TRANSACTIONS OF SOCIETY OF ACTUARIES
1961 VOL. 11 NO. 37

SOME NEW TABLES FOR MAJOR MEDICAL AND DISABILITY BENEFITS

E. PAUL BARNHART

THE purpose of this note is to make available to the profession several morbidity tables constructed by techniques described in the paper "Continuance Functions" presented in Volume XI of the *Transactions*. Two sets of tables are included here, both containing features which are especially advantageous in certain applications. The first set gives claim costs for several formulas of comprehensive or major medical benefits, constructed so as to be usable over a wide range of both inside and outside limits. The second set provides a mathematically graduated version of the Conference Modification of the 1926 Class (3) Disability Table, which continues to be important as a reserve valuation standard. Discounting is given for several interest rates.

COMPREHENSIVE AND MAJOR MEDICAL TABLES

Very little claim cost data on major medical benefits have so far been published. The primary contributions are those of Alan M. Thaler,[1] Morton D. Miller,[2] and Charles N. Walker,[3] and all of these are to a large extent "synthetic," having been necessarily constructed as estimates expanded from available medical cost experience not in itself directly applicable.

The tables presented here are likewise synthetic, and the reader may question the value of yet another such table at this date when actual major medical experience is being accumulated in some volume. There are several values:

1. These tables have been generated by a specific mathematical technique which guarantees consistency among various benefit limits and formulas. Comparison of the results with actual experience data as it is made available will provide some testing of the validity of the method, or else show whether it can be validly applied with modifications. This is important, since, if the method proves to be a valid one, it can be conveniently employed to generate claim costs for almost any sort of new benefit formula or limit that may be desired, leading to far greater confidence in the projection of costs for new plans of coverage.

[1] Group Major Medical Expense Insurance, *TSA* III, 429.

[2] Gross Premiums for Individual and Family Major Medical Expense Insurance, *TSA* VII, 1.

[3] Discussion of Miller's paper, *TSA* VII, 404.

2. The tables given here are in a flexible form which makes them applicable to a far wider range of benefit limits than anything heretofore published.

3. Having been derived by different methods from those used with earlier tables of costs, these tables will serve a useful comparative function for actuaries who must rely, for the time being, upon whatever is available in publication.

4. Several years have elapsed since the last data were published, and rapid evolution in the pattern of medical costs makes an updated attempt desirable. The form of the tables given here permits determination of costs at any desired level by means of a factor derived in a very simple manner from the given assumed level of prevailing costs. This factor device also provides a basis for projection of costs into the future.

Description of the Tables

Each table presents claim costs for a particular benefit formula in which all limits are described in "units" rather than dollars. The dollar value of each unit, or "unit value" (u.v.) is the factor referred to above, and any given limit expressed in units is convertible to the desired dollar equivalent merely by multiplying by the proper unit value.

The tables rest on the assumption that the claim cost varies linearly with unit value. The justification for this assumption will be given later in the description of the derivation of the tables. Stated algebraically, this is simply $S = ka + b$, where S is the desired annual claim cost and k is the corresponding unit value. The tables provide the constants a and b.

Each table provides these constants for a basic deductible of 150 units in combination with any of three maximum benefit choices, and gives, in addition, pairs of constants for computing the *additional* cost resulting when the deductible is reduced to any of six lower amounts. Twenty-one deductible-maximum combinations are thus given (with others obtainable by interpolation), and any of these are valuable at any desired "unit value," so that the tables have very great flexibility. Theoretically, of course, the increment in claim cost arising from reducing the deductible by a given amount will be greater the larger the maximum benefit, since less offsetting cost is being cut off at the maximum end of the continuance interval, but this difference is negligible and is ignored.

Table 1 gives costs for a benefit formula paying 75% of the amount by which eligible expenses exceed the deductible. Eligible hospital room and board expense is assumed to occur at the rate of four units daily. Surgeons' and physicians' fees are assumed to occur according to the weight-

ing of the Second Edition of the California Relative Value Study. These room and board and fee rates may be governed by inside limits in the policy, or else may be assumed to be the rate of payout actually to be anticipated under a plan without inside limits. Thus a $5 "unit value" assumption is equivalent to an expected payout of $20 per day for hospital room and board and, as examples of surgeons' fees, $175 for an appendectomy and $500 for a total gastrectomy.

If costs for an 80% reimbursement formula are desired, the error in simply using 80/75 of the table values will be negligible.

Table 2 gives costs for a formula identical to that of Table 1 except that the assumption as to surgeons' and physicians' fees is 150% of that in Table 1. Thus a $5 unit value assumption leads to an expected fee of $267.50 for an appendectomy and $750 for a total gastrectomy along with a $20 daily hospital room and board payout rate.

One or the other of the Table 1 or Table 2 assumptions as to relative payout rates for hospital room and professional fees appears to be satisfactory in almost every geographical area and over most policyholder income levels.

Table 3 gives costs for an alternate type of benefit formula which is coming into rather common use, since it has several important advantages over the formula involved in Tables 1 and 2.

The formula defines eligible expense to be 100% of hospital room and board charges (assumed to occur at a rate of four units daily), 100% of surgeons' and anesthesiologists' fees (again assumed to occur at the relative levels of the California Relative Value Study), and 80% of other medical expenses which include nonsurgical professional fees also assumed to occur at the relative levels of the California Relative Value Study. These hospital room and professional rates again may be controlled by inside limits or else merely assumed as the expected rates of charge. Plans using this 100%–80% insurance basis generally contain the inside limits in the contract.

The formula then calls for payment of the amount by which eligible expense exceeds the deductible. Note that this approach applies the "coinsurance" factor to eligible expense *before* subtracting the deductible.

Table 4 gives costs for a formula identical to that of Table 3 except that for professional fees 150% of the California scale is assumed in combination with the four unit daily rate for hospital room and board.

The 100%–80% formula of Tables 3 and 4 is advantageous when used with an inside limit contract, since the higher insurance percentage offsets any coverage disadvantage involved in the limits themselves. There has recently been considerable criticism of scheduled limits in major medical

TABLE 1—$S = ka + b$

ANNUAL CLAIM COST, S, FOR BENEFIT PAYING 75% OF AMOUNT BY WHICH ELIGIBLE EXPENSES EXCEED DEDUCTIBLE—HOSPITAL ROOM CHARGE ELIGIBLE AT 4 UNITS DAILY, PROFESSIONAL SERVICES AT 100% OF CALIFORNIA RELATIVE VALUE SCHEDULE

k = Unit Value in Dollars

Age and Sex	Basic Cost, 150 Units Deductible						Add to Basic Cost to Reduce Deductible to Units Stated											
	150/1000		150/2000		150/3000		10		20		40		60		80		100	
	a	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*
Men																		
15	.46	2.08	.50	2.11	.52	2.12	3.43	7.03	2.68	4.61	1.81	2.89	1.19	2.14	.74	1.58	.43	1.08
20	.47	2.11	.53	2.30	.55	2.29	3.40	7.43	2.65	4.90	1.80	3.00	1.15	2.13	.72	1.60	.42	1.07
25	.52	2.43	.57	2.51	.60	2.50	3.50	7.90	2.67	5.30	1.81	3.18	1.17	2.18	.75	1.61	.45	1.08
30	.60	2.73	.66	2.78	.68	2.80	3.70	8.57	2.79	5.83	1.88	3.42	1.27	2.33	.82	1.64	.48	1.12
35	.76	3.29	.86	3.35	.91	3.36	4.17	9.48	3.13	6.54	2.12	3.82	1.48	2.55	.96	1.77	.58	1.18
40	1.02	3.93	1.14	4.02	1.18	4.06	4.88	10.82	3.66	7.52	2.49	4.39	1.75	2.97	1.14	1.99	.71	1.34
45	1.39	4.80	1.51	4.90	1.56	4.93	5.81	13.30	4.39	9.41	2.99	5.48	2.08	3.62	1.39	2.46	.86	1.64
50	1.85	6.00	2.00	6.17	2.10	6.20	7.07	18.00	5.32	13.25	3.62	7.82	2.51	4.98	1.65	3.43	1.04	2.07
55	2.46	7.50	2.64	7.75	2.75	7.80	8.59	21.73	6.46	16.00	4.35	9.85	3.00	6.39	2.01	4.29	1.25	2.72
60	3.23	9.27	3.50	9.59	3.64	9.67	10.31	23.91	7.76	17.86	5.23	10.86	3.66	7.13	2.49	4.75	1.56	3.09
65	4.45	11.26	4.77	11.85	4.91	12.08	12.31	25.62	9.27	19.09	6.45	11.41	4.65	7.37	3.15	4.87	1.99	3.19
70	6.05	13.40	6.45	14.40	6.59	14.80	14.50	27.08	11.09	20.11	7.87	11.83	5.70	7.43	3.99	4.76	2.55	3.06
75	8.06	15.64	8.42	17.28	8.63	17.76	16.78	28.39	13.28	21.05	9.50	12.14	6.97	7.31	4.95	4.50	3.23	2.75
80	10.50	17.92	10.82	20.38	11.05	20.98	19.19	29.64	15.66	21.86	11.26	12.42	8.24	7.08	6.00	4.07	4.03	2.20
Women																		
15	.22	2.43	.22	2.43	.22	2.44	3.72	7.43	2.92	4.78	1.95	3.05	1.27	2.27	.78	1.70	.43	1.20
20	.33	3.22	.33	3.23	.33	3.24	4.67	9.38	3.64	6.13	2.47	3.79	1.65	2.75	1.04	2.03	.59	1.42
25	.45	4.02	.45	4.05	.45	4.06	5.59	11.30	4.36	7.54	3.00	4.54	2.02	3.26	1.30	2.37	.75	1.65
30	.62	4.89	.62	4.91	.62	4.92	6.50	13.24	5.08	8.97	3.52	5.32	2.40	3.80	1.56	2.72	.92	1.88
35	.84	5.88	.84	5.86	.84	5.87	7.56	15.40	5.84	10.50	4.08	6.18	2.81	4.35	1.81	3.10	1.09	2.14
40	1.11	6.86	1.11	6.88	1.11	6.90	8.53	17.56	6.62	12.17	4.75	7.15	3.19	4.95	2.14	3.52	1.29	2.40
45	1.31	7.82	1.31	7.89	1.31	7.91	9.39	19.69	7.27	14.00	5.05	8.31	3.53	5.60	2.35	3.97	1.43	2.66
50	1.51	8.70	1.51	8.78	1.51	8.79	10.08	21.88	7.77	16.00	5.41	9.60	3.77	6.45	2.46	4.56	1.53	3.02
55	1.80	9.62	1.80	9.76	1.80	9.78	10.89	24.04	8.37	17.81	5.79	10.82	4.01	7.38	2.65	5.14	1.64	3.40
60	2.22	10.83	2.22	11.02	2.22	11.05	11.95	26.13	9.17	19.52	6.31	11.95	4.40	8.12	2.94	5.63	1.81	3.72
65	3.08	12.72	3.10	12.94	3.10	13.15	13.46	27.90	10.21	21.03	7.22	12.99	5.22	8.80	3.50	6.03	2.19	3.97
70	4.44	15.18	4.48	15.68	4.48	15.82	15.27	29.59	11.43	22.48	8.48	13.97	6.24	9.43	4.26	6.38	2.72	4.18
75	6.48	18.05	6.54	18.78	6.54	18.94	17.30	31.23	13.82	23.89	10.03	14.87	7.38	10.04	5.25	6.71	3.44	4.36
80	8.92	21.14	9.00	22.48	9.00	22.60	19.60	32.89	14.39	25.30	11.98	15.69	8.73	10.65	6.45	7.01	4.30	4.54
Child	.08	.96	.09	.96	.09	.96	2.61	7.86	1.88	5.09	1.07	3.24	.58	2.36	.29	1.64	.13	1.05

ANNUAL CLAIM COST, S, FOR BENEFIT PAYING 75% OF AMOUNT BY WHICH ELIGIBLE EXPENSES EXCEED DEDUCTIBLE—HOSPITAL ROOM CHARGE ELIGIBLE AT 4 UNITS DAILY, PROFESSIONAL SERVICES AT 150% OF CALIFORNIA RELATIVE VALUE SCHEDULE

k = Unit Value in Dollars

Age and Sex	Basic Cost, 150 Units Deductible						Add to Basic Cost to Reduce Deductible to Units Stated											
	150/1000		150/2000		150/3000		10		20		40		60		80		100	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Men																		
15.....	.58	2.42	.62	2.44	.63	2.45	3.81	6.69	3.05	4.27	2.14	2.60	1.47	1.90	.95	1.43	.57	1.00
20.....	.60	2.52	.63	2.57	.67	2.53	3.75	7.14	2.97	4.61	2.08	2.67	1.44	1.96	.92	1.44	.58	.98
25.....	.67	2.68	.70	2.74	.74	2.69	3.80	7.71	2.98	5.04	2.08	2.90	1.44	2.07	.93	1.49	.59	1.00
30.....	.78	2.91	.83	2.97	.86	2.98	3.99	8.39	3.09	5.63	2.14	3.25	1.49	2.23	.99	1.56	.60	1.05
35.....	1.00	3.35	1.08	3.33	1.12	3.43	4.40	9.47	3.39	6.40	2.31	3.74	1.65	2.54	1.20	1.72	.65	1.14
40.....	1.31	4.03	1.40	4.04	1.44	4.09	5.10	10.99	3.93	7.61	2.68	4.43	1.93	2.98	1.28	1.99	.80	1.30
45.....	1.69	4.96	1.81	5.07	1.86	5.10	6.06	13.12	4.65	9.24	3.22	5.36	2.27	3.56	1.56	2.40	.98	1.55
50.....	2.23	6.51	2.37	6.46	2.45	6.69	7.32	16.67	5.64	11.45	3.87	6.80	2.69	4.47	1.91	3.05	1.20	1.96
55.....	2.91	8.15	3.09	8.18	3.22	8.47	8.85	20.15	6.80	14.16	4.66	8.50	3.25	5.54	2.29	3.75	1.44	2.38
60.....	3.74	9.81	4.01	10.15	4.15	10.25	10.65	23.33	8.10	17.28	5.56	10.33	3.95	6.69	2.72	4.48	1.74	2.83
65.....	4.95	11.48	5.55	12.01	5.59	12.03	12.55	26.19	9.59	19.90	6.65	11.97	4.76	7.82	3.27	5.24	2.08	3.30
70.....	6.65	13.14	7.38	13.83	7.42	13.80	14.45	28.99	11.25	22.23	7.85	13.65	5.67	9.00	3.95	6.01	2.52	3.79
75.....	8.92	14.76	9.45	15.40	9.72	15.55	16.42	31.69	12.93	24.35	9.16	15.36	6.66	10.23	4.72	6.78	3.09	4.28
80.....	11.60	16.46	11.79	16.90	12.15	17.36	18.37	34.12	14.66	26.40	10.55	17.10	7.68	11.43	5.58	7.55	3.73	4.78
Women																		
15.....	.35	2.65	.35	2.66	.35	2.66	4.09	7.20	3.29	4.56	2.29	2.79	1.55	2.09	.99	1.57	.57	1.12
20.....	.55	3.54	.54	3.60	.54	3.61	5.08	9.01	4.07	5.90	2.89	3.47	2.00	2.43	1.30	1.85	.78	1.32
25.....	.75	4.43	.74	4.48	.73	4.49	6.08	10.84	4.82	7.20	3.50	4.18	2.44	2.95	1.62	2.15	.97	1.53
30.....	.96	5.33	.96	5.35	.96	5.36	7.09	12.79	5.67	8.51	4.06	4.93	2.86	3.48	1.92	2.48	1.17	1.74
35.....	1.33	6.30	1.32	6.32	1.30	6.33	8.11	14.95	6.41	10.20	4.60	5.89	3.26	4.05	2.20	2.84	1.35	1.97
40.....	1.69	7.27	1.68	7.30	1.66	7.31	9.06	17.14	7.11	11.95	5.19	6.92	3.63	4.66	2.46	3.25	1.52	2.23
45.....	1.91	8.21	1.91	8.28	1.91	8.29	9.89	19.30	7.78	13.61	5.53	7.95	3.95	5.31	2.69	3.73	1.69	2.49
50.....	2.21	9.07	2.20	9.22	2.19	9.24	10.57	21.42	8.37	15.49	5.83	9.14	4.21	6.08	2.89	4.27	1.80	2.81
55.....	2.35	10.12	2.35	10.27	2.34	10.33	11.38	23.55	8.94	17.29	6.18	10.38	4.43	6.90	3.05	4.81	1.86	3.16
60.....	2.71	11.28	2.71	11.49	2.71	11.52	12.34	25.66	9.56	19.05	6.67	11.57	4.73	7.76	3.22	5.31	2.01	3.50
65.....	3.53	13.04	3.55	13.41	3.54	13.54	13.80	27.46	10.55	20.62	7.61	12.62	5.46	8.51	3.65	5.76	2.39	3.76
70.....	4.98	15.40	5.03	15.98	5.02	16.12	15.53	29.21	12.02	22.13	8.83	13.60	6.42	9.20	4.36	6.18	2.90	4.00
75.....	7.09	18.31	7.15	19.05	7.15	19.22	17.52	30.95	14.04	23.61	10.25	14.58	7.57	9.83	5.41	6.58	3.56	4.23
80.....	9.40	21.80	9.49	22.65	9.50	23.02	19.73	32.68	16.79	25.10	11.73	15.57	8.91	10.39	6.90	6.98	4.37	4.43
Child.....	.10	1.15	.10	1.15	.10	1.16	2.99	7.66	2.24	4.91	1.36	3.14	.79	2.33	.43	1.68	.21	1.11

TABLE 3—$S = ka + b$.—ANNUAL CLAIM COST, S, FOR BENEFIT PAYING AMOUNT BY WHICH ELIGIBLE EXPENSES EXCEED DEDUCTIBLE—HOSPITAL ROOM CHARGES AT 4 UNITS DAILY AND SURGEONS' AND ANESTHESIOLOGISTS' SERVICES AT 100% OF CALIFORNIA RELATIVE VALUE SCHEDULE ARE 100% ELIGIBLE—OTHER EXPENSES ARE 80% ELIGIBLE, INCLUDING OTHER PROFESSIONAL SERVICES AT 100% OF CALIFORNIA RELATIVE VALUE SCHEDULE

AGE AND SEX	BASIC COST, 150 UNITS DEDUCTIBLE						ADD TO BASIC COST TO REDUCE DEDUCTIBLE TO UNITS STATED											
	150/1000		150/2000		150/3000		10		20		40		60		80		100	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Men																		
15	.52	1.90	.58	1.94	.60	1.95	4.11	7.00	3.27	4.54	2.17	3.05	1.39	2.33	.85	1.71	.48	1.16
20	.53	2.02	.59	2.08	.62	2.10	4.00	7.40	3.18	4.80	2.03	3.11	1.34	2.32	.83	1.70	.46	1.15
25	.57	2.22	.64	2.30	.68	2.32	4.08	7.93	3.19	5.17	2.08	3.22	1.38	2.37	.86	1.72	.48	1.16
30	.67	2.53	.75	2.61	.79	2.63	4.33	8.61	3.35	5.68	2.24	3.47	1.47	2.49	.93	1.80	.54	1.21
35	.89	3.00	.99	3.09	1.05	3.12	4.85	9.68	3.78	6.39	2.54	3.86	1.64	2.71	1.08	1.93	.62	1.28
40	1.18	3.64	1.30	3.76	1.38	3.80	5.67	11.20	4.92	7.43	3.01	4.45	1.97	3.06	1.30	2.15	.79	1.40
45	1.57	4.58	1.73	4.72	1.81	4.77	6.78	13.45	5.25	9.17	3.62	5.30	2.50	3.62	1.66	2.49	1.02	1.63
50	2.05	5.77	2.26	6.01	2.38	6.08	8.25	16.97	6.34	11.98	4.38	6.75	3.08	4.47	2.04	3.02	1.28	2.04
55	2.66	7.30	2.94	7.60	3.10	7.72	10.05	20.78	7.71	14.80	5.31	8.53	3.75	5.54	2.51	3.70	1.58	2.47
60	3.53	9.13	3.91	9.54	4.10	9.67	12.09	24.25	9.33	17.29	6.43	10.24	4.50	6.81	3.06	4.52	1.92	2.94
65	4.95	11.24	5.40	11.80	5.60	11.98	14.28	27.54	11.20	19.58	7.80	11.87	5.42	7.97	3.80	5.24	2.41	3.37
70	6.76	13.65	7.32	14.38	7.56	14.63	16.68	30.42	13.21	22.02	9.47	13.50	6.64	8.96	4.70	5.89	3.00	3.81
75	8.97	16.32	9.65	17.28	10.00	17.55	19.20	33.16	15.36	24.56	11.05	15.11	8.09	9.89	5.72	6.49	3.70	4.25
80	11.35	19.20	12.14	20.31	12.66	20.68	21.79	35.90	17.63	27.11	12.88	16.74	9.77	10.74	6.88	7.05	4.43	4.67
Women																		
15	.21	2.19	.21	2.21	.21	2.21	4.48	7.38	3.57	4.83	2.33	3.34	1.44	2.63	.84	1.98	.44	1.37
20	.28	2.91	.28	2.95	.28	2.95	5.58	9.37	4.42	6.13	2.98	4.10	1.88	3.20	1.11	2.06	.57	1.55
25	.43	3.69	.43	3.73	.43	3.73	6.69	11.39	5.31	7.52	3.63	4.85	2.37	3.69	1.45	2.70	.79	1.83
30	.61	4.53	.61	4.57	.61	4.57	7.78	13.37	6.19	9.03	4.27	5.62	2.86	4.15	1.79	3.10	1.03	2.13
35	.86	5.49	.86	5.57	.86	5.57	8.92	15.23	7.07	10.61	4.94	6.42	3.35	4.58	2.16	3.49	1.27	2.42
40	1.11	6.53	1.10	6.61	1.10	6.62	10.07	17.37	7.98	12.20	5.58	7.28	3.89	5.08	2.50	3.81	1.49	2.68
45	1.34	7.51	1.33	7.61	1.33	7.62	11.13	20.02	8.84	13.70	6.19	8.23	4.28	5.72	2.80	4.14	1.66	2.90
50	1.56	8.48	1.56	8.60	1.56	8.61	12.09	22.79	9.61	15.45	6.70	9.30	4.65	6.58	3.04	4.62	1.82	3.16
55	1.85	9.23	1.86	9.39	1.86	9.40	12.84	25.06	10.15	17.52	7.13	10.56	4.91	7.46	3.21	5.22	1.96	3.54
60	2.38	10.19	2.39	10.48	2.39	10.52	13.98	27.10	10.98	19.48	7.61	12.04	5.29	8.26	3.47	5.91	2.10	3.93
65	3.56	12.04	3.60	12.64	3.60	12.75	15.96	28.48	12.30	21.11	8.45	13.02	6.07	8.95	4.11	6.30	2.49	4.16
70	5.53	14.80	5.67	15.71	5.68	15.91	18.45	30.79	14.19	22.60	10.43	13.80	7.37	9.48	5.15	6.52	3.21	4.32
75	7.37	17.46	7.54	18.41	7.55	18.67	20.67	32.59	16.85	23.99	12.48	14.50	9.24	9.82	6.58	6.67	4.28	4.43
80	8.63	19.38	8.79	20.30	8.81	20.52	22.38	34.39	19.20	25.25	13.66	15.16	11.20	10.02	8.24	6.75	5.73	4.50
Child	.12	.78	.12	.78	.12	.79	3.02	7.63	2.19	5.00	1.19	3.33	.61	2.43	.29	1.64	.14	.98

IBLE—HOSPITAL ROOM CHARGES AT 4 UNITS DAILY AND SURGEONS' AND ANESTHESIOLOGISTS' SERVICES AT 150% OF CALIFORNIA RELATIVE VALUE SCHEDULE ARE 100% ELIGIBLE—OTHER EXPENSES ARE 80% ELIGIBLE, INCLUDING OTHER PROFESSIONAL SERVICES AT 150% OF CALIFORNIA RELATIVE VALUE SCHEDULE

AGE AND SEX	BASIC COST, 150 UNITS DEDUCTIBLE						ADD TO BASIC COST TO REDUCE DEDUCTIBLE TO UNITS STATED											
	150/1000		150/2000		150/3000		10		20		40		60		80		100	
	a	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*
Men																		
15.....	.65	2.31	.70	2.35	.73	2.36	4.72	6.58	3.83	4.14	2.64	2.70	1.77	2.07	1.14	1.52	.66	1.09
20.....	.67	2.36	.74	2.43	.76	2.41	4.64	7.06	3.67	4.48	2.57	2.83	1.74	2.10	1.11	1.53	.66	1.07
25.....	.73	2.50	.82	2.59	.84	2.57	4.68	7.64	3.64	4.89	2.56	3.01	1.75	2.19	1.12	1.57	.67	1.07
30.....	.87	2.76	.95	2.84	.99	2.86	4.84	8.37	3.82	5.43	2.63	3.27	1.79	2.34	1.18	1.66	.71	1.12
35.....	1.13	3.17	1.25	3.28	1.28	3.29	5.22	9.34	4.24	6.20	2.89	3.68	1.98	2.60	1.32	1.82	.82	1.21
40.....	1.49	3.79	1.62	3.91	1.67	3.93	6.00	10.90	4.85	7.30	3.35	4.30	2.33	2.98	1.54	2.07	.98	1.37
45.....	1.95	4.73	2.11	4.88	2.19	4.93	7.27	13.27	5.68	9.00	3.98	5.17	2.80	3.50	1.89	2.43	1.18	1.61
50.....	2.55	5.98	2.73	6.24	2.79	6.31	8.98	16.70	6.80	11.40	4.75	6.48	3.39	4.26	2.31	2.96	1.43	1.96
55.....	3.26	7.58	3.51	7.95	3.64	8.04	10.80	20.43	8.23	14.08	5.73	8.04	4.10	5.25	2.79	3.62	1.73	2.35
60.....	4.22	9.48	4.60	9.91	4.79	10.05	12.73	23.86	9.90	16.89	6.90	9.85	4.90	6.43	3.37	4.32	2.15	2.76
65.....	5.70	11.64	6.16	12.21	6.40	12.43	14.94	27.17	12.04	19.50	8.19	11.64	5.89	7.62	4.16	5.03	2.66	3.20
70.....	7.58	14.03	8.17	14.80	8.44	15.06	17.29	30.09	14.06	21.95	9.71	13.30	7.05	8.71	5.01	5.71	3.24	3.67
75.....	9.85	16.53	10.54	17.52	10.90	17.81	19.72	32.89	15.80	24.30	11.39	14.85	8.36	9.77	5.94	6.39	3.87	4.15
80.....	12.36	19.07	13.09	20.21	13.60	20.57	20.34	35.72	17.25	26.60	13.14	16.40	9.81	10.83	6.91	7.06	4.55	4.64
Women																		
15.....	.35	2.47	.35	2.49	.35	2.49	5.08	7.09	4.13	4.54	2.81	3.08	1.85	2.38	1.15	1.78	.66	1.23
20.....	.41	3.34	.41	3.36	.41	3.36	6.13	8.97	5.17	5.70	3.58	3.74	2.37	2.75	1.46	2.14	.87	1.48
25.....	.60	4.19	.60	4.24	.60	4.24	7.41	10.90	6.18	6.92	4.39	4.41	2.93	3.19	1.84	2.51	1.14	1.75
30.....	1.00	5.09	1.00	5.13	1.00	5.13	8.74	12.79	7.14	8.31	5.07	5.14	3.54	3.69	2.30	2.89	1.39	2.00
35.....	1.46	5.98	1.46	6.06	1.45	6.07	10.03	14.68	8.05	9.98	5.80	5.91	4.13	4.22	2.74	3.25	1.65	2.26
40.....	1.92	6.89	1.92	7.00	1.91	7.02	11.13	16.84	8.90	11.69	6.45	6.76	4.58	4.78	3.07	3.56	1.87	2.50
45.....	2.11	7.89	2.11	8.00	2.10	8.02	12.02	19.61	9.68	13.30	6.95	7.77	4.91	5.42	3.30	3.96	2.02	2.77
50.....	2.28	8.77	2.28	8.90	2.28	8.92	12.69	22.22	10.34	14.88	7.32	8.90	5.20	6.22	3.48	4.48	2.15	3.07
55.....	2.52	9.68	2.53	9.87	2.53	9.90	13.47	24.45	10.88	16.82	7.63	10.28	5.36	7.13	3.65	5.02	2.24	3.37
60.....	3.01	10.76	3.02	11.07	3.02	11.11	14.72	26.50	11.67	18.87	8.22	11.46	5.79	7.87	3.90	5.51	2.42	3.63
65.....	4.11	12.31	4.14	12.79	4.14	12.88	16.45	28.43	12.96	20.11	9.46	12.45	6.63	8.48	4.40	5.85	2.83	3.84
70.....	5.79	14.61	5.87	15.30	5.88	15.42	18.60	30.22	14.78	22.18	11.34	13.37	7.85	9.02	5.34	6.11	3.53	4.03
75.....	8.19	17.80	8.36	18.78	8.37	19.04	21.18	32.21	17.31	23.62	12.85	14.25	9.57	9.52	6.85	6.34	4.49	4.20
80.....	9.90	22.03	10.04	22.43	10.05	22.99	24.10	34.06	19.64	24.98	14.03	15.08	11.09	9.98	8.04	6.54	5.41	4.35
Child.....	.13	.96	.14	.96	.14	.97	3.56	7.43	2.68	4.84	1.56	3.26	.86	2.47	.44	1.76	.21	1.12

policies both within and outside of the insurance industry. These things are matters of basic opinion, but I believe many of the critics fail to appreciate some of the important considerations in favor of scheduling. Scheduling does much more than merely control the liability of the insurer and guard against gross overcharging. It permits a very simple and practical basis of adjusting price to both geographical and income levels. A program with flexible limits permits a prospect to pay for the amount of coverage he needs. With two bed daily room rates varying from as little as $8 in some localities to as much as $27 elsewhere, with similar variation in fees, and with the second major dimension of fee variation by patient income level, it is difficult to see how some companies justify charging one scale of rates to everybody everywhere. The average income policyholder winds up subsidizing his wealthier neighbor's fee charges, and the resident of a small North Carolina town helps to pay the hospital bills of urban Californians; hardly an equitable situation. A few companies have tried area rating or income adjustments in the coverage formula, but the practical solution afforded by flexible schedule limits, long accepted as a perfectly natural feature of hospital-surgical policies, seems simpler, more logical and more versatile. For these reasons I recommend scheduled benefit formulas without apology.

No particular assumptions are incorporated into Tables 1 to 4 with regard to length of benefit period, deductible qualification period, or other refinements. The tables may be assumed to apply to average provisions, and use of abnormally liberal or restrictive features will call for some adjustment. Mental illness is assumed to be essentially excluded, pregnancy coverage limited to complications only, and, finally, it is assumed that some reasonable basis is provided for eventual restoration of the maximum limit in the event of a recurrence of cause.

As an example of cost computation for a specific dollar benefit formula, let us use Table 2 to obtain the cost of claim for a man, age 45, for benefits covering up to $20 hospital daily room, $750 professional services schedule, paying 75% of eligible charges over a $500 deductible up to a $10,000 maximum benefit. From the table we obtain:

		a	*b*
for 150/2000	:	1.81	5.07
to reduce to 100/	:	.98	1.55
Total (for 100/2000)	:	2.79	6.62

Thus the desired cost, for $500/$10,000, is $(5 \times 2.79) + 6.62 = \$20.57$.

Derivation of the Tables

All four tables were derived by an IBM 650 computer using the same basic elementary medical cost tables. The computer was programmed to introduce the modifications distinguishing the four formulas in its processing of these basic tables. The technique was to compute costs for five specified u.v. under each benefit formula: \$2.50, \$3.75, \$5, \$6.25, and \$7.50. At four units daily, these values convert into hospital room limits of \$10, \$15, \$20, \$25 and \$30. The computing technique was essentially that which is outlined on pages 692–698 of *TSA* XI.

The five resulting costs at each age, sex, table formula, and outside limit combination were then graphically plotted against unit value as the independent variable and the resulting curve proved to be so close to a straight line that it was decided that ample accuracy would be retained under the convenient assumption that a linear relationship existed. The constants a and b were then derived from the costs for \$3.75 and \$6.25 u.v.

This linear formula overstates the original computed result for \$2.50 u.v. by an average of about 3%. It understates the cost for \$5 u.v. by about 1%, and overstates again at \$7.50 u.v. by an average of about 1.5%. Approximate correction may readily be made for this inherent degree of error, but the nature of the animal makes it doubtful whether such minute refinement is justified. The tables should not be used without correction for a u.v. in excess of \$10, however.

The basic elementary medical tables used were modified from the tables given on pages 711 and 712 of *TSA* XI (which approximate the 1956 Intercompany Tables to the extent that equivalent benefits are represented), so as to adapt them to expenses expected under major medical coverage. These, briefly, were the modifications made:

(1) Hospital confinement continuance functions: h_1 and h_2.
   a) Range constants were modified to give 90% of the 1956 Intercompany Table costs for both h_1 and h_2 in combination.
   b) For $(-s)h$ costs, range was then loaded 18.75% to account for hospital doctor visits. Range was not loaded for $(s)h$.
   c) Attenuation constants for women were loaded at higher ages by an increasing percentage to bring costs for higher deductibles more nearly into line with male values. (Even with this loading, the tables in this note give considerably lower costs for women than for men at higher ages and at higher deductibles.)
(2) Miscellaneous hospital continuance: $(h)m$. Considerable modification was made in this function.

a) The original functions were first altered by making the range constants functions of the expected daily hospital room rate. Hospital claim data indicate that miscellaneous hospital claim costs vary according to the room rate level, and it was decided that sufficient accuracy is achieved under the assumption that miscellaneous costs vary as the 0.6 power of the room rate. Thus any given range constant was replaced by a variable constant of the form: $kz^{0.6}$ where z is the expected daily room rate. k was determined by setting the claim cost corresponding to $z = \$15$ at 105% of the value given by Table 3, p. 711, of *TSA* XI.

b) Range was then loaded 33% to account for coincident $(-h)m$ expense.

c) Attenuation was then loaded to increase F'^{∞} by 20%, to account for private nurse expense. The implied assumption here is that private nurse expense is relatively heavier the greater the amount of miscellaneous expense.

d) Range constants were then still further modified by splitting the $(h)m$ function into two components, $(h_1)m$ and $(h_2)m$, on the assumption that $(h_2)m$ continuance would produce heavier average costs because of the longer average confinement represented by the h_2 function. Attenuation constants were held unchanged while any given range constant a was split according to the relation:

$$mna\,({}^{h_2}r) + na\,({}^{h_1}r) = a\,({}^{h_1}r + {}^{h_2}r)$$

where

$$m = \sqrt{\frac{h_2 F'^{\infty}}{h_1 F'^{\infty}}}$$

and the equation is used to obtain the value of the factor n giving the two component range constants:

$${}^{(h_1)m}a = na\,, \qquad {}^{(h_2)m}a = mna\,.$$

The expression for m is a purely approximate relation derived from a sampling of hospital claims of varying duration.

e) The two components described above were finally subdivided again between $(sh)m$ and $(-s)(h)m$, on the grounds that hospitalization of a specified duration will involve, on the average, heavier miscellaneous expense when surgery is involved. For $(sh)m$, 115% of the range constants were used, and for $(-s)(h)m$, 90%.

These five modifications appear quite intricate, but are actually achieved very easily. They appear to be necessary, under the method of computation used, if reliable results are to be obtained.

(3) Surgical continuance: s.

a) Table 4, p. 712, of *TSA* XI was first split between h_1 and h_2, taking 90% of the table range constants with h_1, and 100% with h_2.

b) The two resulting $(h)s$ functions were then loaded, as to range, 20% for anesthesiologists' fees, and 5% for assistant surgeons' fees. (Extra benefits, not contemplated by Table 4 in *TSA* XI.)

c) The $(-h)s$ function was loaded, as to range, 5% for anesthesiologists' fees and 30% for coincident $(-h)m$ expense.

(4) Miscellaneous nonhospital expense: $(-hs)m$.

a) This was first modified to make the range constants variables depending upon the expected hospital room rate, using the same rule as in (2) (*a*) above.

b) This function becomes a major factor in costs for very low deductibles, where many companies have had adverse experience. Hence it was decided to treat this very conservatively, and 200% of the ${}^{(-h)m}r$ rates of Table 3, p. 711, *TSA* XI were used.

Comparison with Other Published Values

Any comparison with previously published costs is subject to certain pitfalls. This is particularly true here because any specific scale of dollar claim costs constructed from these tables necessarily assumes a specific level of medical costs for hospital room charges and professional services. These claim costs, obviously, will not be equivalent to other available published values unless the medical cost level assumptions are closely equivalent. Other obvious differences may arise on account of differing provisions, exclusions, assumed underwriting standards, and so on. The considerable period of time that has elapsed since publication of earlier data must also be weighed.

In spite of this, such comparison is of value, and is especially helpful in revealing relative differences by age, sex, and deductible amount.

Dollar and ratio comparisons between claim costs from these tables and those given in the tables published by Mr. Miller and Mr. Walker are exhibited in Tables I to V. As an assumed basis of cost equivalence, I have used Table 2 in every instance, and taken a u.v. of \$4.25 (\$17.00 daily hospital rate) to be equivalent to the basis of Mr. Miller's costs. A u.v. of \$3.50 (\$14.00 daily) is assumed as equivalent for

TABLE I

MILLER'S COSTS ($500 DED./$7,500 MAX.: *TSA* VII, p. 4)

AGE	MEN			WOMEN		
	(1) Miller's Cost	(2) Table 2 k=$4.25 $500/$8,500	(3) Ratio (2)/(1)	(4) Miller's Cost	(5) Table 2 k=$4.25 $500/$8,500	(6) Ratio (5)/(4)
25....	$ 7.58	$ 7.79	102.8%	$11.98	$10.92	91.2%
35....	10.59	10.14	95.8	15.64	16.43	105.1
45....	14.79	16.20	109.5	20.42	22.00	107.7
55....	20.66	26.21	126.9	26.65	26.66	100.0
65....	28.87	42.00	145.5	34.79	36.90	106.1

TABLE II

WALKER'S COSTS ($500 DED./$7,500 MAX., $15 LIMIT: *TSA* VII, p. 407)

AGE	MEN			WOMEN		
	(1) Walker's Cost	(2) Table 2 k=$3.50 $500/$7,000	(3) Ratio (2)/(1)	(4) Walker's Cost	(5) Table 2 k=$3.50 $500/$7,000	(6) Ratio (5)/(4)
25....	$ 5.77	$ 5.55	96.2%	$11.28	$ 7.62	67.6%
35....	7.11	7.49	105.3	15.82	11.74	74.2
45....	10.95	12.06	110.1	20.76	15.91	76.6
55....	18.03	19.94	110.6	27.57	19.70	71.5
60....	24.85	23.90	96.2	35.36	22.28	63.0

TABLE III

WALKER'S COSTS ($500 DED./$7,500 MAX., $25 LIMIT: *TSA* VII, p. 408)

AGE	MEN			WOMEN		
	(1) Walker's Cost	(2) Table 2 k=$5.25 $500/$5,250	(3) Ratio (2)/(1)	(4) Walker's Cost	(5) Table 2 k=$5.25 $500/$5,250	(6) Ratio (5)/(4)
25....	$ 7.71	$10.84	140.6%	$14.55	$15.87	109.1%
35....	9.75	13.80	141.5	20.42	23.58	115.5
45....	15.18	21.39	140.9	26.65	30.94	116.1
55....	24.90	34.63	139.1	35.00	36.96	105.6
60....	34.10	42.84	125.6	44.53	41.11	92.3

Mr. Walker's $15.00 daily limit costs, and $5.25 ($21.00 daily) is assumed for his $25.00 limit costs. These may not, of course, be proper average equivalents, but the resulting comparisons will indicate *relative* differences in the tables. It should be mentioned that any adjustment attempted for purposes of reflecting a revision in equivalent unit value cannot be made directly on the dollar values, since the deductible amount is directly affected by the unit value assumed. Thus a fresh start from the basic values is desirable with any change of unit value. In the comparison values, the correct deductible has been estimated by graphic interpolation since the chosen unit values do not directly produce the desired deductibles in combination with any deductible given in Table 2 in units. No correction has been made for a difference in Maximum Benefit, the selected maximum value from Table 2 simply being the nearest value.

TABLE IV

WALKER'S COSTS ($250 DED./$5,000 MAX., $15 LIMIT: *TSA* VII, p. 407)

	MEN			WOMEN		
AGE	(1) Walker's Cost	(2) Table 2 k=$3.50 $250/$7,000	(3) Ratio (2)/(1)	(4) Walker's Cost	(5) Table 2 k=$3.50 $250/$7,000	(6) Ratio (5)/(4)
25....	$ 9.77	$10.94	112.0%	$19.68	$16.37	83.2%
35....	11.84	14.11	119.2	25.74	23.74	92.2
45....	17.36	20.81	119.9	32.07	30.66	95.6
55....	27.16	32.99	121.5	39.90	36.90	92.5
60....	36.32	39.50	108.8	49.07	40.98	83.5

TABLE V

WALKER'S COSTS ($250 DED./$5,000 MAX., $25 LIMIT: *TSA* VII, p. 408)

	MEN			WOMEN		
AGE	(1) Walker's Cost	(2) Table 2 k=$5.25 $250/$5,250	(3) Ratio (2)/(1)	(4) Walker's Cost	(5) Table 2 k=$5.25 $250/$5,250	(6) Ratio (2)/(1)
25....	$11.99	$18.28	152.5%	$23.56	$28.27	120.0%
35....	14.66	22.60	154.2	30.86	39.78	128.9
45....	21.66	33.43	154.3	38.33	50.84	132.6
55....	33.95	52.33	154.1	47.41	60.56	127.7
60....	45.35	64.24	141.7	58.02	66.11	113.9

The error arising from this is quite small although not entirely negligible. The following observations arise from these comparisons:

(1) The ratios of the Table 2 costs to the other values are invariably higher for men than for women. This is because a higher average size claim over any substantial deductible will arise under male claims when using the basic medical tables from which Tables 1 to 4 were developed.

(2) The Table 2 values for men increase relatively more steeply by age than do Mr. Miller's costs. The ratios are comparatively constant for women, however, and are comparatively constant for both sexes when compared with Mr. Walker's costs, except for a moderate dip at 60, the highest age compared.

(3) When compared with Mr. Walker's costs, the ratios tend to become much higher as the deductible reduces and as the daily hospital limit increases. (It is to be expected that this effect would occur with both variations if it occurs with either.) On women, it ranges from only about 70% for the \$15 daily—\$500 deductible costs, up to around 130% for the \$25 daily—\$250 deductible costs. The male ratios exhibit a corresponding range of about 105% to 154%.

I wish to emphasize that these comparisons should not be taken as critical of any of the various tables. All three are developed from limited data or to a large extent from hospital, surgical, and other medical experience which required synthetic expansion to major medical dimensions.

By this time, there is probably sufficient extant experience under major medical benefits to provide some actual testing of these various tables, and I would like to invite anyone who is able to contribute something of this to do so as a discussion of this note.

GRADUATION OF CONFERENCE MODIFICATION OF THE 1926 CLASS (3) DISABILITY TABLE

A two element mathematical graduation of the Conference Table is presented in Table 5. Basic functions without interest discount are given, along with discounted functions at $2\frac{1}{2}\%$, 3%, and $3\frac{1}{2}\%$ interest.

The zero interest functions were derived by the method of 6-point graphic graduation described in *TSA* XI, 662–664. Final adjustments were made on the basis of detailed testing of values of $F^{0/t}$ against the actual tabular values. The right-hand column of the zero discount table gives the maximum percentage deviation of $F^{0/t}$ computed from the two element function as compared with the actual tabular value. The deviation is shown, followed by the duration t at which it occurs.

Conference Modification, 1926 Class (3) Disability Table
(Unit One Month)

Age x	$i=0\%$			
	$\sigma_{r_x^i}$	${}^{a}d_1$ Function	${}^{a}d_2$ Function	Max. Deviation
20	.33960	(.956, .894, 2.72)	(36.4, 122, 4.15)	+0.9% at 90
25	.33450	(.803, .724, 2.50)	(144, 309, 6.74)	+0.7% at 4
30	.33080	(.698, .627, 2.24)	(154, 360, 6.18)	−1.0% at 1
35	.32900	(.792, .728, 2.38)	(1.03, 47.9, 1.30)	−0.6% at 4
40	.32810	(.895, .881, 2.33)	(.406, 41.2, 1.05)	+2.5% at 80
45	.32810	(.749, .697, 2.08)	(.682, 51.3, 1.10)	−2.3% at 120
50	.32890	(.703, .659, 1.86)	(1.77, 84.0, 1.19)	−2.9% at 90
55	.33110	(.681, .634, 1.68)	(84.5, 389, 2.90)	+2.2% at 110
60	.33520	(.928, .906, 1.79)	(76.1, 303, 2.90)	−1.2% at 110
65	.34190	(1.304, 1.343, 1.86)	(739, 1060, 9.78)	+3.0% at 50
70	.35170	(1.276, 1.240, 1.65)	(596, 845, 9.11)	−2.8% at 7

Age	$i=2\frac{1}{2}\%$		$i=3\%$		$i=3\frac{1}{2}\%$	
	${}^{(i)}a_{d_1}$	${}^{(i)}a_{d_2}$	${}^{(i)}a_{d_1}$	${}^{(i)}a_{d_2}$	${}^{(i)}a_{d_1}$	${}^{(i)}a_{d_2}$
20	(.960, .898, 2.73)	(44.4, 129, 4.68)	(.961, .899, 2.73)	(46.3, 131, 4.80)	(.962, .900, 2.74)	(47.9, 133, 4.91)
25	(.805, .728, 2.51)	(179, 339, 8.08)	(.808, .729, 2.51)	(186, 345, 8.37)	(.809, .730, 2.52)	(194, 351, 8.65)
30	(.703, .632, 2.25)	(206, 405, 7.78)	(.704, .633, 2.26)	(217, 414, 8.12)	(.705, .634, 2.26)	(227, 422, 8.46)
35	(.797, .733, 2.39)	(2.18, 53.4, 1.56)	(.798, .734, 2.39)	(2.45, 54.5, 1.61)	(.799, .735, 2.40)	(2.80, 55.6, 1.67)
40	(.900, .886, 2.34)	(1.09, 47.0, 1.29)	(.902, .887, 2.34)	(1.31, 48.2, 1.34)	(.903, .888, 2.35)	(1.53, 49.3, 1.40)
45	(.755, .703, 2.09)	(1.94, 59.2, 1.39)	(.756, .704, 2.10)	(2.29, 60.7, 1.45)	(.757, .705, 2.10)	(2.67, 62.3, 1.51)
50	(.711, .667, 1.88)	(6.61, 103, 1.67)	(.713, .668, 1.88)	(7.97, 106, 1.77)	(.714, .670, 1.88)	(9.57, 110, 1.88)
55	(.694, .646, 1.70)	(205, 510, 4.85)	(.696, .649, 1.71)	(221, 534, 5.29)	(.698, .651, 1.71)	(236, 557, 5.75)
60	(.945, .923, 1.81)	(151, 377, 4.38)	(.947, .925, 1.82)	(166, 390, 4.70)	(.952, .930, 1.83)	(188, 412, 5.12)
65	(1.33, 1.37, 1.89)	(1021, 1299, 14.66)	(1.33, 1.37, 1.89)	(1075, 1346, 15.73)	(1.34, 1.38, 1.90)	(1131, 1395, 16.87)
70	(1.32, 1.28, 1.70)	(791, 1011, 12.98)	(1.33, 1.29, 1.71)	(829, 1044, 13.83)	(1.34, 1.30, 1.72)	(873, 1077, 14.70)

The discounting was obtained by the technique described in *TSA* XI, 671–673. In every instance, $u = 0$ was used in the equations.

The two elements of each compound function shown in Table 5 are not adjusted so that each element separately yields a value of $p^0 = 1$. Hence, in obtaining values of S, the following formula is applicable:

$$S_x^{t_1;\,t_2} = {}^{\sigma}r_x \left({}^{d_1}F^{t_1;\,t_2} + {}^{d_2}F^{t_1;\,t_2}\right).$$

Furthermore, only the values of ${}^{\sigma}P$ or ${}^{\sigma}F$ have absolute meaning.

Continuance functions of this form are quite useful in two respects.

(1) They permit description of an entire continuance table in very concise form. This facilitates easy computer evaluation of claim annuities and reserves, and also makes modification of basic table values for the purpose of reflecting experience trends or loading very simple while retaining full consistency and control over the continuance pattern.

(2) Interest discount is achieved extremely quickly. The discounted functions are approximate, but nevertheless quite accurate. One caution must be observed: some testing should be made to determine whether sufficiently accurate results are obtained when evaluating disabled life reserves of several years duration.

I wish, in concluding, to acknowledge the invaluable aid of Mr. A. S. Geen, who handled the complex task of the IBM 650 computations used in deriving Tables 1 to 4.