COSTS OF HOSPITAL BENEFITS FOR RETIRED EMPLOYEES

BY

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The officers of a client company asked, in mid-1960, for an estimate of the cost of providing hospital benefits for employees who retire under the company pension plan. The pension plan is funded, on an actuarial basis which the company has found to be satisfactory, through a trust fund. The company officials began with the idea that it ought to be possible to provide advance funding for the health benefits of employees who retire with a company pension in the same way regular pensions are provided for in advance. The active employees of the company are covered under Blue Cross and Blue Shield plans; the terms of the Blue Cross plan will be summarized later. The initial request for an estimate was limited to hospital benefits. If a decision were to be made to begin the advance funding of all health care benefits, cost estimates for other areas would be required. This paper deals only with the first estimate.

The company is engaged in manufacturing. As of July 1, 1960, the total number of its employees was a little over 50,000. The major plants were located in the East, Middle West, the South and in California; there were small plants in three other eastern states, warehouses in six more widely located, and sales offices in thirty-two states. There were about 4500 pensioners. Over 96 per cent of active employees and over 99 per cent of the pensioners are men. The pension plan is non-contributory while company and employees share the Blue Cross-Blue Shield premiums for active employees. It would be possible for retired employees to be continued in the group along with the active employees and, initially at least, this is what the company had in mind. The contract between the company and the Blue Cross organization provides that the premiums are to be based on experience.

It was pointed out that the problem of funding health care benefits is beset with even more difficulties than is true for pensions. First of all, the company would want to be sure that any contributions paid into a fund for future health care benefits for retired employees would be fully deductible for income tax purposes. So far as this writer is aware, there have been no arrangements presented to the income tax authorities, either federal or state, which would establish whether and under what conditions tax deductibility could be secured.[1]

Second, the pension under the company plan is the higher of (1) a percentage of average salary during the final 10 years of employment for each year of continuous company service, diminished by approximately two-thirds of the average social security primary insurance amount for employees retiring currently, or (2) a fixed amount for each year of such service up to 35. In 1960,

[1] In an informal conference, the writer was told by an official of the Internal Revenue Service that a pension plan in which the monthly pension would be the variable premium for a prepaid health care plan would probably be approved if the payment were in cash directly to the pensioner who could, of course, choose to spend the pension in any way he saw fit.

new pensions were averaging about 45 per cent more than in 1955; but all pensions being paid were higher than in 1955 by only about 20 per cent because the pensions, once granted, are, under the terms of the plan, fixed for the remainder of the lives of the pensioners.[2] Under an arrangement for the payment of Blue Cross-Blue Shield premiums or the equivalent, all pensions would increase each time the premiums rose. The effect would be to make the costs of the pension equal to health care premiums far more uncertain than the cost of the present pension plan.[3]

Third, while the pension plan is non-contributory, employees pay for approximately half of the cost of Blue Cross-Blue Shield protection. Since the employees are currently exposed to the risk of requiring hospital care or medical services of the kind provided by Blue Shield, their contributions are earned in full by the time their coverage ends following termination of their service. This would not be true for an employee who leaves company service before he is entitled to a company pension. Under such circumstances his contribution would have been paid with respect to a risk to which he had never been exposed and therefore should be returned. Thus the use of employee contributions in paying for retired employee health benefits (i) introduces administrative and actuarial complexities which, as will appear, are in any event not lacking, and (ii) more important, adds to necessary costs the cost of a benefit (payable upon death or withdrawal before retirement or death after retirement, but before exposure to actual risk is fairly commensurate with the accumulated contributions of the employee) not related to the objectives of the plan.

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[2]The plan has been amended twice to increase pensions in effect, but the costs of such increases were calculated at the time they were made.

[3]It is relevant at this point to mention that three methods of financing Blue Cross benefits for pensioners are available to this company: They may be continued in the group along with active employees; they may be continued as a group but with the present plan benefits; or they may, at the time of retirement, convert to individual direct-pay contracts. There is a single uniform plan applicable to all active employees, no matter where they are located or what the provisions of the local Blue Cross plan may be. The various Blue Cross organizations have organized a syndicate, managed by the Blue Cross organization covering employees at operating headquarters, to which a uniform monthly premium per employee is paid for the uniform benefits provided to such employees and their eligible dependents. The premiums are based on an experience rating formula; they are, in effect, 109 per cent of claims plus 8 cents per employee per month.

If the pensioners are kept in the group with the active employees, premiums will be immediately affected and the proportion of pensioners as compared with active employees will be a major factor in premiums. If a special group for pensioners is formed, the costs of claims for pensioners alone will determine the premium. If retiring employees convert to a direct-pay individual contract, they pay the community-rated premium and receive the benefits of the regular plans offered generally by the Blue Cross plan which operates at the last place of employment of the retiring employee. These benefits are frequently less than those of the uniform plan covering the active employees, and the pensioners and the union which represents active employees wish the uniform plan coverage continued. About one-quarter of the pensioners have direct-pay contracts with local Blue Cross plans. With the spread of special plans for covering retired-worker families, the right of conversion is likely to be limited to joining these plans rather than to joining a general conversion pool, implying an increase in required contributions.

Finally, provision of some medical care for aged persons has been the object of intense discussion by federal and state legislators and officials and by the public generally. The demand for health care benefits for retired-worker families which this discussion has encouraged can be expected to find reflection in the utilization of such services when they are made available and perhaps in the prices charged for such services.

PLAN PROVISIONS

Pensions

Since the hospital benefits are to be provided to pensioners, the conditions under which pensions may be granted under the company pension plan are relevant. There are, in general, two classes of pensions—age and disability.[4] A pension is payable to an employee upon his retirement after completing 15 or more years of continuous service if (a) he has attained the age of 65, or (b) has become "permanently incapacitated" while in the active service of the company. An employee is, generally speaking, to be deemed "permanently incapacitated" if he has, for 6 consecutive months, been totally disabled by bodily injury or disease so as to be prevented thereby from engaging in any occupation or employment for remuneration or profit and, in the opinion of a qualified physician, such disability will be permanent and continuous during the remainder of the employee's life. There is no compulsory or automatic retirement age.

Blue Cross[5]

In-patients (pensioners or their spouses) confined to a hospital which is a member of a Blue Cross plan or which participates in a local hospital service plan having reciprocal relations with Blue Cross are entitled, for a period not exceeding 120 days for each hospitalization,[6] to: bed and board in semi-private accommodations; general nursing care; use of the operating room and delivery room; anesthesia when provided as a regular hospital service, dressings, plaster casts and splints; laboratory examinations; basal metabolism tests; x-ray examinations; electrocardiograms; electroencephalograms; physiotherapy and hydrotherapy; oxygen and its administration; administration of blood or blood plasma; radiation therapy; and drugs and medicines as listed at the time of hospitalization in the U. S. Pharmacopoeia, National Formulary or New and Non-Official Remedies.

Readmission to a hospital within 90 days after a previous hospitalization is considered part of the first hospitalization. Each visit for treatment at the out-

[4] Any employee who leaves the service of the company without qualifying for an immediate age or disability pension, but who has completed 15 or more years of continuous service, has the right, under the plan, to a pension beginning when he attains age 65. The company intends only those entitled to a pension immediately following termination of employment to be eligible for health care benefits.

[5] While the plan applied in 1960 only to active employees, it is here described as applicable to pensioners.

[6] An exception relates to mental or nervous disorders and pulmonary tuberculosis, for which benefits are payable up to a maximum of 30 days during any 12-month period.

patient department of a hospital counts as one day of hospitalization. The occupant of a private room would be required to pay the hospital the regular charge for the private room in excess of $12. Subscribers confined in an accredited general hospital which is neither a member of nor covered by reciprocal arrangements with Blue Cross will be entitled to an indemnity of up to $25 for the first day of hospitalization and up to $10 per day for each additional day of hospitalization not in excess of 119 days for a single stay. Maternity benefits are not to be provided under the plan for the spouses of pensioners.

Limited benefits are available for (a) surgical and radiation treatment in the out-patient department of a hospital which is a member of Blue Cross; (b) emergency out-patient treatment in an accredited general hospital, as the result of, and beginning within 48 hours after, a non-occupational accident; and (c) in-patient admissions for diagnostic study and diagnostic services performed in the out-patient department of a hospital which is a Blue Cross member and which provides such services when directed toward a definite condition of disease or injury. The exclusions are, except for the services described in the preceding sentence, those usually to be found in comprehensive Blue Cross service plans.

The hospitalization coverage would begin with the start of the pension. Under the pension plan, all pensions begin with the first day of the first full month of retirement. Coverage for both pensioner and spouse would end on the earlier of the date of death or the last day of the last month for which the pension is paid. A spouse surviving a pensioner, or a pensioner whose pension is terminated, would have the right to convert to a direct-pay contract under the local Blue Cross plan. This conversion option is assumed, for the purposes of the estimate in this paper, to produce no charge against the company.

Blue Cross Premiums.

As mentioned previously, the Blue Cross coverage for pensioners can be obtained in three ways: by continuation in the company group along with active employees, by formation of a separate group with present benefits (except such as may be excluded), or by conversion at the time of retirement to a direct-pay contract under a local Blue Cross plan. The premiums for converted contracts are higher than the current net premiums after experience rating refunds. But, for pensioners, it is reasonably certain that the premiums are less than the cost; on all converted contracts the 1959 losses were almost 110 per cent of earned premiums. A substantial increase in group conversions by pensioners would almost certainly increase the underwriting loss if the relation between the overall community premiums and premiums for conversions remains constant. It is general Blue Cross policy to subsidize premiums on group conversions, but no definite percentage seems to have been fixed for the subsidy. The drive to cover retired persons by Blue Cross through direct-pay contracts can be expected to result in periodic increases in the community premiums for such coverage.

If pensioners are continued in the company group along with active employees or form a separate group, the experience rating formula is such that

any additional cost for pensioners' hospitalization benefits would be immediately reflected in premiums. To the extent by which (a) the ratio of pensioners to the total covered under the company group is less than the corresponding ratio for the whole "community" covered by the entire Blue Cross plan, and (b) the experience with pensioners under the company group is more favorable than for the whole community, net premiums for continuation of pensioners in the company group will offset the subsidy in the community rate and the lower benefits of local Blue Cross plans. The company's favorable experience rate for active employees is attributable to many factors of which (1) a pension plan effectively operating for many years, and (2) youthful hiring ages would be neutral or would tend to raise pensioner costs. The company has a very effective plan under which ill employees and dependents are visited and assisted by company nurses. This plan does not now apply to pensioners, but consideration is being given to such an expansion. If arrangements are made for pensioner coverage, the pensioner experience might be somewhat more favorable than it would otherwise be.

The company was considering making the health care benefits provided for active employees available to former employees who were then pensioners, and wanted an estimate of the cost of such a move. In calculating such a cost it was assumed that the premiums would reflect the full cost on the basis of actual experience with such pensioners.

Pensioners, active employees and spouses[7] were distributed by age on July 1, 1960, as follows:

		Pensioners			
Age of Pensioner	*Age*	*Disability*	*Age of Pensioner*	*Age*	*Disability*
35-39	—	1	69	509	19
40-44	—	4	70	502	12
45-49	—	5	71	426	1
50-54	—	16	72	275	—
55-59	—	37	73	151	—
60-64	—	165	74	131	—
65	221	64	75	90	—
66	492	63	76-79	81	—
67	567	52	80 & over	20	—
68	601	32	Total	4066	471

[7] There has been no count of spouses. Estimates of numbers of spouses in the several age groups have been based on data as to the marital status and ages of spouses of railroad workers on the basis of whose deaths (in 1954-56) application for survivor benefits were made to the Railroad Retirement Board, as reported by the Board in the report on the Seventh Actuarial Valuation. Average ages of spouses (all females) from Railroad Retirement data were rounded up to the next higher integral year.

Age of Pensioner	Spouses of Age Pensioners	Spouses of Disability Pensioners	All Pensioners	Average Age
Under 50	—	8	8	43
50-54	—	13	13	50
55-59	—	30	30	55
60-64	—	134	134	59
65-69	1843	177	2020	63
70-74	1050	9	1059	67
75-79	106	—	106	71
80 & over	10	—	10	75
Total	3009	371	3380	

Active Employees and Spouses

Age	Employees	Spouses	Average Age of Spouses
Under 20	205	51	18
20-24	1,309	785	21
25-29	3,980	3,065	26
30-34	5,768	4,649	31
35-39	7,616	6,306	36
40-44	9,308	7,791	41
45-49	8,576	6,921	46
50-54	6,184	5,120	50
55-59	4,245	3,451	55
60-64	2,664	2,166	59
65-69	924	712	63
70-74	135	95	67
75 & over	9	6	71
Total	50,923	41,118	

The average Blue Cross premium for active employees in the second quarter of 1960 was $8.837 per participant. No separate premiums for employees with and without dependents were quoted; as of January 1, 1960, 82.86 per cent of the employees had dependents. The Blue Cross organization has quoted a premium for the year beginning July 1, 1960, of $8.82 per month for single pensioners and $16.33 for a couple, without subsidy.

A composite rate for pensioners as of July 1, 1960, was estimated to be $14.415, about 63 per cent higher than the active employee cost for the second quarter of 1960. Hospital costs for active employees include maternity services and benefits for children; pensioner family costs contain no maternity benefits and costs for children can, without perceptible error, be disregarded.

It was estimated that maternity and child costs were 31.9 per cent of all hospital costs for the active employee plan. If maternity and children's benefits had been excluded from that plan, the second quarter cost per employee would have been $6.018. Thus the composite quoted premium for pensioners and spouses was about 2.40 times the rate of active employees and spouses, exclusive of benefits for children and maternity cases.

Hospital Utilization by Retired Employees and Their Spouses

In the calculation of long range costs, the initial premium, while important, is by no means the only factor. Utilization increases with age; as pensioners grow older their utilization will rise. And as a pension plan itself ages, the average age of pensioners tends to rise. As will be pointed out, there is a long-term trend towards increasing hospitalization utilization; this trend must be examined. Finally, the costs of hospital care measured in some appropriate units of utilization have been increasing rapidly for a number of years. These price increases have had a marked effect on premiums for hospital benefits.

The best single unit for measuring the volume of hospital services is a day of hospital confinement. It is not a perfect unit; the use of hospital out-patient services is not well measured by this unit, nor has any very satisfactory method of measurement been found. For lack of any better unit, the day of hospital care is used in this paper as the measure of hospital utilization.

What would be desirable, if it were available, is actual experience as to hospital utilization by persons who have retired from their jobs after relatively long periods of steady employment. Most such persons and their spouses are over 65 years of age. Unfortunately, so far as this writer could discover, no such experience has been accumulated. The best that can be done is to examine the experience as to hospital utilization of persons who are under 65. Some comments as to the possible differences between retired persons and elderly persons who have not retired will be made after the experience has been examined.

Eight studies of hospital utilization by elderly persons were analyzed for this paper. These were:

(a) "Voluntary Health Insurance and the Senior Citizen," compiled and published by the New York State Insurance Department (1957);

(b) American Life Convention (ALC), Health Insurance Association of America (HIAA), and the Life Insurance Association of America (LIAA) (1959), study summarized by E. J. Faulkner in testimony before the Congressional Committee on Ways and Means, July 1959;

(c) 1954 hospital utilization by participants in the Philadelphia Blue Cross plan, published by Spiegelman in "Ensuring Medical Care for the Aged";

(d) Direct-pay contract experience under Rhode Island Blue Cross in 1959, compiled and published by that Blue Cross organization;

(e) A study of hospitalization experience of the population of Cuyahoga County, Ohio (utilization experience undated, study published in 1959 by the Citizens Hospital Study Committee, Northeast Ohio);

(f) Health Insurance Plan of Greater New York (HIP), (1955) study by Shapiro and Einhorn in "Public Health Reports," August 1958;

(g) Indiana Blue Cross (1956), study by Hineman published by Blue Cross organization, 1959;

(h) New Jersey Blue Cross (1958), study compiled and published by Research Office of Blue Cross organization in 1959.

The data utilized here and just referred to are based on experience under insurance, Blue Cross or indemnity. Data based on surveys have been omitted as not as useful for present purposes as the experience with insurance operations. The Canadian experience under the Saskatchewan type legislation has been omitted also as not bearing directly on probable experience in the United States.

The data from the studies suggest that the average days of hospitalization per pensioner, if equal to that of the average male over 65, would be at least 3 per annum if the maximum duration per stay is 120 days. The "at least" and the "if" clauses are used advisedly for several reasons. First, most of the experiences are at least 3 or 4 years old and, as will be seen later, there is some trend toward increased utilization. Second, none of the experiences appear to be based on retired lives exclusively. The experience of one large hospital service plan[8] suggests that for persons 65 and over hospital utilization of those who have retired is at least one-third higher than for those employed.

Two of the eight experiences indicate average days of pensioner hospitalization substantially less than the other six: the Health Insurance Plan of Greater New York (HIP) and Cuyahoga County, Ohio. The data based on these two experiences are not given much weight here. The HIP data are related to a particular method of medical practice and payment therefor which is not now in wide use. The likelihood of plans such as HIP being generally available in the foreseeable future is too small to warrant giving weight to the experience for present purposes. The Cuyahoga County figures are based on too diverse groups and cover too brief a period to be significant.

For the purpose of calculating the cost of advance funding of hospital benefits it is concluded that a factor should be added to the averages based on the available experience to allow for the fact that the male group here will be composed entirely of retired persons. The hospitalization experience for the pensioner group here will, other things being equal, be rather less favorable than that of persons retired under private pensions generally. The company has no compulsory or automatic retirement age; health considerations play a large part in decisions (some made by employees, some by the company, as a result of physical examinations) to retire. That is, the physical condition of the pensioners may be somewhat inferior to that of pensioners under the average company pension plan where automatic retirement is frequently to be found.

It is concluded that, for cost calculation purposes, it should be assumed that hospital utilization up to 120 days per stay for the present age pensioners

[8] Cited in Secretary of Health, Education and Welfare "Report Submitted to the Committee on Ways and Means, Hospitalization Insurance for OASDI Beneficiaries" (Committee Print, Government Printing Office, 1959), p. 89, n. 6.

will, at present, be 3.5 days per pensioner per annum. This is based roughly on an increase of 5 per cent over the averages based on the New York State study and the ALC-HIAA-LIAA data and an allowance of just under one-sixth of the base for changing from a part-active part-retired employee base to a base in which all male participants are retired. This allowance implies the guess that the current experience with hospital coverage of persons over 65 is based on active and retired lives in about equal proportions.

It is assumed that the hospitalization experience of the spouses (wives in this case) of employees retired because of age will not differ significantly from that of the wives of active employees of like ages. The averages based on the New York State 1957 data and on the ALC-HIAA-LIAA 1959 study, after adjustment of the latter to a 120-day maximum stay, are in exact agreement. For the present cost calculations it is therefore assumed that the average days of hospitalization per present age pensioner spouse, up to 120 days per stay, will be currently 2.5 per annum.

No study has been available for disability pensioners. To receive a disability pension an employee must have at least 15 years of service, so that the minimum age of a disability pensioner will be about 32. As will later be explained in detail, the after-life of age pensioners is here assumed to be represented by the GA-'51 (male) mortality table with ages set back one year, while current mortality of disability pensioners approximates that of the 1944 Disabled Railway Employees mortality table for persons of equal age who have been disabled for 2 years. The disabled annuity value at 32 approximates that under the GA-'51 table at age (as adjusted) 62. Therefore, the average days of hospitalization for disabled pensioners at age 32 is taken to be the average for persons aged 62, with the differential constant at 28 years instead of 30 from age 37 on. Again, it is assumed that the hospital experience for spouses (wives) of disability pensioners will be the same as for other women of the same age up to age 65. It seems reasonable to suppose that the wives of disabled men are themselves in poorer-than-average health. No exact measurement of this extra hazard is known to this writer. An allowance of 8 per cent is added to the days of hospitalization of wives of disability pensioners over 65 to compensate for this risk.

The average days of hospitalization for current pensioners and the spouses can be expected to rise as more and more pensioners survive to older ages. The ALC-HIAA-LIAA experience, because it is the most recent available for individual ages, is taken as the basis for the slope in increase by age. The ALC-HIAA-LIAA average days for aged persons at each age and sex applied to the actual ages of age pensioners and spouses of pensioners over 65 indicated overall averages of 2.654 days per pensioner and 2.295 days per spouse of a pensioner over 65. To bring these averages up to 3.5 and 2.5 days, respectively, the ALC-HIAA-LIAA averages for males and females were raised by 31.88 per cent and 8.932 per cent, respectively. The average days of hospitalization so adjusted were used in the cost calculations and are given in Table 1.

The proportion of pensioners who are married and the ages of spouses have been based on the Railroad Retirement experience already referred to. For cost purposes, these data, which are published for quinquennial age groups,

are assumed to apply to the middle age of each group and proportions and ages are interpolated on a straight line basis. Ages of spouses are taken to the next higher whole year. The data relating to the proportion of pensioners who are married are also shown in Table 1. On the basis of this table, the average compensable days of hospitalization per annum for present pensioners, age and disability together, is 3.936, and for their spouses 2.481.

UNIT HOSPITALIZATION COSTS

The average total expense per patient day in short-term general and other special hospitals, as compiled and published by the American Hospital Association, was $28.17 in 1958 and $30.19 in 1959. The increase of $2.02, 7.2 per cent, was relatively less than in ten other years since 1946. Or, to state the reverse, in only two years since 1946 has the year-to-year increase in the cost of a day of hospital care increased less than from 1958 to 1959. The nationwide level of cost of a day of hospitalization at the middle of 1960 may well be above $32.

TABLE 1

Proportion of Pensioners at Each Age who are Married and Average Days of Compensable Hospitalization of Pensioners and Their Spouses at Each Age of Pensioners

Age of Pensioner	*Proportion of Pensioners who are Married*	*Average Days of Compensable Hospitalization of Pensioners in Year of Age*		*Average Days of Compensable Hospitalization of Pensioner's Spouses in Pensioner's Year of Age*	
		Disability[a]	*Age*	*Disability*[a]	*Age*
(i)	*(ii)*	*(iii)*	*(iv)*	*(v)*	*(vi)*
32	.8060	2.64		0.86	
33	.8104	2.65		0.89	
34	.8148	2.66		0.92	
35	.8192	2.77		0.96	
36	.8236	2.90		1.01	
37	.8280	3.03		1.05	
38	.8298	3.17		1.09	
39	.8316	3.17		1.12	
40	.8334	3.30		1.17	
41	.8352	3.43		1.20	
42	.8370	3.56		1.23	
43	.8310	3.69		1.26	
44	.8250	3.82		1.27	

[a] Persons retired for disability are permanently classified as disability pensioners, irrespective of their attained ages.

45	.8190	3.96		1.31	
46	.8130	4.22		1.33	
47	.8070	4.35		1.38	
48	.8090	4.48		1.40	
49	.8110	4.75		1.46	
50	.8130	5.01		1.51	
51	.8150	5.41		1.59	
52	.8170	5.67		1.59	
53	.8192	6.07		1.64	
54	.8214	6.33		1.71	
55	.8236	6.73		1.76	
56	.8258	6.99		1.84	
57	.8280	7.25		1.89	
58	.8250	7.65		1.97	
59	.8220	7.91		2.03	
60	.8190	7.91		2.12	
61	.8160	7.91		2.20	
62	.8130	7.91		2.20	
63	.8046	7.91		2.28	
64	.7962	7.91		2.28	
65	.7878	7.91	3.03	2.47	2.29
66	.7794	7.91	3.17	2.47	2.29
67	.7710	7.91	3.17	2.58	2.39
68	.7582	7.91	3.30	2.70	2.50
69	.7454	7.91	3.43	2.71	2.51
70	.7326	7.91	3.56	2.71	2.51
71	.7198	7.91	3.69	2.82	2.61
72	.7070	7.91	3.82	2.83	2.62
73	.6900	7.91	3.96	2.95	2.73
74	.6730	7.91	4.22	3.05	2.83
75	.6560	7.91	4.35	3.05	2.83
76	.6390	7.91	4.48	3.17	2.94
77	.6220	7.91	4.75	3.29	3.05
78	.6008	7.91	5.01	3.40	3.15
79	.5796	7.91	5.41	3.41	3.16
80	.5584	7.91	5.67	3.52	3.27
81	.5372	7.91	6.07	3.76	3.49
82	.5160	7.91	6.33	3.88	3.59
83	.4898	7.91	6.73	3.89	3.60
84	.4636	7.91	6.99	3.99	3.70
85	.4374	7.91	7.25	4.23	3.92
86	.4112	7.91	7.65	4.47	4.14
87	.3850	7.91	7.91	4.47	4.14
88	.3654	7.91	7.91	4.48	4.15

Age of Pensioner	Proportion of Pensioners who are Married	Average Days of Compensable Hospitalization of Pensioners in Year of Age		Average Days of Compensable Hospitalization of Pensioner's Spouses in Pensioner's Year of Age	
		Disability[a]	Age	Disability[a]	Age
(i)	(ii)	(iii)	(iv)	(v)	(vi)
89	.3458	7.91	7.91	4.49	4.16
90	.3262	7.91	7.91	4.81	4.46
91	.3066	7.91	7.91	4.82	4.47
92	.2870	7.91	7.91	4.84	4.48
93	.2720	7.91	7.91	4.86	4.50
94	.2570	7.91	7.91	5.05	4.68
95	.2430	7.91	7.91	5.06	4.69
96	.2290		7.91		5.01
97	.2160		7.91		5.23
98	.2030		7.91		5.56
99	.1910		7.91		5.77
100	.1790		7.91		6.00
101	.1680		7.91		6.32
102	.1570		7.91		6.53
103	.1470		7.91		6.53
104	.1370		7.91		6.53
105	.1280		7.91		6.53
106	.1190		7.91		6.53
107	.1110		7.91		6.53
108	.1030		7.91		6.53
109	.1000		7.91		6.53
110	.1000		7.91		6.53
111	.1000		7.91		6.53

[a] Persons retired for disability are permanently classified as disability pensioners, irrespective of their attained ages.

This is an average for the whole country. While the company involved here has employees in a number of widely scattered states, the nationwide average overstates the actual average slightly. The benefits provided in 1959 had a current value of $29.34 per day in the hospital. Further, the usual Blue Cross plan reimburses hospitals through some formula which, directly or indirectly, results in a discount from the price charged those who pay hospital bills directly. That is true in the present case; the average payment per hospital day in 1959 was $27.64, indicating a discount of about 5.8 per cent. In any event, the cost of a day of hospitalization in 1959 for the company's active employees and their dependents was almost 8.5 per cent less than the national average. The average payments in 1957 and 1958 were, respectively, $22.87 and $25.82 per day of hospitalization. The increase of 1958 over 1957 was 12.9 per cent, while from 1958 to 1959 the rise was 7.0

per cent. The increase of 1959 over 1957 was 20.9 per cent as compared with a 16.2 per cent increase in the national average. That is, a day of hospitalization for employees of the company with whose pensioners this paper is concerned now costs less than the national average but is rising at a more rapid rate. This has apparently been true of the company's hospital costs for some time. Exact comparisons over a longer period are prevented by a substantial change in the plan late in 1956.

We are here concerned with pensioners. Is the cost of a day of hospitalization for a pensioner and his spouse more or less than the average? First, in the company involved here, the cost of a day of hospitalization in maternity cases was higher than the cost of a day of other in-patient care by 12.9 per cent in 1957, 7.6 per cent in 1958 and 16 per cent in 1959. Maternity benefit costs in these three years averaged 14 per cent of total benefits. If the cost of a day of maternity care had been the same as for other in-patient care, the average total cost of a day of hospitalization in the three years would have been reduced by 1.7 per cent. Thus the fact that pensioner families will have, for all practical purposes, no obstetrical cases should tend to reduce costs slightly.

The fact that costs for children will be eliminated from pensioner families will operate in the opposite direction. However, the effect apparently will be slight. Under the company plan the cost of a day of in-patient care for dependents, including children, was about 1 per cent higher than the cost of a day of in-patient hospitalization of an employee in 1958 and 1959 and about 1 per cent lower in 1957. The company hospitalization costs have not been divided for the several age groups of employees and dependents. Such a classification was made in Indiana in 1956. The hospital bill per day for patients over 65 was $21.87 as compared with $22.91 for patients of all ages. In the Hineman study of Indiana Blue Cross 1956 experience, obstetrical cases were omitted. Daily hospitalization costs for participants over 65 in other types of cases were less than the average for all participants other than children.

Using the Indiana figures, all that are available, it is concluded that the omission of children will increase the average daily cost of hospitalization by 1 per cent. The cost per day for persons over 65 will be 4.54 per cent less than the average for all adults. The average for males in the over-65 group will be 3.22 per cent above and that for women over 65, 3.58 per cent below the average for both sexes in the over-65 age group.

Applying these percentages to the $27.64 average for 1959 we get:

$.983 \times \$27.64 = \$27.17$, average cost per day of non-maternity care;

$1.01 \times \$27.17 = \$27.44$, average cost per day of adult care;

$.9546 \times \$27.44 = \$26.194$, average cost per day of hospitalization for patients over 65;

$1.0322 \times \$26.194 = \$27.04$, average cost per day of hospitalization for a male patient over 65;

$.9642 \times \$26.194 = \$25.26$, average cost per day of hospitalization for a female patient over 65.

These were 1959 costs. When this study was being prepared in the third quarter of 1960, it was estimated that the daily Blue Cross costs under the company plan in 1960 would be more than 10 per cent in excess of 1959.[9] Data differentiating between utilization and price of services were not available when the estimate was prepared. For present purposes, it is estimated that the cost of a day of hospital care for a pensioner over 65 in 1960 was $29.75 and for a spouse of such a pensioner $27.80. For want of data indicating different figures for the particular group, these averages will be applied to disability pensioners under 65 and their spouses.

The Blue Cross premiums for pensioners, $8.82 for pensioners without dependents and $16.33 for pensioner and spouse, assumed that expenses and contingency reserves would be 9 per cent of claims. On the basis of the utilization and cost per day of hospitalization developed here (see page 22), with loadings as in the quotation, the monthly premiums would be:

For pensioner without dependents:

$$\frac{(3.936)(\$29.75)(1.09)}{12} = \$10.636$$

For pensioner and spouse:

$$\frac{[(3.936)(29.75) + (2.481)(27.80)](1.09)}{12} = \$16.901$$

Weighted average:

$$\frac{(3380)(\$16.901) + (1157)(\$10.636)}{4537} = \$15.303$$

Hospital Utilization Costs and Trends

For the purposes of a long range cost estimate, trends in the utilization and in costs of hospital services must be taken into account. The first question to be asked is whether hospital utilization among retired persons and their spouses is increasing. Unfortunately, all the over-65 utilization data are from separate studies which have not been repeated. It is impossible to determine from a comparison of the data from the several sources what sort of a trend, if any, exists.

That there has been a general trend toward greater utilization of hospital facilities admits of no doubt. Part of this trend has been connected with the spread of insurance and part is due to change in the public attitude towards and in the functions of hospitals. Between 1949 and 1959 the hospital utilization under all Blue Cross plans in the United States (number of days of hospitalization per 1000 Blue Cross participants) rose from 846 to 1041, or by almost 2.1 per cent per annum, compounded. Over a longer period the increase in Blue Cross utilization has been slower than in the recent past.

[9]The 1960 overall costs per hospital day in fact turned out to be 8.8 per cent higher than in 1959. The daily payment after discount rose 8.5 per cent while average days in hospital per employee (but including days of dependents) increased by 5 per cent. The increase in hospital days per employee (excluding dependents' hospital days) was 2.8 per cent. Partly because of a sharp decline in employees at work in 1960 and 1959, the proportion of employees having dependents rose significantly.

Thus Blue Cross utilization in 1943 was 802 per 1000 participants, indicating an overall increase in utilization in the period 1943-59 of a little over 1.6 per cent per annum compounded.[10] The average increase in days per 1000 participants over the 10-year period was 19.5 as compared with 14.9 in 16 years. Thus utilization seems to be increasing faster in the 1950's than in the 40's.

The use of compound interest in calculating increases in hospital utilization is perhaps not warranted. The implication of compounding is that, in the long run, there is no limit on utilization. The slowing down of the rate of increase, despite liberalized access to hospital services, indicates that there may be some top limit. That limit is probably far from being attained; but for the purpose of projecting costs in the future, arithmetic rather than geometric progression is to be preferred.

Blue Cross utilization in recent years has been increasing more rapidly than formerly, whereas the reverse is true for the general population. Since the latter includes Blue Cross subscribers, the utilization for those who are not covered by Blue Cross must be increasing quite slowly, if at all. This is an illustration of the generally known fact that possession of insurance against health care costs tends to stimulate use of the agencies providing health care. Since we are here dealing with Blue Cross, it would be reasonable to expect utilization to increase in the next several years at the rate, in days per 1000 participants, of, say, the past five if benefits were to be increased as they were during that period. We are here dealing with a fixed plan. Recent increases have not been, overall, substantial. It is concluded that an annual increase in utilization of about 2 per cent of the 1959 average is a reasonable expectation for Blue Cross generally. Will the increase for pensioners be more or less than the average?

The great public interest in health care for the aged is likely to result in an increase in utilization, even if no further legislation is enacted. And the forces that will produce the increase will also make it more rapid than for the average elderly person who is insured against health care costs.

But there is some evidence that for an important group of workers the illness of aged employees has been rising faster than have illnesses among employees in the same industry at all ages. In the year ending June 30, 1949, there were 499.5 days of illness among each 100 male railroad employees eligible for sickness benefits under the Railroad Unemployment Insurance Act. In the year ended June 30, 1958 (the latest for which the necessary data had been published when this paper was prepared), the days of sickness per 100 male eligibles had risen to 780. But there had also been a substantial rise in the proportion of older employees. Weighting the days of sickness at the various ages by the numbers of persons at those ages in the 1949 fiscal year produces an average of 661.6 days of sickness per 100 male eligibles. The proper comparison, therefore, is between 499.5 and 661.6. Sickness

[10] United Steelworkers of America, "Special Study on the Medical Care Program for Steelworkers and Their Families" (Pittsburgh, September 1960), p. 108; Louis S. Reed, "Blue Cross and Medical Service Plans" (Federal Security Agency, 1947), p. 113.

among male railroad employees in the 9-year period rose by 32.45 per cent.[11] During the 9-year period there had been no change either in the definition of sickness, in the length of time for which benefits were paid or in the waiting periods in each benefit year. The relationship between sickness benefits and pensions did not change significantly. There were slight changes in the earnings requirement for eligibility, but it is clear that these could not have had any significant influence on the trend of sickness rates.

The average days of sickness of male employees 65 and over were larger, by about 62.43 per cent, than 9 years earlier. That is, illness among employees over 65 increased at a rate almost double that for all employees.[12] This does not prove that the hospitalization of over-65 employees would have increased in the same ratio; it is to be doubted that such would have been the case. Nor is it certain that railroad experience would have been duplicated in the company involved here, or that the experience of active employees indicates a similar relative change for retired persons. But the railroad sickness insurance system is the largest operating in the United States and its trend experience (after correction for the aging) is hardly atypical. For present purposes it would seem appropriate to assume that the volume of hospitalization among retired employees will tend to rise a little more rapidly than among actives.

Reference has already been made to the rapid rise in the cost of a day in the hospital in recent years. The (national) average cost of hospitalization per patient day since 1946, as compiled and published by the American Hospital Association, is as follows:

Year	*Average Cost per Patient Day*	*Yearly Per Cent Increase*
1946	$9.39	—
1947	11.09	18.1
1948	13.09	18.0
1949	14.33	9.5
1950	15.62	9.0
1951	16.77	7.4
1952	18.35	9.4
1953	19.95	8.7
1954	21.76	9.1
1955	23.12	6.2
1956	24.15	4.5
1957	25.99	7.6
1958	28.17	8.4
1959	30.19	7.2

[11] If the 1958 age distribution were used for 1949, the average days of illness in the earlier year would have been such as to indicate an increase of 33.57 per cent. After the text was written the Railroad Retirement Board published the sickness experience for the year ended June 30, 1960, without any sex breakdown. On the basis of an age distribution the same as in fiscal year 1949, sickness rates in fiscal year 1960 produced an increase in days of sickness of 45.0 per cent above what they were. If the age distribution had been constant at the 1960 figure, the indicated increase would have been 44.1 per cent.

[12] The recently published railroad figures indicate that between the fiscal years 1949 and

This nationwide trend can be duplicated in particular sections. For example, in New York State the average cost per patient day in Blue Cross affiliated hospitals was found by the Columbia study[13] to have been $13.55 in 1947, $20.36 in 1952 and $26.71 in 1957. The rate of increase in the overall state average was influenced largely by the relatively slow increase in New York City hospitals. Over the 10-year period the hospital costs per day in all the up-state cities were more than doubled. The cost of a day of hospitalization under the company plan was given above as $22.87, $25.82 and $27.64 in 1957, 1958 and 1959, respectively. The average in 1953 was $12.98. The increase in company costs due to a change in the plan is indeterminate, but probably between one-fifth and one-third.

Increases in daily hospital costs over periods of time compare as follows:

Coverage of Data	*Period*	*Average Annual Increase in Hospital Costs per Patient Day During Period*	*Percentage of Average Annual Increase to Average Cost in* *First Year of Period*	*Last Year of Period*
Nationwide[a]	1946-59	$1.60	17.04	5.30
Nationwide[a]	1950-59	1.62	10.37	5.37
Nationwide[a]	1955-59	1.77	7.66	5.86
Nationwide[a]	1957-59	2.10	8.08	6.96
New York State[b]	1947-57	1.32	9.74	4.94
New York State[b]	1952-57	1.27	6.24	4.75
New York City[b]	1947-57	1.40	9.03	4.74
New York City[b]	1952-57	1.38	6.10	4.68
Buffalo[b]	1947-57	1.25	12.51	5.56
Buffalo[b]	1952-57	1.46	9.61	6.49
Company[c]	1953-59	2.01	12.90	7.27
Company[d]	1953-59	1.72	9.94	6.22
Company	1957-59	2.38	10.41	8.61

[a] Based on data published by the American Hospital Association as given in the preceding tabulation.
[b] As published in the Columbia study.
[c] Assuming plan improvements would have increased 1953 costs by one-fifth.
[d] Assuming plan improvements would have increased 1953 costs by one-third.

In considering future trends of hospital utilization and unit costs, account must be taken of the current efforts to reduce the volume of hospital inpatient care by greater resort to out-patient services. The Columbia study points out that if the average hospital stay could be reduced by 2 or 3 days, the average cost of a hospital stay would remain about constant if per diem costs increased by 50 per cent.

1960 illnesses among employees over 65 increased 59.4 per cent as compared with 45 per cent for all employees.

[13] "Prepayment for Hospital Care in New York State," report by Ray E. Trussell and Frank Van Dyke of the Columbia School of Public Health and Administrative Medicine to the Commissioner, Department of Health, and Superintendent of Insurance, New York State.

During the 10 years 1949-59, Blue Cross utilization of out-patient services increased much more rapidly than did in-patient care. Despite this trend toward more extensive use of less costly hospital services, the upward surge of both unit and aggregate hospital costs continued.

There has been substantial discussion of the possibility of the substitution of home care with adequate nursing for in-patient hospital services. For older persons, care in skilled nursing homes, if available, may have advantages, including economy, over hospital care. As mentioned earlier, the Company maintains an extensive visiting nurse service. Company hospital costs are perhaps lower than if there had been no such service; but there is nothing to show that the company costs have been rising any less rapidly than hospital costs generally. Nor are there indications that accommodations in nursing homes capable of giving adequate care are likely to be available in sufficient quantity to make any more significant contribution toward the health care of the rapidly increasing numbers of retired persons in the foreseeable future than is the case at present.

It is reasonable to suppose, however, that the efforts to contain the upward trend of hospital utilization and costs will have sufficient power to prevent increases from taking a geometric pattern. For both utilization and unit costs, the calculations in this paper will be based on an upward arithmetic trend, with certain modifications introduced by way of illustration. For the basic calculation (though other amounts will be used to indicate magnitudes) it will be assumed that the average cost of a day of hospitalization will increase at $2.00 per annum for the average retired worker and at an amount for the spouses, $1.87, which is the same percentage of the current daily cost for them as $2.00 is of the current daily cost for retired workers.

Methods of Calculating Cost

It is proposed to use what, in pension terminology, is called the "entry-age normal" method of computing costs. In essence, the process involves calculation of:

(a) The present value of (i) the hospitalization benefits to be provided in the future for present active employees and pensioners and their spouses, and (ii) a contribution of $1.00 per annum payable in equal monthly installments during the remaining service of each present employee;

(b) The annual amount (normal annual cost) required to be paid in equal monthly installments during the entire active service of new employees to provide, for such of them as qualify, hospitalization benefits after retirement for themselves and their spouses;

(c) The present value of the normal annual cost payable during the remaining service of each active employee;

(d) Aggregate past service cost [(a) minus (c)];

(e) The past service cost amortization installment per active employee [(d) divided by the number of employees and multiplied by the appropriate amortization factor]; and

(f) Total cost per active employee [the sum of (b) and (e)].

The calculation of pension costs under the entry-age normal method requires, in addition to the factors already discussed, assumptions as to (i) the rate of termination of employment without the right to any pension or hospitalization benefit, (ii) the rate of retirement among those eligible for an age pension and hence for hospitalization benefits, (iii) the rate of permanent and total disability, (iv) the rate of mortality in active service, (v) the rate of mortality after age and disability retirement, (vi) the distribution by age of new employees, and (vii) the rate of interest to be earned on funds accumulated in excess of benefits in the early years of the plan's operation. The first four of these rates are combined to form a service table. The rate of mortality in active service is based on the A-1949 male table without projection;[14] mortality after age retirement is assumed to follow the GA-1951 table with ages set back one year; and the mortality applied to lives of disability pensioners is the 1944 Disabled Railway Employees table (ultimate rates). The other probabilities needed for construction of the service tables and the service tables themselves used for this paper have been published elsewhere.[15] The distribution of employees by age has been given. For cost calculation purposes a distribution of employees having less than 15 years of service on the valuation date, by age at the time of original hire and by length of service, and a distribution, by attained age, of those having more than 15 years of service are also required. These distributions are given in Table 2. The valuation date is July 1, 1960. The distribution, by age at the time employed, of employees hired in the 5 years preceding the valuation date is taken as the distribution of those who will be hired in the future. The rate of interest assumed to be earned on any excesses of contributions over benefits in the initial years of operation is 3 per cent per annum, compounded annually. Net costs will be increased by 9 per cent for expenses and contingency reserves. Costs will be shown on a minimum basis (normal plus interest on past service cost), maximum (normal plus one-tenth of past service cost) and with past service costs amortized over 30 years from the valuation date.

In order to be able to observe the cost effects of different assumptions as to the future cost of a day's hospitalization and the amount of annual increases in such costs and in utilization, the results of the cost calculations will be presented in several stages and separately for pensioners and their spouses. The final average costs per employee will be given for the following:

I. No increase in either cost per day of hospitalization or in utilization:
   Cost per hospital day
   a. $29.75 for pensioners
      27.80 for spouses
   b. $26.00 for pensioners
      24.30 for spouses
   c. $25.00 for pensioners and spouses

[14] The mortality rate in the A-1949 table was, of course, first converted to a probability of death in active service for use in constructing the service table. The employment termination, disability and retirement "rates" are taken as probabilities.

[15] Murray W. Latimer and Joseph Musher, "The Actuarial Impact of Long-Term Wage Trends on Salary Scales for Industrial Type Pension Plans," Proceedings of the Conference of Actuaries in Public Practice, Vol. VI, pp. 174-204.

II. Cost per day of hospitalization and utilization both increasing;
Both increases will be calculated in terms of percentages of 1960 levels and therefore will be the equivalent of fixed annual amounts. Costs are given for the following increases:

	Annual Increase in Cost per Day of Hospitalization	*Equivalent Annual Increase in Cost per Day of Hospitalization Resulting from Higher Utilization*	*Equivalent Total Annual Amount of Increase Based on Cost of a Day of Hospitalization of $29.75 for Pensioners and $27.80 for Spouses*	
	Per Cent of First-Year Cost[a]	*Per Cent of First-Year Cost*[a]		
	(Uniformly Applicable to Pensioners and Spouses of All Ages)		*Pensioners*	*Spouses*
a.	6%	1%	$2.08250	$1.946
b.	6	1½	2.23125	2.085
c.	6	2	2.38000	2.224
d.	7	1	2.38000	2.224
e.	7	1½	2.52875	2.363
f.	7	2	2.67750	2.502

[a] No compounding. The increase resulting from higher utilization could properly be, but is not, based on the cost after the allowance for the increase. The rate of increase in utilization may properly be thought of as slightly less than the 1, 1½ or 2 per cent per annum shown.

III. Costs per day of hospitalization, after allowance for increased utilization, will be larger than in the first year by the amounts under II. In each year thereafter the increase will be diminished (and after a period of years the decrease will be larger) by:

(a) ¾ per cent of total first-year increase;

(b) 1 per cent of total first-year increase;

(c) 2 per cent of total first-year increase;

(d) 3 per cent of total first-year increase.

In the notation used in this paper, m (the annual amount of reduction in the increase) under (a) coupled with (a) under II for pensioners is ¾ per cent of $2.0825, or .01561875; m under (d) coupled with (c) under II would be 3 per cent of 2.38 for pensioners or 3 per cent of 2.224 for spouses.

Over the years the assumptions in II result in very high costs of a day of hospital care. Thus in 1990 a 6 per cent increase in the cost of a day's hospital care, without compounding, means that such costs would be 180 per cent higher than in 1960; i.e. a $29.75 cost per day in 1960 would be $83.30 in 1990. In addition, if utilization were to increase by 1 per cent of the present level each year, the cost effect is assumed to be the same as if daily hospital costs had increased by 30 per cent over 1960, or by $8.925 per day. The total cost effect, therefore, is the same as if utilization remained constant and daily hospital cost rose to $92.225.

TABLE 2

Number of Employees on July 1, 1960
Distributed by Age and Length of Service

Age when Employed[1]	*Length of Service (Years)*						
	Under 1	*1 & Less than 2*	*2 & Less than 3*	*3 & Less than 4*	*4 & Less than 5*	*5 & Less than 10*	*10 & Less than 15*
Under 20	70	13	130	130	103	527	551
20-24	45	103	722	695	689	2470	1447
25-29	38	46	346	530	660	2605	1429
30-34	14	68	255	298	482	1991	1064
35-39	13	33	172	165	347	1402	812
40-44	10	20	62	101	136	890	589
45-49	5	5	50	19	65	409	361
50-54	5	1	13	8	39	169	203
55-59	3	4	6	3	12	68	32
Total	203	293	1756	1949	2533	10,531	6488

	Total Under 5 Years	*Total Under 15 Year*	*15 Years and Over*	
			Attained Age[2]	
Under 20	446	1524	32-36	1033
20-24	2254	6171	37-41	4214
25-29	1620	5654	42-46	6886
30-34	1117	4172	47-51	5882
35-39	730	2944	52-56	4045
40-44	329	1808	57-61	3083
45-49	144	914	62-66	1733
50-54	66	438	67-71	271
55-59	38	128	72-76	23
Total	6734	23,753	Total	27,170

[1] To nearest birthday.
[2] At last birthday.

Even in the light of the recent rapid increases in unit hospital costs, the amounts to which costs would rise in the next 30 and 50 years under the assumptions specified can only be characterized as colossal. They seem consistent only with a continuous inflation. It is doubtful if any fund accumulation ought to be entered upon now with any such continuous trend in mind. Three methods of reducing the apparent cost can be followed. One is to make the assumed percentages of increase smaller than those listed under II; another is to introduce a decreasing rate of increase and ultimately an absolute decrease. The third method involves formulae which apply differential factors to segments of the commutation functions. The first method can be accom-

plished very simply under II by multiplying the costs of increase, as they will be given separately from (and under the unmodified assumptions to be added to) the costs under I where neither unit costs nor utilization are assumed to increase. The second method is embodied in division III. The third method has not been explored for this paper.

The total cost of a day of hospitalization under II (a) increases by 6 per cent per year and the effect of the assumed rise in utilization is to make the overall increase 7 per cent per year or, for the pensioners' 1960 cost of $29.75, $2.0825 per year. Thus for 1961 the effective overall equivalent cost would be $31.8325, in 1962 $33.9150, and so on. Under III the cost in 1960 and 1961 would be unchanged; the 1962 overall equivalent cost per day of hospitalization, instead of being $2.0825 higher than in 1961, would be higher by only 99.25 per cent of $2.0825 under III (a), [99 per cent under III (b), 98 per cent under III (c), 97 per cent under III (d)]. The effect of introducing each of these various reductions in the factors of increase is illustrated for pensioners under two of the six increase assumptions under II (a) [annual overall increase of $2.0825] and (f) [annual overall increase of $2.6775] in the following tabulation.

			Cost of a Day of Hospitalization of a Pensioner				
	Initial Overall		*Continuous Increase at*	*Increase Reduced Each Year After First by*			
II	*Increase*		*Rate in (2)*	*¾%*	*1%*	*2%*	*3%*
(1)	*(2)*	*Year*	*(3)*	*of Original Amount*			
(a)	$2.0825	1970	$50.58	$49.87	$49.64	$48.70	$47.76
(f)	2.6775	1970	56.53	55.62	55.32	54.12	52.91
(a)	2.0825	1990	92.23	85.43	83.17	74.11	65.05
(f)	2.6775	1990	110.08	101.34	98.43	86.78	75.13
(a)	2.0825	2010	133.88	114.74	108.36	82.85	57.34
(f)	2.6775	2010	163.63	139.03	130.83	98.03	65.23
(a)	2.0825	2030	175.53	137.81	125.23	74.94	24.65
(f)	2.6775	2030	217.18	168.68	152.51	87.85	23.19

VALUATION PROCEDURE

No attempt is here made to describe the details of the several valuations made for cost calculation purposes. There was a number of series of calculations.

1. Several series of present values, as of (a) the date of future age retirements for most active employees, and (b) the present ages of (i) pensioners (age and disability), (ii) active employees 65 and over, and (iii) active employees who have met the service qualification for a disability pension, of the cost of hospitalization for (1) a pensioner (age and disability, as appropriate) during his remaining life, and (2) his spouse, if married, during the shorter of (i) her own remaining lifetime, or (ii) that of the pensioner. In all calculations the number of days in hospital, up to a maximum of 120, was as-

sumed, in 1960, to be accurately stated for each year of age in Table 1. Any increase in cost was assumed to affect all days of hospitalization in identical ratio; and increases in utilization were taken as applicable equally at all ages. Any given percentage increase in utilization would therefore be equivalent to an increase of cost of an identical percentage, and in the calculations the two increases, where assumed, have been treated as if the two increases were a single, appropriately larger, increase in cost.

a. In the first series of calculations the cost of a day of hospitalization was assumed to be constant at the 1960 level, and no allowance was made for any increase in utilization.

b. In a second series the cost and utilization were assumed to increase, after 1960, by a constant percentage of the 1960 levels. Cost and utilization were combined in a single percentage equivalent to an identical cost increase, the calculations involving six combinations (five percentages, as summarized in the tabulation on page 32): 7, 7½, 8, 8½ and 9.

c. In the third series, cost and utilization (combined again in a single percentage) were assumed to increase, but with the increase in each year as compared to the last diminishing by a constant percentage of the original increase.

In the first series of calculations present values of the cost of hospitalization for (i) a pensioner, and (ii) his spouse varied by future pensioners' ages at retirement, with present pensioners and some active employees taken at their ages on the valuation date. Two series (one for pensioners, another for spouses) were obtained for the age pensioners, equated in effect to the earliest age of age retirement. With respect to employees already past the minimum age for age retirement, for disability pensioners generally, and for potential disability pensioners among active employees who have met the minimum service requirement for a disability pension, values had to be worked out for the whole range of possible ages at retirement.

In the second and third series of calculations the present values were needed for all the ages in the first series for every one of many years in the future.

Having calculated the present value of hospital costs as of the time of future retirement, these values must be related back to the valuation date, July 1, 1960. This was done, of course, by discounting the present values as of the various retirement dates from such dates to mid-1960 and making further modification to allow for the varying probabilities of employees of differing ages and periods of service qualifying for a pension. The probability of having a spouse at retirement is allowed for in the present value (as of the date of the pensioner's retirement) of the cost of the spouse's hospitalization. Where present pensioners are involved, the present values are, of course, taken as is.

2. a. The first series of calculations took a day of hospitalization as having a cost of 1, whether such day was in 1960, 1980, 2000 or some other year. These required modification where changes in costs were involved.

b. In the second series calculations were based upon constant annual

increases in the cost of a day of hospitalization equal to certain percentages of 1960 costs: 7, 7½, 8, 8½ and 9 (see the tabulation on page 32). These percentages are the sums of separate percentage increases, one resulting from the rise in the unit price, the other the increased utilization. If the total increase is 7 per cent, the cost in 1960 would be 1, in 1961 1.07, in 1962 1.14 and in 1963 1.21, and so on.

c. In the third series of calculations the increase was assumed to diminish each year by a constant percentage: ¾, 1, 2 or 3 (see the paragraph marked III on page 32). Thus if the 1960 cost per day of hospitalization was 1 and the first-year increase was .09, with the annual increases decreasing by 2 per cent each year [(.02)(.09) = .0018], the series of present values would be based on:

	Increase in Cost from Previous Year	*Cost in Year*
1960	—	1
1961	.09	1.09
1962	.0882	1.1782
1963	.0864	1.2646
1964	.0846	1.3492
1965	.0828	1.4320
	and-so on	

3. The several series of present values based on an initial cost of a day of hospitalization of 1 were translatable into any specified value by simple multiplication or, if values were to be varied as between pensioners and spouses or as between, for example, age and disability pensioners, by multiplying the appropriate series of values by whatever initial cost for the particular group was deemed proper.

All these calculations were, of course, shortened and simplified by the construction of numerous sets of commutation functions. But the next-to-end-product was the average value, as of the valuation date, of the cost of hospitalization of employees and their spouses under the plan during that part of the lifetime of employees which will remain after their retirement (or after the valuation date in case of employees already on pension). Commutation functions were used to get the present value, as of the valuation date, of a unit of contribution payable during the remaining active service of employees who were in such service on the valuation date. The present values of hospital costs and of a unit of contribution were determined for an average employee at each age-service cell.

The final step in the process was the multiplication of the average value of hospital costs and of contributions for an employee in each cell by the number of employees in such cell as shown by the census. To determine the 1960 entry-age normal, the values of costs at each age at 0 service, weighted by the number of employees in the census classified by their ages at the dates of employment, was divided by the value of a unit of contribution at each age at 0 service, identically weighted.

THE RESULTS OF COST CALCULATIONS

1. The total value, as of the valuation date, of benefits under the three sets of daily benefit costs in the first group of assumptions as to such costs,[16] the entry-age normals, the aggregate past service costs and the average past service cost per employee, all before loading, were, as indicated by a valuation as of July 1, 1960:

	1(a)		*1(b)*	
	Daily Benefit $29.75 (Pensioners) $27.80 (Spouses)		*Daily Benefit $26.00 (Pensioners) $24.30 (Spouses)*	
	Employees After Retirement	*Spouses*	*Employees After Retirement*	*Spouses*
Value of benefits	$38,020,563	$13,068,950	$33,228,055	$11,423,578
Annual entry-age normal	16.9521	5.6554	14.8153	4.9433
Past service cost	27,305,920	9,494,432	23,863,985	8,299,145
Average past service cost per employee	536.22	186.45	468.63	162.97

	1(c)	
	Daily Benefit $25 for Pensioners and Spouses	
	Employees After Retirement	*Spouses*
Value of benefits	$31,950,053	$11,752,653
Annual entry-age normal	14.2455	5.0858
Past service cost	22,946,128	8,538,153
Average past service cost per employee	450.60	167.67

The value, as of the valuation date, of a contribution of $1 per annum, payable continuously during the remaining active service of all employees in the census, was $632,054.

Under a pension plan the minimum funding required under Internal Revenue Regulations, for plans in which costs are calculated as here, is normal cost plus interest on the unfunded past service costs. The maximum for which a tax deduction is allowable is the normal cost plus one-tenth of the initial unfunded past service cost. These two costs with, in addition, the

[16] This group of assumptions used days of hospitalization and proportion of pensioners with spouses from Table 1 and allowed for no increase after 1960, either in the per diem cost or in utilization.

normal plus the amount required to amortize the initial unfunded past service costs over a period of 30 years from the valuation date, all on an annual basis and loaded 9 per cent of net, expressed as an amount per employee, are:

		Normal Plus		
	Benefits for	*Interest Only on Unfunded Past Service Cost*	*30-Year Funding of Past Service Costs*	*One-tenth of Initial Unfunded Past Service Costs*
I (a)	Pensioners	$35.76	$47.86	$76.93
	Spouses	12.17	16.38	26.49
	Both	47.93	64.24	103.42
I (b)	Pensioners	31.25	41.83	67.23
	Spouses	10.64	14.32	23.15
	Both	41.89	56.15	90.38
I (c)	Pensioners	30.05	40.22	64.64
	Spouses	10.95	14.73	23.82
	Both	41.00	54.95	88.46

Costs for pensioners are much higher than for their spouses because the spouse benefits never run longer than for pensioners and may terminate earlier; because after age 82 less than half the pensioners are assumed to be married; because the spouses are younger than the pensioners; and because the cost of a day of hospitalization for a spouse is less than for a pensioner. If the spouses' benefits ran for their lives, the costs would be substantially higher than are here recorded.

It should be noted that under all the assumptions the gross costs, when interest only is paid on past service costs, will be level indefinitely if employment remains constant. And given all the assumptions, the past service costs will be amortized in 30 years only under the same circumstances. The assumption that there will be no reduction in employment is probably not warranted.

II. In view of the rise over the last 25 years in the costs of a day of hospitalization and in the utilization of hospital services, the assumption of no change in either of these factors is not justifiable. This section deals with the costs under several differing assumptions as to the rate of change. The increases for which costs are here given were set out in the tabulation on page 32 and apply to the per diem costs assured under I (a) (i.e. $29.75 for pensioners and $27.80 for spouses). Increases for the per diem cost assumed in I (b) and (c), if the percentage increases were the same as those used for (a), would be in the same ratio as that of the per diem cost assumed for such cost in I (a). The results of the calculations, omitting the detail of aggregate values given for the three sets of benefits in the preceding section, are:

Increase as in (see page 32)	*Cost of Increased Benefits as Assumed in II for*			*Grand Total, Including Cost of Constant Benefit Amount [I (a)] and Utilization*
	Pensioners	*Spouses*	*Total*	
	Only Interest Paid on Past Service Liability			
II (a)	$70.94	$23.19	$94.13	$142.06
II (b)	76.00	24.85	100.85	148.78
II (c)	81.07	26.50	107.57	155.50
II (d)	81.07	26.50	107.57	155.50
II (e)	86.14	28.16	114.30	162.23
II (f)	91.20	29.81	121.01	168.94

Annual Additional Cost for Each 1 Per Cent Annual Increase (Not Compounded) in Hospital Costs Above 1960: $13.44

	30-Year Amortization of Past Service Liability			
(a)	$83.39	$27.19	$110.58	$174.82
(b)	89.35	29.13	118.48	182.72
(c)	95.30	31.07	126.37	190.61
(d)	95.30	31.07	126.37	190.61
(e)	101.26	33.02	134.28	198.52
(f)	107.21	34.96	142.17	206.41

Annual Additional Cost for Each 1 Per Cent Annual Increase (Not Compounded) in Hospital Costs Above 1960: $15.80

	Past Service Liability Amortized at Rate of One-tenth Each Year			
(a)	$113.29	$36.79	$150.08	$253.50
(b)	121.38	39.42	160.80	264.22
(c)	129.48	42.05	171.53	274.95
(d)	129.48	42.05	171.53	274.95
(e)	137.57	44.68	182.25	285.67
(f)	145.66	47.31	192.97	296.39

Annual Additional Cost for Each 1 Per Cent Annual Increase (Not Compounded) in Hospital Costs Above 1960: $21.45

If the costs of hospitalization increase for the indefinite future at the rate of the past few years, and if utilization moves upward much less rapidly than in the recent past [assumption II (a)], costs will be, if past service liability is amortized over 30 years, approximately $175 per year. For the reasons discussed in connection with the assumption of no increased costs, amortization at a slower rate would, in view of downward employment trends, be imprudent. Costs, if amortization of past service liability is to be at the maxi-

mum amount for which tax deductions are allowable, would be at least $250 per annum.

The most common concept of entry-age normal relates to what such normal would be on the valuation date if all the employees in service on that date had just been hired at their ages as of the actual employment dates: This concept has been modified slightly here to the extent that there has been substituted for the original hiring ages of all employees the assumption that all employees entered at the ages of those hired in the last 5 years.

There is another concept of entry-age normal which relates to employees to be hired in the future. In a situation when benefits are rising, the costs for future new employees will be higher than now and if consideration is given to this fact, overall costs will be increased; since the value of benefits for present employees is unchanged, the rise in normal costs will be offset in part by a reduction in past service costs.

Two sets of increases related to the higher costs for employees hired in the future have been calculated. In one, the calculation is based on the assumption that the effect of the higher costs is the same as if the normal costs for all employees, present and new, were based on what the per diem costs and utilization will be, under the several assumptions, in 1964. The other calculation follows the same procedure except that the per diem costs and utilization of 1967 are taken as the base. The several assumed increases in hospital costs and utilization operate, above the initial levels, as in the previous calculations. The annual costs per employee would be larger than those shown in the tabulation on page 39 by the following amounts (based on 30-year amortization of past service costs):

Increase as in (see page 32)	*Per Diem and Utilization for the Normal Cost Based on Projection to*	
	1964	*1967*
II (a)	$2.59	$4.54
II (b)	2.78	4.86
II (c)	2.97	5.19
II (d)	2.97	5.19
II (e)	3.15	5.51
II (f)	3.34	5.84

Under the termination rates used for these calculations the rate of replacement or present employees is not high and diminishes steadily, even if there is no reduction in the level of employment. The assumption that the average level of the cost of a day of hospitalization and of utilization will, for all employees, present and new, be as high as in 1967 in effect averages in all the new employees likely to be engaged for 15 to 20 years. This would appear to be sufficiently conservative in any case.

III. The estimates of funding costs in the preceding section indicate that for the company involved here an annual amount (at $175 per employee) of a little more than $8,900,000 is the minimum reasonable cost. The amounts are very likely to appear excessive to company officials. The fact that the overall rate of increase in costs for many years has been much larger than

7 per cent, and that 7 per cent, without compounding, is, over a generation, less than 4 per cent compounded, would not weigh much in comparison with the large sums involved. This section deals with the cost effects of projecting a decreasing rate of increase in costs and utilization.

The costs in the following tabulation relate to an initial cost of a day of hospitalization of $29.75 for pensioners and $27.80 for their spouses, with an initial annual increase of 8 per cent in daily cost and increased utilization combined [II (c) and II (d)], with such increase decreasing after the initial year by the four percentages outlined on page 32.

Rate of Decrease as in	*Cost of Decreasing Increased Benefits as Assumed in II(c) and III for*			*Grand Total, Including Cost of Constant Benefit Amount [I (a)] and Utilization*
	Pensioners	*Spouses*	*Total*	
	Only Interest Paid on Past Service Liability			
III (a)	$71.86	$24.00	$95.86	$143.79
III (b)	68.77	23.16	91.93	139.86
III (c)	56.49	19.82	76.31	124.24
III (d)	44.21	16.49	60.70	108.63
	30-Year Amortization of Past Service Liability			
III (a)	$86.52	$29.03	$115.55	$179.79
III (b)	83.59	28.35	111.94	176.18
III (c)	71.89	25.63	97.52	161.76
III (d)	60.19	22.90	83.09	147.33
	Past Service Liability Amortized at Rate of One-tenth Each Year			
III (a)	$121.74	$41.12	$162.86	$266.28
III (b)	119.17	40.80	159.97	263.39
III (c)	108.86	39.56	148.42	251.84
III (d)	98.55	38.31	136.86	240.28

Looking at costs under the 30-year amortization of past service liability, it is clear that small changes in the rate of increase of hospital costs have a fairly substantial impact on the indicated cost of a plan. If the 8 per cent initial annual increase is reduced to 7.94 per cent in the second year, 7.88 per cent in the third, 7.82 in the fourth, and so on, the annual cost is $179.79 as compared with $190.61 if the annual increase is uniformly 8 per cent. But if, after the first year's 8 per cent increase, the second year's were to be 7.76 per cent, the third 7.52 per cent, the fourth 7.28 per cent, and so on, the cost would be $147.33, or a little over 18 per cent less than under the first set of decelerating increases and almost 23 per cent less than the cost under the annual increase of 8 per cent without deceleration. All these percentages of increase apply, of course, to the initial cost; there is no compounding. Nor is there any adjustment for new entrants in the future; the effect of the deceleration would, with such adjustment, be slightly larger.

The initial increases assumed in the set of calculations was, taking utilization into account, equivalent to 8 per cent of the 1960 cost of a day of hospitalization. The same results could have been obtained, and much more easily, if, instead of a decreasing increase worked out by formula, the net effect of the decreases had been approximated. Thus a constant annual increase of 7.31 per cent of 1960 costs would have produced the same result as assumptions II (c) and III (a) taken together. For all assumptions made in this section, the equivalents are:

Initial Annual Increase (Percentage of 1960 Unit Cost)	*Annual Percentage of Reduction in Initial Annual Increase*	*Equivalent Uniform Annual Increase (Percentage of 1960 Unit Cost)*
II (c) 8	III (a) 0.75	7.31
II (c) 8	III (b) 1.00	7.09
II (c) 8	III (c) 2.00	6.17
II (c) 8	III (d) 3.00	5.26

IV. Any funding program involving so volatile a variable as hospital costs is bound to require frequent adjustment. The safest course—and the most expensive—would be to choose what seem to be conservative assumptions and hope that the adjustments would be the result of surpluses rather than deficits. Fortunately, a partial hedge is available which can be used to good effect. Some of the factors which have produced the rapid upward trend of hospitalization costs also operate on wages. Wages have risen much less rapidly than the cost of hospital care in the past and, in view of the demand for hospital service as compared with that for labor, that disparity seems likely to continue. If therefore, a program for funding hospital costs for retired employees were to be related to the wages of active employees by expressing the contribution commitment in terms of payroll, the extent of periodic adjustments should be appreciably diminished. There is no practical device by which adjustments can be eliminated.

The average annual compensation of active company employees in 1960 was $5200. The cost of benefits under I (a), i.e. with no allowance for future increases, using 30-year amortization of past service costs, was found to be $64.24 per employee per annum, or 1.24 per cent of average annual compensation. If compensation were to be constant and the cost were to increase as in assumption II (c) or II (d) (8 per cent of original cost each year), the constant percentage of compensation required under 30-year amortization would be 3.67. If compensation were to increase at the same rate as hospital costs and utilization, the 1.24 per cent of payroll contribution would cover the cost of the hospital benefit plan.

The preceding paragraph involves an over simplification. If the assumptions as to hospital costs hold and if the downward drift in employment is small, past service costs will have been amortized at some future date, probably deferred by a much longer period than 30 years. If costs rise by a little more than 8 per cent a year and employment holds steady, the past service cost would, in time, be amortized by a contribution of 3.67 per cent of a pay-

roll, without any change in average compensation. And, after the point of completion of past service amortization, costs would be much smaller since the contributions would need to cover only the normal.

The reference to a contribution of 1.24 per cent is intended to serve only as a benchmark. There is no justifiable basis on which it could be regarded as adequate.

The level of compensation in the United States has been rising, sometimes slowly, sometimes rapidly, ever since the nation was established. The long term trend can be expected to continue. And it is reasonable to make such an assumption in preparing a funding program.

Calculations have been made as to the percentages of payroll required to support the hospitalization benefits under the following conditions:

(1) Initial cost of a day of hospitalization, $29.75 for pensioners and $27.80 for their spouses;

(2) An annual increase in such daily cost (including an allowance for rising utilization) of $2.38 for pensioners and $2.224 for their spouses;

(3) Annual compensation of $4600 and $5200 for new employees in their first year of service and for all employees, respectively;

(4) A 30-year amortization period for funding past service liability, with a constant payroll during the period—i.e. the numbers of employees falling in the same ratio that average compensation increases;

(5) Annual increases in the average annual compensation (both of new employees and of present) of

(A) $152 (8 cents per hour for 1900 hours of pay);

(B) $200;

(C) $300.

Finally, these three annual increases will be used in connection with the assumption that the average annual compensation of both new employees when hired and of present employees will be $5200.

No account is taken of the rise, over the 1960 level, of hospital costs and utilization with respect to new entrants. It was found, as indicated, that the effect of such higher costs on the total contribution required for funding was slight. In these calculations based on payroll, it is assumed that newly hired employees will always have the same initial salary. The two omissions fairly well cancel each other out.

Under these several assumptions, and using the method developed by Latimer and Musher,[17] the percentages of total compensation required to fund the benefits are:

[17] See footnote [15], p. 31.

Annual Increase in Average Annual Salaries	*Average Annual Salary in 1960: $5200 Initial Annual Salary of New Employees: $4600*	*Average Annual Salary in 1960 and Initial Annual Salary of New Employees: $5200*
$152	3.25%	3.22%
200	3.14	3.12
300	2.97	2.96

When and if the past service costs are amortized, these percentages, under the assumptions given, would fall to:

Annual Increase in Average Annual Salaries	*Average Annual Salary in 1960: $5200 Initial Annual Salary of New Employees: $4600*	*Average Annual Salary in 1960 and Initial Annual Salary of New Employees: $5200*
$152	1.49%	1.36%
200	1.36	1.25
300	1.16	1.08

The recommendation made to the client was that if the hospital benefit plan were extended as proposed, a reserve be created for the payment of premiums on the coverage by contributing to such reserve (assumed to be a trust, with tax problems involved) an amount equal to 3.15 per cent of the compensation of active employees.