for Support* (NS, "You-shien" in Japanse). Individuals under the NS category require less intensive care services than those under the NLTC category. The NLTC condition is further divided into five levels, while the NS condition is divided into two levels, with higher numbers indicating greater care needs. Among the two categories, NLTC cases represent the primary source of demand for care workers. As of March 31, 2023, approximately 5 million insureds (72%) were certified under the NLTC condition, while 1.94 million (28%) were classified under the NS category (MHLW, n.d.-a). Among insureds aged 65 and over, the share certified as requiring care (i.e. certified as under either NLTC or NS conditions) has increased from 11.0% in 2000 to 19.0% in 2023 (Table 1). To depict the characteristics of insureds certificated under the NLTC and NS conditions, we decompose their age distributions and display them in Figure 1.

On the other hand, the supply of care workers has also arisen, from 549 thousand in 2000 to 2.154 million in 2022 (MHLW, 2024). The number of care workers per 1,000 insured individuals certified as requiring care is a useful metric for quantitatively assessing the extent of the labor shortage. In fact, between 2000 and 2022, this number rose from 214 to 310 per 1,000 insureds requiring care,[3] indicating a relative strengthening of the workforce staffing in proportion to certificated care needs.

Importantly, the NLTC and NS certifications are conducted by local government officials, in consultation with the insured individual's physician when necessary. This process is institutionally and operationally independent from the care worker employment system. Additionally, since Japan's LTCI system covers

[1] As of April 1, each year.
[2] As of March 31, each year.
[3] Data of the number of care workers are as of October 1, each year (MHLW, 2024), and data of the insureds certifications is as of the end of each fiscal year (March 31 of the next year) (MHLW, n.d.-a).

nearly the entire population aged 65 and over (99.0% in 2023[4]), the demand for care workers among insured elderly individuals largely reflects the overall demand within the elderly population.

In this context, the available data suggest that the projected workforce shortfall stems from the increasing number of elderly adults requiring care, while maintaining the service levels or care needs certification thresholds. The so-called "labor shortage" should be understood primarily as a demographic challenge resulting from rising care needs among an aging population, rather than as a consequence of lenient certification practices or shifting care standards.

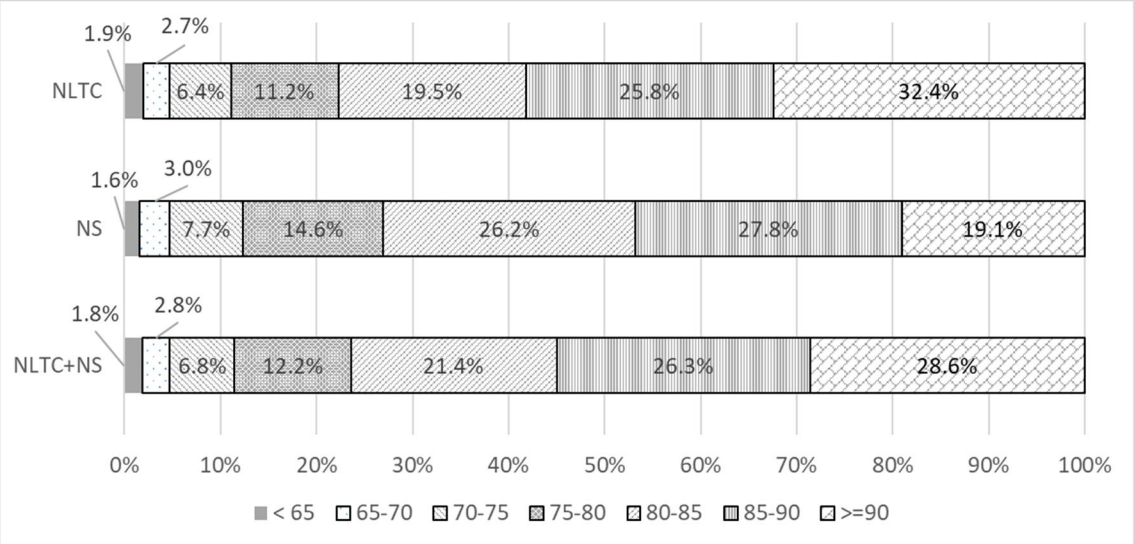
Notably, Japan is attempting to adapt to this challenge, with the expansion of immigration for care workers emerging as a key policy response.

Table 1. Number of insureds certified as requiring care

Year	Number of insureds certified under NLTC or NS conditions			Total number of insureds (65 and over)	Share of insureds certified under NLTC or NS conditions of among insureds aged 65 and over
	Aged 65 and over	Aged under 65	Total		
2001	2,470,982	90,612	2,561,594	22,422,135	11.0%
2023	6,814,344	130,033	6,944,377	35,845,134	19.0%

Source: Ministry of Health Labour and Welfare of Japan (n.d.-a).

Notes: (1) The data are as of March 31 of the corresponding year. (2) NLTC: Need for Long-Term Care; NS: Need for Support.



[4] Population data are as of April 1, 2023 (SOJ, n.d.-b). Insureds data are as of March 31, 2023 (MHLW, n.d.-a). Additionally, the insurance coverage rate is 99.5% for those aged 65-75, 99.3% for those aged 75-85, and 97.4% for those aged 85 and above.

Figure 1. Age structure of individuals certified under the condition of Need for Long-Term Care (NLTC), Need Support (NS), or either (NLTC+NS).
Source: Ministry of Health Labour and Welfare of Japan (n.d.-a).
Note: The data are as of March 31, 2024.

2.1.2 The care worker system and immigration to it

In Japan, care workers are typically employed by nursing care institutions rather than by individual households. In contrast, in the U.S. and some Asian countries or regions like Singapore, Hong Kong and Taiwan, it is common for care workers to be directly hired by individual consumers and to provide live-in care services. Japan does not have such arrangements; instead, care services are provided through nursing care institutions that employ the workers.

Under the LTCI scheme in Japan, insured individuals can choose from four types of services.

- Home-based care service: Care workers visit clients' homes to provide assistance with daily tasks.
- Community-based care service: Clients commute to local facilities for outpatient care or rehabilitation on a day-trip basis.
- Facility-based care service: Clients reside in care facilities, either temporarily or long-term, to receive continuous support.
- Combinations of the above: A hybrid approach incorporating elements of home-, community-, and/or facility-based care.

Generally, all care services are delivered by care workers affiliated with institutions, including those providing visiting care support as a part of home- or community- based care services.

Second, Japan has a national examination and certification system for care workers. Those who have passed the National Examination for Care Workers and registered, become CCWs. International students who graduate from Japanese CCW training institutions can also register as CCWs, provided they meet certain requirements. Those who have not yet registered as CCWs are treated as uncertificated care workers (UCWs) in this study. As of October 1, 2024, Japan had over 1.35 million full-time equivalent care workers working in various care institutions, of whom 58.2% were CCWs and 41.8% were UCWs.[5] For foreign care workers, in addition to professional qualifications, proficiency in the Japanese language is also a prerequisite for taking this national examination.

Regarding the admission of foreign care workers, Japan has established or revised four visa categories:

[5] Calculated based on data from MHLW (n.d.-b).

- *Nursing Care* (NC): This visa category is only issued for foreign CCWs. Applicants must register as CCWs to obtain this visa.
- *Designated Activities* (DA): This visa category covers various designated activities, including care workers entering Japan under Economic Partnership Agreements (EPAs). Visa holders initially enter Japan as UCWs. They are allowed to take the National Examination for Care Workers, which they first became eligible to sit for in 2011 (MHLW, 2012) After obtaining certification as CCWs, they may either renew their DA visa or switch to a NC visa (Cheng, 2023). However, while holding a DA visa, they are required to report to the authorities—via the designated JICWELS EPA Integration System—if their employer changes (JICWELS, 2024).
- *Technical Intern Training* (TIT): This visa category covers practical training in various occupations, including care work. Care workers holding this visa are generally UCWs. They can change to a *Specified Skilled Worker* visa that permits a longer stay, if meet certain requirements. Once they become CCWs, they can switch to a NC visa (Cheng, 2023; MHLW, 2025)
- *Specified Skilled Worker* (SSW): This visa category covers semi-skilled foreign labors in multiple occupations, including UCWs. Once they become CCWs, they can switch to a NC visa (Cheng, 2023; MHLW, 2025).

The NC visa is issued for five years and can be renewed without restrictions on the number of renewals. Japan began issuing the NC visa on September 1, 2017. Initially, eligibility was limited to those who had completed formal care worker education in Japan, mainly those foreigners in *Student* Visa and passed the National Examination for Care Workers. However, as of April 2020, the policy was revised to allow graduates of CCW education institutes in Japan to register as CCWs without taking the national examination, and to apply for the NC visa. More importantly, the revised policy also permits applicants who acquired their skills through workplace training or other non-institutional paths to apply for the NC visa, provided they pass the national examination and meet language requirements. This reform broadened access to the NC visa and allowed for more diverse entry routes.

The number of NC visa holders has grown steadily—from just 18 as of December 31, 2017 (ISA, n.d.) to 12,227 as of December 31, 2024 (MHLW, 2025). During the same period, the total number of registered CCWs rose from 1.5 million in March 2017 to 1.94 million in March 2025 (SWPNE, n.d.). That means, as

of 2024, NC visa holders represent 0.63% of all CCWs in Japan.[6] Although the number of foreign CCWs has increased rapidly in recent years, their proportion is still small.

The basic information on visa holder numbers and the restrictions of other visa categories is as follows:

- DA visa: The EPA program for care workers was launched in 2008 with Indonesia, followed by the Philippines in 2009 and Vietnam in 2014 (MHLW, 2023). As of March 1, 2025, there were 3,252 EPA-based care workers, of whom 452 had become CCWs (MHLW, 2025). These CCWs can renew their DA visa without restriction on the number of renewals and they can also change to NC visa [7].
- TIT visa: The TIT program began accepting care workers on November 1, 2017, and had 15,909 participants by the end of 2023 (MHLW, 2025). This type of visa has restrictions on the number of renewals.
- SSW visa: The SSW visa began accepting care workers on April 1, 2019. As of the end of 2024, it had 44,367 holders (MHLW, 2025). This type of visa also has restrictions on the number of renewals.

Due to limitations in data availability, this study can construct prefecture-level panel data only for foreign CCWs under the NC visa. Detailed regional data for care workers under the other three visa types are unavailable, as they are grouped together with workers in other occupations. Accordingly, this study focuses exclusively on the impact of foreign CCWs under the NC visa category. Although there are also CCWs under the DA visa, they account for only 3.7% (452 out of 12,227) of all foreign CCWs; therefore, we tentatively consider the bias to be acceptable.

[6] The number of *Nursing Care* visa holders is as of December 31, 2024 (MHLW, 2025). The number of CCWs is as of March 31, 2025 (SWPNE, n.d.).

[7] In fact, the number of EPA program care workers who passed the national examination is far greater than 452. For example, there were 440, 374, and 754 successful candidates in the 33rd (2020–2021), 34th (2022), and 35th (2023) rounds of the National Examination for Care Workers (JACCW, 2024), respectively. However, many of them have either switched to other visa types such as NC visa or left Japan.

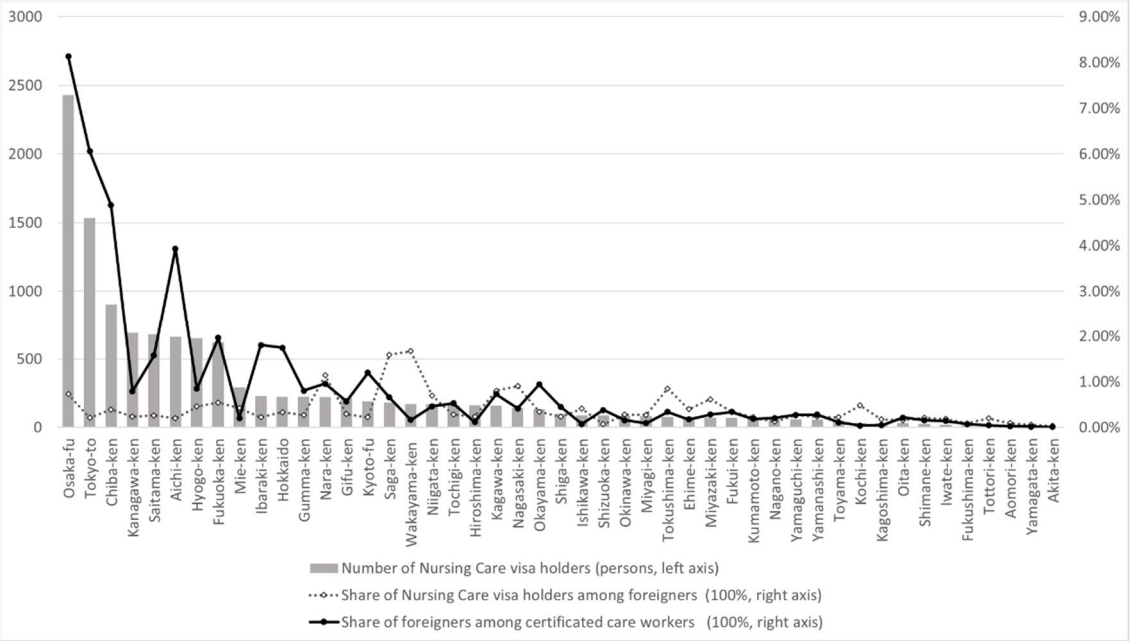


Figure 2. Cross-prefecture comparison of Nursing Care visa holders in 2024

Source: Immigration Services Agency of Japan (n.d.).

Note: The data are as of as of the end of 2024.

2.2 Existing research on the impacts of foreign care workers on health outcomes

To address the shortages in care sector, many countries have turned to foreign care workers, providing a distinctive setting to study how immigration affects care quality and client health.

Empirical evidence generally points to positive associations between foreign care employment and health outcomes of care recipients. In Singapore, support from foreign-born domestic care workers has been found to contribute to better caregiving outcomes (Østbye et al., 2013). In Italy, migrant-provided home-based care has been shown to causally improve elderly health by reducing the frequency of hospital admissions, the duration of hospitalizations, and mortality rates (Capretti et al., 2024).

Beyond domestic care workers, similar positive impacts have been observed from foreign-born care workers in institutional care settings in the U.S. Furtado and Ortega (2023), using data from 2000 to 2010 and causality analyses, find that local increases in immigration lead to improvements in various measures of nursing home quality. These include fewer falls, reduced use of restraints, and fewer pressure ulcers among residents. The authors attribute this to immigration increasing the local supply of nurse aides—key personnel responsible for hands-on care in nursing homes. This increase stems not only from a greater number of foreign-born nurse aides but also from a crowding-in effect, where native workers shift into nurse aide roles as immigrants take over informal employments (such as home help) that require fewer formal credentials and communication skills.

While Furtado and Ortega (2023) focus on the quantity of immigrant workers, other studies have examined the composition of the workforce, comparing foreign-born workers with native ones. For example, Jun and Grabowski (2024) find that, in the U.S, nursing homes with a higher percentage of foreign-born certified nursing assistants reported better quality of care. These facilities had more direct care staff hours per resident and better health outcomes of residents, including lower shares of residents that experienced recent falls, weight loss, and pressure ulcers. Their nursing home quality indicators are based on data from 2018, while the share of foreign-born certified nursing assistants reflects the average from 2010 to 2018.

Several mechanisms may explain these positive associations. First, positive selection implies that immigrants—particularly those from countries such as the Philippines—may be more motivated or better qualified to work in nursing. Cortés and Pan (2015b) show that Philippine-educated registered nurses earn higher wages in the U.S. than similarly qualified natives, while Cortés and Pan (2014) find that the equilibrium wages of registered nurses did not decline with increased immigration, suggesting that foreign-born nurses may be of higher average quality. Jun and Grabowski (2024) highlight motivational factors: immigrant workers tend to work longer shifts, have stronger incentives to retain their jobs, and are less likely to quit. The substantial wage differential between their home countries and the U.S. may lead to higher job satisfaction and better performance.

A second mechanism involves increased professional competition and standard-setting. Cortés and Pan (2015a) find that in the U.S., states with more foreign-born nurses, native candidates taking the nursing licensure exams tend to achieve higher scores. This suggests that the presence of foreign-born workers may raise overall professional standards—a phenomenon that may extend to other nursing and caregiving roles as well (Furtado & Ortega, 2023).

Despite these positive findings, employing foreign-born nursing or care workers is not without challenges. Language and cultural differences may create communication barriers that reduce care quality. Nonetheless, Jun and Grabowski (2024) argue that the benefits provided by foreign-born certificated nursing assistants outweigh these drawbacks.

Importantly, not all evidence supports a significant link between foreign care workers and health outcomes. Using U.S. data from 2012 to 2016 and a longitudinal model with a fixed effect for each nursing home, Dai (2021) find no significant association between the share of foreign-born workers in nursing-

related occupations and nursing home quality—as measured by health outcomes such as the proportion of long-stay residents experiencing daily pain.

In summary, the existing evidence on whether employing foreign care workers improves the health outcomes of natives remains mixed. The effects of foreign care workers on elderly health likely depend on country-specific institutional settings, labor policies, and cultural factors.

Given its rapidly increasing aging rate, ongoing shortage of care workers, and recent policy reforms allowing more foreign care workers, Japan provides a particularly compelling case for investigation into how the employment of foreign care workers affects elderly health outcomes.

3. Data and methods

3.1 Data and variables

While an empirical analysis based on microdata would be ideal, such data is currently unavailable. Therefore, this study relies on existing statistical data for its analysis. We compile a panel dataset at the prefecture level, spanning 2012–2023.

The dependent variable in this study is the regional mortality rate attributable to care institutions among the native Japanese population (*MRC*), which serves as a proxy for health outcomes of care recipients. In the absence of data on micro-level health indicators for individual care recipients or institutions, this regional mortality rate—regularly published in official population statistics—offers a practical and consistent measure. The dependent variable MRC is measured as the number of mortalities among Japanese natives occurring in care institutions relative to the prefectural population of Japanese natives. It is calculated by the following formula:

$$MRC = \frac{Number\ of\ mortalities\ among\ Japanese\ natives\ occurring\ in\ care\ institutions}{Japanese\ population} \times 1{,}000$$

Mortality data is specifically about Japanese natives. It is as of end of each year, and is sourced from Statistics of Japan (SOJ, n.d.-d). Accordingly, the population data also corresponds to Japanese natives and is as of October 1 (SOJ, n.d.-a). Except for *MRC*, all other variables regarding per capita form use the overall population (including both immigrants and natives) as the denominator, unless otherwise noted.

Our explanatory variable of interest is *FCWS*, which represents the average number of foreigners per 1,000 CCWs. Foreigners are defined as individuals with non-Japanese nationality. It is calculated as the ratio of foreign CCWs to the total number of CCWs (in 1,000 persons). Data on foreign CCWs comes from

Immigration Services Agency of Japan (ISA, n.d.) and reflects the number of foreign residents holding a NC visa as of December 31 each year. In this study, “foreigner” is used to denote nationality (rather than "foreign-born", which denotes birthplace), in accordance with Japanese statistics. Data on the total number of CCWs is sourced from Social Welfare Promotion and National Examination Center (SWPNE, n.d.) as of the end of each fiscal year (March 31, the next natural year).

A series of control variables are also included, as suggested by prior research regarding regional mortality rates. They include extreme temperature (Onozuka & Hagihara, 2015), per capita gross domestic product (Ying & Li, 2022), air pollution (Chen et al., 2022), health conditions (Li et al., 2024), and public healthcare investment (Li, 2020).

We include two variables that quantitatively represent care service in care institutions. The variable *CCWtoR* denotes CCW-to-resident ratio, measured as the average number of CCWs for every 100 residents in care institutions. *BedOcR* represents the bed occupancy rate of care institutions, measured as the number of residents relative to institutional capacity. The data are obtained from the Ministry of Health Labour and Welfare of Japan (MHLW, n.d.-b).

A variable captures the need for care service is also included. *ECShare*, represents the number of insureds who are certified under NLTC conditions relative to the total population (MHLW, n.d.-a).

Extreme temperatures have been proved to have an impact on mortality rates, including both extreme heat and extreme cold. Following a previous study in Japan (Onozuka & Hagihara, 2015), we define extreme heat as a 2-day moving average of the mean temperature exceeding 30℃ and extreme cold as a 26-day moving average of the mean temperature falling below 5 ℃. We then count the number days of extreme heat, denoted as *ExHeat*, and the number of days of extreme cold, denoted as *ExCold*. The data are sourced from Japan Meteorological Agency (JMA, n.d.).

Regional medical quality may also affect mortality rates. Therefore, *PGDP* (log-transformed per capita gross domestic product) is included to reflect overall economic capacity and potential healthcare quality. Data are from the Cabinet Office of Japan (COJ, n.d.). Another related variable included is *PExSW*, the log-transformed per capita government expenditure on social welfare (SOJ, n.d.-c).

Lastly, we include air quality variables—*AqNO2, AqPM10,* and *AqPM2.5*—which represents the compliance rate with air quality standards for nitrogen dioxide (NO2), suspended particulate matter smaller than 10 micrometers in diameter (PM_{10}), and suspended particulate matter smaller than 2.5 micrometers in

diameter ($PM_{2.5}$), respectively. The data are obtained from the Ministry of the Environment of Japan (MEJ, n.d.-a).

A summary and description of all variables are presented in Table 2.

Table 2. Descriptions and summary statistics of the dependent variable and potential determinants

Variable	Description	Obs	Mean	SD	Min	Max
MRC	The Japanese native mortality rate attributable to care institutions (i.e., the number of mortalities among Japanese natives occurring in care institutions per 1,000 Japanese natives)	564	1.418	0.631	0.319	3.354
FCWS	The average number of foreigners (as of year-end) per 10,000 certificated care workers (CCWs) (as of fiscal year end, i.e., March 31 the next year)	564	0.817	1.747	0	13.441
CCWtoR	The average number of CCWs per 100 residents in care institutions	564	25.467	2.998	18.480	35.530
BedOcR	The bed occupancy rate of care institutions	564	0.935	0.015	0.884	0.971
ECShare	The number of insureds who are certified under NLTC conditions (including level 1 to level 5) per 1,000 population	564	40.821	7.023	24.027	61.420
ExHeat	The number of days on which the 2-day moving average of the mean temperature was above 30.0 ℃	564	6.975	7.755	0	44.000
ExCold	The number of days on which the 26-day moving average of the mean temperature was below 5 ℃	564	37.459	40.687	0	147.000
PGDP	The logarithm of per capita real gross domestic product (1,000 JPY, 2015 price)	516	8.288	0.178	7.886	9.018
PExSW	The logarithm of per capita government expenditure on social welfare (1,000 JPY)	470	4.157	0.202	3.691	4.841
AqNO2	The compliance rate with air quality standards for nitrogen dioxide (NO2), monitored by roadside air quality monitoring stations	458	0.999	0.006	0.933	1.000
AqPM10	The compliance rate with air quality standards for suspended particulate matter (<10 micrometers in diameter) (PM_{10}), monitored by ambient air quality monitoring stations	470	0.996	0.020	0.800	1.000
AqPM2.5	The compliance rate with air quality standards for suspended particulate matter (<2.5 micrometers in diameter) ($PM_{2.5}$), monitored by ambient air quality monitoring stations	469	0.766	0.343	0	1.000

Note: The variables above are measured at the prefecture level.

3.2 Methods

To analyze the potential association between the share of foreigners among CCWs and native mortality rate attributable to care institutions, we construct a panel dataset at the prefecture level and employ fixed-effect models. The model is specified as follows and estimated using ordinary least square (OLS) method:

$$MRC_{it} = \alpha \cdot FCWS_{it} + \beta' \cdot X_{it} + \gamma_t + \delta_i + C + \varepsilon_{it} \quad (1)$$

As introduced earlier, *MRC* represents the mortality rate among Japanese natives attributable to care institutions, and *FCWS* represents the share of foreigners among CCWs. Besides that, *X* denotes a set of control variables. *i* indexes prefectures, and *t* indexes years. γ_t captures year-fixed effects, and δ_i captures prefecture-fixed effects. α and β are coefficients to be estimated. *C* is the constant term, and ε is the error term. We choose to cluster standard errors at the prefecture level, which allows for unrestricted correlation among prefectures and across time.

If significant association is revealed by estimation results of fixed-effect regression, there is still endogeneity issues due to potential occurrence of reverse causality and omitted variables. To alleviate the potential endogeneity issues inherent in the OLS regression, we employ the instrument variable (IV) regression.

A suitable IV must satisfy two key assumptions. The first is the exclusion restriction, which requires that the IV influences the outcome (i.e., the population-based care-institution mortality rate) solely through its effect on the core explanatory variable (i.e., the share of foreigners among CCWs), and not through any other covariates or error term. The second assumption is relevance, which requires that the IV be strong correlated with the core explanatory variable.

We utilize the share of foreigners from major origins of CCWs in the total population (*FS_iv*) as an instrument for the share of foreigners among CCWs (*FCWS*). The rationale for this IV is as follows. First, the share of these foreigners in the total population does not directly affect the mortality rate attributable to care institutions, particularly when our dependent variable—mortality rate is only about Japanese natives. Therefore, this foreigner-specific IV does not affect the regional care-institution mortality rate of Japanese natives. If any influence exists in the empirical results, it can be attributed solely to the IV's effect on the share of foreigners among CCWs. Second, foreign CCWs are a subset of the foreign population, and an increase in the former naturally contributes to an increase in the latter, suggesting a strong correlation between the share of foreigners among CCW (*FCWS*) and the corresponding share in overall population (*FS_iv*). These two considerations support the validity of this IV by satisfying the two key assumptions of IV approach.

To construct the IV, first, we identify the major source countries of foreign care workers in Japan as of the end of 2024, including Vietnam (43.2%), Nepal (13.1%), Indonesia (11.7%), the Philippines (9.8%), the mainland of China (9.2%), Myanmar (6.0%) and Sri Lanka (1.8%). Among thirty-seven origins, these

seven are the seven largest origins of foreign CCWs, each accounting for more than 1% of the total foreign CCWs. We construct an IV by aggregating their numbers and calculate the share in the overall population (*FS_iv*). This IV satisfies the two key requirements of the IV approach and is validated by the tests conducted using our dataset (Table 7).

We employ two-stage least-square (2SLS) approach to investigate the impact of foreign CCWs on care-institution mortality rate. In the first stage, we regress the share of foreigners among CCWs on our IV, alongside other control variables (*X*):

$$FCWS_{it} = \alpha_f \cdot FS\_iv_{it} + \beta_f{}' \cdot X_{it} + \gamma_t + \delta_i + C_f + \varepsilon_{fit} \quad (2)$$

where *f* denotes the first stage, α_f, $\beta_f{}'$, and C_f are unknown parameters, and ε_{fit} is an error term. By doing this, this stage isolates the exogenous component of the share of foreigners in CCWs that is uncorrelated with the error term. The predicted value of the share of foreigners among CCWs ($\widehat{FCWS}_{it}$) derived from this regression is subsequently served as the main covariate in the following second stage:

$$MRC_{it} = \alpha_s \cdot FCWS_{it} + \beta_s{}' \cdot X_{it} + \gamma_t + \delta_i + C_s + \varepsilon_{sit} \quad (3)$$

where *s* signifies the second stage, α_s, $\beta_s{}'$, and C_s are unknown parameters, and ε_{sit} is an error term. We assume that FS_iv_{it} is uncorrelated with a prefectures' care-institution mortality rate. As a result, α_s can be interpreted as the causal impact of foreign share among CCWs on the regional care-institution mortality rate.

4. Empirical results

4.1 Main results

We estimate three models, each incorporating different sets of control variables over varying year ranges. Panel A covers the years 2012–2023 and includes control variables of *FCWS*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold*. The first model uses Panel A and the results are presented in Column (1) of Table 3. For robustness checks, we also estimate the model for panel B, which covers 2012–2022 and adds *PGDP* to the set of control variables. The third model, corresponding to panel C (2012–2021), further includes *PExSW*, *AqNO2, AqPM10,* and *AqPM2.5* as control variables. The results are reported in Column (2) and (3) of Table 3, respectively. All three models control for both prefecture- and year-fixed effects. They all use robust standard errors clustered at the prefecture level, which means the model allows for arbitrary correlation of residuals within each prefecture while permitting heteroskedasticity across prefectures.

The estimation results reveal significant and negative association between the share of foreigners among CCWs (*FCWS*) and the native mortality rate attributable to care institutions (*MRC*). The results remain robust across different model specifications.

Table 3. Foreign care workers and care-institution mortality (FE estimations)

Variable	(1) *MRC*	(2) *MRC*	(3) *MRC*
PANEL-Data time period	PANEL A: 2012–2023	PANEL B:2012–2022	PANEL C:2012–2021
FCWS	-0.0387***	-0.0429***	-0.0422***
	(0.0118)	(0.0119)	(0.0130)
Control variables	*FCWS*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold*	*FCWS*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold, PGDP*	*FCW`S*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold, PGDP, PExSW*, *AqNO2, AqPM10, AqPM2.5*
Prefecture-fixed effects	YES	YES	YES
Year-fixed effects	YES	YES	YES
Observations	564	516	457
R^2	0.9712	0.9733	0.9735

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Robust standard error is in parentheses and clustered at the prefecture level.

4.2 Endogeneity concerns

While the estimated findings derived from the fixed-effects regression reveal a significant association, there are concerns about potential endogeneity. The first source of endogeneity is reverse causality. Specifically, it may be that higher mortality rates lead care institutions to hire more CCWs, including foreigners. Accordingly, the share of foreigner among CCWs may be influenced by native mortality rates attributable to care institutions, raising the possibility of endogeneity. Another source of endogeneity may arise from the possibility that immigrant care workers may choose their locations based on local economic conditions, which may also affect the capacity of care institutions in those areas to improve service quality. In such cases, the economic situation of a given location could affect both the immigration of care workers and the care outcomes. To address these issues, we employ the 2SLS regression and uses the IV explained in Subsection 3.2.

The 2SLS regression results validate the suitability of the chosen IV. Specifically, Table 4 reports the first-stage regression results, revealing a significant association between the IV (*FS_iv*) and the core explanatory variable (*FCWS*), satisfying the requirement of relevance. The weak identification test results (22.164) indicate that the estimation passes the weak instrument test. The second-stage regression result clearly shows that the negative effect of the share of foreigners among CCWs (*FCWS*) on the native mortality rate attributable to care institutions (*MRC*) remains statistically unchanged even after addressing

endogeneity concerns. Furthermore, the absolute magnitude of estimated coefficients from the 2SLS regressions (-0.0675) is slightly larger than those obtained from the fixed effects models in Table 3 (around -0.04). Ignoring endogeneity concerns leads to an underestimation of the beneficial impact of foreign care workers on care outcomes. Thus far, the results seemingly indicate a causal link suggesting that foreign CCWs improve the health outcomes among Japanese natives in care institutions.

Table 4. The impact of the share of foreigners among population on the share of foreigners among CCWs

Dependent variable: care-institution mortality rate (*MRC*)	
Second-stage results	
$\widehat{FCWS}_{it}$: predicted share of foreigners among CCWs	-0.0675 **
	(0.0316)
Centered R²	0.9491
Observations	564
Weak id.	22.164
First-stage results	
FS_iv: share of foreigners from major care-worker origins relative to the total population	0.3889 ***
	(0.0826)

Note: ** and *** denote significance at the 5% and 1% levels, respectively. Robust standard error is in parentheses and clustered at the prefecture level. Control variables include *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*. *Weak id.* Refers to Kleibergen-Paap rk Wald F statistic, and exceeds the Stock-Yogo weak ID test critical values for a 10% maximal IV size (16.38).

4.3 Robustness checks

As a robustness check, we also utilize data from 2017 to 2023 for the estimation. The results in Table 5 show that the significant and negative correlation remains consistent. Specifically, for every additional 1 foreigner per 10,000 CCWs, the mortality in care institutions decreases by 0.02～0.03 for every 1,000 population.

Lastly, we test the robustness of our main results by using an alternative sample period (2017–2023) and performing 2SLS fixed-effect regressions. Table 6 shows that the corresponding second-stage coefficients are consistent in sign, and the magnitude of the coefficient is also larger than that obtained from FE models in Table 5. Although the significance does not meet the conventional significance levels (10%), the p-value of 0.111 suggests marginal significance at the 15% level, likely due to the relatively small sample size and large clustered standard errors.

Further robustness checks include placebo regressions, where we examine the effect of foreign CCWs when no effect is supposed to be observed. We restrict our data to the pre-treatment years, 2012–2016, and assign the value of *FCWS* and *FS_iv* in 2023 to 2016. In that way, we assume the foreign CCWs in 2023 has been in Japan in 2016. We rerun a 2SLS regression and find significant results for the instrumented share of foreigners among CCWs (*FCWS*) (Table 7). This indicates that the instrumented the share of

foreigners among CCWs show a significantly negative impact during this pre-treatment period, violating the exclusion restriction and suggesting that the instrument may be correlated with unobserved factors affecting mortality prior to the policy shock (i.e., the introducing of NC visa in Japan).

Overall, the robustness checks yield mixed results, and the causal impact of foreign care workers on native mortality rate attributable to care institutions remains uncertain. Continued observation and re-estimation with larger samples or improved instruments will be necessary to draw more conclusive evidence.

Table 5. Foreign care workers and care-institution mortality (FE estimations)

Variable	(2) *MRC*	(4) *MRC*	(6) *MRC*
PANEL-Data time period	PANEL D: 2017–2023	PANEL E: 2017–2022	PANEL F: 2017–2021
FCWS	-0.0315***	-0.0313***	-0.0248***
	(0.0093)	(0.0092)	(0.0089)
Control variables	*FCWS*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold*	*FCWS*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold, PGDP*	*FCWS*, *CCWtoR*, *BedOcR, ECShare*, *ExHeat*, *ExCold, PGDP, PExSW*, *AqNO2, AqPM10, AqPM2.5*
Prefecture-fixed effects	YES	YES	YES
Year-fixed effects	YES	YES	YES
Observations	329	281	230
R^2	0.9795	0.9830	0.9856

Note: *** denotes significance at the 1% level. Robust standard error is in parentheses and clustered at the prefecture level.

Table 6. Results using panel data covering the period 2017-2023 (2SLS-fixed-effects)

Dependent variable: care-institution mortality rate (*MRC*)	
PANEL D: 2017–2023	
Second-stage results	
$\widehat{FCWS}_{it}$	-0.0350
	(0.0220)
	p=0.111
Centered R^2	0.9492
Observations	329
Weak id.	19.735
First-stage results	
FS_iv	0.7341***
	(0.1652)

Note: ** and *** denote significance at the 5% and 1% levels, respectively. Robust standard error is in parentheses and clustered at the prefecture level. Control variables include *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*. *Weak id.* Refers to Kleibergen-Paap rk Wald F statistic, and exceeds the Stock-Yogo weak ID test critical values for a 10% maximal IV size (16.38).

Table 7. Placebo check– regressions with pre-treatment data (2012-2016) where 2023 values of the endogenous and instrumental variable for each prefecture are assigned to 2016, 2SLS Estimates

Dependent variable: care-institution mortality rate (*MRC*)
PANEL G: 2012–2016

Second-stage results	
$\widehat{FCWS}_{it}$	-0.0148 **
	(0.0073)
Centered R²	0.8867
Observations	235
Weak id.	20.559
First-stage results	
FS_iv	0.5534***
	(0.1220)

Note: ** and *** denote significance at the 5% and 1% levels, respectively. Robust standard error is in parentheses and clustered at the prefecture level. Control variables include *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*. *Weak id.* Refers to Kleibergen-Paap rk Wald F statistic, and exceeds the Stock-Yogo weak ID test critical values for a 10% maximal IV size (16.38).

4.4 Heterogenous results

We conduct further analyses to investigate the heterogeneity in the impacts of the share of foreigners among CCWs on the native mortality rate attributable to care institutions, considering prefecture's aging level and regional location. To begin, we categorize prefectures by the society's aging rate level—the proportion of the population aged 65 and above—and divide them into three categories based on the yearly 33rd percentile and 67th percentile. As shown in Table 8, all three categories exhibit a negative association, while only the results for prefectures in the top (67th to 100th percentile) and bottom (0 to 33rd percentile) tiers are statistically significant. Moreover, the effect of the share of foreigners among care workers is stronger in the top-tier prefectures (-0.0589) than in the bottom tier prefectures (-0.0407). Increasing the share of foreign workers in the care workforce benefits the most aged societies more than the less aged societies.

Next, we reclassify prefectures by their super-aged rate—the proportion of the population aged 85 and above—and conduct similar analyses. The results in Table 9 exhibit a comparable pattern. A significantly negative association exists between the share of foreigners among CCWs and the native mortality rate attributable to care institutions in both the top- and bottom-tier prefectures. However, in contrast to the classification by aging rate, the effect observed in the bottom tier (-0.0521) is slightly larger than in the top tier (-0.0546).

In addition, we run regressions separately for prefectures classified as *metropolitan* and *non-metropolitan* to examine potential differences. In Japan, metropolitan areas typically refer to the Tokyo Metropolitan Area (four prefectures: Tokyo-to, Saitama-ken, Chiba-ken, and Kanagawa-ken), the Nagoya Metropolitan Area (three prefectures: Aichi-ken, Gifu-ken, and Mie-ken), and the Osaka Metropolitan Area (four prefectures: Osaka-fu, Kyoto-fu, Hyogo-ken, and Nara-ken). The results in Table 10 indicate that both groups experience a significantly negative impact of foreigner care worker share, although the absolute

magnitude is slightly larger for the metropolitan prefectures (-0.0406) than for non-metropolitan prefectures (-0.0359).

Finally, we divide the prefectures into two subsets based on their proximity to Fukushima, where the nuclear accident took place in 2011. The accident resulted in the release of radioactive contaminants into the surrounding environment. As the request of the Ministry of the Environment of Japan, Fukuoka and ten other prefectures (including Miyagi-ken, Yamagata-ken, Fukushima-ken, Ibaraki-ken, Tochigi-ken, Gumma-ken, Saitama-ken, Chiba-ken, Tokyo-to, Kanagawa-ken, and Niigata-ken) continuously monitoring the radioactive materials in water environments (MEJ, n.d.-b). These eleven prefectures are categorized as *in or near Fukushima*, while the others are categorized as *not near Fukushima*. We observe a negative and significant association in not-near-Fukushima category, while the near-Fukushima category does not exhibit significant results (Table 11).

Table 8. Heterogenous effects by aging rate levels of prefectures (FE models)

Sample prefectures by aging rate	>= 67th percentile	the 33rd ~ 67th percentile	<= 33rd percentile
Variable	*MRC*	*MRC*	*MRC*
FCWS	-0.0589***	0.0029	-0.0407***
	(0.0186)	(0.0196)	(0.0101)
Prefecture-fixed effects	YES	YES	YES
Year-fixed effects	YES	YES	YES
Observations	192	179	191
R^2	0.9810	0.9764	0.9862

Note: *** denotes significance at the 1% level. Robust standard error is in parentheses and clustered at the prefecture level. All estimations include the following control variables: *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*.

Table 9. Heterogenous effects by super ager rate levels of prefectures (FE models)

Sample prefectures by super ager rate	>= 67th percentile	the 33rd ~ 67th percentile	<= 33rd percentile
Variable	*MRC*	*MRC*	*MRC*
FCWS	-0.0521*	0.0139	-0.0546***
	(0.0264)	(0.0207)	(0.0173)
Prefecture-fixed effects	YES	YES	YES
Year-fixed effects	YES	YES	YES
Observations	190	177	191
R^2	0.9805	0.9647	0.9809

Note: * and *** denote significance at the 10% and 1% level, respectively. Robust standard error is in parentheses and clustered at the prefecture level. All estimations include the following control variables: *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*.

Table 10. Heterogenous effects by metropolitan status of prefectures (FE models)

Sample prefectures	Metropolitan	Non-metropolitan
Variable	*MRC*	*MRC*
FCWS	-0.0406***	-0.0359**
	(0.0110)	(0.0155)
Prefecture-fixed effects	YES	YES
Year-fixed effects	YES	YES
Observations	132	432

R^2	0.9849	0.9673

Note: ** and *** denote significance at the 5% and 1% level, respectively. Robust standard error is in parentheses and clustered at the prefecture level. Both estimations include the following control variables: *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*.

Table 11. Heterogenous effects among prefectures by proximity to Fukushima (FE models)

Sample prefectures Variable	Near Fukushima *MRC*	Not near Fukushima *MRC*
FCWS	-0.0466	-0.0361***
	(0.0277)	(0.0128)
Prefecture-fixed effects	YES	YES
Year-fixed effects	YES	YES
Observations	132	432
R^2	0.9770	0.9700

Note: *** denotes significance at the 1% level. Robust standard error is in parentheses and clustered at the prefecture level. Both estimations include the following control variables: *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*.

4.5 Potential pathways

Pathway 1: Through improved human capital quality

In this section, we investigate the potential pathways underlying the relationship between the share of foreigners among CCWs and the native mortality rate attributable to care institutions. Do foreign CCWs affect native mortality rates attributable to care institutions through improved human capital quality in the care workforce? The results in Table 12 show that the share of foreigners among CCWs in a prefecture (*FCWS*) is positively and significantly associated with its share of passers of the National Examination for Care Workers (*PExS*). Among all examination passers in a given year, the prefecture's share reflects the competitiveness of the examinees—that is, care assistants or students preparing to become CCWs. The results suggest that a higher share of foreigners among CCWs is associated with a more competitive pool of prospective CCWs. This relationship remains when using one- or two-year forward values of *PExS* (i.e., the prefecture's share of examination passers relative to the national total in the following year or two years later).

Table 12. Foreign certificated-care-workers and care workforce human capital quality (FE models)

Variable	Pathway (1a) *PExS*	Pathway (1b) *F.PExS*	Pathway (1c) *F2.PExS*
PANEL A - Data time period: 2012–2023			
FCWS	0.0003*** (0.0001)	0.0004*** (0.0001)	0.0005** (0.0001)
Prefecture-fixed effects	YES	YES	YES
Year-fixed effects	YES	YES	YES
Observations	564	564	517
R^2	0.9942	0.9955	0.9959

Note: ** and *** denote significance at the 5% and 1% level, respectively. Robust standard error is in parentheses, clustered at the prefecture level. All estimations include the following control variables: *lnCareWorker*, *CCWtoR*, *BedOcR, ECShare, ExHeat* and *ExCold*.

Pathway 2: Through increased care worker staffing

Do foreign CCWs affect native mortality rates attributable to care institutions through increase in care worker staffing? We examine the association between the share of foreigners among CCWs (*FCWS*) and staffing indicators. In Pathway (2a) and (2b), staffing is measured by the total number of registered CCWs in the prefecture, expressed in logarithm term (*lnCareWorker*). In Pathway (2c) and (2d), we use an indicator of relative staffing in care institutions: the ratio of CCWs (converted to full-time equivalents) per 100 residents there (*CCWtoR*). As shown in Table 13, none of the four estimations exhibits a significant association. We do not find significant evidence supporting this pathway through improved care worker staffing.

Table 13. Foreign certificated-care-workers and care worker staffing (FE models)

	(1)	(2)	(3)	(4)
Variable	Pathway (2a) *lnCareWorker*	Pathway (2b) *lnCareWorker*	Pathway (2c) *CCWtoR*	Pathway (2d) *CCWtoR*
PANEL A - Data time period: 2012–2023				
FCWS	0.0012 (0.0011)	0.0006 (0.0010)	-0.0000 (0.0445)	0.0023 (0.0432)
Prefecture-fixed effects	YES	YES	YES	YES
Year-fixed effects	YES	YES	YES	YES
Observations	564	564	564	564
R^2	0.9998	0.9998	0.9642	0.9642

Note: Robust standard error is in parentheses, clustered at the prefecture level. All estimations include control variables of *BedOcR, ExHeat* and *ExCold*. Column (1) and (3) also include *lnNLTC1to5* (logarithm of the number of insureds certificated as under the condition of NLTC level 1 to 5) as control variables, while column (2) and (4) also include *lnNLTC3to5* (logarithm of the number of insureds certificated as under the condition of NLTC level 3 to 5).

5. Concluding remarks

5.1 Key finding and academic contributions

This paper examines whether the employment of foreign care workers in the care sector affects the health outcomes of native residents. We use the native mortality rate attributable to care institutions as a proxy for health outcomes and focus on the impact of the share of foreigners among CCWs. We use prefecture-level panel data from 2012 to 2023 and fixed effects models. The results reveal a statistically significant and negative association between the share of foreigners among CCWs and Japanese native mortality rates attributable to care institutions. However, when applying causal inference methods, the causal effect remains inconclusive. Continued observation and re-estimation with larger samples or improved instruments will be necessary to draw more conclusive evidence.

Heterogenous analyses show that the beneficial association of foreign CCWs and native's health is more pronounced in prefecture groups with highest and lowest aging rates. Meanwhile, this association is stronger in metropolitan prefectures than non-metropolitan ones. Additionally, the association is insignificant in prefectures near Fukushima but significant in those farther away.

Building on the pathway analysis results, we find that the negative association between the share of foreigners among CCWs and the native mortality rate attributable to care institutions is likely driven by improvements in the *quality*, rather than the *quantity*, of human capital in care workforce. On the one hand, evidence suggests that the introduction of foreign CCWs is associated with improved performances on the national certification examination. At this stage, however, it remains unclear whether this improvement in the human capital quality stems from higher quality of foreign care workers themselves, or from the stiffer competition introduced into the Japanese care labor market by their entry—an issue that warrants further research. On the other hand, our results do not exhibit a significant association between the share of foreigners among CCWs and care worker staffing levels.

This study enriches the existing literature on population health and immigration by empirically examining the impact of immigration in the care sector on native health outcomes. It also contributes by providing evidence from an Asian context, where research on this issue is still emerging.

5.2 Limitations and future research

This study also has its limitations. First, from a policy and practical perspective, it is timely and important to explore this issue, especially as it has been over eight years since the implementation of Japan's NC visa. At this stage, our finding that immigration is associated with native's beneficial health outcomes supports the continuation of Japan's immigration policy for foreign CCWs in the care sector—a field facing an increasingly severe labor shortage. Nevertheless, from a data and methodological standpoint, the timing is not ideal for conducting a robust empirical analysis, given the current limitations in data availability. Specifically, foreign care workers account for only 0.65% of all CCWs.[8] With larger samples and longer-term data, future studies could adopt more sophisticated analytical methods and potentially yield more definitive results.

Second, our dependent variable—mortality rates—captures only one dimension of health outcomes and does not reflect other important aspects of care recipients' health. Ideally, more specific indicators such as recent falls, weight loss, pressure ulcers, or mortality rates specifically linked to care recipients—which are frequently used in the U.S. studies, would provide a more accurate measure of direct health outcomes. To enhance the precision of future analyses, it would be beneficial for relevant Japanese surveys—such as *Survey of Institutions and Establishments for Long-Term Care*—to include data on both the health

[8] This is a combination of CCWs holding NC visa (0.63%) and DA visa (0.02%).

outcomes of facility residents and the proportion of foreign care workers at each facility. Access to such data would allow for a more robust evaluation of elderly health outcomes and the potential impact of foreign care workers.

Third, our panel dataset does not include CCWs under the DA visa due to the lack of available statistics. Omitting foreign CCWs under the DA visa—who accounted for only 3.6% of all foreign CCWs—results in a 3.6% undercount of total foreign CCWs. Their share among all CCWs is even smaller, at just 0.02% in 2024. This omission is therefore likely acceptable, and our main finding of a significantly negative association is likely to hold. Nonetheless, we recommend that immigration authorities publish comprehensive statistics on care workers under all relevant visa categories (i.e., DA, TIT, and SSW), including distinctions between CCWs and UCWs. Such data would enable the creation of a more accurate dataset.

Fourth, future studies should also examine the impact of UCWs, compare their effects with those of CCWs, and investigate whether foreign workers are disproportionately represented in more physically demanding roles, as nurse aides are in the nursing sector. Research in other contexts (e.g., Furtado and Ortega (2023)) has shown that in the U.S., foreign-born workers are often overrepresented in the most demanding nursing care tasks, which natives are less willing to perform. Increases in the local supply of nurse aides—typically staffed by foreign-born individuals—have been linked to improvements in care quality in nursing homes. Whether similar patterns exist in Japan's care sector remains a question. With better data, future research can explore whether foreign care workers are also overrepresented in physically demanding care tasks (such as UCWs), and whether this affects elderly's health outcomes.

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Appendix

Table A.1. English-Japanese Glossary of Terms

Terminologies in English	Terminologies in Japanese
Long-Term Care Insurance	Kaigo hoken (介護保険)
Nursing Care	Kaigo (介護)
Designated Activities	Tokutei Katsudo (特定活動)
Technical Intern Training	Gino Jishu (技能実習)
Specified Skilled Worker	Tokutei Gino (特定技能)
Certified Care Workers	Kaigo Fukushi (介護福祉士)
Need for Long-Term Care	You-kaigo (要介護)
Need for Support	You-shien (要支援)