

# Analysis of the Actual Usage of Care for the Establishment of a Fair and Equitable Care Service Provision System

A Case Study of  $\alpha$ -City, Tochigi Prefecture, Japan.

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## Abstract

*Japan is rapidly developing into a super-aged society, with an ageing population rate of 29.1%, the highest in the world. Demand for medical and long-term care services for the elderly is expected to increase further in the future. On the other hand, however, local resources such as human resources and facilities to support medical and long-term care services are limited due to the declining population, so the formulation of a welfare plan for the elderly to support a super-aged society is an urgent issue.*

*Therefore, the Government of Japan aims to establish a community-based integrated care system to enable people to continue living in the community by providing integrated services. However, the planning areas of this system are formal and don't reflect the actual situation.*

*Accordingly, this study compared the planning areas with actual care usage, analysed the completeness of care within each planning area, and analysed the fairness of access to facilities to understand the actual situation of care usage.*

*The results revealed that long-term care isn't completed within the planning areas, and confirmed the need to consider facility allocation plans to maintain equity between areas, abolition or integration of planning areas, and establishment of planning areas across cities.*

## Keywords

*Community-based Integrated Care System, Sphere of daily life, Planning Area, Geographic Information System, Mountainous Region, Super aged society*

## 1. Introduction

### 1.1. Themes of the Study and the Social Background in Japan

This paper aims to gain knowledge from an analysis of the actual usage of long-term care in Japan's provincial cities in order to realise a fair and equitable long-term care service provision system.

In Japan, the super-aged society is progressing at a rate unparalleled in the world. According to data released by the Statistics Bureau of Japan's Ministry of Internal Affairs and Communications, the ageing rate in Japan has reached a record high of 29.1%, which is the highest in the world.

Demand for medical and long-term care services for the elderly is expected to increase further in the future. On the other hand, local resources such as human resources and facilities to support medical and long-term care services are limited due to the declining population.

Therefore, in order to build a system to provide long-term care and medical care to meet the needs of a super-aged society, the Long-Term Care Insurance Law was amended in Japan in 2005, with the aim of establishing a 'community-based integrated care system'. The community-based integrated care system is a framework defined as "a system in which residence, medical care, nursing care, prevention and lifestyle support are provided in an integrated manner in the community so that people can continue to live their own lives in their familiar neighbourhoods until the end of their lives, even if they require severe nursing care"(Ministry of Health, Labour and Welfare,2022). In order to realise the construction of this framework, each municipality formulates a 'Insured Long-Term Care Service Plans' every three years and defines 'spheres of daily life', which are the planning units of the framework. The 'sphere of daily life' is an area where necessary services can be provided within approximately 30 minutes, and specifically, the junior high school district is assumed to be the unit of planning.

However, in provincial cities, junior high school districts vary in size. There is no academic basis for considering the planning area for welfare services for the elderly on the basis of the junior high school district, which is a school district, and it is a formality that does not reflect the actual situation. In particular, the uneven distribution of local resources such as care personnel and care service facilities is a problem in mountainous regions with a declining birthrate, ageing population and depopulation, and the need to carefully consider the appropriateness of setting up sphere of daily life based on junior high school districts.

Therefore, it is necessary to set up sphere of daily life in accordance with the actual conditions of each area and to consider fair and equitable methods of planning for the welfare of the elderly that reflect the actual situation. We believe that this will contribute to solving the problem of establishing a sustainable service provision system by making effective use of limited local resources, by aiming to complete long-term care and medical care within each planning area.

## 1.2. Japan's Insurance System

Japan is a country with a "universal health insurance system (Kokuho)", under which all citizens are enrolled in some form of public insurance. Long-term care services for the elderly are also managed through the national universal health insurance system. Japan's "universal health insurance system (Kokuho)" is a system in which all citizens are enrolled in a public insurance scheme, and each citizen contributes to the insurance premiums and helps each other, so that everyone can receive medical and long-term care services with peace of mind. Under this universal health insurance system, citizens are free to choose their medical institutions and long-term care facilities and can receive necessary medical and long-term care services on an equal basis. This system is operated by the State, prefectures and municipalities as insurers.

The system of the long-term care insurance system, which is particularly relevant to this study, is a system in which society as a whole supports elderly people aged 65 and over or people aged 40-64 with a specific illness who need long-term care. The insurers of long-term care insurance are municipalities and special wards. When long-term care insurance services are used, 10% of the costs incurred (20% or 30% if the income is above a certain level) is paid by the user, and the remaining 90% (80% or 70%) is paid from long-term care insurance finances. Long-term care insurance is financed half by taxes and other public funds and half by insurance premiums.

The actual usage of this long-term care insurance is recorded in “long-term care receipts”, which are held by the insurer, the respective municipality. The long-term care receipts contain data on the long-term care services used, detailed service descriptions, insurance points and the resident register code of the user. Long-term care receipt data is accumulated in the national 'Kokuho Data Base System (KDB system)' and is used for the effective implementation of insurance projects. The KDB system stores data not only on long-term care insurance, but also on health guidance, medical care, etc.

This study will use these long-term care receipts and the Basic Resident Register to ascertain the actual usage of long-term care.

### 1.3. Organisation of Previous Studies and Positioning of This Study

Previous studies on the sphere of daily life in community-based integrated care systems and on accessibility to long-term care facilities include those by Nishino et al., Osawa et al. and Sato et al. Nishino et al. analysed the appropriateness of setting up welfare administrative zones by ascertaining the sphere of daily life of elderly people in three provincial cities in Japan, and concluded that junior high school districts based on primary schools districts are significant as an example of an abstract sphere of daily life (Nishino, 2018). However, in the study by Nishino et al. the study subjects were circle or elderly club users and not the entire population of long-term care services users. Also, the target cities were three cities in Ishikawa Prefecture, and it is not known whether junior high school district is appropriate as a planning unit in the whole of Japan. In a study by Osawa et al. accessibility to long-term care services is measured using GIS and the impact of accessibility on regional differences in the use of long-term care services is analysed. Ultimately, they show that there is a relationship whereby regions with higher accessibility to long-term care services use more long-term care services, while regions with lower accessibility also use fewer services (Osawa, 2018). Sato et al. use long-term care receipts, which are data on the use of long-term care insurance, and geographical information to clarify accessibility and the actual use of different types of long-term care services (Satoh, 2018) (Nohara, 2021).

Studies using receipts are common in the medical field, but studies linking long-term care receipts and geospatial information are less common, mainly from the perspective of protecting personal information. Although studies have been conducted on indicators to assess the uneven distribution of local resources, there are few studies that have analysed in detail the actual situation of care usage by sphere of daily life in provincial cities, including mid-mountainous areas (Nakamura, 2017).

In view of these previous studies, this study is novel in that it links long-term care receipts with geographical information and analyses the completeness of long-term care services by sphere of daily life, as well as in that it analyses accessibility in the city as a whole.

### 1.4. Objectives of the Study

This study uses long-term care receipts held by municipalities to grasp the actual usage of long-term care services by sphere of daily life. The long-term care receipt data will be combined with basic resident register data, and the actual usage data of long-term care will be linked to geographical information such as the residence of the user and the location of the service facility. By analysing these data for each sphere of daily life, the inflow and outflow of users across the sphere is analysed. In addition, an accessibility analysis using road network data considers the relationship between accessibility and actual usage. By analysing these analyses by long-term care services type, the characteristics of each service type are analysed.

Through the above analysis, the objective is to evaluate the relationship between the actual usage of care and the planning area in provincial cities and to gain knowledge for elderly welfare planning that incorporates the actual situation in the region.

## 2. Research Methods

Using long-term care receipt data accumulated in the KDB system, a comparison between the planning area where long-term care users reside and the planning area where the offices they actually use are located was conducted. In addition, the road distances between the user's place of residence and the office used were calculated and evaluated using network analysis.

### 2.1. Analysis Target

The target area was selected as one of Japan's provincial cities,  $\alpha$ -city in Tochigi Prefecture, where the western part is the city centre and the eastern part is a mountainous area, and it is expected that the actual usage of care would differ depending on the area.

$\alpha$ -city has 13 spheres of daily life. In the western areas A, B, C, D, E, F, G and H, which form the city centre and have a high population density, the spheres of daily life are based on primary school districts, while in the other eastern mountainous areas the spheres of daily life are based on junior high school districts. In addition, three Community General Support Centres have been established in the city based on the criteria indicated by the national government (population size, geographical relationship, etc.), each of which is responsible for four to five spheres. Community General Support Centres play the role of core institutions that implement comprehensive support projects and other services in an integrated manner in the region.

The data analysed consisted of 6,455 long-term care receipts for the month of January 2018. Of these, the analysis was conducted on the usage data of elderly persons residing in  $\alpha$  city and aged 65 years or older as of 1 January 2018. This paper analyses eight types of in-home long-term care services: home-visit care, home-visit bathing, home-visit nursing care, home-visit rehabilitation, day care (day care for dementia, community-based day care), outpatient rehabilitation, short-term admission for daily life long-term care, and multifunctional long-term care in a small group home. The distribution of the elderly population in  $\alpha$ -city and basic information on the 13 spheres of daily life are shown in Figure 1.

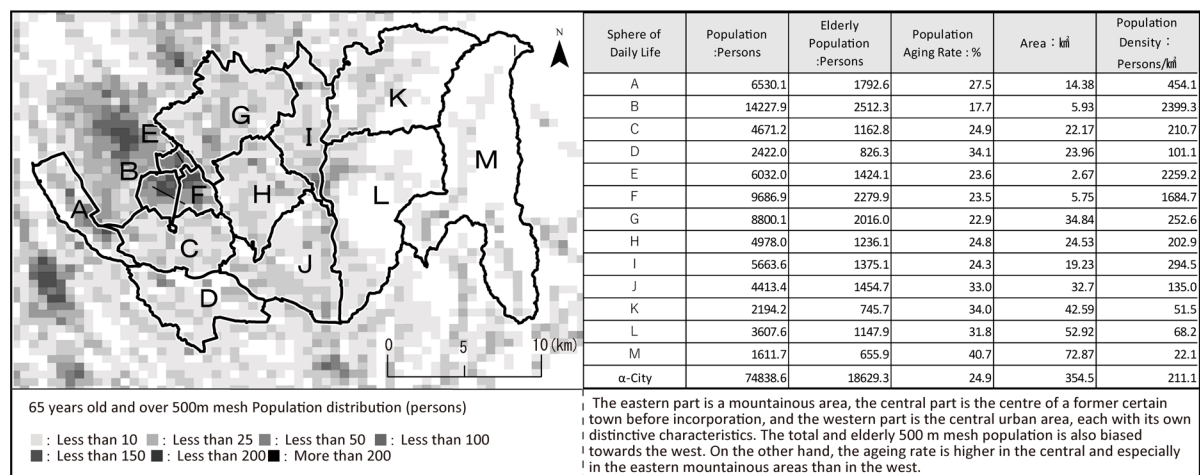


Figure 1. Basic Information on the Distribution of the Elderly Population and 13 Spheres of Daily Life in  $\alpha$  City

## 2.2. Analysis Methods

Using a geographic information system (GIS), an analysis of (1) the completeness of care in the sphere of daily life and (2) the distance between the user's place of residence and the place of care office for each type of long-term care services was conducted based on data on planning areas, data on care offices, care receipts and road data.

### (1) Completeness of care within spheres of daily life

We created area data for the 13 spheres of daily life defined by  $\alpha$ -city and analysed care receipts (anonymised with data on address, long-term care services used, etc.) for  $\alpha$ -city obtained from the KDB system. The same analysis was also conducted not only in the sphere of daily life but also in the sphere in charge of each Community General Support Centre, and the scope of use outside the sphere of daily life was considered.

### (2) Analysis of the distance between the user's place of residence and the place of care office

GIS was used to analyse the road distance between the residence of care users and the location of the care office they actually use, and to analyse how far away the office is from the nearest care office for each user.

## 3. Analysis Results

### 3.1. Analysis of the Completeness of Long-term Care Services within the Sphere of Daily Life

Of the eight service types analysed, home bathing and home rehabilitation were excluded from the tabulations in the tables because the data for these services were very small (25 and 8 cases respectively).

Tables 2 to 7 show the tabulation results for each service type by the sphere of daily life in which the user lives and the sphere of daily life in which the care office is located. The rows indicate the sphere of daily life in which the care user lives, analysed from the receipts, and the columns indicate the sphere of daily life in which the care office is located. In the table, the numbers in white letters in the cells with corresponding alphabetical letters, such as column A, row A, column B, row B..., indicate the number of uses and completion rates within each sphere of daily life. In Tables 2 to 7, the percentage values in brackets are calculated using the number of users residing within each sphere of daily life as 100%, so that the total on the horizontal axis is 100%, but the total on the vertical axis is not 100%. Figures 2 to 4 also show the location of long-term care services offices by type of service. This section looks at the proportion of people whose sphere of daily life where they live and the sphere of daily life where the care office is located are the same (completion rate) and the proportion of people who use a care office located outside their sphere of daily life where they live (outflow rate).

#### (1) Home-visit Care (Table 1)

The completion rate shows that the D, E and K spheres have relatively high rates of over 40%. Conversely, the H-sphere is low at 17.6%, confirming an outflow to the E, F and G spheres. The five areas of C, I, J, L and M, where there is no home-visit care office in the sphere of daily life, also show a high rate of outflow to the E, F and G spheres. In terms of the Community General Support Centre's sphere of responsibility, there is also a high outflow from the X and Z spheres to the Y sphere. In addition, the overall outflow to outside the city is 14.4%.



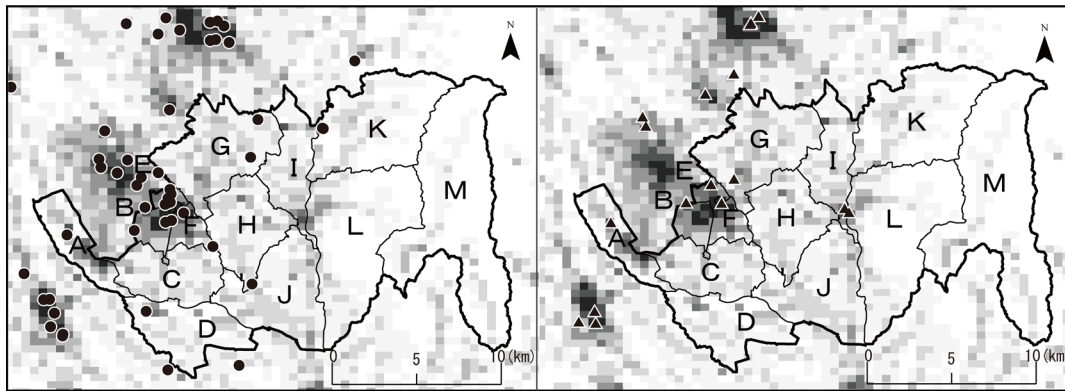


Figure 2. Location of Home-visit Care Offices (left) and Home-visit Nursing Care Offices (right)

Table 1. Tabulation by Sphere of Daily Life Where Elderly People Who Use Home-visit Care Offices Reside and by Sphere of Daily Life Where the Offices are Located

		Sphere of daily life where the facility is located															Total			Total	
		Within a-city												Outside of a-city							
		X Community Comprehensive Area			Y Community Comprehensive Area			Z Community Comprehensive Area			Total	Adjacent cities/towns	Others	Unknown							
Sphere of daily life where the user's lives(persons)	Comprehensive Area	A	B	C	D	E	F	G	H	I	J	K	L	M	Total	Adjacent cities/towns	Others	Unknown	294		
		9(37.5%)	—	—	3(12.5%)	3(12.5%)	3(12.5%)	—	—	—	—	—	—	—	—	18(75.0%)	6(25.0%)	—		6(25.0%)	
		—	7(29.2%)	—	2(8.3%)	8(33.3%)	3(12.5%)	2(8.3%)	—	—	—	—	—	—	—	22(91.7%)	2(8.3%)	—		2(8.3%)	
		1(6.7%)	2(13.3%)	—	1(6.7%)	2(13.3%)	3(20.0%)	3(20.0%)	1(6.7%)	—	—	—	—	—	—	13(86.7%)	2(13.3%)	—		2(13.3%)	
		1(7.1%)	1(7.1%)	—	6(42.9%)	—	—	—	—	—	—	—	—	—	—	11(78.6%)	1(7.1%)	2(14.3%)		3(21.4%)	
		—	8(24.2%)	—	1(3.0%)	15(45.5%)	5(15.2%)	1(3.0%)	—	—	—	—	—	—	—	30(90.9%)	2(6.1%)	1(3.0%)		3(9.1%)	
		—	12(25.5%)	—	1(2.1%)	6(12.8%)	11(23.4%)	6(12.8%)	7(14.9%)	—	—	—	—	—	—	43(91.5%)	3(6.4%)	1(2.1%)		4(8.5%)	
		—	7(24.1%)	—	3(10.3%)	5(17.2%)	1(3.4%)	6(20.7%)	1(3.4%)	—	—	—	—	—	—	25(86.2%)	4(13.8%)	—		4(13.8%)	
		—	1(5.9%)	—	1(5.9%)	3(17.6%)	4(23.5%)	2(11.8%)	3(17.6%)	—	—	—	—	—	—	14(82.4%)	1(5.9%)	1(5.9%)		2(11.8%)	
		—	1(3.7%)	—	1(3.7%)	6(22.2%)	—	12(44.4%)	5(18.5%)	—	—	—	—	—	—	26(96.3%)	1(3.7%)	—		1(3.7%)	
		—	—	—	—	1(12.5%)	3(37.5%)	2(25.0%)	1(12.5%)	—	—	—	—	—	—	7(87.5%)	1(12.5%)	—		1(12.5%)	
		—	2(8.7%)	—	—	3(13.0%)	—	3(13.0%)	—	—	—	—	—	—	—	18(78.3%)	5(21.7%)	—		5(21.7%)	
		—	2(9.5%)	—	3(14.3%)	3(14.3%)	1(4.8%)	6(28.6%)	—	—	—	—	—	—	—	19(90.5%)	2(9.5%)	—		2(9.5%)	
—	—	—	—	—	1(8.3%)	5(41.7%)	—	—	—	—	—	—	—	8(66.7%)	4(33.3%)	—	4(33.3%)				
Unknown	2(5.1%)	6(15.4%)	—	2(5.1%)	7(17.9%)	1(2.6%)	3(7.7%)	1(2.6%)	—	—	—	—	—	9(23.1%)	—	—	—	39			
Total	13	49	0	24	62	36	53	19	0	0	28	0	0	28	43	5	1	333			
															48(14.4%)			0(0.3%)			

(2) Home-visit Nursing Care (Table 2)

There are no offices in the city except in the five spheres of A, E, F, G and I. A high completion rate of around 50% was identified in Spheres A and I. As with home-visit care, a large inflow from other spheres can be observed in Spheres E, F and G. In terms of the spheres in charge of Community General Support Centre, as in the case of home-visit care, an outflow from the X and Z spheres to the Y sphere, which is in charge of the E, F, G and H spheres, can be confirmed. A comparison of the same home visiting services shows that home-visit nursing services have a higher outflow to neighbouring municipalities, with eight of the spheres having an outflow rate of more than 30%. The overall outflow rate outside the city is also high at 30.3%.

Table 2. Tabulation by Sphere of Daily Life Where Elderly People Who Use Home-visit Nursing Care Offices Reside and by Sphere of Daily Life Where the Offices are Located

		Sphere of daily life where the facility is located															Total			Total	
		Within a-city												Outside of a-city							
		X Community Comprehensive Area			Y Community Comprehensive Area			Z Community Comprehensive Area			Total	Adjacent cities/towns	Others	Unknown							
Sphere of daily life where the user's lives(persons)	Comprehensive Area	A	B	C	D	E	F	G	H	I	J	K	L	M	Total	Adjacent cities/towns	Others	Unknown	170		
		10(47.6%)	—	—	—	1(4.8%)	—	1(4.8%)	—	—	—	—	—	—	—	12(57.1%)	7(33.3%)	1(4.8%)		8(38.1%)	
		1(6.7%)	—	—	—	4(26.7%)	2(13.3%)	7(46.7%)	—	—	—	—	—	—	—	14(93.3%)	1(6.7%)	—		1(6.7%)	
		—	—	—	—	3(23.1%)	1(7.7%)	5(38.5%)	—	—	—	—	—	—	—	9(69.2%)	4(30.8%)	—		4(30.8%)	
		—	—	—	—	—	1(12.5%)	3(37.5%)	—	—	—	—	—	—	—	4(50.0%)	4(50.0%)	—		—	
		1(7.7%)	—	—	—	3(23.1%)	3(23.1%)	4(30.8%)	—	—	—	—	—	—	—	11(84.6%)	2(15.4%)	—		2(15.4%)	
		2(11.1%)	—	—	—	3(16.7%)	2(11.1%)	3(16.7%)	—	—	—	—	—	—	—	10(55.6%)	7(38.9%)	—		7(38.9%)	
		3(20.0%)	—	—	—	3(20.0%)	3(20.0%)	3(20.0%)	—	—	—	—	—	—	—	11(73.3%)	4(26.7%)	—		4(26.7%)	
		1(10.0%)	—	—	—	2(20.0%)	3(30.0%)	3(30.0%)	—	—	—	—	—	—	—	9(90.0%)	1(10.0%)	—		1(10.0%)	
		—	—	—	—	2(12.5%)	—	—	—	—	—	—	—	—	—	10(62.5%)	6(37.5%)	—		6(37.5%)	
		—	—	—	—	1(12.5%)	—	3(37.5%)	—	3(37.5%)	—	—	—	—	—	7(87.5%)	1(12.5%)	—		1(12.5%)	
		—	2(18.2%)	—	—	1(9.1%)	1(9.1%)	—	—	2(18.2%)	—	—	—	—	—	6(54.5%)	4(36.4%)	—		4(36.4%)	
		—	1(5.3%)	—	—	4(21.1%)	—	2(10.5%)	—	5(26.3%)	—	—	—	—	—	12(63.2%)	7(36.8%)	—		7(36.8%)	
—	—	—	—	—	—	—	—	2(66.7%)	—	—	—	—	—	2(66.7%)	1(33.3%)	—	1(33.3%)				
Unknown	1(6.7%)	—	—	—	3(20.0%)	—	5(33.3%)	—	—	—	—	—	—	6(40.0%)	—	—	—	15			
Total	22	0	0	0	30	16	38	0	20	0	0	0	0	20	55	1	3	185			
															56(30.3%)			1(1.6%)			

(3) Day Care (Table 3)

Looking at the completion rate, high rates of more than 50% were identified in four spheres of A, D, H and J. Conversely, in Spheres B, E and F, the completion rate is low at around 20%. This is assumed to be due to the fact that the B, E and F spheres form an integrated urban area with the neighbouring  $\beta$ -city to the west, which has a large number of care offices in the surrounding area and is active in terms of outflows to the city and flows in and out between these spheres. A low completion rate of 15.7% is also observed in the L-area, which is a mid-mountainous area, indicating that there is no characteristic difference in completion and outflow rates between the central city and the mid-mountainous area. In terms of the Community General Support Centre's sphere of responsibility, a large number of outflows from the X and Z spheres to the Y sphere were identified.

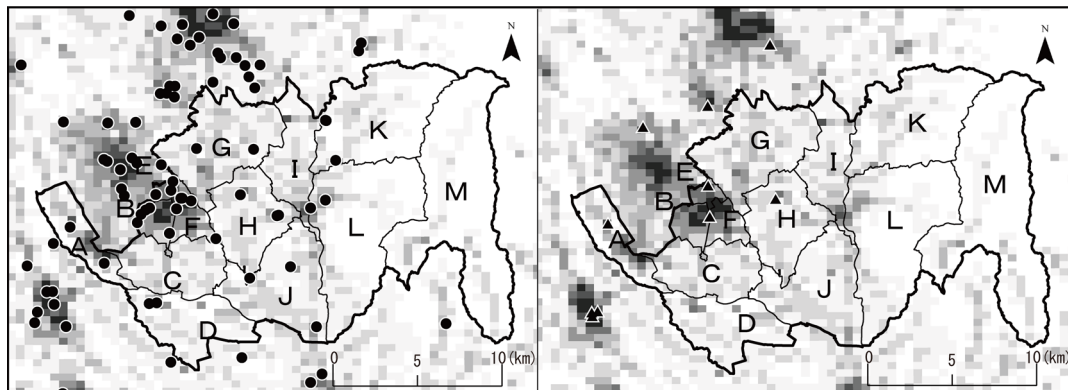


Figure 3. Location of Day Care Offices (left) and Outpatient Rehabilitation Offices (right)

Table 3. Tabulation by Sphere of Daily Life Where Elderly People Who Use Day Care Offices Reside and by Sphere of Daily Life Where the Offices are Located

		Sphere of daily life where the facility is located															Total	Unknown	Total				
		Within $\alpha$ -city										Outside of $\alpha$ -city				Total							
		X Community Comprehensive Area			Y Community Comprehensive Area			Z Community Comprehensive Area				Total	Adjacent cities/towns	Others									
A	B	C	D	E	F	G	H	I	J	K	L	M											
Sphere of daily life where the user's lives/persons	Comprehensive Area	A	42(60.9%)	4(5.8%)	—	10(14.5%)	—	5(7.2%)	1(1.4%)	2(2.9%)	—	—	—	—	—	—	64(92.8%)	5(7.2%)	—	5(7.2%)	—	69	
		B	7(9.5%)	17(23%)	—	1(1.4%)	13(17.6%)	14(18.9%)	2(2.7%)	9(12.2%)	—	—	—	—	—	—	—	63(85.1%)	6(8.1%)	1(1.4%)	7(9.5%)	4(5.4%)	74
		C	8(14.3%)	6(10.7%)	—	9(16.1%)	6(10.7%)	7(12.5%)	5(8.9%)	12(21.4%)	—	—	—	—	—	—	—	53(94.6%)	2(3.6%)	1(1.8%)	3(5.4%)	—	56
	Comprehensive Area	D	1(1.8%)	1(1.8%)	—	29(50.9%)	3(5.3%)	4(7.0%)	1(1.8%)	11(19.3%)	—	—	—	—	1(1.8%)	—	—	53(93%)	2(3.5%)	2(3.5%)	4(7%)	—	57
		E	1(1.6%)	5(8.2%)	—	3(4.9%)	14(23.0%)	18(29.5%)	2(3.3%)	7(11.5%)	—	—	—	—	1(1.6%)	—	—	51(83.6%)	5(8.2%)	1(1.6%)	6(9.8%)	4(6.6%)	61
		F	—	3(5.0%)	—	4(6.7%)	15(25.0%)	12(20.0%)	5(8.3%)	12(20.0%)	—	—	—	—	1(1.7%)	—	—	52(86.7%)	6(10.0%)	1(1.7%)	7(11.7%)	1(1.7%)	60
	Comprehensive Area	G	2(2.7%)	5(6.7%)	—	—	17(22.7%)	1(1.3%)	19(25.3%)	13(17.3%)	—	—	—	3(4.0%)	—	—	—	64(85.3%)	8(10.7%)	—	8(10.7%)	3(4.0%)	75
		H	—	4(5.6%)	—	2(2.8%)	10(14.1%)	5(7.0%)	1(1.4%)	37(52.1%)	—	5(7.0%)	—	2(2.8%)	—	—	—	66(93%)	2(2.8%)	1(1.4%)	3(4.2%)	2(2.8%)	71
		I	—	7(10.3%)	—	—	4(5.9%)	4(5.9%)	6(8.8%)	19(27.9%)	—	1(1.5%)	17(25.0%)	3(4.4%)	—	—	—	61(89.7%)	6(8.8%)	1(1.5%)	7(10.3%)	—	68
	Comprehensive Area	J	—	2(2.9%)	—	—	2(2.9%)	1(1.4%)	1(1.4%)	25(35.7%)	—	35(50.0%)	—	2(2.9%)	—	—	—	68(97.1%)	1(1.4%)	1(1.4%)	2(2.9%)	—	70
		K	—	1(1.9%)	—	—	—	—	1(1.9%)	11(20.4%)	—	—	—	—	—	—	—	44(81.5%)	10(18.5%)	—	10(18.5%)	—	54
		L	—	4(5.7%)	—	—	3(4.3%)	3(4.3%)	2(2.9%)	17(24.3%)	—	6(8.6%)	22(31.4%)	11(15.7%)	—	—	—	68(97.1%)	1(1.4%)	1(1.4%)	2(2.9%)	—	70
	Comprehensive Area	M	—	—	—	—	2(4.3%)	1(2.2%)	5(10.9%)	—	—	—	—	—	—	—	—	25(54.3%)	9(19.6%)	—	—	—	46
Unknown		3(6.3%)	12(25.0%)	—	1(2.1%)	5(10.4%)	2(4.2%)	3(6.3%)	4(8.3%)	—	1(2.1%)	9(18.8%)	—	—	—	—	6(12.5%)	1(2.1%)	—	—	1(2.1%)	48	
Total		64	71	0	59	92	78	50	184	0	52	103	36	0	—	—	63	12	—	15	—	879	
		789(89.8%)										191				75(8.5%)		15(1.7%)					

(4) Outpatient Rehabilitation (Table 4)

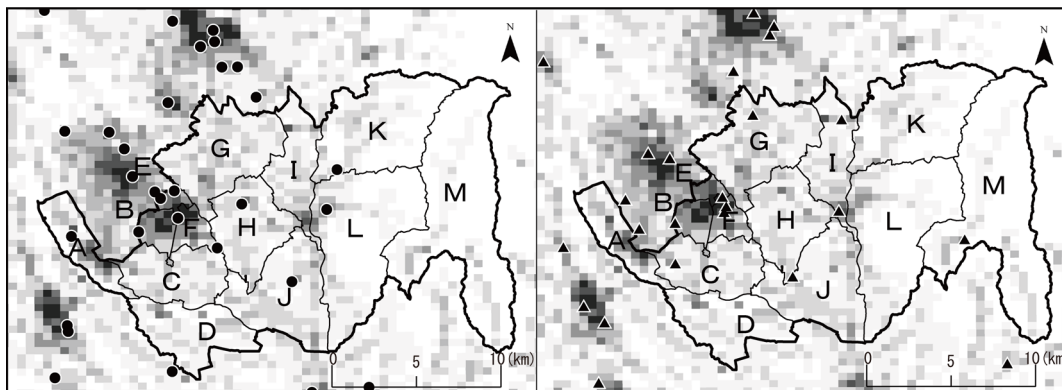
Except for the four areas of A, B, E and H, there are no offices within the area. A high completion rate of over 70% was observed in the two spheres of A and E. In terms of outflow destinations, it can be seen that the two spheres of E and H have by far the highest inflows from other spheres. In particular, the outflow from spheres I, J, K, L and M to spheres E and H is high. This can be assumed to be because there are no offices in the I, J, K, L and M spheres, which are located in the mid-mountainous area to the east of  $\alpha$  city, and the nearest office is in the H sphere. Overall, the outflow rate to neighbouring cities and towns was not high at 6.7%, and 202 (67.3%) of the 300 cases of usage data for the whole of  $\alpha$ -city that were tabulated were from offices in the E and H spheres. In terms of the sphere of responsibility of Community General Support Centre, a large number of outflows were identified from the X and Z spheres to the Y sphere, which is in charge of the E and H spheres.

**Table 4. Tabulation by Sphere of Daily Life Where Elderly People Who Use Outpatient Rehabilitation Offices Reside and by Sphere of Daily Life Where the Offices are Located**

		Sphere of daily life where the facility is located															Total			Unknown		Total											
		Within a-city																															
		X Community Comprehensive Area					Y Community Comprehensive Area					Z Community Comprehensive Area																					
Sphere of daily life where the user's lives(Persons)		A		B		C		D		E		F		G		H		I		J		K		L		M		Total	Adjacent cities/towns	Others	Total	Unknown	Total
		A	B	C	D	E	F	G	H	I	J	K	L	M																			
Sphere of daily life where the user's lives(Persons)	Comprehensive Area	A	24(72.7%)	2(6.1%)	—	—	—	—	—	2(6.1%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29(87.9%)	4(12.1%)	—	4(12.1%)	—	33	
		B	3(7.9%)	13(34.2%)	—	—	—	—	—	—	12(31.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	36(94.7%)	2(5.3%)	—	2(5.3%)	—	38
		C	4(21.1%)	1(5.3%)	—	—	—	—	—	—	8(42.1%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16(84.2%)	3(15.8%)	—	3(15.8%)	—	19
	Comprehensive Area	D	4(33.3%)	2(16.7%)	—	—	—	—	—	—	6(50.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12(100%)	—	—	0(0.0%)	—	12
		E	—	5(16.1%)	—	—	—	—	—	—	22(71.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30(96.8%)	—	1(3.2%)	1(3.2%)	—	31
		F	2(6.3%)	8(25.0%)	—	—	—	—	—	—	16(50.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31(96.9%)	1(3.1%)	—	1(3.1%)	—	32
	Comprehensive Area	G	1(2.9%)	2(5.9%)	—	—	—	—	—	—	24(70.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31(91.2%)	3(8.8%)	—	3(8.8%)	—	34
		H	—	1(5.6%)	—	—	—	—	—	—	10(55.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18(100%)	—	—	0(0.0%)	—	18
		I	—	—	—	—	—	—	—	—	7(35.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20(100%)	—	—	0(0.0%)	—	20
	Comprehensive Area	J	—	—	—	—	—	—	—	—	4(28.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13(92.9%)	1(7.1%)	—	1(7.1%)	—	14
		K	—	—	—	—	—	—	—	—	2(33.3%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5(83.3%)	1(16.7%)	—	1(16.7%)	—	6
		L	—	—	—	—	—	—	—	—	4(28.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14(100%)	—	—	0(0.0%)	—	14
	Comprehensive Area	M	—	—	—	—	—	—	—	—	1(33.3%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3(100%)	—	—	0(0.0%)	—	3
Unknown		—	4(15.4%)	—	—	—	—	—	—	11(42.3%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4(15.4%)	—	—	—	—	26	
Total		38	40	0	0	0	0	129	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	0	0	19	1	—	0	—	300		
		280(93.3%)															20(6.7%)			0(0.0%)													

(5) Short-term Admission for Daily Life Long-term Care (Table 5)

The completion rate shows that the four spheres A, E, H and J have a relatively high rate of more than 40 %. While there are offices within the sphere, the completion rate is low in spheres B and F, at less than 20 %. Looking at the destinations of outflows from the B and F spheres, it can be confirmed that the outflow rate is high to the E sphere, which forms an urban area integrated with the B and F spheres, and to outside the city. The C, D, G, I and M areas, which have no offices in the sphere, are confirmed to have a high rate of outflow to the E, F and H spheres, which the Y Community General Support Centre is in charge of.



**Figure 4. Location of Short-term Admission for Daily Life Long-term Care Offices (left) and Multifunctional Long-term Care in a Small Group Home (right)**

**Table 5. Tabulation by Sphere of Daily Life Where Elderly People Who Use Short-term Admission for Daily Life Long-term Care Offices Reside and by Sphere of Daily Life Where the Offices are Located**

		Sphere of daily life where the facility is located															Total			Unknown		Total											
		Within a-city																															
		X Community Comprehensive Area					Y Community Comprehensive Area					Z Community Comprehensive Area																					
Sphere of daily life where the user's lives(Persons)		A		B		C		D		E		F		G		H		I		J		K		L		M		Total	Adjacent cities/towns	Others	Total	Unknown	Total
		A	B	C	D	E	F	G	H	I	J	K	L	M																			
Sphere of daily life where the user's lives(Persons)	Comprehensive Area	A	10(40.0%)	2(8.0%)	—	—	—	—	—	—	2(8.0%)	4(16.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22(88.0%)	3(12%)	—	3(12.0%)	—	25	
		B	3(10.7%)	2(7.1%)	—	—	—	—	—	—	5(17.9%)	7(25.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	25(89.3%)	3(10.7%)	—	3(10.7%)	—	28
		C	3(14.3%)	1(4.8%)	—	—	—	—	—	—	4(19.0%)	4(19.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21(100%)	—	—	0(0.0%)	—	21
	Comprehensive Area	D	3(17.6%)	—	—	—	—	—	—	—	2(11.8%)	3(17.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17(100%)	—	—	0(0.0%)	—	17
		E	1(4.5%)	2(9.1%)	—	—	—	—	—	—	12(54.5%)	2(9.1%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22(100%)	—	—	0(0.0%)	—	22
		F	1(4.5%)	—	—	—	—	—	—	—	7(31.8%)	4(18.2%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20(90.9%)	2(9.1%)	—	2(9.1%)	—	22
	Comprehensive Area	G	—	1(2.6%)	—	—	—	—	—	—	11(28.9%)	3(7.9%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35(92.1%)	3(7.9%)	—	3(7.9%)	—	38
		H	—	2(6.5%)	—	—	—	—	—	—	10(32.3%)	3(9.7%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31(100%)	—	—	0(0.0%)	—	31
		I	—	2(6.7%)	—	—	—	—	—	—	5(16.7%)	3(10.0%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30(100%)	—	—	0(0.0%)	—	30
	Comprehensive Area	J	—	1(2.6%)	—	—	—	—	—	—	1(2.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	39(100%)	—	—	0(0.0%)	—	39
		K	—	1(5.3%)	—	—	—	—	—	—	3(15.8%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19(100%)	—	—	0(0.0%)	—	19
		L	—	1(3.4%)	—	—	—	—	—	—	2(6.9%)	2(6.9%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28(96.6%)	—	1(3.4%)	1(3.4%)	—	29
	Comprehensive Area	M	—	—	—	—	—	—	—	—	2(13.3%)	1(6.7%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15(100%)	—	—	0(0.0%)	—	15
Unknown		—	1(11.1%)	—	—	—	—	—	—	5(55.6%)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	
Total		21	16	0	0	0	0	70	37	204	0	97	0	25	25	42	0	—	—	—	—	—	—	—	—	11	1	—	0	—	345		
		333(96.5%)															12(3.5%)			0(0.0%)													



(6) Multifunctional Long-term Care in a Small Group Home (Table 6)

All seven sphere B, C, F, G, I, J and M, where there are offices within the sphere, showed high completion rates of more than 50%. In particular, the C, J and M spheres had a very high rate of more than 70%. This may be because the C and M spheres have no long-term care offices (1) to (5) mentioned above within the sphere, and the J sphere has only a few types of long-term care services from offices located within the sphere, so multifunctional long-term care in a small group home are the closest care offices. An outflow from the six spheres where no care offices are located within the sphere to the surrounding spheres was identified. The overall outflow rate outside the city is very low at 0.6%, indicating a high degree of completion within the city.

**Table 6. Tabulation by Sphere of Daily Life Where Elderly People Who Use Multifunctional Long-term Care in a Small Group Home Offices Reside and by Sphere of Daily Life Where the Offices are Located**

		Sphere of daily life where the facility is located															Unknown	Total				
		Within α-city										Outside of α-city										
		X Community Comprehensive Area				Y Community Comprehensive Area				Z Community Comprehensive Area		Total	Adjacent cities/towns	Others	Total							
Sphere of daily life where the user's lives/residence	Area	A	B	C	D	E	F	G	H	I	J	K	L	M	Total	Adjacent cities/towns	Others	Total	Total			
		X Community Comprehensive Area	A	—	2(40.0%)	2(40.0%)	—	1(20.0%)	—	—	—	—	—	—	—	5(100%)	—	—		0(0.0%)	—	5
			B	—	9(50.0%)	—	—	2(11.1%)	6(33.3%)	1(5.6%)	—	—	—	—	—	18(100%)	—	—		0(0.0%)	—	18
			C	—	2(13.3%)	11(73.3%)	—	—	1(6.7%)	—	—	—	—	—	—	15(100%)	—	—		0(0.0%)	—	15
			D	—	1(25.0%)	3(75.0%)	—	—	—	—	—	—	—	—	—	4(100%)	—	—		0(0.0%)	—	4
			E	—	2(22.2%)	—	—	—	6(66.7%)	1(11.1%)	—	—	—	—	—	9(100%)	—	—		0(0.0%)	—	9
			F	—	1(5.9%)	—	—	5(29.4%)	9(52.9%)	1(5.9%)	—	1(5.9%)	—	—	—	17(100%)	—	—		0(0.0%)	—	17
			G	—	—	—	—	1(5.6%)	7(38.9%)	9(50.0%)	—	1(5.6%)	—	—	—	18(100%)	—	—		0(0.0%)	—	18
			H	—	—	1(9.1%)	—	5(45.5%)	1(9.1%)	1(9.1%)	—	3(27.3%)	—	—	—	11(100%)	—	—		0(0.0%)	—	11
			I	—	—	1(6.3%)	—	1(6.3%)	2(12.5%)	2(12.5%)	—	8(50.0%)	1(6.3%)	—	1(6.3%)	16(100%)	—	—		0(0.0%)	—	16
			J	—	—	1(6.3%)	—	—	—	—	2(12.5%)	13(81.3%)	—	—	—	16(100%)	—	—		0(0.0%)	—	16
			K	—	—	—	—	—	—	—	—	5(83.3%)	—	—	—	6(100%)	—	—		0(0.0%)	—	6
			L	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—
	M	—	—	—	—	—	—	1(10.0%)	—	4(40.0%)	4(40.0%)	—	—	1(10.0%)	10(100%)	—	—	0(0.0%)	—	10		
	Unknown	—	3(37.5%)	—	—	3(37.5%)	1(12.5%)	—	—	—	—	—	—	21(91.3%)	22(95.7%)	1(4.3%)	—	—	23			
	Total	0	20	19	0	20	34	16	0	24	19	0	0	23	1	0	0	0	8			
		39				70				66				1(0.6%)				0	176			
		175(99.4%)															0	176				

(7) Home-visit Bathing and Home-visit Rehabilitation

Only a small number of offices provide home-visit bathing, with 14 out of 25 cases being used by offices in the city, while 11 cases were used outside the city.

All 8 of the home-visit rehabilitation services were used outside the city.

**3.2. Analysis of the Distance Between the User's Place of Residence and the Place of Care Office**

The relationship between the road distance between the user's place of residence and the nearest neighbouring care office (vertical axis) and the road distance between the user's place of residence and the care office they use (horizontal axis) and the distribution of users by distance zone are shown in Figure 5. If users choose the nearest neighbouring office, they are distributed on the solid line in the diagram. The further the points are from the central solid line to the right; the more distant care offices are used. The analysis covers the area up to 40 km from the user's place of residence and excludes the use of services outside the neighbouring cities and towns.

Figure 5 shows that for all service types, most of the points are distributed off to the right of the solid line. From this, it can be analysed that regardless of the distance to the nearest neighbouring care office, users tend to choose an office further away than the nearest neighbouring care office, and this tendency is particularly pronounced for day-care offices. On the other hand, in the case of home-visit nursing and short-term admission for daily life long-term care services, the users are distributed along a relatively central line more than in the other four service types, and the correlation coefficient is also higher, but it can be seen that not all users choose the nearest neighbouring care office. In other words, it can be analysed that the most neighbouring office is not selected regardless of service type or distance to the most neighbouring office. The distribution of users by distance zone shows that for all six service types,

use is concentrated in the distance zone of 10 km or less. For the two home-visit service types, home-visit care services and home-visit nursing care services, it can be analysed that more than 20% of the users are also located in the distance zone of more than 10 km, indicating that the distance zone of use is wider than for the other service types.

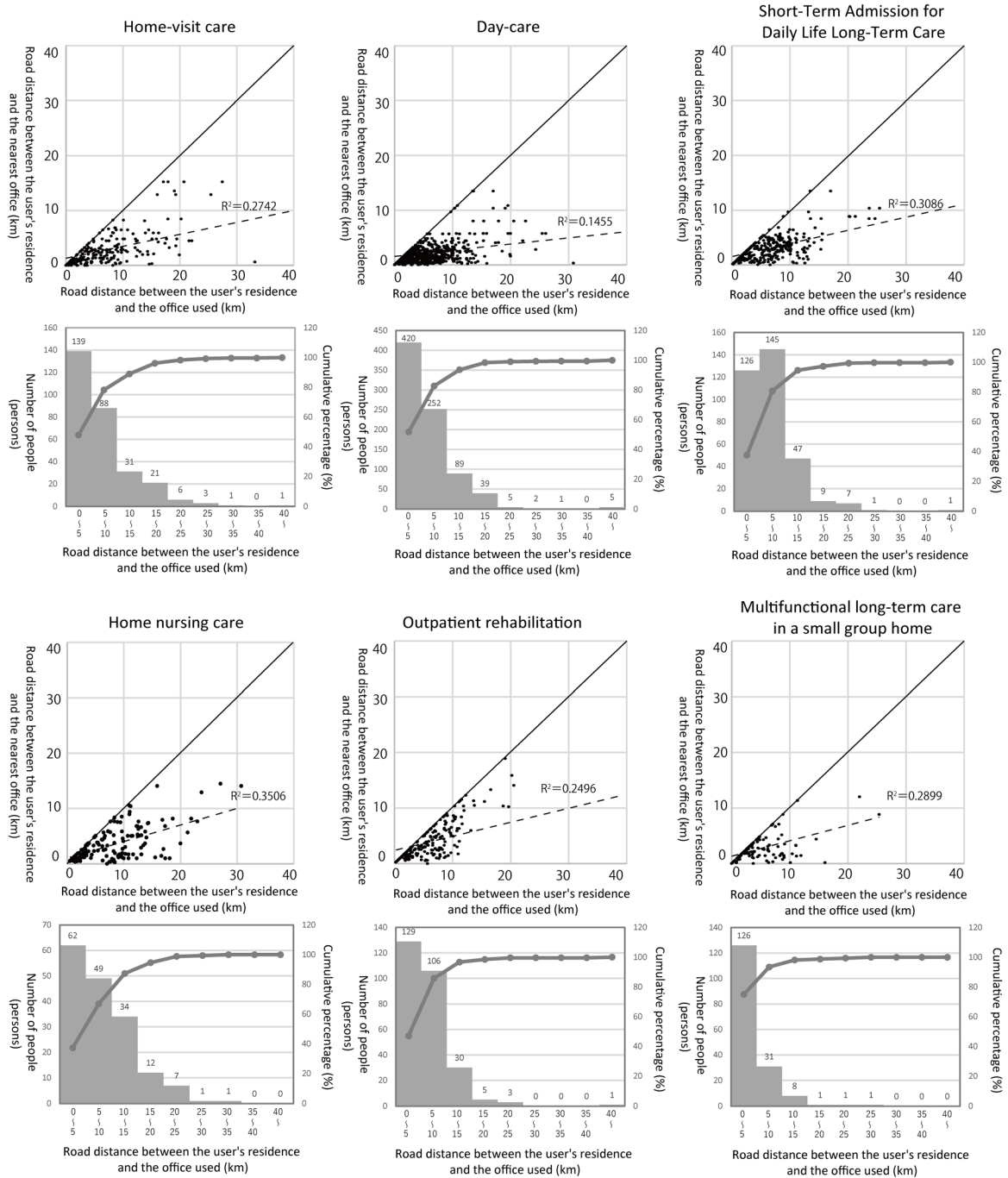


Figure 5. Relationship Between the Road Distance Between the User's Place of Residence and the Nearest Neighbouring Office and the Road Distance Between the User's Place of Residence and the Office Actually Used (Upper Panel); and Distribution of Users by Road Distance Zone Between Their Place of Residence and the Office They Use (Bottom Panel)

## 4. Conclusion

### 4.1. Summary of Analysis Results

This study has analysed the completeness of long-term care services in the sphere of daily life and analysed accessibility using road distances, based on one month's long-term care receipts in  $\alpha$ -city, in order to understand the actual usage of long-term care services. The results revealed the following.

(1) Whether or not there is a relevant care office within the sphere of daily life depends on the type of long-term care services, and therefore the characteristics of service completeness within the sphere of daily life also differ for each type of service. If there is no care office in the sphere, the rate of outflow to the neighbouring sphere tends to be relatively high.

(2) Some service types, such as home-visit care, home-visit nursing care, home-visit bathing and home-visit rehabilitation, have a high outflow rate outside the city. The tendency for a high rate of outflow outside the city for home-visit services is common with previous studies.

(3) Out of the K, L and M spheres in the mid-mountainous region to the east of  $\alpha$  city, the L and M spheres in particular have a small number of care offices located within the spheres, and the use of care beyond the sphere of responsibility of the Community General Support Centre is high. Conversely, in the B, E and F spheres on the west side of  $\alpha$  city, which form an urban area integrated with  $\beta$  city, there are many care offices located in the surrounding area, resulting in a high outflow rate to  $\beta$  city and the surrounding spheres. Although a previous study showed that the completion rate was low in the sphere of daily life in urban areas and that people in mid-mountain areas tended to choose the nearest neighbouring care office, the results of this study differed from those of previous studies in that the completion rate within the sphere was low in both urban and mid-mountain areas.

(4) From both the analysis of completion within the sphere of daily life for each service type and the analysis of the distance of use for each service type, it was found that, regardless of the characteristics of each sphere of daily life, service type and distance to the most neighbouring office, the most neighbouring office was not selected, and care was not completed within the sphere of daily life as a whole. In addition, looking at the Community General Support Centre's sphere of responsibility, it became clear that the use of services was concentrated in the Y area, which covers the areas including the B, E and F spheres that form the city centre, and that many people outflow from the X and Z spheres, indicating that care was not completed in the sphere of responsibility of the Community General Support Centre.

(5) From (1) to (4) above, it can be concluded that long-term care services are not completed within the sphere of daily life in  $\alpha$ -city, which has set up spheres of daily life based on elementary and junior high school districts, and that there is a large discrepancy between the current setting of sphere of daily life and the actual usage of long-term care. It was also found that there are differences in accessibility by region, with many people using services from the middle and mountainous areas to the urban areas.

### 4.2. Discussion

Regarding the actual situation in which service use is not restricted to the sphere of daily life or the nearest neighbourhood office, it can be considered that flexible service use is taking place according to the diverse needs of users and their respective environments. Specifically, in the sphere of daily life on the west side of  $\alpha$  city, which forms an integrated urban area with the neighbouring  $\beta$  city on the west side, there are many long-term care services offices located there, so there is a large choice of care offices, and it can be considered that users are selecting offices in search of services that are more suited to their needs. Conversely, in the mountainous areas to the east of  $\alpha$  city, there are no care offices



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located within the sphere or close to where the residents live, and they are often forced to use offices located further away. This is thought to be due to the fact that long-term care services in Japan are provided by the universal health insurance system, which results in a mixture of public and private services, and thus in coarse and dense use of services.

Based on these realities, it is necessary to consider long-term care services planning for the sphere of daily life, the sphere in charge of the Community General Support Centre and the city as a whole according to the characteristics of the inflow and outflow of each type of service, rather than the current area setting based on junior high school districts and primary school districts. The study also confirmed the need to consider facility allocation plans to maintain equity between spheres, the abolition or integration of spheres of daily life, and the establishment of planning areas across the city. In this study, the analysis was conducted without considering frequency in order to clarify the actual situation of long-term care services use on a city-wide basis, but in reality, frequency of use x distance is an important factor in considering the sustainability of services.

It is a future task to further widen the period and areas covered by the analysis and to incorporate the factors of frequency and distance into the analysis. This will allow us to study the possibility of introducing indicators such as distance indicators for the establishment of spheres of daily life and the assessment of accessibility equity. This study also did not consider the influence of user attributes, psychological factors and facility attributes (e.g. age, size, services provided, number of staffs, etc.) on facility selection. In the future, it will be necessary to consider the possibility of conducting interviews, questionnaires and other surveys on the impact of user attributes, psychological factors and facility attributes on facility choice, and to conduct additional analysis.

## 5. Acknowledgement

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