

**IRSET-0014**

**Estimation of Service Utilization and Occupancy Rate of Day Care Facility in Yamaguchi Prefecture**

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**Abstract**

Because of aging progress, elderly people with high degree of care are increasing, and many elderly people are waiting for entering a special nursing home. A day care facility has a large role, because waiting elderly people use a day care facility until entering a special nursing home. On the other hand, many day care facilities are established in urban area, so there is the disparity between urban and mountainous area.

This paper investigates establishment of day care facilities quantitatively by survey on the number of care-need certificated persons, a service utilization rate and occupancy rate in Yamaguchi prefecture, where aging is rapidly advanced and it is estimated to increase the demand of a day care facility.

The number of the care-need certificated persons of Yamaguchi prefecture has been calculated. The estimation accuracy is over 0.9, so parameter value is effective for estimating the number of the care-need certificated person of Yamaguchi prefecture. The service utilization rates are 0.20-0.49 in many old cities and 0.5 and more in many old towns and villages, so it tends to be high in mountainous area. The occupancy rates of all municipalities are 0.6-0.8, and has individualities. And there is the disparity among the municipalities specially in mountainous areas.

Keywords: Nursing-care insurance system, Day care facility, Care-need certificated person, Service Utilization rate, Occupancy rate

## **1. Background/ Objectives and Goals**

Because of aging progress, aging rate of 2014 became 26% and elderly people with high degree of care has continued to increase. The elderly people can use the visiting type, type to go to a facility, short-stay type and housing type service after introducing the aged person welfare work, such as the nursing-care insurance system. A day care facility is the type to go to facility and has a large role that providing the place where the elderly people spend in the daytime.

A special nursing home is the housing type and receives the elderly people with high degree of care. It is a serious issue that 524,000 people were waiting for entering a special nursing home in 2014. However, it is not easy to establish the new facility, because the number of the facilities is limited by local governments. Therefore, the role of a day care facility will become bigger in the future, because waiting elderly people use a day care facility until entering a special nursing home. On the other hand, many day care facilities are established in urban area, so there is the disparity between urban and mountainous area. Therefore, it is important to clarify the demand of a day care facility in detail.

In previous studies of the field of building and city planning, there are the accumulations of the study such as a grasp of the location actual, evaluation of the service level, consideration and suggestion of optimal location layout planning 1-3), and classifying the characteristics of the demand for the elderly 4). On the other hand, about the problems considering disparities of welfare services, there are the accumulations of the study such as the research pointing out uneven distribution and regional disparity of the facilities location 5-6). But there are few studies of analysis of the time-series change of facilities supply based on each small area for 15 years since nursing-care insurance system was introduced, as a target for whole area of the local prefecture including the urban region and rural region where the depopulation and aging is remarkable.

As mentioned above, this paper investigates establishment of day care facilities quantitatively by survey on the number of care-need certificated persons, a service utilization rate and occupancy rate in Yamaguchi prefecture, where aging is rapidly advanced and it is estimated to increase the demand of a day care facility.

## **2. Methods**

Firstly, the number of care-need certificated persons of Yamaguchi prefecture have been estimated in 2000-2040, using parameter values of before 2005 and after 2009. After that, the estimation accuracy of the care-need certificated persons in Yamaguchi prefecture was calculated. The data used for analysis are compiled from All-Japan Federation of National Health Insurance Organizations: the number of care-need certificated persons by age group and a care-need level in all over japan (2001-2015), result of national census and vital statistics (2000-2014) and

National Institute of Population, Social Security Research: future population estimates (2015-2040) and WAM NET: the number of care-need certificated persons (Welfare and Medical Service Agency) (2001-2014).

Secondly, a service utilization rate in 2015 has been calculated for every municipalities division before merger in the Heisei era, for analyzing the states of facility utilization in detail. The utilization rate is a ratio of the facility user for the number of the care-need certificated persons.

Thirdly, an occupancy rate in 2015 has been calculated for analyzing the states of facility management in detail. The occupancy rate is a ratio of the number of users of a day for the facility capacity. We conducted a questionnaire survey to 588 day care facilities in Yamaguchi prefecture in January, 2016. Survey components is the facility capacity, the number of facility registrants and the number of users of a day. 225 facility data were gathered and the response rate was 38.3%. In this paper, 297 facility data were gathered including the past survey.

### 3. Results

#### 3.1 The Estimation Method of the Number of the Care-Need Certificated Persons

The number of the care-need certificated persons of Yamaguchi prefecture has been estimated by based on the change of the care-need certificated persons number by an age group and a care-need level in all over Japan. Figure 1 shows change of the care-need certificated person number in all over Japan. The care requiring state sections have been able to divide into three periods. The state section of requiring help had one level in 2000-2005 as to first period. The state section of requiring help had two level, and a temporary care level was added in 2006-2008 as to second period. The temporary care level was deleted after 2009 as to third period. So, the data used for estimation are the number of them in 2001-2005 and 2009-2015. And the number of the care-need certificated persons has been estimated separately for before 2005 and after 2009. Firstly, the ratio of the care-need certificated person is calculated by an age of group and a care-need level. Figure 2 and 3 show the ratio of the care-need certificated person with care level 1.

Secondly, parameter values are calculated using the ratio of the care-need certificated person. In this paper, if the change of ratio of the care-need certificated person for 5 years is over 0.01, the parameter value is calculated using a regression equation. And if it is under 0.01, the parameter value is calculated using an average. Table 1 and 2 show the parameter value by an age group and a care-need level.

Thirdly, the number of the care-need certificated persons is estimated by based on the parameter value. The number of the care-need certificated persons by a care-need level is given by the following equation,

$$P_j = \alpha_{ij} \times A_i \tag{1}$$

where  $P_j$  is the number of the care-need certificated persons by a care-need level,  $\alpha_{ij}$  is the parameter value by an age group and a care-need level and  $A_i$  is the population by an age group.

And the number of the care-need certificated persons is given by the following equation,

$$P = \sum_{n=1}^7 (P_j) \tag{2}$$

where  $P$  is the number of the care-need certificated persons.

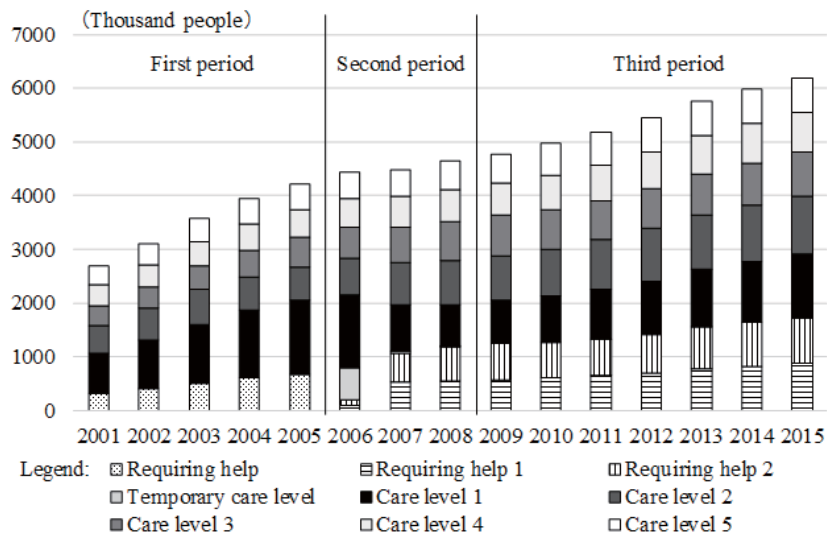


Fig. 1: Change of the care-need certificated person number in all over Japan

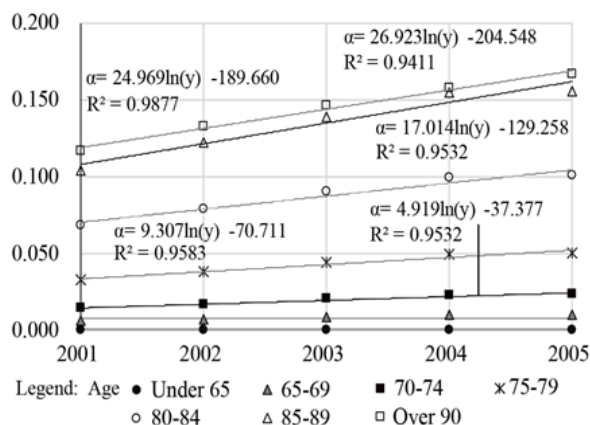


Fig. 2: The ratio of a care-need certified person with care level 1 in 2001-2005

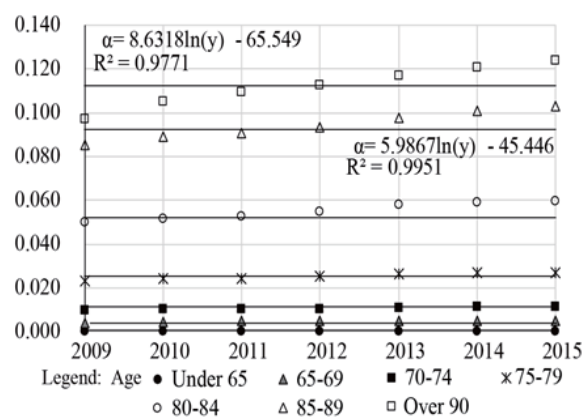


Fig. 3: The ratio of a care-need certified person with care level 1 in 2009-2015

The number of the care-need certified persons of all over Japan has been calculated using the above equations and compared with actual values. Table 3 shows the estimation accuracy. The estimation accuracy is over 0.95 in almost years as to 2001-2005, but the estimation accuracy of 2001 is 0.93 and a little low. However, the estimation accuracy is over 0.9 in all years. And, the estimation accuracy is over 0.95 in all years as to 2009-2015. So, parameter value is effective for estimating the number of the care-need certified persons.

### 3.2 The Estimation of the Number of the Care-Need Certified Persons of Yamaguchi Prefecture

The number of the care-need certified persons of Yamaguchi prefecture has been

Table 1: The parameter value by an age group and a care-need level before 2005

Age	Requiring help	Care level 1	Care level 2	Care level 3	Care level 4	Care level 5
-65	0.00008	0.00039	0.00030	0.00019	0.00016	0.00019
65-69	0.00363	0.00840	0.00519	0.00356	0.00315	0.00329
70-74	$3.523 \times \ln(y) - 26.776$	$4.919 \times \ln(y) - 37.377$	0.01056	0.00739	0.00671	0.00680
75-79	$7.424 \times \ln(y) - 54.153$	$9.307 \times \ln(y) - 70.711$	0.02052	0.01466	0.01350	0.01329
80-84	$12.462 \times \ln(y) - 94.695$	$17.014 \times \ln(y) - 129.258$	0.04171	0.03050	0.02877	0.02747
85-89	$13.754 \times \ln(y) - 104.505$	$26.923 \times \ln(y) - 204.548$	0.07576	0.05908	0.05850	0.05377
90-	$7.330 \times \ln(y) - 55.685$	$24.969 \times \ln(y) - 189.660$	0.11014	0.10030	0.11720	0.10760

Legend) y : Year

Table 2: The parameter value by an age group and a care-need level after 2009

Age	Requiring help 1	Requiring help 2	Care level 1	Care level 2	Care level 3	Care level 4	Care level 5
-65	0.00015	0.00026	0.00030	0.00041	0.00028	0.00022	0.00025
65-69	0.00370	0.00424	0.00481	0.00538	0.00378	0.00310	0.00305
70-74	0.00955	0.00943	0.01071	0.01087	0.00774	0.00645	0.00603
75-79	0.02370	0.02163	0.02534	0.02273	0.01648	0.01406	0.01272
80-84	0.04732	0.04384	0.05502	0.04670	0.03451	0.02970	0.02613
85-89	0.06164	0.06507	0.09426	0.08572	0.06747	0.05949	0.05116
90-	0.04417	0.05975	0.11229	0.13229	0.12649	0.13211	0.11405

Table 3: The estimation accuracy of all over Japan

Year	2001	2002	2003	2004	2005		
Estimate	2,879,633	3,171,344	3,471,153	3,785,895	4,160,577		
Actual figure	2,700,541	3,110,391	3,567,165	3,944,010	4,216,929		
Estimation accuracy	0.93	0.98	0.97	0.96	0.99		
Year	2009	2010	2011	2012	2013	2014	2015
Estimate	4,765,384	4,897,286	5,103,159	5,308,634	5,505,691	5,701,676	6,133,802
Actual figure	4,769,464	4,966,682	5,180,436	5,447,653	5,762,609	5,974,193	6,179,948
Estimation accuracy	1.00	0.99	0.99	0.97	0.96	0.95	0.99

estimated. Figure 4 shows the result. The increasing rate of the care-need certificated persons between 2000 and 2040 is about 3 times. And increasing rate between 2000 and 2005 is high especially. However, it has turned constant after 2035. According to a care level, increasing rates of them with care level 3 and 4 are about 2.6 and high.

The estimation results have been compared with actual values. Table 4 shows the estimation accuracy. The estimation accuracy is over 0.9 in all years as to 2001-2005, but the estimation accuracy of 2002-2004 is a little low. The estimation accuracy is over 0.95 in all years as to

2009-2015. Therefore, parameter value is also effective for estimating the number of the care-need certificated person of Yamaguchi prefecture, because the estimation accuracy is over 0.9 in all years.

**3.3 The Estimation of a Service Utilization Rate of a Day Care Facility**

A service utilization rate of a day care facility is calculated by each self-government body in 2000, because the facility use condition is clarified in detail. The service utilization rate is the number of facility registration users to the number of the care-need certificated persons, and can show the close value to the actual facility use condition. And, the service utilization rate of a day care facility is given by the following equation,

$$U_m = R_m / P_m \tag{3}$$

where  $U_m$  is a service utilization rate,  $R_m$  is the number of facility registration users by the municipality and  $P_m$  is the number of care-need certificated persons by the municipality.

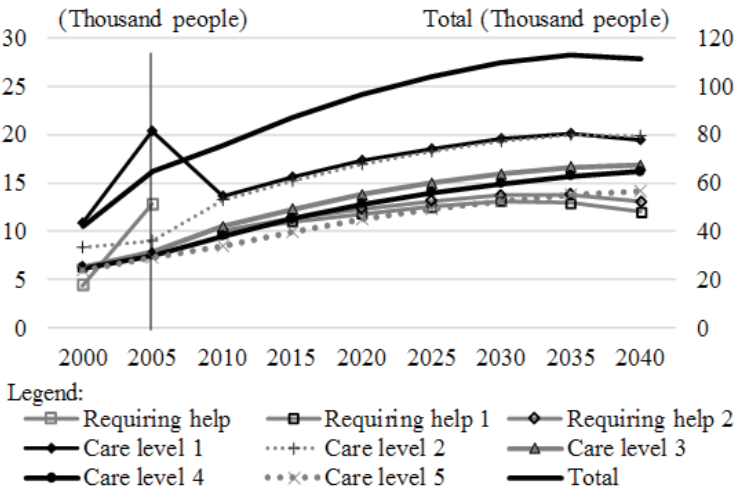


Fig. 4: The number of care-need certificated persons of Yamaguchi prefecture

Table 4: The estimation accuracy of Yamaguchi prefecture

Year	2001	2002	2003	2004	2005	2009	2010	2012	2013	2014
Estimate	46,166	50,443	53,816	58,266	64,415	70,137	73,167	77,812	79,727	81,791
Actual figure	46,929	53,433	58,575	62,506	64,943	69,981	72,531	76,984	82,678	85,959
Estimation accuracy	0.98	0.94	0.92	0.93	0.99	1.00	0.99	0.99	0.96	0.95

Before that, a registration magnification is estimated by based on the facility registration uses, because the all data of the facility registration users couldn't be gathered. The registration

magnification is the number of the facility registration users to the facility capacity, and is given by the following equation,

$$R_{mf} = E_f / C_f \quad (4)$$

where  $R_{mf}$  is the registration magnification,  $E_f$  is the number of facility registration users of each facility and  $C_f$  is the facility capacity of each facility.

Figure 5 shows the relationship between the registration magnification of each facility obtained by a questionnaire survey and a fulfilment rate of the facility demand by the municipality. A fulfilment rate of the facility demand is the facility capacity to the number of care-need certificated persons. However, they don't have a relationship. So, the registration magnification is estimated using an average of the facility of each municipality as to old cities, because the data of the facility registration users are many. And the rate is estimated using an average of the facility of the surrounding municipalities except for old cities, because the data of the facility registration users are few. And, the number of the facility registration uses is calculated by based on the registration magnification, and is given by the following equation,

$$R_f = M_f \times C_f \quad (5)$$

where  $R_f$  is the facility registration uses.

Figure 6 shows the number of the municipalities by the service utilization rate. The average of the service utilization rate of all over Japan is 0.22, and the average of the rate of Yamaguchi prefecture is 0.41. So, the rate of Yamaguchi prefecture is higher than all over Japan. The municipalities that the service utilization rate is from 0.20 to 0.39 are the most



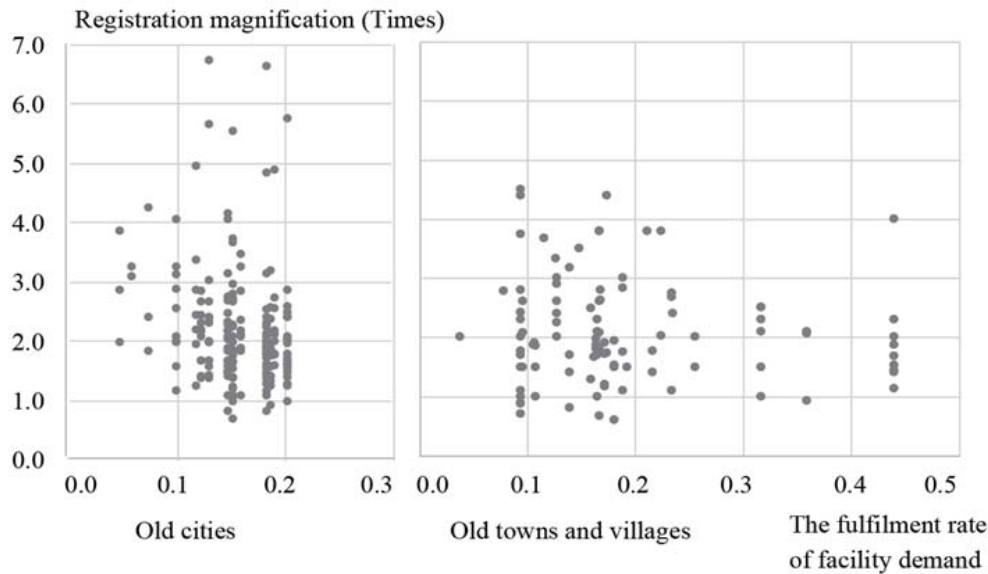


Fig.5: Relationship between the registration magnification and the fulfilment rate

with 9 in old cities. And, the rate of almost the municipalities is from 0.20 to 0.49. The municipalities that the service utilization rate is 0.50 or more are the most with 14 in old towns and villages, and the rate tends to be high. That's because the number of the care-need certificated persons is small. The service utilization rates of municipalities are distributed in the same number between 0.10 and 0.49, so there is the disparity among old towns and villages. In addition, the municipalities that the service utilization rate is low tend to have the small number of the care-need certificated persons, so the small number of the care-need certificated persons maybe affects the higher average rate of Yamaguchi prefecture than all over Japan.

### 3.4 The Estimation of an Occupancy Rate of a Day Care Facility

An occupancy rate of a day care facility is the number of users of a day to a facility capacity, and is efficient for grasping the status of facility administration. And, an occupancy rate of a day care facility is given by the following equation,

$$Mm = Rm / Cm \tag{6}$$

where  $Mm$  is an occupancy rate,  $Rm$  is the number of users of a day.

Figure 7 shows the number of the facilities by the occupancy rate, and the data is obtained by a questionnaire survey. The max occupancy rate is 0.90 or more and the minimum rate is 0.49 or less in all municipalities, and there is the big disparity. The municipalities that the occupancy rate is from 0.70 to 0.79 are many in old towns. On the other hand, there are no characteristics in old towns and villages. So, the occupancy rate has individualities, because it is affected by not only

the number of the facility registrants but also use frequency. Therefore, the occupancy rate is estimated using an average of the facility of each municipality as to old cities and an average of the facility of the surrounding municipalities except for old cities as with estimation of the service utilization rate.

Figure 8 shows the number of the municipalities by the occupancy rate. The municipalities

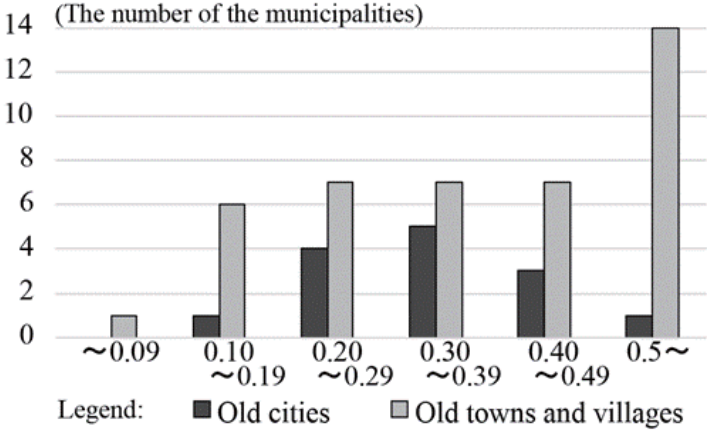


Fig.6: The number of the municipalities by the service utilization rate

that the occupancy rate is from 0.70 to 0.74 are the most in old cities. On the other hand, there is the disparity, because the max occupancy rate is 0.80 or more and the minimum rate is 0.65. And, the municipalities that the occupancy rate is from 0.70 to 0.74 are the most with 11 in also old towns and villages. However, the max occupancy rate is 0.80 or more and the minimum rate is 0.60, so there is bigger disparity than old cities. The individualities of the facilities maybe affect the individualities of the municipalities.

**3.5 Acknowledgments and Legal Responsibility**

- (1) The number of the care-need certificated persons of Yamaguchi prefecture have been calculated. The estimation accuracy is over 0.9 in all years, so parameter value is effective for estimating the number of the care-need certificated person of Yamaguchi prefecture. The increasing rate of the care-need certificated persons between 2000 and 2015 is about 2 times and the increasing rate of it between 2000-2040 is about 3 times. The increasing rate of it between 2000 and 2005 is the highest, when nursing care insurance was introduced just after. However, it has turned constant after 2035.

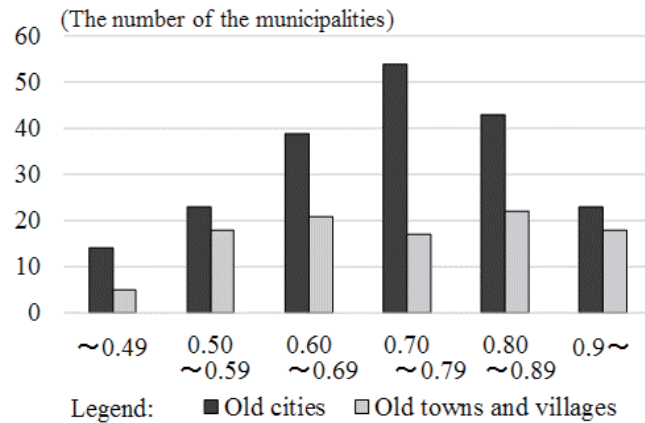


Fig.7: The number of the facilities by the occupancy rate

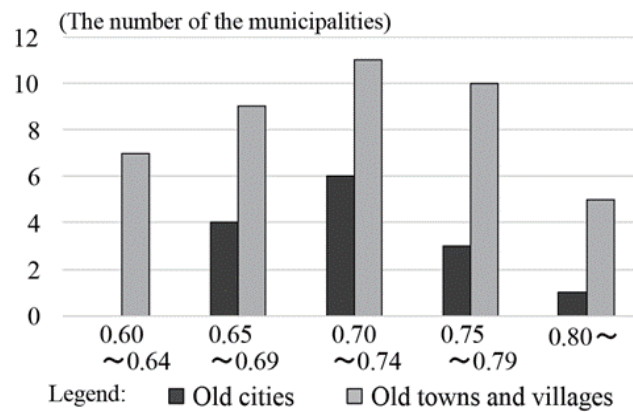


Fig.8: the number of municipalities by the occupancy rate

- (2) The service utilization rates are 0.20-0.49 in many old cities, and 0.5 and more in many old towns and villages. So, it tends to be high in mountainous area. It is particularly high in the areas, where the number of the care-need certificated persons is small or some the facilities with a fee-based home for the elderly have been established. And there are some municipalities that the service utilization rate is 0.09 or less, so there is the disparity among old towns and villages.
- (3) The occupancy rates of all municipalities are from 0.6 to 0.8, and has individualities. That's because it is affected not only the number of the facility registration users but also use frequency. Therefore, the occupancy rate of each facility has individualities, so the occupancy rate of each municipality also has individuality.

As mentioned above, the number of the care-need certificated persons of Yamaguchi prefecture was calculated, and good result has been obtained. It is possible to analyze the states of facility utilization in detail by calculation of the service utilization rate and the occupancy rate. And

there is the disparity among the municipalities specially in mountainous areas. It is important to analyze facility administration, using the data of the states of facility utilization.

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