

# Analysis of Changes in Elderly People's Levels of Long-Term Care Needs and Related Factors With a Focus on Care Levels II and III

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## Abstract

New preventative benefits will be offered in Japan from spring 2018 in conjunction with reforms to the long-term care insurance system. We examined the relationship between maintenance/deterioration of the level of long-term care and services and diseases over time using KDB<Kokuho database> from late-stage elderly (hereafter "late-stage KDB") residing in City A, a medium-sized rural town. "Late-stage KDB" data from the 3-year period between 2012 and 2015 were combined, and 878 people requiring long-term care at levels II and III were included in the study. Based on the year 2012, we compared the groups requiring long-term care II and III. Furthermore, in comparison with 2015, we divided the subjects according to maintenance/deterioration of care level and compared the relevant factors between the groups.

In 2015, the care level remained the same for 354 (40.3%) people, and deteriorated for 524 (59.7%), while long-term care benefits and medical costs increased. The rate of increase in the level of care needs was higher among those in care level II. With regard to services, multifunctional long-term care in small group homes and admission increased, and facility services accounted for 47%.

On the other hand, in 2012, there were no differences with regard to service use or medical costs in the group of participants requiring long-term care levels II/III who experienced care maintenance/deterioration. This was because these services were already being used in City A. Maintenance rates were high in care facilities in the surrounding areas. Pathologically, the rates of respiratory, cerebrovascular, and cognition problems increased after 3 years. Logistic regression analysis showed no relationship between type of disease and maintenance/deterioration of care level. We believe that the reason for care deterioration is related to following the age-survival curve rather than service use.

## KEY WORDS

Level of Long-Term Care Needs , Changes , Factors , Long-term Care Insurance Services , Diseases , Late-stage KDB

## Introduction

It is clear that in the future in Japan, the population of the very old will increase, and the number of elderly with diseases such as dementia who require care will also grow. Thus, along with measures to counter frailty so that elderly people do not enter a state of long-term care needs, it is important to maintain their current state of

care needs and to have a tertiary system of prevention against deterioration including rehabilitation, medical care, and long-term nursing care. This tertiary system is known as the Long-Term Care Insurance System.

This system was first introduced in the year 2000 and is now entering its seventeenth year. It is an essential social security system to support the elderly by providing them

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with long-term care services based on comprehensive community care. The services are an integrated set including material services such as housing renovation and rental service for equipment for long-term care that is covered by public aid, services such as home-visit catering to long-term care (home-visit long term care) and home-visit nursing, and public facility services such as short-term admission for recuperation and health facility services. In recent years, there is a growing concern about the rising cost of total insurance (cost of nursing care benefits) due to the increased use of services, leading to various issues that need to be addressed<sup>1,2)</sup>. In response, the Ministry of Health, Labour and Welfare has been promoting the reform of the Long-Term Care Insurance System.

The ministry is in its second stage of these reforms, and is preparing for the complete enactment of the revised law in April 2018. The amended framework includes the following<sup>2)</sup>: ① a shift from a “long-term care” model to a “long term care” and “prevention” model; ② due to the increase in the prevalence of dementia, a shift from a “physical care” model to a “physical care” and “dementia care” model; and ③ due to the rapid increase in the number of elderly households, a shift from a “living with family” model to a “living with family and living alone” model. A significant change is that insurance for long-term care will become a two-pronged system of preventative benefits and long-term care benefits, and Supports I and II will be provided at the municipal level under the new framework of preventative benefits. Additionally, a community-based service will be introduced, in which multiple services can be offered efficiently at single locations with multi-functional long-term care in small group homes.

Amid these changes, this study used a data approach for elderly people in mid-sized regional City “K” to reveal changes in the level of care required with the passage of time, current usage of nursing care services, primary factors related to changes in the level of care required, and whether nursing care services are related to the maintenance or increase in the level of care required.

## Research Method

1. Object of Research and Method: empirical investigation. The data was extracted for care level II and III using late-stage KDB (2012-2015) residing in City A.

Subjects care level II and III were chosen for the research. Because, we examined the relationship between the maintenance/deterioration of the level of long-term care over time. We thought care level II and III were levels related to the divide from home to facility.

## 2. Data Collection

The city under investigation, City A in I Prefecture, is located in the southwest of the prefecture, and is a mid-sized city with a population of 100,000. It is the third largest in the prefecture. The district is standard, with 26.7% of the population being elderly, and 12.2% being very old<sup>3)</sup>. This was marginally younger than the prefectural average. The average age of the elderly was 75 years, with 17.9% in care, and this was lower than the prefectural average. The proportion with dementia, 12% (22.1% in the very old), was lower than the national average<sup>4)</sup>.

Having drawn up the “Sixth Elderly Health and Welfare Plan/Insured Long-Term Care Service Plan: 2015-2029,” City A is providing systematic support to the elderly<sup>5)</sup>. In 2014, health facility services and residential services were utilized at a rate of nearly 100%. Meanwhile, the rate of use was 87.6% for home-visit long-term care, 90.9% for home-visit nursing, and 50-70% for outpatient long-term day care; compared to neighboring municipalities, the oversupply of outpatient long-term day care in City A is notable.

This study used Health Insurance database (described below, KDB) of late-stage (henceforth “late-stage KDB”) within the city’s jurisdiction. Subjects 75 years old and over were chosen for the research, since over 90% of elderly who require support or long-term care are very old.

## 3. Framework of concept

The conceptual frameworks of this study are **【Classification of long-term care services】** and **【Classification of diseases】**.

### **【Classification of long-term care services】**

There are 48 kinds of long-term care services listed in KDB. It was classified into eight kinds of services mainly used, and it was shown below.

- ① [Home-Visit Long-Term Care]: Home-Visit Long-Term Care, Home-Visit at Night for Long-Term Care
- ② [Home-Visit Nursing]
- ③ [Rental Service of Equipment for Long-Term Care Covered by Public Aid]

④ [Outpatient Services] : Outpatient Day Long-Term Care, Outpatient Rehabilitation, Outpatient Long-Term Care for a Dementia Patient

⑤ [Guidance for Management]:Guidance for Management of In-Home Medical Long-Term Care , In-Home Long-Term Care Support

⑥ [Short-Term Admission for Recuperation] : Long-Term Care Covered by Public Aid,Long-Term Care Health Facility ,Sanatorium Long-Term Care

⑦ [Facility Service] : Long-Term Care Covered by Public Aid, Long-Term Care Health Facility, Sanatorium Long-Term Care、 Communal Daily Long-Term Care

⑧ ["Other"; integrated services] : Daily Life Long-Term Care Admitted to a Specified Facility、 Multifunctional Long-Term Care in a Small Group Home、 Income Maintenance, Communal Daily Long-Term Care for a Dementia Patient

**[Classification of diseases]** In every June from 2012 to 2015, the names of the first and second most common diseases were enumerated. The diseases were classified into 10 types, using their generic names.

#### 4. Method

##### (1) Comparing Data of 3 Years

It was compiled databases on Late-stage KDB since 2012. Late-stage KDB from June 2012 to September 2015 were used. Those whose "end date" was filled out for insurance during this period were removed from the data as they were assumed to be "deceased." There were 1966 individuals who were deceased. Then, data was extracted for care level II and III, and the data of 3 years were compared.

##### (2) Statistical Analysis

The basic attributes of the elderly, the long-term care requirement certification period, the long-term care services, the cost of nursing care benefits, medical costs, and disease names were reported using descriptive statistics, and their distribution was examined using each variable's skewness and kurtosis.

Based on the year 2012, we compared the group of requiring long-term care II and III and examined the relationship with long-term care services. Furthermore, in comparison with 2015, we divided the group of maintenance/deterioration of care level and compared the relevant factors between this groups.

Furthermore, chi-squared tests and one-way analyses

of variance (with a significance threshold of 5%) were conducted for changes in care levels (maintained or deteriorated) across the 3 years and gender differences; a logistic regression analysis was also conducted for factors related to the maintenance or deterioration in Care Level.

##### (3) Mapping

ArcsGIS Network Analyst was used to visualize geographic information regarding the locations of the facilities.

#### 5. Research Ethics

Informed consent procedures and methods for protecting personal information were taken into account.

##### (1) Informed consent procedures

Because we handled personal information regarding the residents, we exchanged a pledge and a collaborative research contract with the city, in accordance with City A' s personal information protection regulations. We abided by the contents of the pledge, which in detail establish confidentiality, prevent information leaks, provide for the appropriate management of information and the scope of disclosure of research findings to the public.

##### (2) Methods for protecting personal information

Full names and detailed addresses had previously been deleted from the KDB of City A, and we received the information from the university in its unlinkable and anonymized state, reducing the risk of leakage of personal information. Furthermore, the data were stored in a locked cabinet at the university.

This study was conducted with the approval of the Research Ethics Committee of the Kanazawa University School of Medicine, with which the authors are affiliated (approval number: 646-1) .

#### Results

The number of elderly peoples who require support or long-term care was 5008 people, accounting for all the elderly was 17.2% (2015) . This study focused on elderly people at care level II and III among subjects excluding those who deceased and moving in 2012-2015; there were 878 subjects in the sample, including 195 men and 683 women, with an average age of 85.4 years (SD=5.5) .

##### 1. Changes in Care Level Over Time for Elderly in Need of Long-Term Care

Overall trends for long-term care insurance certification

in City A in 2012-2015 included 1966 persons deceased and moving. The breakdown of decease was 301 persons care level II, 377 persons care level III, and a total of 626 people (31.8%) . In addition, 1031 people (52.4%) was care level IV and V .

Out of those who had long-term care insurance certification in 2015, compared to the time when they were first certified for care, 408 (8.2%) showed a reduction in the level of care required, 1775 (35.4%) showed no change, and 2576 (51.9%) showed an increase in the level of care required.

Based on the year 2012, there were 501 people at care level II and 377 at care level III.

Furthermore, in comparison with 2015, focusing on changes in care level II and III over the 3-year period, the care level remained the same for 354 (41.3%) people and deteriorated for 524 (59.7%) . The details were as follows; 180 (33.9%) of those at care level II had required the same level of care, while the care level requirements of 321 (64.1%) had increased; meanwhile, 174 (46.2%) in care level III had maintained the same care level required, while the care level required of 203 (53.8%) had increased. Thus, the rate of increase in the level of care required was higher among those in care level II; there was a significant difference between maintenance/increase and care level II /care level III. ( $\chi^2=512.337$  df=3  $p < .01$ ) .

## 2. Maintenance/Deterioration in Care Level Relative to Age, Period of Certification for Long-term Care, and Long-Term Care Services

The amount of time since being certified first was 8.0 years (SD=3.40) for those whose level focusing on changes over the 3-year period, the average age was 85.3 years (SD=5.54) for those who maintained the same care level, and 85.5 years (SD=5.48) for those whose level deteriorated at 2012. The average remained the same, and 8.1 years (SD=3.39) for those whose level deteriorated. The logistic regression analysis showed no relation between maintenance/deterioration in care level and age or period of time since certification.

In 2012, the cost of long-term care benefits was 155,853 yen (SD=72549) for care level II and 219,102 yen (SD=70762) for care level III, revealing a higher cost for care level III ( $t=-12.3$ , df=795,  $p<.01$ ) . Comparing maintenance/deterioration in care level with 2012 and 2015, the cost was 178,365 yen for those whose level remained the same (SD=79745) , and 185,524 yen (SD=77236) for those whose level deteriorated; the cost for those whose level of care level deteriorated was slightly higher, but the difference was not significant.

Meanwhile, looking at changes over time, the cost of long-term care benefits was 182,677 yen (SD=78273) in 2012, and 239,978 yen (SD=75543.8) in 2015; the cost after 3 years was significantly higher ( $t=-19.7$ , df=755,  $p<.01$ ) .

Table 1. The Basic Attribute and Long-Term Care Services in 2012

population	ages (SD)	Care Levels	population (%)	sex		Home-Visit Care N=77	Home-Visit Nursing N=30	Outpatient Services N=444	Rental Service N=255	Short-Term Admission N=105	Other;integrated services N=228
				male(%)	female(%)						
878	85.3 (3.4)	Care Levels II	501 57.1%	114(22.8%)	387(77.2%)	57	23	298	152	52	100
		Care Levels III	377 42.9%	81(21.5%)	296(78.5%)	20	7	146	103	53	128
				N=195	N=683						

Table 2. Maintenance/Deterioration in Care Level (2012-2015) and Long-Term Care Services in 2015

	Sex <sup>1)</sup>		Chang ,Popuration <sup>2)</sup> N=878	Care Levels, Popuration	Home-Visit Care	Home-Visit Nursing	Outpatient Services <sup>3)</sup>	Rental Service	Short-Term Admission	Other;integrated services <sup>4)</sup>	Facility Service
	Male	Female									
Maintenance	90 46.2%	264 38.7%	354 (41.3%)	Care Levels II 180 Care Levels III 174	33 13	12 5	189 76	97 59	35 32	74 71	0 0
Deterioration	105 53.8%	419 61.3%	Care Levels II⇒III	321	14	5	56	46	18	86	70
			Care Levels II⇒IV	(36.6%)	16	8	49	55	27	127	123
			Care Levels II⇒V								
			Care Levels III⇒IV	203	6	7	17	23	5	60	54
			Care Levels III⇒V	(23.1%)							

1) Chi-square test with Sex and Care Level \*  $P<.05$ )

2) Chi-square test with Maintenance/Deterioration and level of long-term care required \*\*  $P<.01$ )

3) Chi-square test with Maintenance/Deterioration and Outpatient Services \*\*  $P<.01$ )

4) Chi-square test with Maintenance/Deterioration and integrated services \*  $P<.05$ )

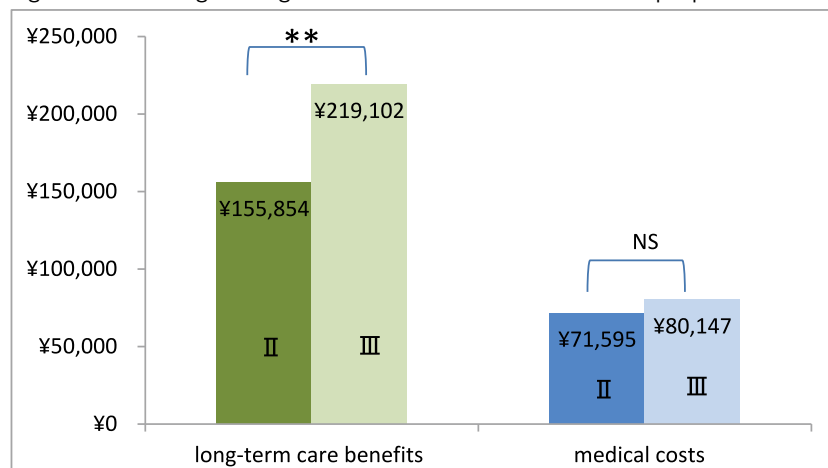
In comparing costs for maintenance/deterioration of care level, it was found that as of 2015, the cost for the group whose level deteriorated was significantly higher ( $t=171.3$ ,  $df=796$ ,  $p<.01$ ) .

On the other hand dates back to 2012, the primary services used 77 people (8.8%) used home-visit long-term care; of the group who maintained the same care level, 31 people (3.5%) used this service with the cost of benefits at 52,177 yen ( $SD=46785$ ) ; of the group whose care level deteriorated, 46 people (5.2%) used this service with the cost of benefits at 69,461.6 yen ( $SD=58476.8$ ) . No relationship was found between use of this service and maintenance/deterioration of care level.

444 people (50.6%) used Outpatient Services; of the group who maintained the same care level, 179 people

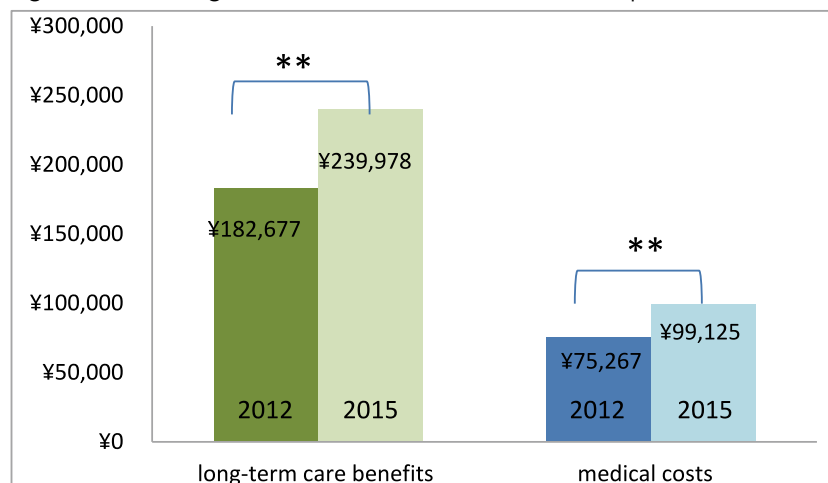
(40.3%) used this service with the cost of benefits at 105,841 yen ( $SD=57288$ ) ; of the group whose care level deteriorated, 265 people (59.6%) used this service with the cost of benefits at 108,471 yen ( $SD=56009$ ) . Focusing on changes over the 3-year period, those at deterioration group used the service more than those at maintenance group ( $\chi^2 = 26.698$ ,  $df=1$ ,  $P < .001$ ) , although in 2015, those at care level II used the service more than those at care level III ( $\chi^2 = 55.623$ ,  $df=1$ ,  $P < .001$ ) . As for integrated services listed as "other," the group whose care level deteriorated used these services more than the group who maintained the same care level over time ( $\chi^2 = 2.530$ ,  $df=1$ ,  $P < .05$ ) . A logistic regression analysis showed no relationship between use of services and maintenance / deterioration of care level.

Figure1 The average of long-term care benefits and medical costs per person in 2012



1) t-test with care leaves II, III in 2012, \*\*  $p<.001$

Figure2 Cost of long-term care benefits and medical costs compare with 2012 and 2015



t-test with a corresponding with cost of long-term care benefits and medical cost in 2012- 2015, \*\*  $p<.001$

### 3. Changes in Services in Conjunction with deterioration Care Level

Of the 524 people whose level of care deteriorated over the 3-year period, the level of care of 312 (59.5%) deteriorated by one level, that of 166 (31.7%) deteriorated by two levels, and that of 46 (8.8%) deteriorated by three levels. The cost of long-term care benefits for each service in 2015 went up, but those that reached significance were home-visit long-term care, ( $t=-2.69$ ,  $df=35$ ,  $p<.05$ ), outpatient services ( $t=-7.64$ ,  $df=225$ ,  $p<.001$ ), and other; integrated services ( $t=-2.90$ ,  $df=189$ ,  $p<.01$ ). Another notable change in 2015 was the increase in the use of health facility services; 247 people (47%) used this service, with the cost of benefits at 260,272 yen ( $SD=45519$ ).

### 4. The Relationship Between Medical Costs and Disease Type on the maintenance/deterioration of Level of Care Required

In 2012, no significant difference in medical care costs was found between care level II at 71,595.1 yen ( $SD=14521.4$ ) and care level III at 80,147.1 yen ( $SD=1999.0$ ). In 2015, medical costs rose significantly ( $t=-2.96$ ,  $df=877$ ,  $p<.01$ ) to 99,125.4 yen ( $SD=192469.9$ ).

As for the main diseases cited in 2012, 207 (23.6%) people were undiagnosed, 199 people (22.7%) had circulation problems including high blood pressure, and 164 (18.7%) had cognitive disorders. For sub diseases, 252

(28.8%) were undiagnosed, 252 (28.8%) had circulation problems including high blood pressure, 75 (8.6%) had cognitive disorders, and 77 (8.8%) had muscular-skeletal problems. The group whose care level needs deteriorated had a higher proportion of respiratory problems and cerebrovascular problems than the group who maintained the same care level, but the difference was not significant.

We compared the main diseases cited in 2015 between the group who maintained the same level of care needed and the group whose level deteriorated; in terms of respiratory problems, there were 17 (28.8%) and 42 (71.2%) respectively; in terms of cerebrovascular problems, there were 15 (23.1%) and 50 (76.9%) respectively, showing a significant difference ( $\chi^2 = 20.881$ ,  $df=10$ ,  $P < .05$ ) between the two groups.

We also compared the sub diseases cited between the group who maintained the same care level needs and the group whose level deteriorated; for cerebrovascular problems, there were 24 people (35.3%) and 44 (64.7%) respectively, while for cognitive problems there were 23 (37.1%) and 39 (62.9%) respectively.

The rates of respiratory problems, cerebrovascular problems, and cognition problems deteriorated after 3 years. A logistic regression analysis showed no relationship between type of disease and maintenance/deterioration of care level.

Table 3. Disease Type on the Maintenance/Deterioration of Level of Care Required

	2012 main diseases			2012 sub diseases			2015 main diseases <sup>1)</sup>			2015 sub diseases		
	population %	Maintenan ce	Increase	population %	Maintenan ce	Increase	population %	Maintenan ce	Increase	population %	Maintenan ce	Increase
Nothing or Unknown	207 23.6%	92 44.4%	115 55.6%	252 28.8%	110 43.7%	142 56.3%	231 26.3%	93 40.3%	138 59.7%	296 33.8%	112 37.8%	184 62.2%
Cardiovascular problems	199 22.7%	80 40.2%	119 59.8%	180 20.5%	73 40.6%	107 59.4%	136 15.5%	56 41.2%	80 58.8%	173 19.7%	77 44.5%	96 55.5%
Respiratory problems	25 2.9%	6 24.0%	19 76.0%	23 2.6%	8 34.8%	15 65.2%	59 6.7%	17** 28.8%	42** 71.2%	37 4.2%	12 32.4%	25 67.6%
DM	57 6.5%	29 50.9%	28 49.1%	66 7.5%	23 34.8%	43 65.2%	48 5.5%	24 50.0%	24 50.0%	51 5.8%	23 45.1%	28 54.9%
Gastrointestinal problems	31 3.5%	15 48.4%	16 51.6%	60 6.8%	24 40.0%	36 60.0%	45 5.1%	20 44.4%	25 55.6%	59 6.7%	27 45.8%	32 54.2%
Cerebrovascular problems	46 5.2%	14 30.4%	32 69.6%	57 6.5%	20 35.1%	37 64.9%	65 7.4%	15** 23.1%	50** 76.9%	68 7.8%	24 35.3%	44 64.7%
Cognitive disorders	164 18.7%	56 34.1%	108 65.9%	75 8.6%	28 37.3%	47 62.7%	138 15.7%	60 43.5%	78 56.5%	62 7.1%	23 37.1%	39 62.9%
Cancer	11 1.3%	6 54.5%	5 45.5%	0 0.0%	0 0.0%	0 0.0%	7 .8%	3 42.9%	4 57.1%	2 .2%	2 100.0%	0 0.0%
Bone muscle problems	69 7.9%	31 44.9%	38 55.1%	77 8.8%	34 44.2%	43 55.8%	46 5.2%	24 52.2%	22 47.8%	55 6.3%	25 45.5%	30 54.5%
Renal urological problems	32 3.6%	14 43.8%	18 56.3%	32 3.7%	15 46.9%	17 53.1%	51 5.8%	26 51.0%	25 49.0%	32 3.6%	16 50.0%	16 50.0%
Other	36 4.1%	11 30.6%	25 69.4%	54 6.2%	19 35.2%	35 64.8%	51 5.8%	16 31.4%	35 68.6%	42 4.8%	13 31.0%	29 69.0%

1) Chi-square test with Maintenance/Deterioration and Main Diseases in 2015 \*\*  $P < .05$

#### 5. Map of maintaining / deterioration by district

To find the rate of maintenance of required level of care and the rate of deteriorated care level required in 2015, a comparison from 25 elementary school districts was done, with care levels II and III in 2012 as denominators. No statistical difference was revealed; however, it could be inferred from the map that the group who maintained the same required level of care lived near health facilities.

### Discussion

#### 1. Overview of Maintenance/Deterioration of Required Long-Term Care Level for Elderly in City A and Changes Over Time in care level II and III

Overall, the elderly in City A in 2015 were comprised of 29,092 elderly, 13,539 very old, and 5,008 who had certification for long-term care. In the period from 2012 to 2015, of those who were certified, 40% died, and as for changes in level of care required, 8.2% improved, 35.4% maintained the same level, and 51.9% deteriorated.

Of the 524 in this study whose required level of care deteriorated, 60% deteriorated by one level, 32% deteriorated by two levels, and 8.8% deteriorated by three levels.

This change in level of care has also been pointed out in a 9-year modified distribution study of levels of care by Nagata et al<sup>4)</sup> ., wherein higher the level of care required, lower was the exponential curve for survival rate, with the greatest difference after 5 years. Furthermore, the length of time it took to reach 50% survival rate was 2 years for care level V, 5 years for care level II, and roughly equal 1-year intervals from care level V to care level II, with care level III showing the greatest shifts to other levels. This study found similar results.

This study focused on care level II and III; that is because as the survival rate curve drops as people become very old, those at care level II and III are on the cusp of requiring the same and deteriorated levels of care. The number of people in the maintained/deteriorated groups from 2012 to 2015 were 40% and 60%, respectively.

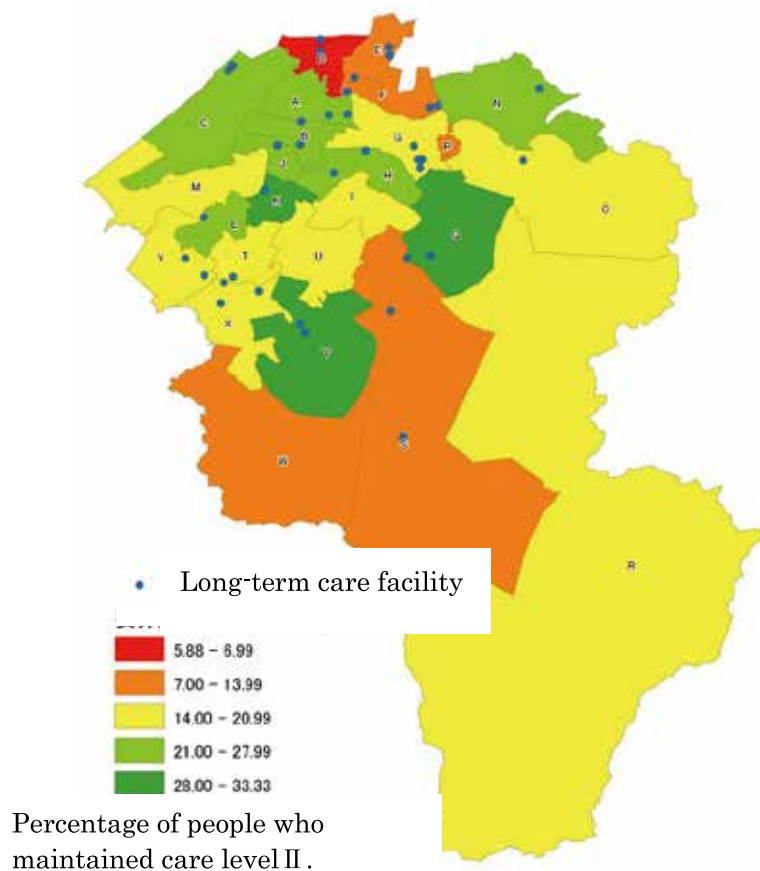


Figure3 Map of long-term care levels II and Long-term care facilities

Comparing care level II and care level II within these groups, care level III is almost 50%, while for care level II, the rate for deteriorate in level of required care is higher, at 64% compared with 34% for maintaining the same level of required care. Due to differences in the population and the survival rate, this is similar to results noted in earlier studies<sup>6)</sup>.

## 2. Analysis of maintenance/deterioration pertaining to long-term care level II and III and related factors

Analysis of maintenance/deterioration in the level of nursing care and related factors was conducted with respect to (1) basic attributes, (2) availability of nursing care services and long-term care benefit costs, and (3) maintenance/deterioration in the level of care and disease.

### ① Sample Characteristics.

The average age of participants was 85.4 years, with no significant differences between long-term care levels II and III. In general, the level of care provided to the elderly is dependent on age, but there was no difference in the ages of people receiving care level II and III among the participants close to the mean age in the late-stage elderly group. Regarding gender, women in the deterioration group worsened, which is common among all elderly people, although more frequent with respect to women<sup>8)</sup>.

We also examined the period following initial certification. As the average care period for both maintenance/deterioration groups was 8 years and the life expectancy of long-term care level II and III participants was 4 to 5 years, in general, it can be said that the "long-term care period for elderly people is 10 years,"<sup>9)</sup> which was supported by these results.

### ② Long-Term Care Services and Benefit Costs.

The average benefit cost of long-term care at care level II and III (2012) was 182,677 yen, and the mode value was 237,132 yen. Incidentally, 81 people (9%) did not use the services. The cost for care level III was higher than for care level II. In contrast, when comparing the maintenance and deterioration groups, costs in the deterioration group were slightly higher, but no significant difference between the groups was observed. Although higher use for care level III is to be expected, we did not anticipate that there would be no significant difference between the groups. That is, we did not expect that in City A, where long-term care services are customarily used, that there would be no deterioration of services due to the societal issue of

lack of use or limited use of these services<sup>10)</sup>. We verified the importance of fully utilizing the necessary long-term care services in the early stages of In-Home Medical Long-Term Care in improving or maintaining elderly people's ability to function in their daily activities<sup>11)</sup> and that the necessary services were used in City A.

These services were most frequently accessed as outpatient services by 50% (444 people). We found that care level II was used more often by people in the deterioration group than in the maintenance group. Stated differently, people who were anticipated to deteriorate used these services more regularly. Studies concerning factors preventing deterioration in the level of care provided have found that physical therapy can be effective in recovering ADL in patients with disuse syndrome<sup>12)</sup>.

Regular use of these services has also been indicated as effective for patients with dementia<sup>13)</sup>. The next most frequently used service was Short-Term Admissions for Recuperation (105 people (12%)), which was used regardless of maintenance/deterioration status. Because Short-Term Admissions for Recuperation also reduce the care burden on patients' family members, there was no difference between the maintenance/deterioration groups or between care level II and III. In the past, use of Short-Term Admissions for Recuperation led to deterioration in the level of care provided, that is, the sudden change in environment and the accompanying feeling of abandonment was disturbing for the elderly<sup>4)</sup>. However, in recent years, progress has been made towards solving this issue by providing home-care visits, such as facilities providing daily services, and via Multifunctional Long-Term Care in Small Group Home Facilities.

In contrast, the utilization of home-visit services was low, with Home-Visit Long-Term Care use at 8.8% and Home-Visit Nursing use at 3.4%. This reason for this finding is believed to be that care level II and III often comprise care plans for facility services. However, the use of home-visit services is expected to increase among elderly people requiring housekeeping assistance, such as those with Parkinson's disease<sup>15)</sup>, as well as among people needing medical treatment for conditions such as cancer. In addition, 255 people (29.0%) used welfare services, and there was no difference with respect to users' maintenance/deterioration status. Others have pointed out that excessive services, such as wheelchair rental services may cause deterioration in the level of care<sup>14)</sup>, but this



issue is unrelated to our study.

In examining changes by year, the cost of care benefits was significantly higher in 2015. We believe that this is a natural consequence of aging and deterioration in the level of care. Among the services provided, Home-Visit Long-Term Care use increased in regard to housekeeping assistance, physical care, and outpatient services, and the use of Multifunctional Long-Term Care in Small Group Homes and Specific Facility Outpatient Day Long-Term Care services also increased. Multifunctional Long-Term Care in Small Group Homes is a combination of the services provided to private homes. In addition, specialized Outpatient Day Long-Term Care is a service in which fee-collecting nursing homes or residences offering services for seniors are visited by helpers, and demand for this particular service has been growing in recent years.

Facility services have undergone substantial change, resulting from deterioration in the level of care provided. These services accounted for half of the 247 people who shifted from level IV to level V long-term care.

Based on this study, no relationship between maintenance/deterioration and specific services was observed. Because the study population was small and standard nursing care services were provided in City A, we believe that there were no discrepancies in the level of care provided. We found that service facilities were located near areas with high maintenance levels and also that services were used in a standardized fashion according to the geographical map.

### ③ Maintenance/deterioration of the level of care and association with disease

There was no difference in medical costs in 2012 for those requiring long-term care at care level II/III and there were no differences in medical necessity. Medical expenses in 2015 were significantly higher. This result was caused by an increase in medical examinations due to declines in the level of care provided, as well as by age-related deterioration in bodily capacities, such as physical and mental disorders.

We examined the diseases affecting people in the deterioration group each year between 2012 and 2015. Considering the most common diseases among the deterioration group in 2015, respiratory system disorders affected 17 people and the rate of neurovascular diseases was higher in comparison to the maintenance group.

Regarding the sub diseases, neurovascular and psychiatric diseases were more common compared with the maintenance group. These results were consistent with the prevalence of these diseases in late-stage elderly<sup>7)</sup>. Many studies have cited aspiration pneumonia as the cause of deterioration in the level of care<sup>16)</sup>. Unexpectedly, there was no respiratory system disease indicated in this study.

When we examined diseases through binomial logistic regression analysis with maintenance/deterioration in the level of care provided as a dependent variable, the results showed no relationship between type of disease and maintenance/deterioration of care level.

### Study Limitations

Although this study used late-stage KDB data from 30,000 people residing in K city, the study population decreased in size due to the fact that the study was conducted as a 3-year longitudinal survey focusing on late-stage elderly requiring long-term care at level II/III. As such, it was not possible to obtain adequate results through multivariate analysis. In the future, we would like to increase the study population and reconfirm this relationship by including other cities as well.

In this study, we analyzed the changes in care level over time for elderly in need of long-term care. Therefore, it was necessary to analyze related factors among groups of maintenance, deterioration and decease. However, because decease could not be concluded, we compared in the maintenance and deterioration groups. An analysis of the decease groups is very important, so we would like to analyze related factors in the next study.

### Conclusion

Eight things have been clarified through this analysis of late-stage KDB with 878 elderly people in A City.

1. Focusing on changes in care level II and III over the 3-year period, the care level remained the same for 354 (40.3%) people, and deteriorated for 524 (59.7%) .

2. The rate of deteriorate in the level of care required was higher among those in care level II; there was a significant difference between maintenance/deterioration of care level and level of long-term care required ( $t < .01$ ).

3. Combining the 524 people at care level II and III whose care level requirements deteriorated, 312 (59.4%) deteriorated by one level, 166 (31.8%) deteriorated by two

levels, and 46 (8.8%) deteriorated by three levels. There was a significant difference between men and women in terms of the maintenance/deterioration of care level ( $t < .05$ ), with a higher rate of increase among women.

4. The statistical analysis showed no relation between maintenance/deterioration in care level and age or period of time since certification.

5. The cost of long-term care benefits for those whose level of care deteriorated was slightly higher, but the difference was not significant. However it was found that as of 2015, the cost for the group whose level deteriorated

was significantly higher

6. A logistic regression analysis showed no relationship between use of services and maintenance/worsening of care level.

7. The rates of respiratory problems, cerebrovascular problems, and cognition problems deteriorated after 3 years. A logistic regression analysis showed no relationship between type of disease and maintenance/deterioration of care level.

8. The maintenance groups rates were high in the surrounding area's care facilities.

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## 要介護高齢者の介護度維持と悪化の実態と関連要因の分析 －介護度Ⅱ、Ⅲと介護サービスを焦点化して－

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### 要 旨

我が国は2018年春より介護保険制度の新予防給付が始まり、制度改革の転換点にある。本研究は地方の中規模A市の後期高齢者医療データベース（以下「後期KDB」）を使って、介護度の維持／悪化の経年的変化と介護サービス、疾病との関連を検討するものである。データは「後期KDB」の2012年・2015年の3年分を結合し、要介護度ⅡとⅢの878人を対象とした。分析は2012年を基準として要介護度Ⅱ／Ⅲの群で比較し、さらに2015年との比較において維持群と悪化群で関連要因をみた。

2015年では介護度の維持が約4割で、6割が悪化、要介護ⅡがⅢよりも悪化し、介護給付費および医療費は増大した。サービスでは小規模多機能と入所サービスが増え、施設入所は47%に至る。一方2012年度に遡って、要介護ⅡとⅢの維持／悪化群を比較すると、サービス利用および医療費に差はなかった。介護度の維持／悪化群に差が無かったのは、A市では元来標準的にサービスが使われていたことが推察される。実際介護度維持率が高い地区は、サービス施設周辺地区であった。介護度悪化要因と疾病との関連では、3年後の群に呼吸器系、脳血管系、精神認知系疾患が増えていた。しかしロジスティック回帰分析では、疾病と維持／悪化に有意な関連はなかった。介護度悪化の理由は、介護サービス内容の関連はなく、加齢による生存率曲線（生命曲線）を辿っていると考えられる。