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Concentration and Persistence of Health Care Costs for the Aged

Seiritsu Ogura and Reiko Suzuki

6.1 Introduction

There have been very few studies of the distribution of health care costs among individuals in Japan. The most likely explanation for this may be an absence of the appropriate longitudinal data sets that are indispensable to carrying out such analyses. Another reason, however, may be the implicit assumption that health care resources naturally are consumed by a small number of individuals who are in poor health or are in danger of dying. Moreover, even if we find that health care expenditures indeed are heavily concentrated among a few individuals, is there anything to be done about it? Are we ready to look at total health care resources and decide anew how they should be distributed?

It is interesting to note that it is common to discuss the regional variation in health care costs, even in Japan. Regional variations have been studied jointly with the physician-induced demand (PID) hypothesis; in PID studies, generally speaking, the main objective was not to judge whether given regions were spending too little or too much, but rather to test a particular hypothesis about how health care expenditures are determined.

This paper describes the distribution of health care expenditures among the elderly in Japan. We examine both regional and interpersonal variations in the hope of finding what determines each. Some have argued that it is not appropriate for us to discuss the interpersonal distribution of health care resources,¹ but we do not subscribe to such an “extreme” view.

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1. This is one of the reactions to a study on the costs of terminal care patients written by one of the coauthors of the present paper.

Even if we cannot find a way to improve the distribution of health care right away, we may obtain new insights into what health care is really about, why it costs so much, and why it grows so persistently.

The rest of this paper is constructed as follows: In section 6.2, we outline the distribution of health care costs among the elderly population, and single out the factors that characterize the high-cost elderly. In section 6.3, we focus on the high-cost elderly as represented by long-term inpatients and look into the effect that long-term hospitalization has on the regional variation in health care costs.

6.2 Distribution of Health Care Costs among the Japanese Elderly Population

As we stated at the beginning of this paper, there is virtually no information on the distribution of medical costs among elderly individuals (seventy years old or over) in Japan. It is the primary purpose of our exposition here to present a reasonably accurate picture of the distribution of medical expenditures among such individuals. We then focus on the characteristics of the “expensive” elderly and try to single out the factors that make them expensive.

6.2.1 Data Sources

We use a subset of the experimental Health and Medical Services System for the Elderly (HMSSE) data collected by a group of researchers at the National Institute of Public Health.² The original data were collected from participating municipalities of twelve prefectures during the period 1991–93. (Certain prefectures’ data were ultimately excluded, as will be discussed later.) The original database consists of two different data sets: Part A provides a summary of the health insurance claims of individual elderly in each month of that year, and Part B provides a slightly more detailed accounting of health insurance claims in a given month of the year (cross-sectional data). As a basis of our analysis we have chosen samples that satisfy the following requirements:

Complete records for twenty-four months. We selected individuals with complete entries for each month in Part A for both 1992 and 1993, including months with zero claims.³ Some prefectures, such as Hokkaido, Osaka, and Kochi, use different identification codes for different years; we eliminated their data.

2. The group was headed by professor Atsushi Gunji of Tokyo University; Mr. Tetsuji Fukawa almost single-handedly collected and prepared the data.

3. Again, we have excluded those who have become eligible for HMSSE benefits or those who have died sometime in the course of these two years.

Consistent identification coding for Part A and Part B. Unlike Part A, where the costs of all claims are aggregated for an individual, Part B contains the costs and primary diagnosis of each claim for one month in 1992 and 1993. Some municipalities (and all the municipalities in Okayama) used different identification codes for Part A and Part B, making it impossible to integrate them.

Matching 1993 for Part A and Part B. More municipalities provided Part B data in 1993 than in 1992. As a result, even in prefectures that used consistent identification codes for Part A and Part B and did so for both years, we have far more individuals matching in 1993 than in 1992. Instead of insisting that individual records match in 1992 and 1993, we require that they match only in 1993; we rely on 1993 diagnoses as our source of primary diagnosis.

Of the original data covering twelve prefectures, only data from Aomori, Fukushima, Toyama, Ishikawa, Fukui, Shizuoka, Shiga, and Wakayama met these criteria. So far, we have analyzed the data from Aomori, Fukushima, Toyama, Fukui, and Wakayama. Thus, our samples may not be nationally representative, because these five prefectures are concentrated heavily toward the rural north and are perhaps below average in terms of economic well-being. The number of individuals in our sample of five prefectures is 479,673 for Part A,⁴ and 328,134 for Part B.

6.2.2 Individual Ranking of Health Care Expenditures

We added inpatient and outpatient health care costs for each individual during the twenty-four-month period, ranked each individual in order of total expenditures within each prefecture, then computed the percentile for each individual in the prefecture. No attempt has been made to generalize percentiles across prefectures or to the general population. In the five prefectures taken together, the health care costs during these two years totaled 952,602 yen per elderly patient,⁵ of which 474,170 yen were for inpatient care and 478,432 yen were for outpatient care.

6.2.3 Concentration of Health Care Expenditures

In Japan as in the United States (Gornick, McMillan, and Lubitz 1993), at any point in time, health care expenditures are concentrated heavily on a relatively small number of individuals; this pattern tends to persist over

4. Of these, Aomori accounted for 110,323, Fukushima for 92,801, Toyama for 103,896, Fukui for 74,182, and Wakayama for 98,471.

5. The average total cost figure was 963,784 yen for Aomori, 855,449 yen for Fukushima, 1,101,504 yen for Toyama, 933,319 yen for Fukui, and 899,052 yen for Wakayama. The average total inpatient-care cost figure was 497,161 yen for Aomori, 407,956 yen for Fukushima, 606,050 yen for Toyama, 468,959 yen for Fukui, and 375,614 yen for Wakayama.

time. In our sample of almost half a million elderly in five prefectures observed over a two-year period, the median elderly spent slightly more than 500,000 yen in two years, while the mean elderly spent almost twice as much, slightly less than 1 million yen. The top 1 percent, on the other hand, spent about 9.5 million yen, or about twenty times the median amount, during the same period.

In terms of the proportion of the total expenditures on health care in a given prefecture, the results are even more dramatic. The bottom half of the elderly in terms of health care costs spent about 11 percent of the total, while the top 1 percent spent about 10 percent of the total. The top 3 percent spent about 22 percent of the total, the top 5 percent about 30 percent, and the top 10 percent about 45 percent. Now we know that, even among the elderly, health care expenditures are very heavily concentrated on a relatively small number of individuals. The degree of concentration is probably far beyond anything anyone has yet imagined.

6.2.4 Inpatient Care Costs, Outpatient Care Costs, and the Factors Leading to Concentration

In order to single out factors leading to this drastic concentration of health care expenditures, we decompose expenditures into inpatient and outpatient care costs. Figure 6.1 shows three cumulative distribution functions: for total costs, inpatient care costs, and outpatient care costs. The horizontal axis variable, the percentile ranking of health care costs, is common in three distributions. Clearly, compared with the distribution of total health care costs, outpatient costs are distributed far more equally among the elderly, and inpatient care costs are even more concentrated among the expensive few. In terms of the numbers, the bottom half of the elderly population consumed only about 1.2 percent of total inpatient care costs, but about 20 percent of total outpatient costs. The top 1 percent consumed about 3 percent of the total outpatient care costs, but almost 17 percent of the inpatient care costs. The top 10 percent consumed 18.4 percent of the outpatient care costs, but 73.5 percent of the inpatient care costs. Thus, it is the inpatient care costs that are producing the heavily concentrated health care expenditure patterns in the elderly population in Japan.

The two cumulative distributions in figure 6.2 look almost identical to those in figure 6.1, but are based on the number of days that health care services were received: the number of visits for outpatients and the number of days hospitalized for inpatients. Each distribution is shown separately in figures 6.3 and 6.4, respectively. Comparing these two, we may conclude that the primary determinant of the concentrated expenditure pattern is the extraordinarily large number of days that the highest percentile of elderly are hospitalized. For instance, not the proportion of individuals who stayed in the hospital for more than 730 days in each percentile of total health care costs. At the 95th percentile, only 2 percent of the elderly

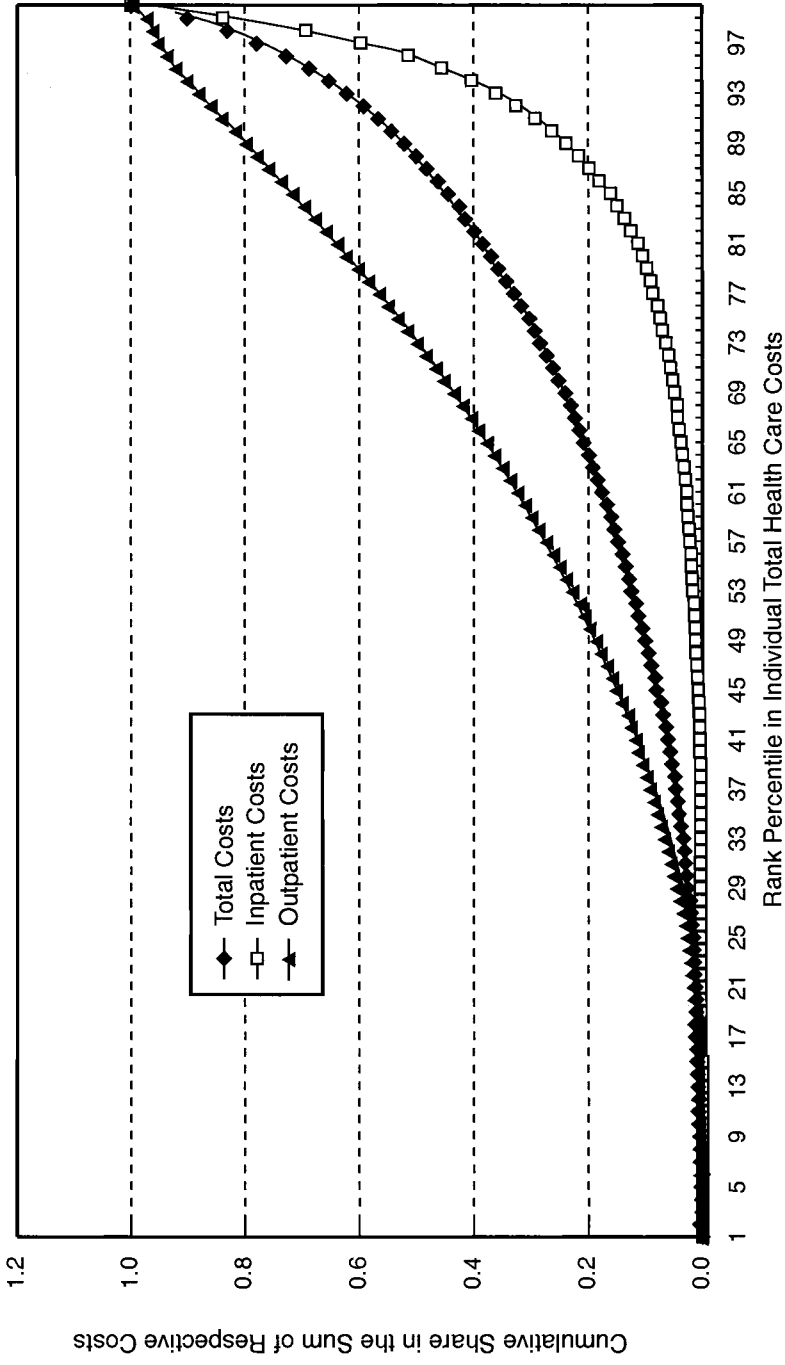


Fig. 6.1 Cumulative distribution of individual health care costs

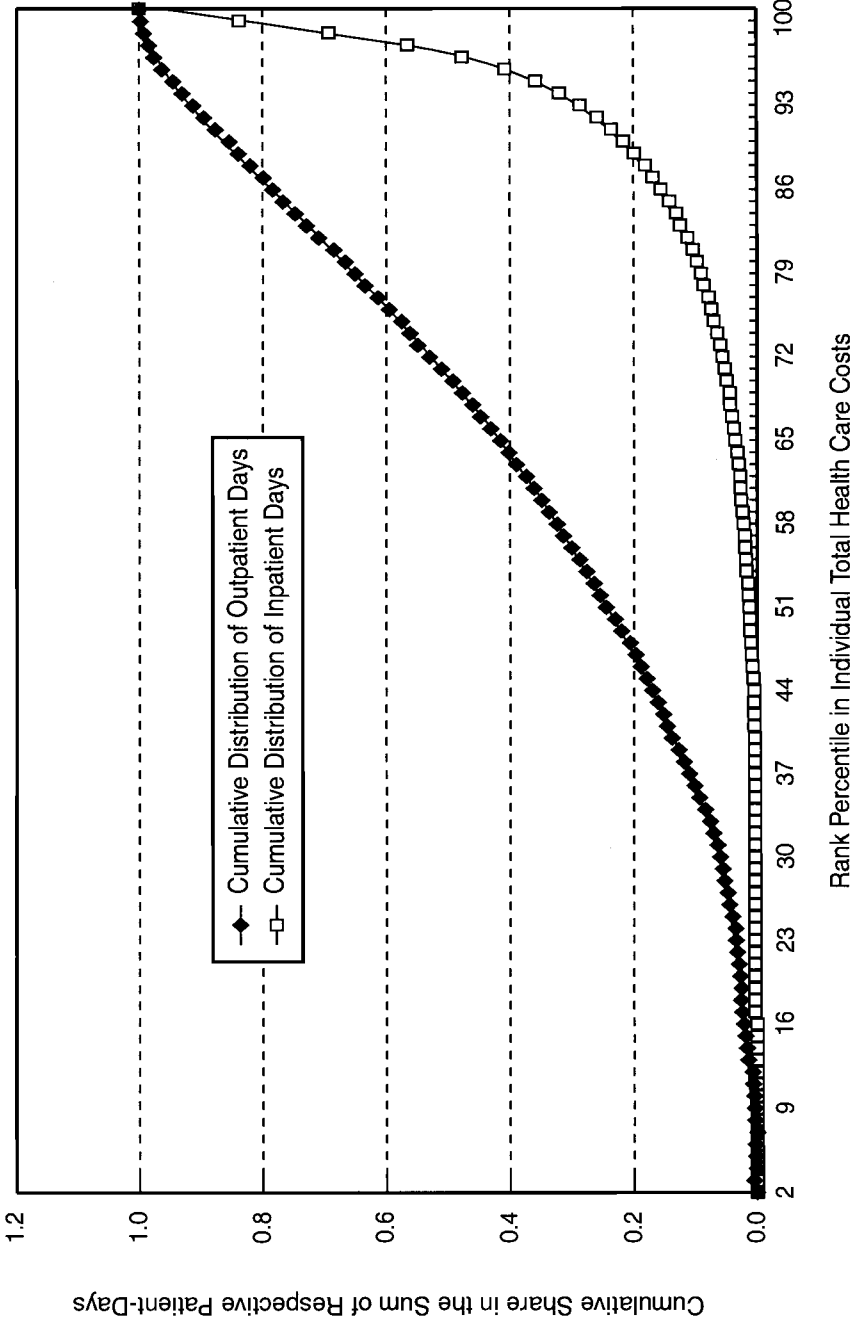


Fig. 6.2 Cumulative distribution of inpatient and outpatient days

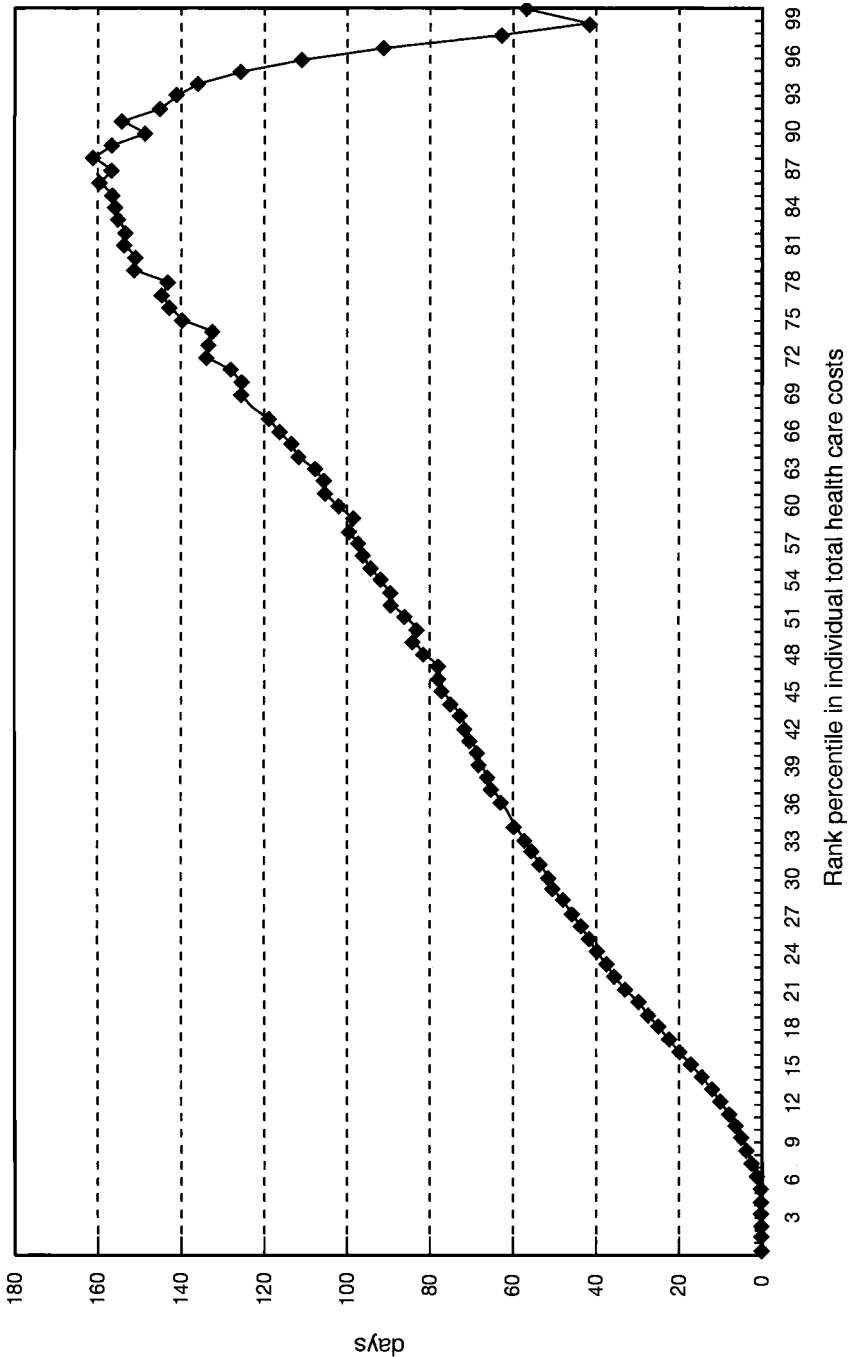


Fig. 6.3 Distribution of total outpatient days over a two-year period

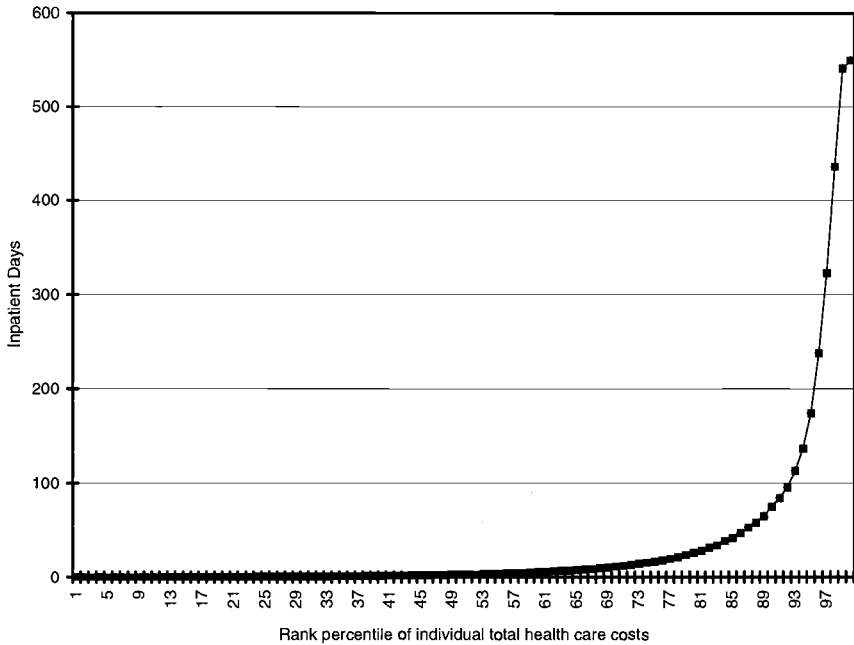


Fig. 6.4 Cumulative distribution of inpatient days

stayed in the hospital practically every day of the two-year period. At the 96th percentile, that proportion was 6 percent. But the proportion increases to 15 percent at the 97th percentile, 27 percent at the 98th percentile, 40 percent at the 99th percentile, and 45 percent at the top 1 percent.

6.2.5 Primary Diagnoses of the “Expensive Elderly”

In order to obtain information on diagnoses of the patients in Part B, we integrated Part B (cross-sectional data) with Part A (longitudinal data) for each patient. There were two problems associated with this process. First, since not everyone receives medical care in a given month, we lost some individuals who were in Part A. In fact, we lost about one-fourth of the individuals in Part A in this process, including those who never see a doctor during these twenty-four months. We were still left with almost 330,000 individuals in our combined sample. Second, in a given month, many patients see several doctors for an identical (or different) ailment(s); these several doctors may in turn give different diagnoses. For these patients, we had to choose a primary diagnosis. We simply chose the diagnosis for the most expensive claim of each patient in the month.

Table 6.1 gives the distribution of primary diagnoses of the patients whose Part A and Part B records are successfully integrated. In the same table, the distribution of primary diagnoses of the top 3 percent in health

Table 6.1 Number of Individuals in Each Primary Diagnosis Group in a Given Month in 1993

	Total Elderly Population					Top 3% of the Total Elderly Population						
	Total	Aomori	Fukushima	Toyama	Fukui	Wakayama	Total	Aomori	Fukushima	Toyama	Fukui	Wakayama
Contagious	4,458	1,086	477	921	779	1,195	199	58	26	34	37	44
Neoplastic	7,726	1,787	1,140	1,922	1,278	1,598	601	138	110	93	135	125
Endocrinal	14,395	3,584	1,735	4,123	2,060	2,893	607	168	64	182	77	116
Hematological	1,154	202	108	408	177	259	53	7	5	19	5	17
Mental	4,452	1,069	699	868	729	1,087	935	222	243	57	124	289
Ophthalmological/ Audiological	62,135	15,848	6,977	15,832	9,247	14,231	1,458	366	191	292	243	366
Respiratory	14,130	2,636	1,741	2,894	3,690	3,169	443	69	83	45	117	129
Digestive	27,855	6,794	4,075	5,534	4,249	7,203	674	164	110	110	102	200
Genitourinary	6,683	2,102	766	1,331	1,152	1,332	646	186	89	110	92	169
Dermatological	7,942	1,563	667	2,051	1,605	2,056	189	59	15	32	37	46
Skeletal	42,722	10,516	4,974	9,999	8,612	8,621	1,199	291	134	258	261	254
Unknown	2,517	424	319	450	319	1,005	56	4	8	2	5	37
Traumatic	5,757	1,298	567	1,334	1,116	1,442	328	92	30	58	44	104
Hypertensive	68,257	18,451	12,976	14,851	6,983	14,996	1,066	241	161	265	158	241
Coronary	23,638	5,846	3,874	5,040	4,151	4,727	1,005	248	152	238	152	215
Cerebrovascular	29,839	8,086	4,287	7,446	5,021	4,999	3,226	822	309	1,184	454	457
Other Circulatory	4,405	1,321	649	696	779	960	129	41	24	21	26	17
Total	328,134	82,625	46,047	75,707	51,964	71,791	12,816	3,176	1,743	3,001	2,069	2,827

Note: Total elderly population was taken from the five prefectures sampled: Aomori, Fukushima, Toyama, Fukui, and Wakayama.

care costs are given. In the general population of elderly, the most common diagnosis is hypertension (20.8 percent), followed by ailments of the nervous system (18.9 percent) and the musculoskeletal system. Among the group we describe as the “expensive” elderly, however, it is cerebrovascular disease (25.2 percent), followed by mental disease (11.4 percent). We have also computed the probabilities that a patient in each primary diagnosis group will join the expensive elderly.⁶ Mental diseases rank the highest at 21.0 percent, or 7.0 times the average likelihood; cerebrovascular diseases rank second highest (10.8 percent); and diseases of the urinary system rank third highest (9.7 percent), or 3.0 times the average likelihood.

Tables 6.2 through 6.4 give the average total costs, average inpatient care costs, and average outpatient care costs, respectively. Table 6.5 computes how much more time the expensive elderly spend in inpatient and outpatient care than do the average elderly with the same primary diagnosis. On average, the expensive elderly consume about 10.8 times as much inpatient care as the average elderly, but only 1.3 times as much outpatient care. On the other hand, average patients with mental diseases, diseases of the urinary system, and cerebrovascular diseases are relatively expensive to begin with and consume relatively intensive inpatient care, which accounts for the relatively low numbers for these groups for inpatient care.

6.2.6 Relevance of the Type of Medical Institution

Part B provides some information on the type of medical institution where a patient has been treated. Unfortunately, the classification of medical institutions is very crude. It distinguishes a teaching hospital, an incorporated private hospital, a hospital that is neither teaching nor incorporated, a clinic, or an out-of-prefecture institution, but does not provide any information on the size or location of the institution.

Based on this limited information, we have computed distribution statistics for utilization and costs. Table 6.6 shows the distribution of elderly patients across different types of institutions in a given month of 1993 in each prefecture. Throughout the municipalities of these five prefectures, 57 percent of all patients chose clinics, 12 percent chose incorporated private hospitals, and 28 percent chose the other types of hospitals. Teaching hospitals and out-of-prefecture hospitals accounted for only 1 percent of patients each. As for the expensive elderly, the distributions are very different (table 6.7): Only 17 percent were in clinics, but 42 percent were in incorporated private hospitals, and 36 percent in the other types of hospitals. Thus, if one is computing the probability that a patient in a given type of institution belongs to the expensive elderly (table 6.8), incorporated pri-

6. As we have defined the “expensive” to be at the top 3 percent, if we sum over all the primary diagnosis groups, we should get 3 percent—but, in fact, we recovered 3.9 percent. This is due to the fact that top 3 percent are defined relative to all the elderly in Part A, from which we have lost about one-fourth in our attempt to combine Part A with Part B.

Table 6.2 Average Health Care Costs during Two Years in Each Primary Diagnosis Groups (in thousands of yen)

	Total Elderly Population					Top 3% of the Total Elderly Population						
	Total	Aomori	Fukushima	Toyama	Fukui	Wakayama	Total	Aomori	Fukushima	Toyama	Fukui	Wakayama
Contagious	1,251	1,303	1,143	1,380	1,276	1,131	6,899	6,705	6,435	8,463	6,628	6,447
Neoplastic	1,922	1,791	1,863	2,018	2,096	1,855	6,920	6,624	6,418	8,137	7,033	6,662
Endocrinal	1,314	1,357	1,143	1,456	1,215	1,230	7,613	6,865	6,389	8,646	7,616	7,747
Hematological	1,306	1,096	1,219	1,428	1,185	1,398	8,121	5,941	8,240	9,688	10,878	6,421
Mental	2,379	2,313	2,806	2,219	2,219	2,405	6,161	5,978	6,045	7,383	6,090	6,189
Ophthalmological/ Audiological	1,123	1,112	1,016	1,190	1,149	1,096	7,020	6,708	6,080	8,661	6,726	6,708
Respiratory	1,114	1,125	1,158	1,076	1,086	1,147	6,651	6,875	6,069	8,026	6,361	6,691
Digestive	1,042	1,057	934	1,165	1,020	1,006	6,627	6,409	5,908	8,146	6,465	6,407
Genitourinary	2,092	2,005	2,163	2,259	1,831	2,245	10,474	10,375	10,524	11,104	9,959	10,426
Dermatological	1,032	1,141	898	1,122	991	935	7,496	7,110	5,966	9,756	6,507	7,712
Skeletal	1,107	1,098	973	1,254	1,087	1,045	6,775	6,270	5,945	8,039	6,728	6,549
Unknown	980	980	853	999	911	1,034	6,557	10,172	6,958	7,713	5,464	6,165
Traumatic	1,416	1,526	1,235	1,559	1,183	1,436	7,064	6,823	6,751	8,281	6,994	6,719
Hypertensive	852	857	733	993	877	799	6,853	6,461	5,773	8,247	6,653	6,565
Coronary	1,279	1,267	1,103	1,521	1,259	1,196	6,976	6,682	6,198	8,294	6,813	6,524
Cerebrovascular	1,827	1,665	1,343	2,613	1,603	1,558	7,245	6,632	6,468	8,065	6,996	6,992
Other Circulatory	1,092	1,092	939	1,255	1,176	1,007	7,086	6,489	6,340	8,464	7,815	6,759
Total	1,200	1,186	1,040	1,390	1,193	1,125	7,147	6,795	6,394	8,333	6,932	6,906

Note: See table 6.1.

Table 6.3 Average Inpatient Care Costs during Two Years According to Primary Diagnosis Groups (in thousands of yen)

	Total Elderly Population						Top 3% of the Total Elderly Population					
	Total	Aomori	Fukushima	Toyama	Fukui	Wakayama	Total	Aomori	Fukushima	Toyama	Fukui	Wakayama
	Contagious	655	725	593	742	719	506	6,232	6,315	5,448	7,271	6,244
Neoplastic	1,142	1,097	1,119	1,221	1,316	973	5,995	5,868	5,446	7,515	6,028	5,453
Endocrinal	650	722	522	783	561	510	6,651	6,251	5,396	7,958	5,841	6,410
Hematological	719	632	806	740	643	769	6,309	5,483	8,005	6,116	10,703	5,073
Mental	1,893	1,894	2,405	1,638	1,736	1,873	6,059	5,888	6,004	7,054	5,981	6,073
Ophthalmological/ Audiological	441	460	406	496	469	358	5,842	5,877	4,939	7,368	5,439	5,329
Respiratory	533	540	620	506	521	518	5,896	5,860	5,484	7,314	5,525	6,029
Digestive	468	506	416	571	452	394	5,980	5,823	5,275	7,554	5,768	5,695
Genitourinary	998	1,057	1,077	1,070	812	930	5,944	7,054	6,077	5,354	5,289	5,394
Dermatological	422	526	380	470	421	307	5,731	5,791	5,052	6,674	5,388	5,497
Skeletal	492	504	400	609	499	390	6,121	5,721	5,123	7,396	6,134	5,792
Unknown	424	475	373	471	384	410	5,453	10,080	5,791	7,448	3,549	5,029
Traumatic	921	1,056	771	1,053	695	911	6,487	6,449	6,271	7,820	6,259	5,937
Hypertensive	322	334	253	420	379	241	6,309	6,045	5,193	7,602	6,299	5,903
Coronary	676	696	555	890	627	566	6,443	6,123	5,624	7,905	6,188	5,956
Cerebrovascular	1,251	1,139	769	2,067	996	887	7,062	6,448	6,153	7,979	6,761	6,705
Other Circulatory	491	521	409	649	547	347	6,349	5,872	5,701	8,080	6,717	5,715
Total	589	601	488	755	586	467	6,363	6,156	5,606	7,639	6,093	5,907

Note: See table 6.1.

Table 6.4 Average Outpatient Care Costs during Two Years According to Primary Diagnosis Groups (in thousands of yen)

	Total Elderly Population										Top 3% of the Total Elderly Population				
	Total					Total					Total				
	Aomori	Fukushima	Toyama	Fukui	Wakayama	Aomori	Fukushima	Toyama	Fukui	Wakayama	Aomori	Fukushima	Toyama	Fukui	Wakayama
Contagious	597	549	638	558	626	667	987	1,192	384	674	390	987	1,192	384	674
Neoplastic	780	744	796	780	883	925	972	621	1,004	1,210	756	972	621	1,004	1,210
Endocrinal	664	621	672	654	720	962	992	688	1,776	1,337	614	992	688	1,776	1,337
Hematological	587	463	688	542	629	1,812	235	3,572	175	1,347	459	235	3,572	175	1,347
Mental	485	401	580	482	531	102	41	328	109	116	90	41	328	109	116
Ophthalmological/ Audiological	682	610	694	679	737	1,178	1,141	1,294	1,287	1,379	832	1,141	1,294	1,287	1,379
Respiratory	581	538	570	565	629	753	584	712	835	662	1,015	584	712	835	662
Digestive	573	518	594	567	613	648	634	592	697	712	586	634	592	697	712
Genitourinary	1,093	948	1,189	1,019	1,295	4,529	4,447	5,750	4,670	5,032	3,321	4,447	5,750	4,670	5,032
Dermatological	610	518	652	570	628	1,764	914	3,082	1,118	2,215	1,319	914	3,082	1,118	2,215
Skeletal	615	594	646	588	655	654	822	643	594	757	550	822	643	594	757
Unknown	556	480	528	526	624	1,104	1,167	265	1,914	1,135	92	1,167	265	1,914	1,135
Traumatic	495	470	506	488	525	577	480	461	735	782	374	480	461	735	782
Hypertensive	531	523	573	498	557	544	580	645	354	662	415	580	645	354	662
Coronary	603	571	631	632	630	533	574	390	625	568	559	574	390	625	568
Cerebrovascular	576	527	546	607	671	183	315	86	235	288	184	315	86	235	288
Other Circulatory	600	571	606	628	660	736	639	384	1,098	1,044	617	639	384	1,098	1,044
Total	611	552	635	607	658	784	788	694	839	999	639	788	694	839	999

Note: See table 6.1.

Table 6.5 Relative Sizes of Health Care Costs in Top 3 Percent Compared with the Averages of Primary Diagnosis Groups

	Inpatient Care Costs					Outpatient Care Costs						
	Total in the Five Prefectures	Aomori	Fukushima	Toyama	Fukui	Wakayama	Total in the Five Prefectures	Aomori	Fukushima	Toyama	Fukui	Wakayama
Contagious	9.5	8.7	9.2	9.8	8.7	11.4	1.1	0.7	1.8	1.9	0.7	1.1
Neoplastic	5.3	5.3	4.9	6.2	4.6	5.6	1.2	1.1	1.3	0.8	1.3	1.4
Endocrinal	10.2	8.7	10.3	10.2	10.4	12.6	1.4	1.0	1.6	1.0	2.7	1.9
Hematological	8.8	8.7	9.9	8.3	16.6	6.6	3.1	1.0	0.6	5.2	0.3	2.1
Mental	3.2	3.1	2.5	4.3	3.4	3.2	0.2	0.2	0.1	0.6	0.2	0.2
Ophthalmological/ Audiological	13.2	12.8	12.2	14.9	11.6	14.9	1.7	1.3	1.9	1.9	1.9	1.9
Respiratory	11.1	10.9	8.8	14.5	10.6	11.6	1.3	1.7	1.1	1.2	1.5	1.1
Digestive	12.8	11.5	12.7	13.2	12.8	14.5	1.1	1.1	1.2	1.0	1.2	1.2
Genitourinary	6.0	6.7	5.6	5.0	6.5	5.7	4.1	3.5	4.1	4.8	4.6	3.9
Dermatological	13.6	11.0	13.3	14.2	12.8	17.9	2.9	2.1	1.8	4.7	2.0	3.5
Skeletal	12.4	11.4	12.8	12.1	12.3	14.9	1.1	0.9	1.4	1.0	1.0	1.2
Unknown	12.9	21.2	15.5	15.8	9.2	12.3	2.0	0.2	2.4	0.5	3.6	1.8
Traumatic	7.0	6.1	8.1	7.4	9.0	6.5	1.2	0.8	1.0	0.9	1.5	1.5
Hypertensive	19.6	18.1	20.5	18.1	16.6	24.5	1.0	0.8	1.2	1.1	0.7	1.2
Coronary	9.5	8.8	10.1	8.9	9.9	10.5	0.9	1.0	1.0	0.6	1.0	0.9
Cerebrovascular	5.6	5.7	8.0	3.9	6.8	7.6	0.3	0.4	0.5	0.2	0.4	0.4
Other Circulatory	12.9	11.3	13.9	12.5	12.3	16.5	1.2	1.1	1.2	0.6	1.7	1.6
Total	10.8	10.2	11.5	10.1	10.4	12.7	1.3	1.1	1.4	1.1	1.4	1.5

Table 6.6 Distribution of Elderly Patients across Institutions in a Given Month in 1993

	Types of Institutions						Percentage					
	Total	Other Types	Teaching	Incorporated	Clinics	Outside	Total	Other Types	Teaching	Incorporated	Clinics	Outside
Aomori	82,626	23,286	0	11,424	47,214	702	100	28.2	0.0	13.8	57.1	0.8
Fukushima	46,048	11,035	236	9,564	24,800	413	100	24.0	0.5	20.8	53.9	0.9
Toyama	75,708	27,736	811	5,623	40,977	561	100	36.6	1.1	7.4	54.1	0.7
Fukui	51,965	19,065	776	5,396	25,639	1,089	100	36.7	1.5	10.4	49.3	2.1
Wakayama	71,792	12,003	1,718	7,789	48,756	1,526	100	16.7	2.4	10.8	67.9	2.1
Total	328,139	93,125	3,541	39,796	187,386	4,291	100	28.4	1.1	12.1	57.1	1.3

Table 6.7 Distribution of the Expensive Elderly Patient Group (top 3 percent) across Institutions in a Given Month in 1993

	Types of Institutions						Percentage					
	Total	Other Types	Teaching	Incorporated	Clinics	Outside	Total	Other Types	Teaching	Incorporated	Clinics	Outside
Aomori	3,177	1,023	0	1,526	584	44	100	32.2	0.0	48.0	18.4	1.4
Fukushima	1,744	502	18	907	291	26	100	26.8	1.0	52.0	16.7	1.5
Toyama	3,002	1,469	40	1,153	301	39	100	48.9	1.3	38.4	10.0	1.3
Fukui	2,070	925	52	637	350	106	100	44.7	2.5	30.8	16.9	5.1
Wakayama	2,828	737	84	1,099	603	305	100	26.1	3.0	38.9	21.3	10.8
Total	12,821	4,656	194	5,322	2,129	520	100	36.3	1.5	41.5	16.6	4.1

Table 6.8 Probability of Belonging to the Expensive Elderly Patient Group (top 3 percent) in a Given Type of Institution

	Percentages					
	Total	Other Types	Teaching	Incorporated	Clinics	Outside
Aomori	3.8	4.4		13.4	1.2	6.3
Fukushima	3.8	4.5	7.6	9.5	1.2	6.3
Toyama	4.0	5.3	4.9	20.5	0.7	7.0
Fukui	4.0	4.9	6.7	11.8	1.4	9.7
Wakayama	3.9	6.1	4.9	14.1	1.2	20.0
Total	3.9	5.0	5.5	13.4	1.1	12.1

vate hospitals rank at the top with about 13.4 percent, followed by out-of-prefecture hospitals (12.1 percent), teaching hospitals (5.5 percent), and the other types (5.0 percent). The patients at the clinics rank the lowest with only 1.1 percent probability, or one-fourth the average likelihood (3.9 percent).

The average health care costs of a patient treated for a certain primary diagnosis in a given type of institution during 1992–93 are given in table 6.9. In table 6.10, we have shown how many times more an expensive elderly patient costs than an average elderly patient for each type of institution in each prefecture. On the average, the ratio is 6.0, and except for clinics, the variation across different types of institutions is provided by the difference in the denominator (i.e., the cost of an average elderly), rather than the numerator (the cost of an expensive elderly). In the same table, the average health care cost of an expensive elderly patient in a given type of institution is given. Both of these cost measures can be subject to serious criticism, however, for two reasons. First, since we have nothing to impute the monthly expenditures to different institutions by Part A, we must rely on information supplied by Part B. In fact, we are imputing the costs incurred during a twenty-four-month period based on only one month of data. Second, in order to simplify the analysis, we impute all the health care costs of a patient incurred for all ailments and at all institutions to the institution where the patient is treated for the primary diagnosis. In spite of these shortcomings, we feel that the figures in table 6.9 are useful because, as we have seen, the major component of health care costs for the most expensive elderly is inpatient care, and many of these patients have been hospitalized for most of the twenty-four months studied.

Table 6.11 points to another source of concentration of health care expenditures among the elderly. Apparently, close to half (48.1 percent) of the revenues of the incorporated private hospitals come from the expensive elderly, or the top 3 percent of the elderly in the health care cost ranking, while other types of hospitals derive 25.4 percent of their revenue from

Table 6.9 Average Health Care Costs of a Patient, by Institution Type (primary diagnosis only) during 1992–93 (unit = 1,000 yen)

	All Elderly											
	Total					Expensive Elderly (top 3%)						
	Total	Teaching	Incorporated	Clinics	Outside	Other	Total	Teaching	Incorporated	Clinics	Outside	Other
Aomori	1,186.5		1,945.6	932.0	1,450.8	1,322.1	6,794.6		6,885.2	6,450.1	8,176.9	6,796.4
Fukushima	1,040.3	1,503.1	1,514.9	764.4	1,407.7	1,225.4	6,393.8	5,687.9	6,459.9	6,037.3	7,008.1	6,474.5
Toyama	1,389.5	1,751.7	2,948.7	939.2	1,873.6	1,718.3	8,332.9	9,870.1	8,133.0	8,300.9	8,670.9	8,445.6
Fukui	1,192.6	1,696.4	1,861.7	920.8	1,733.4	1,317.4	6,932.1	7,967.8	7,021.4	6,739.0	6,910.0	6,888.0
Wakayama	1,125.1	1,418.0	1,960.2	868.0	2,378.4	1,426.5	6,905.7	6,998.1	6,894.3	6,669.0	7,505.4	6,857.4
Total	1,200.4	1,561.1	1,975.3	893.2	1,903.5	1,441.1	7,147.0	7,728.6	7,101.4	6,765.0	7,503.4	7,309.7

Table 6.10 Ratio of the Health Care Costs of the Expensive Elderly to Those of All Elderly, by Institution Type (primary diagnosis only)

	Total	Teaching	Incorporated	Clinics	Outside	Other
Aomori	5.7		3.5	6.9	5.6	5.1
Fukushima	6.1	3.8	4.3	7.9	5.0	5.3
Toyama	6.0	5.6	2.8	8.8	4.6	4.9
Fukui	5.8	4.7	3.8	7.3	4.0	5.2
Wakayama	6.1	4.9	3.5	7.7	3.2	4.8
Total	6.0	5.0	3.6	7.6	3.9	5.1

Table 6.11 Revenue Share (%) of the Expensive Elderly, by Institution Type (primary diagnosis only)

	Total	Teaching	Incorporated	Clinics	Outside	Other
Aomori	22.0		47.3	8.6	35.3	22.6
Fukushima	23.3	28.9	40.4	9.3	31.3	24.0
Toyama	23.8	27.8	56.6	6.5	32.2	26.0
Fukui	23.2	31.5	44.5	10.0	38.8	25.4
Wakayama	24.2	24.1	49.6	9.5	63.1	29.5
Total	23.3	27.1	48.1	8.6	47.8	25.4

these patients. For clinics, the proportion is only 8.6 percent. Table 6.12 computes the average inpatient days of an elderly patient treated at an institution for what is considered his or her primary diagnosis, versus those of an expensive elderly patient. Average inpatient days for patients treated for all primary diagnoses in incorporated private hospitals are 116.8 days, or more than twice those of hospitals other than teaching and incorporated (55.1 days), and more than three times those of teaching hospitals (38.6 days). This bias seems to cut across all diagnoses and can easily push up the costs for those treated at incorporated hospitals relative to other institutions. It is interesting to see that even among the most expensive elderly patients, such a bias can still be observed across all diagnoses.

6.3 Long-Term Inpatients and Regional Variations in the Distribution of Health Care Costs

In the analysis presented in the previous section, several facts concerning the concentration of health care expenditure were revealed. In particular, the following facts strongly indicate that the presence of large numbers of inpatients may explain the increasing cost of health care for the elderly in Japan.

1. There is a significant concentration of health care costs for the elderly in Japan: The top 1 percent of patients account for 10 percent of total

Table 6.12 Average Inpatient Days of Patients Treated for Primary Diagnosis

	All Elderly						Expensive Elderly					
	Total	Teaching	Incorporated	Clinics	Outside	Other	Total	Teaching	Incorporated	Clinics	Outside	Other
Contagious	51.0	41.4	113.9	25.1	55.1	73.5	511.4	323.4	540.9	461.6	547.0	518.5
Neoplastic	64.7	65.5	103.6	39.9	79.9	59.9	380.7	307.6	451.6	326.1	329.2	357.3
Endocrinal	46.2	32.7	113.4	23.1	57.1	50.9	504.2	214.5	595.2	381.1	571.2	458.4
Hematological	46.0	58.1	115.0	22.5	140.1	55.8	402.9	482.0	494.8	289.6	548.5	350.3
Mental	211.0	38.2	328.0	35.4	418.2	182.1	685.9	513.5	698.0	473.3	673.4	680.8
Ophthalmological/ Audiological	31.4	31.1	61.7	27.4	46.0	33.7	464.1	333.1	519.9	465.2	556.8	431.2
Respiratory	37.0	32.2	83.1	22.8	48.4	54.6	444.0	182.1	509.2	378.3	420.0	442.9
Digestive	33.6	33.8	69.9	20.4	66.5	43.5	459.7	251.6	533.8	355.5	543.6	439.8
Genitourinary	57.8	43.7	120.0	38.5	69.3	54.9	317.6	269.1	386.5	271.5	340.7	276.3
Dermatological	27.1	39.8	42.8	23.7	60.5	30.5	400.7	346.8	483.6	443.4	581.7	282.5
Skeletal	37.5	40.0	84.3	22.2	74.0	45.5	508.1	287.9	585.9	403.8	520.0	487.7
Unknown	26.5	34.3	33.9	18.0	59.6	34.4	330.4	158.0	358.8	349.3	450.3	303.1
Traumatic	69.6	64.8	125.8	37.7	117.9	74.2	501.8	417.0	532.3	453.2	546.7	480.7
Hypertensive	23.6	19.9	69.1	13.5	56.7	36.2	504.0	288.0	598.6	315.2	589.8	479.4
Coronary	47.1	37.5	96.7	24.5	99.6	51.6	475.6	250.7	540.6	361.6	463.5	448.0
Cerebrovascular	107.3	44.3	223.4	32.4	266.8	118.3	620.1	323.6	641.5	489.0	626.2	607.4
Other Circulatory	33.7	46.3	84.2	18.9	69.0	45.2	439.8	312.8	511.8	391.7	507.0	412.7
Total	44.3	38.6	116.8	22.5	95.3	55.1	517.2	296.6	588.6	408.1	565.4	489.3

health care costs, and the top 10 percent account for a staggering 45 percent of these costs.

2. This concentration derives from inpatient care rather than outpatient care.

3. The concentration of spending on inpatient care appears to be attributable to the fact that the continuous length of stay of inpatients is high.

Most of the inpatients who stay in the hospital for a long time are elderly people who have difficulty living independently because they are left with physical disabilities after the completion of treatment during the acute stage of illness. Because there is a lack of alternative facilities for these elderly patients, this is called *social hospitalization*. In many cases, these long-term inpatients need long-term care, rather than actual medical treatment. How much of our valuable health care resources are taken up by these long-term inpatients whose need for medical treatment is limited? Is it perhaps possible that health care costs are higher in regions in which there are large numbers of long-term inpatients? Moreover, is it not true that increasing the supply of medical resources (the numbers of hospitals and hospital beds) will encourage long-term hospitalization, which in turn will generate higher health care costs?

In this section, we take the view that the existence of long-term hospitalization has a significant effect on the cost of health care for the elderly. Its effect on regional variations in health care expenditure, along with the effects that the regional supply of medical resources has on long-term hospitalization, are analyzed in this section from the point of view of the regional distribution of health care costs.

6.3.1 Explanation of the Data Set and the Definition of Long-Term Hospitalization

In the analysis of the concentration and continuation of health care expenditure discussed earlier, a new data set was created by combining two data sets, 1992 and 1993, with a common patient code among the insurance claims for health care for the elderly. Now we must obtain as much regional data as possible in order to analyze variations in regional health care costs. Thus, we discard the integrated two-year data in favor of the data for 1993 (twelve months) only.⁷ (The original data consist of individual health care microdata for elderly people from twelve municipalities, but it was possible to consolidate the data for two consecutive years in only five prefectures.)

7. The data set used in this analysis consist of health care insurance claim data for the elderly, excluding the following microdata: (a) those who became eligible for health care for the elderly in the course of 1993; (b) those who lost their eligibility through death or other reasons during 1993; and (c) those who had no municipality address code. Excluding these, there are 1,286,559 items of microdata for eleven prefectures (77 medical zones and 765 municipalities) in the data set.

Next, we define long-term hospitalization as a period of three months (ninety days) or more. Inpatients staying for 180 days or more are, however, included when necessary. It should be noted that the number of long-term patients is probably underestimated because of the truncation of the data.⁸ We cannot single out those who have been hospitalized three months or more among the inpatients in the first two months or the last two months of our twelve-month longitudinal data set.

6.3.2 Health Care Costs for Long-Term Inpatients

In section 6.2, the longitudinal data on two consecutive years of health care showed that health care costs were concentrated among a relatively small number of elderly patients with lengthy periods of hospitalization. In this section, we study the relationship between concentration and long-term hospitalization, as revealed by the data. (Although the data cover a period of only one year, they are based on a large number of samples.)

Table 6.13 shows the proportion of long-term inpatients generating high health care costs, and the proportion of long-term inpatient health care costs attributable to these patients. The table shows that 82.9 percent of the top 1 percent of high-cost patients were long-term inpatients staying ninety days or more. The share peaked at 88.3 percent for the top 3 percent, then fell to 82.6 percent for the top 5 percent and to 55.6 percent for the top 10 percent. The majority of patients in the top 5 percent were long-term inpatients. From a health care cost viewpoint, we can see that although the top 1 percent of high-cost elderly patients accounted for 11.3 percent of the total health care costs for the elderly, 82.9 percent of that expenditure was attributable to long-term inpatients staying ninety days or more. Similarly, the top 5 percent accounted for 36.0 percent of the total health care costs, but 83.9 percent of that figure was attributable to long-term inpatients. Furthermore, the top 10 percent accounted for more than half (52.1 percent) of health care costs; of this amount, 67.7 percent was attributable to health care costs for long-term inpatients. So, from the one-year health care cost data for 1993, we can also confirm that more than 80 percent of the top 5 percent of high-cost elderly patients' health care cost was attributable to long-term inpatients, and that these same patients accounted for more than 80 percent of the total expenditure on high-cost patients.

Next, we ascertain from table 6.14 the role of long-term hospitalization in the total cost of health care for the elderly. By looking at the health care cost shares in the three right-hand columns, we see that the cost of health

8. It was difficult to determine the effect of truncating data at both ends, but a Ministry of Health and Welfare patient survey showed, with respect to patients aged seventy or over, that 13.3 percent were hospitalized for three months or over, and 6.0 percent for six months or over. By contrast, in our data set the incidence of inpatients hospitalized for three months (90 days) or over was 5.8 percent, and for six months (180 days) or over, 3.4 percent.

Table 6.13 The Proportion of Long-Term Inpatients to Patients with High Health Care Costs

	Number of Patients				Health Care Costs			
	Patients with High Health Care Costs (share in total elderly enrollees)	Patients with High Health Care Costs	Inpatients Staying 90 Days or More	Inpatients Staying 180 Days or More	Patients with High Health Care Costs (share in total costs for the elderly)	Patients with High Health Care Costs	Inpatients Staying 90 Days or More	Inpatients Staying 180 Days or More
Top 1%	1.0	100.0	82.9	69.8	11.3	100.0	82.9	69.6
Top 2%	2.0	100.0	88.2	75.1	19.1	100.0	87.2	74.1
Top 3%	3.0	100.0	88.3	73.4	25.7	100.0	87.6	73.1
Top 4%	4.0	100.0	86.3	68.5	31.3	100.0	86.3	69.7
Top 5%	5.0	100.0	82.6	61.8	36.0	100.0	83.9	65.1
Top 10%	10.0	100.0	55.6	34.2	52.1	100.0	67.7	47.5
Top 20%	20.0	100.0	28.9	17.1	68.8	100.0	51.8	35.9
Top 30%	30.0	100.0	19.3	11.4	78.9	100.0	45.2	31.4
Top 40%	40.0	100.0	14.5	8.6	86.0	100.0	41.5	28.8
Top 50%	50.0	100.0	11.6	6.9	91.3	100.0	39.1	27.1

Note: 12,286,559 observations in eleven prefectures were used from the insurance claim data for elderly health care (1993).

Table 6.14 Comparisons of Long-Term Inpatients and Other Enrollees

Prefecture	Share in the Number (%)			Average Health Care Costs per Enrollee in a Year (× 10,000 yen)			Share in Total Health Care Costs (%)		
	All Elderly Enrollees	Inpatients Staying 90 Days or More	Other Enrollees	All Elderly Enrollees	Inpatients Staying 90 Days or More	Other Enrollees	All Elderly Enrollees	Inpatients Staying 90 Days or More	Other Enrollees
Hokkaido	100.0	8.6	91.4	70.8	354.6	44.1	100.0	43.2	56.8
Aomori	100.0	6.6	93.4	49.6	275.4	33.6	100.0	36.7	63.3
Fukushima	100.0	4.4	95.6	44.5	300.3	32.8	100.0	29.6	70.4
Toyama	100.0	6.6	93.4	58.0	350.5	37.3	100.0	40.0	60.0
Ishikawa	100.0	7.5	92.5	62.5	334.7	40.5	100.0	40.0	60.0
Fukui	100.0	6.0	94.0	49.5	293.6	34.0	100.0	35.4	64.6
Shizuoka	100.0	3.2	96.8	42.9	339.1	33.2	100.0	25.0	75.0
Shiga	100.0	3.2	96.8	40.9	339.4	31.1	100.0	26.3	73.7
Wakayama	100.0	3.8	96.2	45.5	313.3	34.7	100.0	26.5	73.5
Okayama	100.0	5.9	94.1	53.0	319.0	36.3	100.0	35.6	64.4
Kochi	100.0	8.8	91.2	59.4	316.9	34.6	100.0	46.9	53.1
Average of eleven prefectures	100.0	5.8	94.2	53.0	326.8	36.2	100.0	35.7	64.3

care for long-term inpatients staying for ninety days or more accounts for 35.7 percent of the total cost of health care for the elderly. Thus, more than one-third of the cost of health care is spent on long-term inpatients who need comparatively little active medical treatment but much more long-term caretaking. Incidentally, there is a wide variation in these ratios from one prefecture to another. The cost of long-term inpatient health care accounts for more than 40 percent (the highest figures) in Kochi prefecture (46.9 percent) and Hokkaido (43.2 percent). The ratio is much smaller in Shizuoka prefecture (25.0 percent).

Why are there differences at a prefectural level in the share of health care costs attributable to long-term inpatients? In the 11 prefectures, the average cost of health care for a long-term inpatient is 3,268,000 yen, nine times higher than the figure of 362,000 yen for other elderly patients (columns [8] and [9] in the table). However, prefectural differences are surprisingly small and the difference between the figures is always less than 30 percent (2,754,000 yen in Aomori prefecture and 3,546,000 yen in Hokkaido). If this cannot be explained by the difference in per-patient health care costs, then the main reason for prefectural variations in the percentage share of health care costs for long-term inpatients (between 25 percent and 46.9 percent) must be the difference in numbers of long-term inpatients: In other words, the difference in the incidence of long-term hospitalization.

If we look at the percentage of long-term inpatients in the total of elderly patients (column [2]), although the average is 5.8 percent, the differences among prefectures vary widely between the high figures in Kochi (8.8 percent) and Hokkaido (8.6 percent) and the low ones in Shizuoka and Shiga (each at 3.2 percent). In other words, the figures confirm that the total long-term inpatient health care costs are high in prefectures with a large proportion of long-term inpatients.

Furthermore, in prefectures where the ratio of long-term inpatients is high, the average health care cost per elderly patient (column [4]) is also high. The scatter diagram in figure 6.5 confirms the relationship between the ratio of long-term inpatients and average health care costs. There is a strong positive correlation between the two, and the larger the number of long-term inpatients, the higher the average health care costs for the elderly become. From this, the possibility emerges that among the many reasons for the prefectural variations in health care costs for the elderly, the incidence of long-term hospitalization is a particularly valid one.

6.3.3 Long-Term Inpatients and the Distribution of Health Care Costs

We have now established that there are two effects of the incidence of long-term inpatients' staying ninety days or more. One is that the average health care cost rises significantly; the other is that regional variations in health care costs increase in direct proportion to the number of long-term inpatients. We examine this in more detail below.

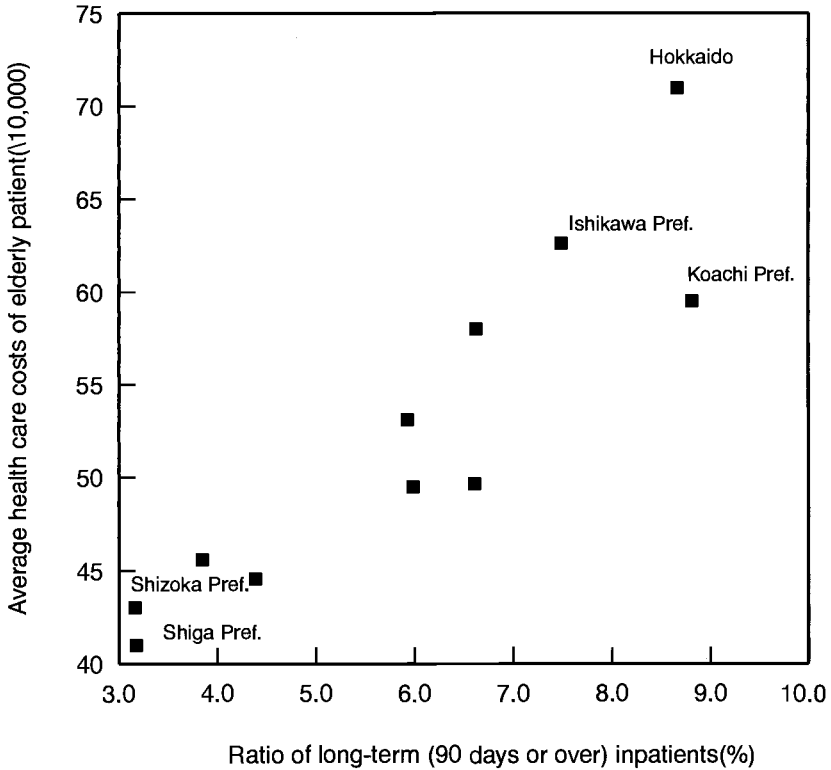


Fig. 6.5 Ratio of long-term inpatients to average health care cost of elderly patients (per prefecture)

First, however, let us consider what kind of regional medical units exist. In many cases, when discussing health care cost issues, a prefecture is taken as the unit of discussion. However, in terms of medical resources such as hospitals and hospital beds, there are many instances in which a medical zone is the unit of discussion. The number of medical zones depends to some extent on the area of the prefecture, but a prefecture is generally divided into several zones. From the viewpoint of a patient covered by National Health Insurance, the municipality should be considered the unit. We consider all three units in our analysis.

To establish the extent to which variations in health care costs can be increased by the incidence of long-term hospitalization, we compare the values of the total number of elderly people eligible for health care, including long-term inpatients, and the number of those eligible for health care, excluding long-term inpatients (table 6.15). The first and second rows show the values for microdata, whereas the third and fourth rows give the values at a prefectural level. The average prefectural health care cost per elderly

Table 6.15 Health Care Costs With and Without Long-term Inpatients in Different Aggregation Levels

	Number of Samples	Average Cost (yen)	Standard Deviation (yen)	Minimum Cost (yen)	Maximum Cost (yen)
Microdata					
All elderly enrollees	1,286,559	530,072	914,084	0	23,149,610
Excluding inpatients staying 90 days or more	1,212,069	361,803	502,682	0	16,335,410
Prefectural aggregation					
All elderly enrollees	11	524,150	93,340	409,179	708,435
Excluding inpatients staying 90 days or more	11	356,597	37,559	311,253	440,667
Medical-zone aggregation					
All elderly enrollees	77	533,358	129,172	331,559	817,414
Excluding inpatients staying 90 days or more	77	363,344	55,916	265,319	479,391
Municipality aggregation					
All elderly enrollees	765	526,564	144,255	244,774	1,118,971
Excluding inpatients staying 90 days or more	765	357,032	68,139	180,190	641,588

patient ranges from about 409,000 yen to about 708,000 yen, producing a standard deviation around 93,000 yen. If the long-term inpatients are excluded, however, the prefectural averages range from about 311,000 to about 441,000 yen, bringing the standard deviation down to around 38,000 yen. Thus, variations in health care costs for the elderly are relatively small when long-term hospitalization is excluded. If the element of long-term inpatient care could somehow be removed from the calculation of health care costs, the prefectural variations in such costs would automatically decrease.

Health care costs vary more widely between medical zones (rows [5] and [6] of the table) than between prefectures (rows [3] and [4]) and even more widely between municipalities (rows [7] and [8]). Our data set, which covers seventy-seven medical zones, shows that their average medical costs range between about 332,000 and 817,000 yen, the ratio of the maximum to the minimum being 2.5:1. If the element of long-term inpatient care is excluded, however, the costs range from about 265,000 to 479,000 yen, and the ratio falls to 1.8:1. For municipalities, the costs, including those of long-term inpatient care, range between about 245,000 and 1,119,000 yen, and the ratio rises to 4.6:1. Furthermore, this variation can be reduced to about 180,000 to 642,000 yen by excluding the cost of long-term inpatient care.

Thus, we can see that the distribution of average health care costs in medical zones and municipalities can be leveled to some extent by excluding expenditures on long-term inpatient care. To illustrate this visually, figures 6.6 and 6.7 show the changes in the frequency distribution. The upper graph shows the overall distribution including long-term hospitalization, and the lower graph shows the distribution when long-term hospitalization is excluded. In the upper graph, the distribution shows the right side (high-cost portion) extending farther because there are regions with high medical expenditures. It resembles a normal distribution more closely in the lower graph. Incidentally, the horizontal axis represents the annual health care costs in yen, and the vertical axis represents the relative frequency (percent).

6.3.4 Long-Term Inpatients and the Availability of Medical Resources

It is evident that long-term hospitalization not only pushes up the cost of health care for the elderly, but also that, because it distorts the distribution of health care costs, it influences regional variations in those costs. One of the reasons for these regional variations is that some regions have large numbers of long-term patients, while others have relatively few.

What are the reasons for these differing demands for long-term inpatient care? Starting from the premise that a market for health care for the elderly develops in each region, the elderly are consumers; hospitals, clinics, and other health care institutions are suppliers. (In Japan, it is more appro-

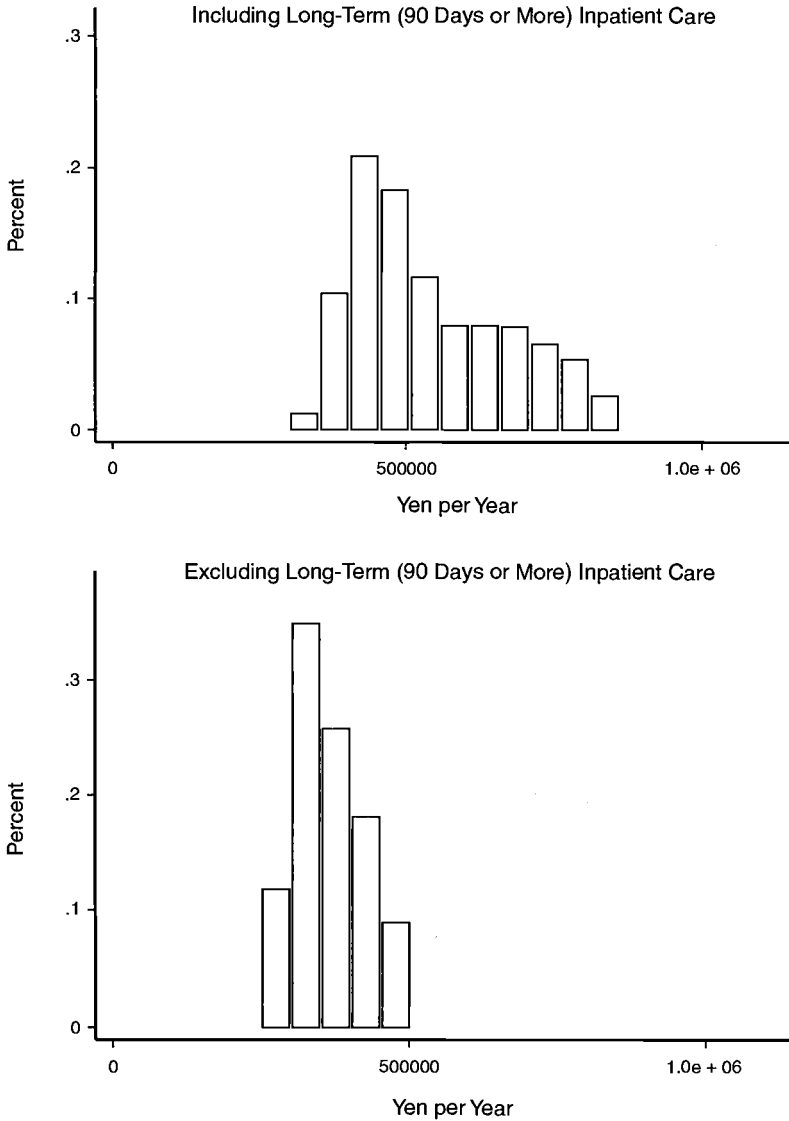


Fig. 6.6 Frequency distribution of average health care cost in fiscal 1993, by zone

appropriate to describe health care institutions, rather than individual doctors, as economic entities.)

Elderly consumers create a demand for health care as their health declines, but the extent of that demand is determined by such elements as age, sex, family circumstances, and so on. Since it is believed that the level of medical treatment demanded by an individual is a function of that person's financial status, the demand for health care may be considered to

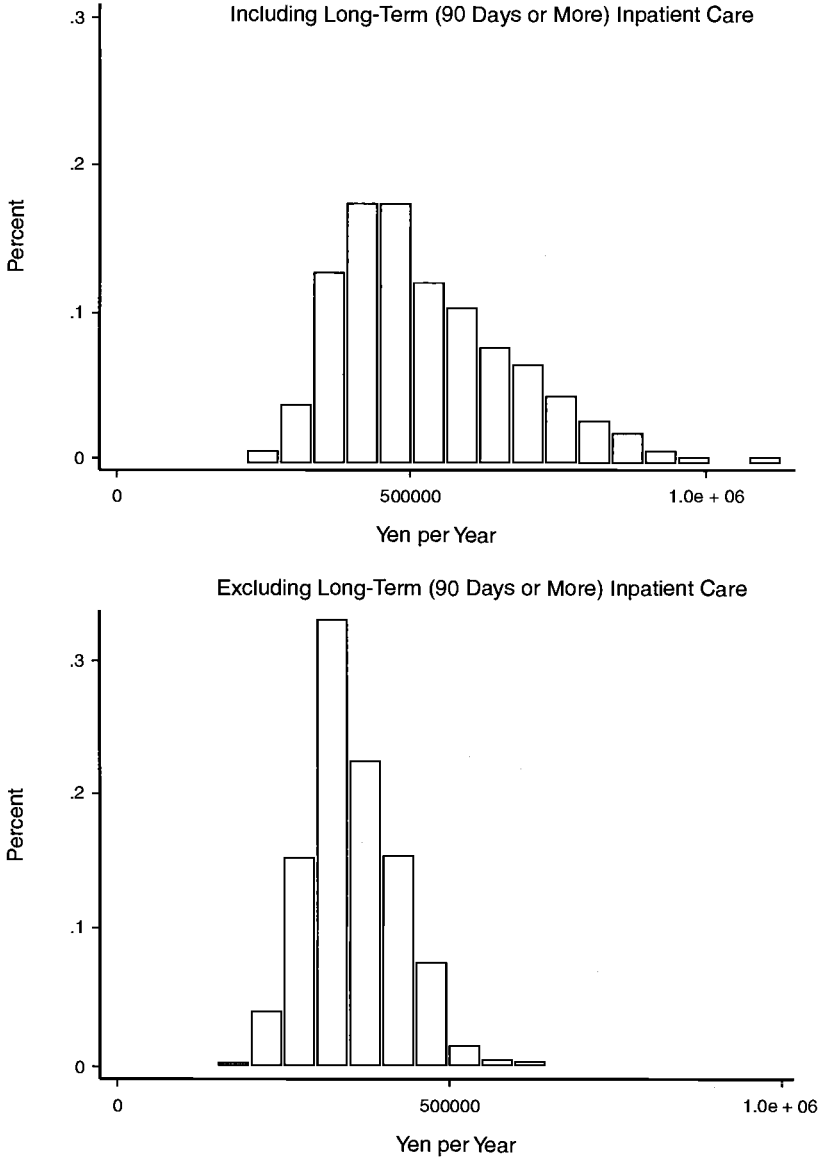


Fig. 6.7 Frequency distribution of average health care cost in fiscal 1993, by municipality

be an increasing function of the general level of income. However, if we consider that the possibility of declining health increases as the level of income diminishes, then the demand for health care can also be regarded as a decreasing function of the general level of income.

Health care institutions, on the other hand, provide services on a fixed-

price basis. The government can restrict increases in the numbers of beds, but under the fee-for-service system, the institutions can provide unrestricted health care service to their patients. In regions where there are larger health care resources (numbers of doctors, health care institutions, beds) per capita, health care institutions have greater incentive to provide health care services in order to make a profit (supplier-induced demand hypothesis [Nishimura 1987]). The levels of incentive vary as a function not only of the availability of health care resources, but also of the degree of concentration.

According to American interpretations, the likelihood of oversupply diminishes as concentration decreases and the market becomes more competitive. This presupposes that prices are free to fluctuate in response to demand, a situation that does not necessarily apply in Japan. In fact, the opposite could be said to apply in Japan, where prices are fixed and the patient's own financial contribution is low. In other words, there is a tendency toward an oversupply with respect to health care services in regions in which there are of large numbers of medium-sized hospitals.

What about the demand for long-term hospitalization? If this demand is almost the same as that for health care, then the situation is almost the same as that of general health care services, in that demand is affected by individual and family circumstances. However, if we believe that patients with larger incomes are more likely to purchase health care services other than hospitalization, then the demand for long-term hospitalization should decrease as the level of patient income increases.

As to the provision of long-term hospitalization services, there is still a significant incentive for hospitals to accept elderly long-term inpatients, although the profit motive is considered to have diminished after Japan's Ministry of Health and Welfare introduced a system under which hospitalization charges decrease progressively as the period of hospitalization increases.

Recently, the fixed-price system was introduced. Under this system, a certain amount of remuneration is paid without the prescription of medicine or injections, if the capability of providing care is enhanced. Hence, accepting long-term inpatients leads to a stable operational basis for health care institutions. We can assume that health care institutions have an incentive to provide long-term hospitalization services to patients whose treatment at the acute stage has been completed.

What if the demand for long-term hospitalization and for caretaking are identical? The much higher demand than supply of caretaking leads to the rationing of services, rather than to the unreasonable creation of demand by health care institutions.

Whichever hypothesis is correct may be determined by taking into account the contribution by special nursing homes for the elderly—alternative institutions specializing in long-term care. If the levels of long-term

hospitalization are lower in the regions with more of these special nursing homes, the first hypothesis applies. If the number of long-term hospitalizations remains the same when the number of special nursing homes increases somewhat, then the latter hypothesis that demand for caretaking exceeds the supply (total of the number of beds in health care institutions and special nursing home for the elderly) is valid.

6.3.5 Estimation of the Probability of Long-Term Hospitalization

The aim of this section is to determine whether the market hypothesis matches the reality, and to measure the extent to which the supply of health care influences the incidence of long-term hospitalization.

In the measurement, whether each elderly patient is (1) or is not (0) a long-term inpatient is defined as a dependent variable. Demand-side factors (patient attributes, income, etc.) and supply-side factors (density of health care resources, degree of market concentration, density of alternative care facilities, etc.), which were examined in the previous section, were defined as explanatory variables to explain the probability of long-term hospitalization.

Therefore, we use the estimation formula

$$Y = f(\text{Patient Attributes, Income, Density of Health Care Resources, Degree of Market Concentration, Density of Alternative Care Facilities}),$$

where

$$Y = 1(\text{Long-term Inpatient}) \text{ and } 0 (\text{Others}).$$

In formulas such as this in which the dependent variable is 0/1, the logit model and the probit model typically are employed for estimation. Since it is easier to evaluate the estimation parameters, the logit model is used here.

Table 6.16 summarizes the variables used in the estimation. The dummy for long-term hospitalization, which is the dependent variable, will be 0 or 1, and the average value is 5.79 percent. The individual attributes used as demand factors are an average age of 77 and a male/female ratio of 40 percent to 60 percent. The share of subscribers to health insurance other than the National Health Insurance is 19.6 percent. Income is an individual attribute, but since individual income figures were not available, the average taxable income of the region (approximately 1,200,000 yen) was used as an alternative.

With regard to supply variables, three types of aggregate value were established for each market unit (the scale of the region). To indicate the density of health care resources, we used bed density (per capita number of beds) was used (the number of beds being the total in both clinics and hospitals). Doctor density is also frequently used as a variable, but in the case of long-term hospitalization, inpatient health care resources—partic-

Table 6.16 Statistical Description of Variables

Variables	Average	Standard Deviation	Minimum	Maximum
Microdata				
Long-term hospitalization Dummy ^a	0.0579	0.2336	0	1
Age	77.11	5.72	65	110
Male dummy	0.404	0.491	0	1
Non-National Health Insurance dummy	0.196	0.397	0	1
Prefectural aggregation data				
Number of beds ^b	110.1	23.8	75.0	146.8
Concentration index of beds ^c	0.011	0.005	0.003	0.023
Capacity of nursing homes for the elderly ^d	158.2	53.8	102.5	259.7
Taxable income ^e	1,261.2	198.0	889.5	1,530.5
Medical-zone aggregation data				
Number of beds ^b	109.6	34.9	10.7	236.8
Concentration index of beds ^c	0.070	0.065	0.020	0.554
Capacity of nursing homes for the elderly ^d	158.7	71.9	30.6	597.3
Taxable income ^e	1,246.2	229.6	728.8	1,614.2
Municipality aggregation data				
Number of beds ^b	106.4	83.1	0	2,670.8
Concentration index of beds ^c	0.336	0.333	0	1
Capacity of nursing homes for the elderly ^d	160.4	165.8	0	2,126.0
Taxable income ^e	1,232.4	258.2	573.5	1,886.2

^aLength of stay in hospitals during the year (dummy variable: 180 or more = 1, less than 180 = 0).

^bNumber of hospital beds per 10,000 people.

^cHerfindahl index.

^dCapacity per 10,000 elderly patients aged sixty-five or above.

^eTaxable income per capita (in thousands of yen).

ularly bed capacity—are considered to be more important. The Herfindahl index⁹ for the number of beds is used to measure the degree of market concentration. The value of this index is between 0 and 1; the larger the figure, the higher the degree of concentration. The degree of bed density decreases as the market expands. At an average value, it gets higher in the order of prefectures, medical zones, and municipalities. The capacity of special nursing homes for the elderly is included as an alternative long-term hospitalization facility.

Table 6.17 shows the results. Number of beds, degrees of bed concentration, and capacity of special nursing homes for the elderly have significant

9. The Herfindahl index, which is defined by the following equation, indicates the degree of concentration or monopoly of suppliers in a market: $H = \sum_{i=1}^n [X_i / \sum_{i=1}^n X_i]^2$. In this analysis, X_i is the number of patients in i -th hospital in the given municipality.

Table 6.17 Estimation Results (logit model)

	Prefectural Aggregation Data		Medical-Zone Aggregation Data		Municipality Aggregation Data	
	Parameter	z-value	Parameter	z-value	Parameter	z-value
Explanatory variable						
Number of beds	0.01124	50.3	0.00640	48.3	0.00166	41.8
Bed concentration	-10.66006	-9.3	-2.46781	-27.4	-0.30137	-22.9
Capacity of nursing homes	0.00125	8.5	0.00147	24.3	0.00029	13.1
Taxable income	-0.00045	-15.6	-0.00038	-20.0	-0.00045	-27.1
Age	0.04821	78.3	0.04787	77.7	0.04725	76.8
Male dummy	-0.21385	-26.7	-0.21099	-26.3	-0.20295	-25.4
Non-National Health Insurance dummy	-0.02687	-2.6	-0.00803	-0.8	0.07355	7.5
Constant	-7.25689	-97.5	-6.78071	-114.6	-6.03846	-110.5
Pseudo R^2	0.027		0.0276		0.0174	

Notes: Dependent variable: Length of stay in hospitals during the year (dummy variable: 180 or more = 1, less than 180 = 0). 1,286,559 observations of eleven prefectures were used from the insurance claim data of elderly patients (1993). Those variables such as length of stay, age, male dummy, and non-National Health Insurance dummy are individual patient base, while the variables of the number of beds, bed concentration, capacity of nursing homes, and taxable income are aggregate values of each geographical boundary level of medical markets. Pseudo R^2 is $(1 - LI/LO)$ where LO is log-likelihood with only constant, and LI is log-likelihood when all explanatory variables are included in the calculation. If LI is the same as LO, it will be 0, and if it is a perfect prediction ($LI = 0$), then it will be 1.

explanatory power. The positive number of beds suggests that the larger the number of beds per capita, the higher the probability of long-term hospitalization. The negative degree of bed concentration shows that the probability of long-term hospitalization decreases as the degree of concentration gets higher. The positive capacity of nursing homes indicates that the probability of long-term hospitalization is higher in regions with more special nursing homes for the elderly. The hypothesis that the supply of long-term care services by special nursing homes for the elderly serves as an alternative to long-term hospitalization cannot be proved. As was mentioned earlier, one interpretation of this is that in the current situation, in which there is insufficient provision of specialist long-term care facilities such as nursing homes, both they and other health care facilities are providing long-term care services in regions where the demand for care is particularly high.

The estimation was based on the premise that there were three types of health care market (prefectures, medical zones, and municipalities). Overall statistical significance is highest in terms of the number of beds, degree of concentration, and capacity of special nursing homes for the elderly, in the medical zone. We conclude that the market for long-term hospitalization services is likely formed within medical zones.

Next, we evaluate the degree of effects by estimated parameters on the dependent variables using average values.¹⁰ At the prefectural level, when the number of beds per 10,000 population is increased by one, the probability of average long-term hospitalization (5.79 percent) rises by 0.06 percent. Thus, a 10 percent increase in the bed density causes a 0.7 percent rise in the probability. The effect appears to be small. However, when this relationship is assumed to be constant, difference in bed density among prefectures (75.0 – 146.8 beds) may produce a maximum of 4.4 percent difference in the probability of the elderly's long-term hospitalization. As figure 6.4 shows, the effect of an increase in the number of long-term inpatients on health care costs is large, so the effects of the bed density cannot be ignored. A 10 percent change in bed density at the medical-zone level causes the probability of long-term hospitalization to increase by 0.38 percent, which is lower than at the prefectural level. However, since the variance in bed density is much larger (between 10.7 and 236.8) at the medical-zone level, the difference in bed density may produce a maximum of 7.9 percent difference in the probability of long-term hospitalization. The difference in the probability at the municipal level may reach as high as 24.2 percent.¹¹

10. The changes in the probability P_i for the dependent variable Y to become 1 when the explanatory variable x_j changes is given by the formula $\partial P_i / \partial x_{ij} = \beta_j P_i (1 - P_i)$, where i and j are adscripts meaning observation and explanatory variables, respectively.

11. Since, in the logit model, the assessment of a parameter that is an average value cannot be applied at a point where it is far from the average value, the above applications to maximum and minimum values should be considered only as references.

When we look at the demand factors, income, age, and sex are all highly significant, except in the case of the non-National Health Insurance dummy, which has a low statistical significance. Moreover, the scale of the parameters at prefecture, medical zone, and municipality levels is stable. When trial estimations are made of the degree of influence of each variable, income has a clear negative effect, as expected, and a 100,000-yen increase in income reduces the long-term hospitalization probability by 0.2 percent. As for the effect of age, in an average sample age of seventy-seven, for each age increment of one year the long-term hospitalization probability increases by 0.26 percent. The probability of long-term hospitalization is 0.6 percent higher for males than for females.

From these estimation results, the following four points are evident:

1. Demand for long-term hospitalization (or long-term care service) forms a market within medical zones.
2. Long-term hospitalization increases when the number of beds per capita increases (when the number of beds increases by 10 percent at medical-zone level, the long-term hospitalization probability increases by 0.38 percent).
3. In areas with special large-capacity nursing homes for the elderly, the long-term hospitalization probability was also high.
4. As the long-term hospitalization probability increased with age (0.26 percent increase per year), the increase in the number of long-term inpatients reflected an increase in the numbers of late-stage elderly patients.

6.4 Conclusions

We have learned that more than 80 percent of high-cost elderly patients (top 5 percent) are long-term inpatients hospitalized for ninety days or more. One-third of the cost of health care for the elderly is devoted to such long-term hospitalization. Consequently, the difference in the incidence of long-term hospitalization is one of the main reasons for regional variations in health care costs. We also know that the probability of an elderly patient's becoming a long-term inpatient is high in areas where the number of beds per capita is high, and that the long-term hospitalization probability is high in areas where the capacity of special nursing homes for the elderly is large.

We conclude, therefore, that long-term hospitalization or care-oriented services explain the major part (over 80 percent) of high-cost elderly patients in the health care system in Japan, rather than any unforeseeable phenomena such as accidents, fatal diseases, or serious surgical operations. The health care costs associated with long-term hospitalization account for one-third of the total cost of health care for the elderly. It is interesting to note that expenditure on long-term care by Medicaid, the public health care insurance system for the elderly in the United States,

accounted for 33 percent of the total expenditure in 1994, a figure almost identical to our own measurement. Because home-care charges are included in Medicaid's long-term care figures, we cannot compare the two directly, but it can be said that the cost of long-term care is very high in both countries. The important point here is that in the United States, long-term care is considered quite separately from acute care. In Japan, the same high level of human resources used at the acute stage is also employed in long-term care. It is apparent that this leads to a very considerable demand on such resources. It is important to define clearly the "care" aspect of health care, and to ensure that there is a "care" service in place to provide it.

Finally, there are more long-term hospitalizations in areas in which there are large numbers of beds in health care facilities, as well as in areas where the capacity of special nursing homes, which are formal long-term care service providers for the elderly, is large. This leads us to conclude that a care-service provision system, which combines health care facilities and special nursing homes for the elderly, exists in areas where there is a large demand for long-term hospitalization (that is, demand for long-term care). In order to establish whether rationing is occurring—because supply cannot catch up with a rapidly increasing care demand—a further detailed analysis, taking into consideration other care facilities and differences in family circumstances, is needed.

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