TRANSACTIONS OF SOCIETY OF ACTUARIES
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REPORT OF THE COMMITTEE TO RECOMMEND NEW DISABILITY TABLES FOR VALUATION*

The Committee's charge was to develop new disability tables for possible adoption by appropriate authorities for valuation of individual policy reserves (active lives) and individual and group claim reserves (disabled lives). The 1964 Commissioner's Disability Table (1964 CDT) has been recognized as being inadequate for claim reserves and is thought to be too conservative for active life reserves for policies sold to females in general and to males in the more popular occupation classes. A table was needed to better represent current products and experience.

The Committee believed that any new valuation table should be the simplest table that would embrace all of the factors that seem to affect policy liabilities. Its plan was to:

1. Develop an experience table involving all the variables we could statistically and rationally relate to either the incidence or termination of disability. The significant variables were determined to be age, sex, occupation class, elimination period, cause (sickness or accident), and duration from the date of disablement.
2. Eliminate any variable that does not significantly affect policy liabilities. Company and year of exposure were also found to be significant but were not kept isolated. The DTS Valuation Table was developed as an industry average table reflecting exposure periods of broad economic experience.
3. Develop appropriate margins to be added to such experience table to form a valuation table.

DISABILITY TABLE STUDY (DTS) BASIC TABLE

Development of such a table required collection of data in sufficient volume, detail, and credibility as to warrant a sound analytical approach to determining the contingency factors affecting claim costs, to mathematically quantify those factors (which we will call variables) and to produce a simple, credible means to express those results in an experience table. Our approach was to build from a disability termination study that had been initiated by Mr. John Haynes Miller to collect and analyze data on policyholder terminations from claim. This study would tell us what variables appeared to be

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significant in influencing claim continuance. Although far fewer variables were available, the same statistical methods were used to establish the variables that were significant for incidence rates.

The DTS Basic Table has been developed on this basis and appears in Appendix E of this report. Throughout this report, the letters DTS refer to the Disability Table Study. The report will refer to the tables as the DTS Basic Table and the DTS Valuation Table.

Appendix A provides a detailed description of the process of collecting and editing the DTS claim termination study data. Twenty companies participated, submitting usable experience data on 133,936 closed claims.

Appendix B describes the method used to determine the significant variables and to calculate numerical factors to reflect each variable's related significance in the rate of termination from claim. It describes further the practical application of this method to the determination of factors which would produce smooth termination rates for the first 2 years from disablement. Appendix B also describes the different methods used for determining rates of termination for the third through the tenth years and for ultimate years. Group long-term disability (LTD) experience was the primary influence for rates from the latter part of the second year through the tenth year. The method used to determine ultimate rates by attained age and by sex for durations 11 years and over was to evaluate ultimate data from several sources.

Appendix C describes the method used to determine disability incidence rates from data from several sources: DTS, Society of Actuaries (SOA), and the New York Study. Included are a large number of graphs, displayed here to provide the reader the means to evaluate the graduation process employed as well as for a quick assessment of the relationship of incidence rates to the parameters—age, sex, occupation class, elimination period, and cause (accident or sickness).

Appendix D contains illustrative values determined from the DTS Basic Table defined in Appendixes B and C. Comparisons are made to the SOA data as well as to the 1964 CDT.

Appendex E illustrates the methods for constructing a conventional continuance table from the DTS Basic Table. This appendix also shows two sample tables (males—class 3—e.p. 7 days, and males—class 1—e.p. 30 days), as well as the total DTS Basic Table. The DTS Basic Table is expressed in variable form.

Each variable found to be significant has been evaluated for the period of significance as indicated by Exhibit 1. The conventional continuance tables are readily constructed from these factors. It is expected, however, that most companies will work more directly from incidence rates and probabilities of termination from claim.

EXHIBIT 1

DISABILITY TABLE STUDY
DETERMINING VARIABLES FOR RATES OF INCIDENCE AND TERMINATION*

DETERMINING VARIABLES	DURATION FROM DISABLEMENT					
	By Week	By Month			By Year	By Attained Age
	0–13	4–6	7–12	13–24	3–10	Over 10 Years
AGE:						
SEX:						
Male						
Female						
CAUSE:						
Accident				} Independent		
Sickness						
ELIMINATION PERIOD:						
0 Day**						
7 Day		Com-				
14 Day		bined		} Independent		
30 Day						
90 Day						
CLASS:						
1—(4A,3A)						
2—(2A)		} Independent				
3—(A)						
4—(B)***						

*Rates of incidence and termination vary by age, sex, cause, elimination period, and class for incidence and for each claim duration as shown. Claim termination data were analyzed as to the significance by duration for each of 12 reported variables. The variables found to be significant and the durations for which they are significant are shown. (Note: The period of observation provided too little data to determine the significance of the "his own occ." clause.)
**Incidence rates for accident only.
***Small volume of data.

The DTS table data base and the simple Fortran computer program the Committee used is available from the Society's office. Over three hundred requests for the diskette already have been filled. It should be noted that the diskette is essentially the working version of the Committee's report and is incorporated into the National Association of Insurance Commissioners' (NAIC) recommendation whereby the DTS Valuation Table is now known as the "1985 Commissioner's Individual Disability Tables A."

SUITABILITY

There are several characteristics of the DTS table that will make it a suitable table as a basis for a valuation table for both active life reserves and claim reserves for individual disability income policies:

1. The DTS table was developed from exposures of the mid to late 1970s. At that time, the industry was going through a period of claims deterioration, to about 1976, and

the beginning of a claims improvement trend thereafter. The DTS table is, therefore, on the conservative side, relative to the good claims experience of the early 1980s.

2. The DTS table is sufficiently flexible as to lend itself to any company's particular mix of business by sex, elimination period, or occupation class.
3. The DTS table, although appearing complex, is very easy to use.
4. Each feature of the parametric approach is readily understandable.
5. This variable factor approach gives companies good detail with which to analyze the adequacy of their reserves over short periods of time and the tools to isolate any discriminating factor and adjust for it at the proper point.
6. The analytical approach and the subsequent method of determining termination rates should give the DTS table a high incidence of credibility and, of course, reliability.
7. Above all, the DTS table will promote the Society's intended position of prescribing sound principles of valuation, in contrast to specific minimal reserves from an aggregate table. Regulators can, with the DTS Valuation Table, enforce sound principles. Traditionally defined minimal reserves, though simple for regulation mechanics, have little reliability or credibility. Regulators, we believe, will be appreciative of a better way to set reserve standards tailored to the product and the company. This table offers an approach that considers the occupation class, elimination period, cause and sex, as well as age and claim duration.
8. The DTS table is easy to modify in order to add a contingency margin for a specific purpose.
9. During the second year of disablement, the termination rates were graduated from the level indicated in loss-of-time (LOT) experience to the level indicated by LTD. The rates are then based upon LTD experience for the third through the sixth years and graded into the ultimate rates of the eleventh year. LTD termination rates are considerably lower than LOT rates during the first 2 years of disablement and somewhat lower thereafter. Therefore, the table includes some implied margin beginning in the second year.

There are, of course, characteristics of any company's business which would make it not completely homogeneous to the underlying aggregate experience included in the DTS. Characteristics that would seem to inherently affect reserving requirements would include such items as:

1. the dimensions of the occupation classes;
2. the use of specialty classes;
3. either tight or liberal underwriting;
4. the relationship between benefits and earnings;
5. prudent claims-handling techniques, including rehabilitation activity;
6. geographic concentration of business;
7. definition of disability in the insuring clause;
8. other special features that might result in longer periods of claim, or reductions in the elimination period; or
9. even the quality of the field force.

There was definite evidence of antiselection by amount observed in our analysis, but we did not have information on the suspected underlying cause—

the relation of insured benefits to the household spendable income—and so we could not produce reliable relative numerical values for an amount variable.

We have no definite evidence of antiselection on the residual clause. Nevertheless, it seems logical that a person could be on claim for a longer period of time under residual, even though the aggregate amount paid may not be any greater than full benefits for the regular, shorter period.

ALTERNATIVE MARGINS

The need for a small margin arises from the uncertainty in incidence (affecting the number of claims) and from the uncertainty of recovery (affecting the aggregate amount of claims payments). This need would be appropriately covered by a margin in the claims cost (affecting the active life reserves) and a margin in the claim reserves. It is not feasible for a valuation table to be so strong as to cover the worst possible experience of all companies. Nevertheless, there should be small margins to give some assurance of adequacy of reserves for the most likely unusual occurrences.

Minimal reserves could be prescribed as multiples of the DTS reserve factors on a scale graded by the size of a company's block of individual disability income business. Unfortunately, the approach would place too heavy a burden on a company that is growing conservatively or would not produce strong enough reserves for a company growing aggressively.

Adding a flat percentage margin of, say, 10 percent is very practical but is not objective, and when the margin is set high enough to adequately cover most cases, it would subject the more standard policies to unnecessary strain. Providing for a small margin by modifying a particular variable seems to be a better way to fulfill the purpose.

The adverse part of claims experience during the 1970s was caused mostly by the prolonging of early claims (short deferring of recovery), rather than by higher claim rates. Claims incidence on SOA data actually showed slight improvement during that period on policies with longer elimination periods and at the higher ages.

Increasing an incidence factor, while directly increasing active life policy reserves, would not affect claim reserves. Nor should it, because higher incidence could lead to higher termination from claims where there are more claimants less severely impaired.

Decreasing the termination rate by a percentage during the early influential months of a claim will add a margin to most active life reserves as well as increase all of the claim reserves in the early durations, where it is really needed.

Since the DTS terminations are highly influenced by group LTD experience by the end of the second year and through the tenth year, and since

terminations reflect, essentially, ultimate insured disabled life mortality experience thereafter, it would seem prudent to also allow for extra morbidity where it is likely to occur and would be most significant, during the first year of claim, and grading off during the second year of claim.

A possible 5 percent adverse deviation from normal claims terminations rates during the first year of disablement is well within the range of managerial judgment. Such a change could arise insidiously before the company actuary or the industry could recognize the trend or identify the cause. The DTS Valuation Table includes such a margin.

RECOMMENDATION

The DTS Valuation Table consists of the DTS Basic Table allowing for 95 percent of standard termination from disablement rates during the first year of disablement, grading to 100 percent of the DTS standard termination rates in the eighteenth month. An illustration of the approximate reserve margins can be obtained by reviewing Exhibit D-8 in Appendix D of this report. Active life reserve margins would be from 5–10 percent, and claim reserve margins would be about 10 percent in the first 2 months of disablement. The claim reserve margin will decrease each month and disappear by the eighteenth month.

We recommend that the Society of Actuaries propose the DTS Valuation Table (Exhibits 2, 3a–3c, and 4) to the NAIC as the minimal valuation table for individual disability income active life and claim reserves.[1] We recommend that this DTS Valuation Table be used with 1980 CSO ultimate mortality, sex distinct. Select mortality would be more precise than ultimate, but we believe it is more acceptable to be consistent with life insurance valuation standards.

The Committee did not have sufficient data to evaluate variables for policies with 6-month elimination periods. The 90-day elimination table would be used to calculate costs for policies with greater elimination periods even though this would interject some possible conservatism in active life reserves for such policies. For most insurers, the proportion of such policies would be minor.

The industry currently takes some comfort in the reserve margin being provided by low-valuation interest rates (3–3.5 percent) as an offset to current valuation morbidity deficiency. Greater confidence in valuation adequacy is obtained, of course, where reserving margins are more explicit with respect to each contingency. This is accomplished for morbidity by the

[1] The recommendation was adopted by the NAIC at its December 1985 meeting. The DTS Valuation Table is now known officially as the "Commissioners 1985 Individual Disability Tables A."

EXHIBIT 2

DTS VALUATION TABLE
(Incidence of disability
rates per 1,000 lives exposed)

	Age	Male—Accident					Age	Male—Sickness				
		Elimination Period						Elimination Period				
		0 day	7 day	14 day	30 day	90 day		0 day	7 day	14 day	30 day	90 day
Class 1	25	33.97	25.84	13.13	4.90	.86	25	. . .	32.26	18.22	5.51	1.01
	35	32.88	24.42	11.99	4.23	.51	35	. . .	36.11	21.55	6.48	1.13
	45	30.40	20.40	9.86	4.50	.65	45	. . .	47.12	31.19	12.63	2.70
	55	30.19	18.32	9.63	4.71	.80	55	. . .	69.48	52.75	25.11	7.78
	62	33.45	16.11	10.39	5.47	1.18	62	. . .	91.52	74.06	41.24	15.20
Class 2	25	59.96	47.98	30.01	10.48	2.07	25	. . .	46.61	27.01	12.17	2.23
	35	59.96	44.62	28.83	10.14	2.09	35	. . .	52.79	33.37	14.47	2.56
	45	56.74	38.49	25.67	9.86	2.14	45	. . .	65.97	46.91	25.40	6.21
	55	51.66	31.31	20.50	10.03	2.20	55	. . .	92.99	71.27	41.37	15.74
	62	52.84	29.85	19.86	10.92	2.57	62	. . .	116.81	93.05	58.54	25.94
Class 3	25	75.80	62.68	42.87	23.69	7.04	25	. . .	46.83	32.22	14.75	2.99
	35	74.78	58.37	39.59	22.57	6.48	35	. . .	52.72	38.32	18.70	3.52
	45	69.76	50.41	34.61	20.49	5.97	45	. . .	67.05	51.53	29.45	7.83
	55	66.37	44.27	30.51	18.49	5.46	55	. . .	92.60	76.39	52.66	20.07
	62	65.04	39.98	27.96	18.56	5.30	62	. . .	116.23	98.78	78.56	36.04
Class 4	25	89.42	77.60	52.59	27.03	8.73	25	. . .	48.20	33.28	15.07	3.04
	35	91.59	73.24	50.53	26.93	8.17	35	. . .	53.75	39.27	19.33	3.59
	45	84.64	62.13	42.61	24.78	7.68	45	. . .	70.03	52.71	30.13	7.97
	55	79.77	52.03	37.34	22.78	7.27	55	. . .	95.01	77.91	55.87	20.45
	62	79.95	49.76	36.11	22.96	7.20	62	. . .	119.16	101.41	81.62	36.63

EXHIBIT 2—*Continued*

	Age	Female—Accident					Age	Female—Sickness				
		Elimination Period						Elimination Period				
		0 day	7 day	14 day	30 day	90 day		0 day	7 day	14 day	30 day	90 day
Class 1	25	23.06	19.92	12.96	6.00	1.14	25	. . .	61.10	39.29	14.03	2.55
	35	26.28	20.87	13.39	6.21	.91	35	. . .	84.38	56.89	24.75	4.37
	45	32.36	22.77	13.78	6.83	1.11	45	. . .	94.57	68.33	34.14	7.64
	55	45.05	26.77	14.82	8.06	1.46	55	. . .	90.28	61.49	34.23	10.31
	62	69.00	31.56	17.54	9.91	2.25	62	. . .	93.06	69.44	45.30	13.85
Class 2	25	35.05	31.48	23.39	13.40	3.22	25	. . .	80.97	53.57	20.03	3.75
	35	39.36	32.01	23.36	14.02	3.20	35	. . .	116.02	80.05	35.34	6.60
	45	47.46	33.55	24.40	15.02	3.40	45	. . .	134.18	92.93	47.62	10.81
	55	62.53	37.10	26.13	16.11	3.75	55	. . .	117.29	84.93	49.00	14.95
	62	88.91	44.31	29.27	17.88	4.46	62	. . .	120.40	87.53	63.15	18.86
Class 3	25	41.93	38.01	27.94	17.63	6.19	25	. . .	86.64	57.85	24.83	5.03
	35	46.30	38.45	28.54	18.20	6.54	35	. . .	124.79	96.77	44.67	8.43
	45	53.01	39.08	29.09	19.24	6.75	45	. . .	145.58	116.19	58.44	14.43
	55	66.71	41.96	30.86	20.99	7.08	55	. . .	122.98	99.89	59.99	17.86
	62	90.05	48.12	33.60	23.74	7.26	62	. . .	125.95	101.06	69.18	22.76
Class 4	25	52.41	47.52	34.93	22.04	7.74	25	. . .	90.24	60.26	25.86	5.23
	35	57.87	48.07	35.67	22.75	8.17	35	. . .	130.00	100.81	46.53	8.79
	45	66.26	48.86	36.36	24.05	8.45	45	. . .	151.65	121.04	60.87	15.03
	55	83.39	52.45	38.58	26.25	8.85	55	. . .	128.10	104.05	62.49	18.61
	62	112.57	60.16	42.00	29.67	9.08	62	. . .	131.20	105.27	72.07	23.71

EXHIBIT 3a

DTS VALUATION TABLE
FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES*

FACTORS**	WEEK 1	WEEK 2	WEEK 3	WEEK 4
DURATION RATE	.132	.114	.111	.119
Age 25:	1.019	1.138	1.127	1.105
EP—0,7,14,30	1.000	1.053 .941	1.131 1.066 .788	1.061 1.074 .849
Class—1,2,3,4	.978 .981 .995 1.011	.951 .968 1.012 1.053	.963 .983 1.009 1.036	.983 .997 1.005 1.009
Sex—M,F	1.154 .859	1.142 .858	1.101 .897	1.079 .922
Cause—A,S	1.034 .957	.956 1.018	.912 1.074	.894 1.098
Age 35:	1.014	.961	.959	.997
EP—0,7,14,30	1.000	1.062 .934	1.176 1.067 .757	1.130 1.049 .815
Class—1,2,3,4	1.111 1.030 .957 .882	1.046 .999 .977 .960	1.006 .998 .995 .991	1.007 1.001 .996 .991
Sex—M,F	1.101 .901	1.190 .824	1.146 .862	1.090 .913
Cause—A,S	.995 .994	1.044 .933	.996 .984	.960 1.023
Age 45:	1.027	.894	.898	.943
EP—0,7,14,30	1.000	1.082 .916	1.218 1.053 .741	1.185 1.023 .797
Class—1,2,3,4	1.215 1.070 .934 .796	1.135 1.029 .951 .884	1.061 1.017 .977 .939	1.041 1.011 .984 .960
Sex—M,F	1.038 .955	1.146 .856	1.110 .890	1.063 .936
Cause—A,S	.977 1.013	1.132 .860	1.090 .898	1.046 .939
Age 55:	1.016	.949	.942	.948
EP—0,7,14,30	1.000	1.136 .873	1.263 1.001 .751	1.228 .988 .797
Class—1,2,3,4	1.243 1.080 .936 .769	1.193 1.057 .935 .832	1.120 1.039 .959 .887	1.086 1.028 .970 .918
Sex—M,F	.972 1.020	1.002 .978	1.000 .988	1.000 .995
Cause—A,S	1.031 .960	1.191 .817	1.171 .836	1.142 .860
Age 62:	.924	1.058	1.072	1.007
EP—0,7,14,30	1.000	1.109 .894	1.210 .958 .819	1.210 .965 .827
Class—1,2,3,4	1.205 1.072 .938 .797	1.185 1.066 .941 .825	1.167 1.057 .949 .847	1.143 1.049 .955 .868
Sex—M,F	.908 1.092	.850 1.153	.873 1.132	.922 1.080
Cause—A,S	1.245 .794	1.300 .749	1.266 .773	1.257 .781

*The termination rate is the product of the Duration Rate and the corresponding variable factors for the respective Age, e.g., for Week 2 (.114), age 35 (.961), EP 7day (.934), class 2 (.999), male (1.190), accident (1.044), the termination rate is .127.

**Age is age at disablement.

Duration is from the date of disablement.

Class 1 includes the 2 lowest premium occupation classes of a 5-class manual, or the lowest premium class of a 4-class manual.

EXHIBIT 3a—*Continued*

DTS VALUATION TABLE

FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES*

FACTORS**	WEEK 5	WEEK 6	WEEK 7
DURATION RATE	.112†	.117	.120
Age 25:	1.048	1.060	1.066
EP—0,7,14,30	1.156 1.246 1.036 .597	1.076 1.210 1.048 .689	1.018 1.177 1.053 .760
Class—1,2,3,4	1.006 1.006 1.000 .984	.992 1.008 1.007 .990	.986 1.010 1.009 .993
Sex—M,F	1.060 .942	1.036 .965	1.022 .978
Cause—A,S	.884 1.112	.878 1.118	.874 1.125
Age 35:	.985	1.019	1.043
EP—0,7,14,30	1.249 1.191 .985 .608	1.164 1.153 .998 .701	1.119 1.121 1.006 .759
Class—1,2,3,4	1.007 1.003 .997 .988	.999 1.003 1.002 .994	.996 1.001 1.003 .998
Sex—M,F	1.055 .946	1.019 .981	.994 1.005
Cause—A,S	.937 1.050	.925 1.062	.916 1.073
Age 45:	.962	.988	1.007
EP—0,7,14,30	1.298 1.123 .938 .652	1.206 1.096 .962 .738	1.172 1.073 .974 .783
Class—1,2,3,4	1.025 1.009 .990 .972	1.015 1.006 .995 .983	1.010 1.003 .996 .990
Sex—M,F	1.033 .966	1.005 .995	.984 1.016
Cause—A,S	1.014 .970	1.002 .981	.989 .994
Age 55:	.977	.969	.964
EP—0,7,14,30	1.298 1.056 .897 .725	1.220 1.052 .930 .786	1.196 1.041 .946 .814
Class—1,2,3,4	1.060 1.023 .979 .938	1.041 1.018 .985 .956	1.030 1.013 .989 .968
Sex—M,F	.997 1.001	.995 1.005	.990 1.010
Cause—A,S	1.118 .879	1.111 .884	1.098 .895
Age 62:	1.028	.965	.920
EP—0,7,14,30	1.257 1.004 .867 .815	1.196 1.031 .896 .849	1.191 1.031 .910 .857
Class—1,2,3,4	1.120 1.044 .962 .885	1.090 1.040 .971 .906	1.071 1.037 .977 .921
Sex—M,F	.955 1.045	.988 1.012	1.011 .988
Cause—A,S	1.245 .790	1.260 .780	1.253 .785

*The termination rate is the product of the Duration Rate and the corresponding variable factors for the respective Age, e.g., for Week 2 (.114), age 35 (.961), EP 7day (.934), class 2 (.999), male (1.190), accident (1.044), the termination rate is .127.

**Age is age at disablement.

Duration is from the date of disablement.

Class 1 includes the 2 lowest premium occupation classes of a 5-class manual, or the lowest premium class of a 4-class manual.

†Use .080 for 30-day elimination periods to allow for the short week from 30 to 35 days.

EXHIBIT 3a—*Continued*

DTS VALUATION TABLE
FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES*

FACTORS**	WEEK 8	WEEK 9	WEEK 10
DURATION RATE	.119	.116	.111
Age 25:	1.073	1.079	1.086
EP—0,7,14,30	.980 1.147 1.054 .820	.958 1.118 1.049 .873	.951 1.087 1.038 .921
Class—1,2,3,4	.983 1.009 1.010 .997	.978 1.007 1.012 1.004	.972 1.002 1.013 1.013
Sex—M,F	1.012 .988	1.004 .995	.997 1.002
Cause—A,S	.871 1.129	.870 1.131	.871 1.131
Age 35:	1.058	1.066	1.068
EP—0,7,14,30	1.082 1.099 1.013 .807	1.051 1.082 1.017 .848	1.025 1.069 1.019 .885
Class—1,2,3,4	.993 1.000 1.004 1.003	.990 .999 1.005 1.006	.986 .997 1.006 1.010
Sex—M,F	.978 1.022	.967 1.033	.961 1.040
Cause—A,S	.912 1.078	.913 1.078	.919 1.072
Age 45:	1.019	1.024	1.022
EP—0,7,14,30	1.143 1.057 .983 .818	1.113 1.046 .990 .851	1.083 1.040 .995 .882
Class—1,2,3,4	1.006 1.000 .997 .995	1.004 .999 .998 .998	1.002 .999 .999 1.000
Sex—M,F	.969 1.031	.959 1.042	.951 1.050
Cause—A,S	.982 1.001	.981 1.003	.986 .999
Age 55:	.961	.957	.953
EP—0,7,14,30	1.171 1.031 .957 .841	1.147 1.021 .964 .869	1.121 1.013 .967 .900
Class—1,2,3,4	1.023 1.009 .991 .976	1.020 1.007 .993 .981	1.019 1.005 .993 .982
Sex—M,F	.984 1.016	.976 1.024	.966 1.034
Cause—A,S	1.089 .902	1.084 .908	1.082 .910
Age 62:	.890	.874	.871
EP—0,7,14,30	1.180 1.024 .917 .876	1.166 1.010 .919 .907	1.147 .987 .917 .951
Class—1,2,3,4	1.058 1.033 .980 .933	1.048 1.028 .982 .944	1.043 1.022 .984 .953
Sex—M,F	1.025 .975	1.024 .976	1.008 .991
Cause—A,S	1.245 .790	1.236 .796	1.223 .806

*The termination rate is the product of the Duration Rate and the corresponding variable factors for the respective Age, e.g., for Week 2 (.114), age 35 (.961), EP 7day (.934), class 2 (.999), male (1.190), accident (1.044), the termination rate is .127.

**Age is age at disablement.

Duration is from the date of disablement.

Class 1 includes the 2 lowest premium occupation classes of a 5-class manual, or the lowest premium class of a 4-class manual.

EXHIBIT 3a—*Continued*

DTS VALUATION TABLE
FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES*

FACTORS**	WEEK 11	WEEK 12	WEEK 13
DURATION RATE	.104	.094	.082
Age 25:	1.096	1.110	1.133
EP—0,7,14,30	.963 1.051 1.018 .964	.996 1.008 .985 1.007	1.059 .949 .935 1.050
Class—1,2,3,4	.966 .994 1.015 1.026	.957 .982 1.017 1.045	.944 .964 1.021 1.074
Sex—M,F	.990 1.008	.984 1.013	.975 1.018
Cause—A,S	.876 1.127	.884 1.118	.897 1.104
Age 35:	1.062	1.049	1.027
EP—0,7,14,30	1.003 1.058 1.017 .920	.985 1.049 1.008 .955	.971 1.038 .989 .992
Class—1,2,3,4	.981 .996 1.007 1.015	.974 .994 1.009 1.002	.962 .993 1.012 1.032
Sex—M,F	.958 1.042	.959 1.039	.967 1.026
Cause—A,S	.930 1.060	.950 1.040	.984 1.006
Age 45:	1.012	.993	.962
EP—0,7,14,30	1.048 1.039 .998 .914	1.007 1.043 .997 .951	.952 1.054 .989 .995
Class—1,2,3,4	1.001 1.000 1.000 .999	1.000 1.003 1.000 .995	1.000 1.008 1.001 .989
Sex—M,F	.946 1.055	.943 1.057	.942 1.053
Cause—A,S	.998 .989	1.020 .969	1.058 .935
Age 55:	.948	.941	.932
EP—0,7,14,30	1.090 1.005 .966 .938	1.052 .997 .959 .989	.999 .988 .943 1.062
Class—1,2,3,4	1.022 1.006 .992 .980	1.031 1.009 .989 .971	1.048 1.015 .984 .953
Sex—M,F	.953 1.048	.935 1.066	.908 1.092
Cause—A,S	1.086 .909	1.094 .904	1.110 .891
Age 62:	.881	.907	.946
EP—0,7,14,30	1.119 .956 .913 1.017	1.079 .914 .906 1.114	1.024 .853 .894 1.265
Class—1,2,3,4	1.041 1.016 .984 .961	1.043 1.009 .982 .967	1.052 .998 .978 .972
Sex—M,F	.975 1.024	.920 1.083	.844 1.175
Cause—A,S	1.210 .816	1.193 .829	1.166 .849

*The termination rate is the product of the Duration Rate and the corresponding variable factors for the respective Age, e.g., for Week 2 (.114), age 35 (.961), EP 7day (.934), class 2 (.999), male (1.190), accident (1.044), the termination rate is .127.

**Age is age at disablement

Duration is from the date of disablement.

Class 1 includes the 2 lowest premium occupation classes of a 5-class manual, or the lowest premium class of a 4-class manual.

EXHIBIT 3b

DTS VALUATION TABLE

FACTORS FOR CALCULATION OF MONTHLY TERMINATION RATES

	MONTH 4		MONTH 5		MONTH 6	
Duration Rate	.224		.198		.173	
<90 day elimination period	1.172		1.109		1.051	
90 day elimination period	.828		.891		.949	
Male:	.989		.981		.975	
Female	1.011		1.019		1.025	
Age: 25 A,S	1.082	1.186	1.103	1.182	1.149	1.173
35 A,S	1.039	1.103	1.065	1.123	1.089	1.134
45 A,S	1.012	.989	1.045	.993	1.061	.989
55 A,S	1.017	.857	.980	.837	.970	.809
62 A,S	.981	.732	.971	.701	.963	.663

	MONTH 7		MONTH 8		MONTH 9	
Duration Rate	.145		.118		.090	
Male:	.947		.943		.939	
Female	1.053		1.057		1.061	
Age: 25 A,S	1.204	1.218	1.259	1.262	1.351	1.289
35 A,S	1.108	1.187	1.127	1.240	1.167	1.243
45 A,S	1.040	1.019	1.019	1.048	1.031	1.021
55 A,S	.920	.815	.869	.820	.856	.772
62 A,S	.835	.657	.706	.651	.671	.600

	MONTH 10		MONTH 11		MONTH 12	
Duration Rate	.071		.063		.057	
Male:	.935		.931		.945	
Female:	1.065		1.069		1.055	
Age: 25 A,S	1.442	1.317	1.534	1.344	1.626	1.371
35 A,S	1.207	1.245	1.247	1.248	1.287	1.251
45 A,S	1.042	.993	1.054	.966	1.066	.939
55 A,S	.844	.724	.831	.676	.818	.628
62 A,S	.637	.550	.602	.499	.567	.448

SECOND YEAR OF DISABLEMENT

MONTH	13	14	15	16	17	18
Duration Rate	.051	.046	.042	.037	.031	.028
Male:	.960	.975	.978	.981	.984	.988
Female:	1.040	1.025	1.022	1.019	1.016	1.012
Age: 25	1.558	1.625	1.692	1.758	1.825	1.897
35	1.288	1.292	1.296	1.299	1.303	1.298
45	.971	.937	.903	.869	.835	.797
55	.658	.629	.600	.571	.542	.516
62	.524	.517	.510	.503	.496	.493

MONTH	19	20	21	22	23	24
Duration Rate	.024	.021	.019	.017	.016	.015
Male:	.993	.997	1.001	1.005	1.009	1.013
Female:	1.007	1.003	.999	.995	.991	.987
Age: 25	1.970	2.042	2.061	2.079	2.098	2.117
35	1.294	1.289	1.265	1.241	1.217	1.193
45	.758	.720	.706	.693	.679	.665
55	.489	.463	.471	.479	.487	.495
62	.489	.486	.497	.508	.519	.530

EXHIBIT 3c

DTS VALUATION TABLE

FACTORS FOR CALCULATION OF ANNUAL TERMINATION RATES

YEARS 3 THROUGH 10

YEAR	3	4	5	6
Duration Rate	.123	.084	.062	.050
Male:	1.080	1.129	1.179	1.200
Female:	.920	.871	.821	.800
Age: 25	2.085	1.832	1.554	1.262
35	1.164	1.103	1.017	.909
45	.727	.757	.767	.754
55	.536	.616	.697	.832
62	.489	.691	.965	1.244
YEAR	7	8	9	10
Duration Rate	.045	.042	.042	.043
Male:	1.212	1.210	1.204	1.200
Female:	.788	.790	.796	.800
Age: 25	.994	.776	.617	.524
35	.792	.696	.631	.582
45	.741	.737	.739	.751
55	.984	1.103	1.182	1.226
62	1.489	1.688	1.830	1.918

EXHIBIT 4

DTS Valuation Table
Ultimate Termination Rates for
Duration 11 Years and Over
by Attained Age

Attained Age	Male	Female	Attained Age	Male	Female
30	.0238	.0160	65	.0665	.0446
31	.0240	.0161	66	.0707	.0474
32	.0242	.0162	67	.0753	.0504
33	.0244	.0163	68	.0802	.0538
34	.0246	.0165	69	.0857	.0574
35	.0249	.0167	70	.0916	.0614
36	.0251	.0168	71	.0986	.0657
37	.0254	.0170	72	.1051	.0704
38	.0258	.0173	73	.1127	.0755
39	.0261	.0175	74	.1210	.0811
40	.0265	.0178	75	.1301	.0871
41	.0270	.0181	76	.1398	.0937
42	.0275	.0184	77	.1504	.1008
43	.0280	.0188	78	.1619	.1085
44	.0286	.0192	79	.1743	.1168
45	.0292	.0196	80	.1878	.1258
46	.0299	.0200	81	.2022	.1355
47	.0306	.0205	82	.2178	.1459
48	.0315	.0211	83	.2345	.1571
49	.0324	.0217	84	.2525	.1691
50	.0334	.0224	85	.2717	.1820
51	.0345	.0231	86	.2922	.1958
52	.0357	.0239	87	.3140	.2104
53	.0370	.0248	88	.3372	.2259
54	.0384	.0257	89	.3618	.2424
55	.0400	.0268	90	.3877	.2598
56	.0417	.0279	91	.4149	.2780
57	.0436	.0292	92	.4435	.2971
58	.0456	.0306	93	.4732	.3171
59	.0479	.0321	94	.5041	.3378
60	.0503	.0337	95	.5360	.3591
61	.0530	.0355	96	.5686	.3801
62	.0559	.0375	97	.6020	.4033
63	.0592	.0397	98	.6357	.4259
64	.0627	.0420	99	.6695	.4486

implicit margin inherent in the method of construction, the parametric approach of the DTS Valuation Table, and the explicit front-end margin in rates of termination from claim. Valuation interest rates then need to be updated as well, and a change in interest rates is being reviewed by an Academy of Actuaries' committee that will recommend model reserve standards to the NAIC.

Although the DTS Valuation Table is reasonably representative of group LTD experience after the first 2 years of claim, a consensus was reached during the exposure period that additional margin, varying by age, would be needed for a group LTD valuation standard. Accordingly, the Committee is not proposing a valuation table for group LTD at this time.

Although the proposed DTS Valuation Table would be the individual disability income valuation standard, there may be blocks of business where the resulting reserves are inadequate under prudent management. In such a case, as has been the situation historically, the company must hold adequate liabilities. Termination rates on the proposed DTS Valuation Table are easily modified to handle that contingency on a very flexible, practical, and even seriatim, basis.

Each company actuary should be required periodically, in any event, to demonstrate to the Commissioner's satisfaction that the reserves held are reasonable and adequate for each unique policy form.

The *termination rate* for any duration is the product of the duration rate and the appropriate factor from each set of factors for that duration.

The *values for the individual ages* were obtained by the Lagrange interpolation formula shown in Exhibit 5.

Age is age at disablement.

Duration is measured from the date of disablement.

Occupation Class 1 includes the 2 lowest premium classes of a 5-class manual or the lowest premium class of a 4-class manual.

Although many people contributed substantial amounts of time, the Committee wishes to express its special appreciation to Mr. Frank Knorr and Mr. John Haynes Miller for their very capable and most extensive effort in support of the work of this assignment.

The Committee also wishes to formally acknowledge with appreciation, the assistance received from Mr. Frank O'Grady, from Mr. Tappan Roy, and from the New York Insurance Department for making the results of their study available to us.

EXHIBIT 5

5-POINT LAGRANGE INTERPOLATION FORMULA

Used for incidence rates and termination rates.
Given points $F(a)$, $F(b)$, $F(c)$, $F(d)$, and $F(e)$, then:

$$
\begin{aligned}
F(x) \quad = \quad & \frac{(x\text{-}b)}{(a\text{-}b)}\frac{(x\text{-}c)}{(a\text{-}c)}\frac{(x\text{-}d)}{(a\text{-}d)}\frac{(x\text{-}e)}{(a\text{-}e)}F(a) \\
+ \quad & \frac{(x\text{-}a)}{(b\text{-}a)}\frac{(x\text{-}c)}{(b\text{-}c)}\frac{(x\text{-}d)}{(b\text{-}d)}\frac{(x\text{-}e)}{(b\text{-}e)}F(b) \\
& \quad \vdots \\
+ \quad & \frac{(x\text{-}a)}{(e\text{-}a)}\frac{(x\text{-}b)}{(e\text{-}b)}\frac{(x\text{-}c)}{(e\text{-}c)}\frac{(x\text{-}d)}{(e\text{-}d)}F(e)
\end{aligned}
$$

for $a<x<e$,
a,b,c,d, and e are ages 25,35,45,55, and 62, respectively.

When $x\leq 25$:
for incidence rates, $F(x) = F(25)$
for termination rates, $F(x) = F(25) + (25\text{-}x)[F(25)\text{-}F(26)]$

When $x\geq 62$:
$F(x) = F(62) + (x-62)\ [F(62)\text{-}F(61)]$.

APPENDIX A

COLLECTION AND EDITING OF THE DATA USED IN DEVELOPING TERMINATION RATES

The original solicitation of data to be used in developing a table of disability termination rates was made in 1977 by John H. Miller through his *Disability Newsletter*. The data requested were records for each disability claim which either terminated in 1975 or 1976 or was outstanding at the end of 1976. A number of companies contributed data in response to this solicitation.

Subsequent to the formation in 1978 of the Committee to Recommend New Disability Tables for Valuation, John Miller obtained approval from all contributing companies to turn the data he had collected from them over to the Committee. During the next several years, the Committee solicited contributions from additional companies, as well as requested and received additional years of experience from many of the original contributors. The extent of the data contributed is shown in the following table.

Contributing Company	Number of Claims Terminated in Calendar Year							
	1973	1974	1975	1976	1977	1978	1979	Totals
American Mutual	0	0	245	280	0	0	0	525
Durham Life	0	0	0	78	0	0	0	78
Franklin Life	0	0	816	880	0	0	0	1,696
IDS Life	0	0	1,066	1,050	840	781	0	3,737
John Hancock	3,746	3,312	3,313	2,758	2,558	2,344	2,089	20,120
Life of Virginia	0	0	129	116	157	296	0	698
Mass. Casualty	0	0	0	2,449	0	0	0	2,449
Mass. Indemnity	0	0	4,137	3,629	0	0	0	7,766
Mass. Mutual	0	0	263	254	322	322	0	1,161
Metropolitan	0	0	5,847	6,175	5,694	0	0	17,716
Monarch	0	0	8,978	8,230	7,908	7,185	6,642	38,943
Mutual of Omaha*	1,261	1,334	1,379	1,333	1,256	0	0	6,563
Northwestern Mut.	0	0	260	295	0	0	0	555
Provident L & A	0	0	1,726	2,207	2,319	2,151	0	8,403
Provident Mutual	0	0	0	450	0	0	0	450
Prudential	0	0	9,842	3,806	0	0	0	13,648
State Mutual	0	0	1,139	1,072	0	0	0	2,211
Travelers*	0	0	187	85	0	0	0	272
Washington Nat.	0	0	2,906	3,013	0	0	0	5,919
Woodman A & L	0	0	0	1,026	0	0	0	1,026
Totals:	5,007	4,646	42,233	39,186	21,054	13,079	8,731	133,936

*Second year and later data only

The specifications of the data to be included and the format of the data are contained in the instructions furnished to each contributing company. These instructions are reproduced below.

INTERCOMPANY DISABILITY TERMINATION TABLE INSTRUCTIONS
(Original Instructions of May 1977, as edited December 1979)

Data Specifications. For the development of disability termination rates the following data are required:

1. A claim record for each claim for total disability under coverage through an individual policy providing both accident and sickness total disability benefits. (The original instructions indicated that accident-only business could be submitted at the option of the contributor, but such contributions as were received have been excluded from the processing of the data.)
2. A separate record for:
   a. Each claim terminated by death, recovery, or expiration of benefit period or of coverage in each year of observation.
   b. Each claim outstanding at the end of each period of observation.
3. Partial Disability will be excluded.

FORM OF DATA

The data should be submitted on 80-column punch cards or on magnetic tape, using the following outlined format. The following format specifications are very similar to those outlined in the *TSA 1959 Reports* pages 156–63, as well as to those required for the 1975 submission of disability experience to the New York Insurance Department for its analysis of *Disability Income Insurance Cost Differentials between Men and Women*. However, in this study each claim requires only one record—neither summary cards nor exposure cards are necessary.

CLAIM RECORD FORMAT

Field	Columns	Description of Field
1	1	skip
2	2	Last digit of calendar year of observation
(see field 30)		
3	3–5	Company Code Number.
4	6	Type of coverage or cause of disability: 3 for Accident, 4 for Sickness. (1 was used for Accident Only and 2 designates Sickness under a Sickness Only policy—now a rarity.)
5	7–9	(optional) Contributing company's policy form code.

6 10 Type of Renewal Provision

Code	Renewal Type
1	Noncancelable
2	Guaranteed renewable
3	Nonrenewable for stated reasons only.
4	Collectively renewable
5	Level premium policies not included in 1–4 above.
6	Step rate policies not included in 1–4 above.
7	Other policies. Please explain the renewal conditions.

7 11–12 Age at expiration of coverage. Record the limiting age of coverage specified in the policy contract, even though it may be continued by company policy, to some more advanced age. If there is no expiry age specified in the policy, punch 99.

8 13 Sex: Men = 1; Women = 2; Combined = 5.

9 14 Occupational class. Please code from 0 to 7 according to the following table.

Code	4-class manual	5-class manual	"Bureau Manual"	"NY" class code*
0		4A		1
1		3A		1
2	3A		A & B	1
3	2A	2A	C & D	2
4	A	A	D* & E	3
5	B	B	F & G	4
6	C	C	H & I	4
7	D + over	D + over	J & over	4
9	Separation by class not available			

If your classification system does not approximate one of the four above groupings, please send an explanation which will enable us to determine appropriate codes.

*Codes used for the New York Study, indicating our impression of the typical correspondence with other designations displayed above.

Definition of Occupation Classes:

Class 1: the lowest premium class, includes professional, technical and managerial occupations that are generally office duties only.

Class 2: includes supervisory and other skilled clerical and skilled technical people.

Class 3: nonhazardous light manual workers.

Class 4: hazardous work with heavy manual labor or using heavy equipment.

10	15–17	Elimination period in days for sickness benefits. This may be left blank if the cause is accident.
11	18–20	Elimination period in days for accident benefits. This may be left blank if same as sickness or if the cause is sickness.
12	21–23	Benefit period, sickness. Enter the maximum number of months for which total disability sickness benefits are payable under the terms of the policy. Code 965 for benefits to age 65; 999 for lifetime benefits. This may be left blank if the cause is accident.
13	24–26	Benefit period, accident. Enter maximum number of months for which total disability accident benefits are payable under the terms of the policy. Code 965 for benefits to age 65; 999 for lifetime benefits. This may be left blank if the same as sickness or if the cause is sickness.
14	27	skip
15	28–29	Attained age at disablement. Age nearest birthday at date of disablement.
16	30–31	(optional) Year of issue. Enter last two digits of the year of issue.
17	32–34	skip
18	35–38	Amount of monthly indemnity or 4.35 × weekly indemnity, to nearer dollar.
19	39	Status of claim Code 0—claim open at end of observation period 1—claim terminated by recovery 2—claim terminated by death 3—claim terminated because benefit period was exhausted.

Note re: Status of claim, cause of termination. If data source does not distinguish between deaths and recoveries, terminations by either of

these causes may be coded: 4—claim terminated by recovery or death.

20 (see field 31)	40	(optional Month incurred. Enter calendar month of incurral (Jan. = 1, Feb. = 2,. . .,Sept. = 9, Oct. = 0, Nov. = x, Dec. = y).
21	41–42	Enter the last two digits of the calendar year of incurral.
22	43–45	(optional) Date reported. Month and year as in columns 40–42. Will be used to study the lag in reporting, if enough contributors include this date.
23	46–47	skip
24	48–52	Duration of disability. Show the duration in days for which total disability benefits were incurred (i.e. measured from the end of the elimination period). On open claims, show the duration for which total disability payments were incurred up to December 31 of the year of observation. (Estimates of future durations on open claims should be excluded.) For recurrent disabilities, follow the policy contract and report the total number of days for which benefits were incurred under the claim. In cases settled by legal judgment, arbitration, or compromise, compute an "adjusted duration of disability" which, when multiplied by the rate of disability indemnity, will reproduce the amount of the settlement.

Note re: Duration of disability. If the record for open claims shows only "last transaction date," or similar information, the days of duration to the year-end should be: Duration in days = December 31, calendar year of observation − (date incurred) − (elimination period). If the record includes the number of days of disability up to the last transaction date, just increase it by the number of days between the last transaction and December 31 in order to obtain the duration.

25	53–57	(optional) Diagnosis of disability.
26	58–62	(optional) Impairment code. Companies that maintain records as to the types of impairment riders added to policies are encouraged to furnish this information. Companies coding this information would supply a copy of their code.

27 63–65 Definition of disability

Columns 63–64: Years at "his occupation,". . ., e.g., 01, 02, 05, 08 (100 months), 10. If to age 60 or 65, code 60 or 65, respectively. If no limit, enter 99. If no provision for disability from "his occupation," enter 00.

Column 65: Indemnity provision

0 = no benefits payable if insured has earnings from a new occupation for which he is reasonably fitted by education, training, and experience.
1 = pro rata for earnings in his new occupation.
2 = pro rata for earnings in his regular occupation.
3 = 1 for 1 offset in earnings.
4 = 2 for 3 offset in earnings.
5 = 1 for 2 offset in earnings.
6 = claimant's option of either his occupation to 65 without reduction, or residual benefit.
7 = other—please define.
9 = no reduction in indemnity payable and no offset by reason of earnings in new occupation.

Note re: Definition of disability. If the determination of this information for each claim poses a major problem, a code appropriate for at least 90 percent of all claims, or 90 percent of all claims in each major category, may be used for all such cases. However, this alternative should not be employed if the actuary responsible for the submission believes it might result in a significant error in termination rates applicable to a particular definition, for which there is a credible volume of experience.

28 66–73 Claim identification number. This number will provide a means of reference to follow up inconsistencies and correct errors.

29 74 Indicate whether policy is standard or substandard

0 = standard
1 = substandard
2 = substandard cases included but not identifiable
3 = no substandard policies issued

30 75–77 Month and day claim was closed. Together with field 2, this will provide the complete date of disability termination, or

31	78–79	Day claim was incurred. Together with fields 20 and 21 this will provide the complete date of incurral. As an alternative, field 31 together with fields 20 and 21 will suffice as a substitute for field 30. Note: The separation of fields 30 and 31 from fields 2 and 20, respectively, results from omitting the information for these fields in the original specifications.

Claims to be excluded: These are all cases where a claim has not been admitted by insurer but include, as outstanding, cases on which one or more payments have been made if policyholder is now contesting termination.

Successive or recurrent periods of disability: The following illustrates the entry for claim duration: Policyholder with three-month elimination period became totally disabled 1/1/74. Disability terminated 1/1/75. The duration of disability would be 9 months (expressed in days, field 24). If disability recurs 5/1/75, original claim is reopened and then terminated 11/1/75, the duration would be 15 months (original 9 plus additional 6). If claim is reopened again on 5/1/76 and remains open on 12/31/76, the elapsed duration of disability (field 24) will be 23 months. If the insurer treated these three disability periods as three different claims, they should be so reported for this study.

Editing the Data: All of the claim records for each contributing company were processed through an edit program that tested the various fields of the record for valid data. A record that contained invalid data was rejected and printed on an error list. The error list was referred to the contributing company for review and correction. Most of the records that originally contained errors have been corrected and passed successfully through this edit program.

Exhibit A-1 shows the format of the output record containing the edited data. Acceptable values for each edited field are indicated. It will be noted that in a few cases the acceptable values were translated into a simple code to facilitate further processing.

Some special routines were used in creating certain of the output fields. A detailed description of these routines is given below.

1. *Elimination Period and Benefit Period*

The appropriate accident or sickness periods were selected depending upon whether the type was coded accident or sickness. If the type was coded "unknown" the sickness periods were used. However, if a further test showed that the duration of disability exceeded the sickness benefit period and also the accident benefit period exceeded the sickness benefit period, then the accident benefit period was used.

EXHIBIT A-1

FORMAT OF EDITED DATA

(Logical Record Length of 51, all fields in Integer form)

Beginning Position	Field Length	Description
1	1	Elimination Period Code 1—0 day 5—60 2—7 day 6—90 3—14 day 7—180 4—30 day 8—360
2	2	Age Group at Disablement 1—20–24 5—40–44 9—60–64 2—25–29 6—45–49 10—65–69 3—30–34 7—50–54 11—70–74 4—35–39 8—55–59 12—75–79
4	1	Occ. Class Code

Occ. Class Code	4 Class Manual	5 Class Manual	Bureau Manual	NY Class Code
0		4A		1
1		3A		1
2	3A		A & B	1
3	2A	2A	C & D	2
4	A	A	D & E	3
5	B	B	F & G	4
6	C	C	H & I	4
9	—Unknown			

5	1	Sex 1—male 2—female
6	3	Benefit period in Months or 965—to age 65 999—Lifetime
9	1	Type 3—accident, 4—sickness, 5—unknown
10	1	Renewal Provision 1—Non Can 2—G.R. 3—Non Ren. for stated reasons only 4—C.R. 5—all other 0,9—Unknown
12	1	Impairment 0—standard, 1—substandard, 3—unknown
13	2	His. Occ. Period in years or 55—to age 55 65—to age 65 99—Lifetime
15	1	Indemnity Provision 0—complete reduction 1—pro rata for new occ. 2—pro rata for regular occ. 5—1 for 2 offset 7—others 9—no reduction
17	1	Experience Year 1—1975, 1976 combined 3—1973 4—1974 5—1975 6—1976 7—1977 8—1978 C—1975, 1976, 1977, 1978 combined

23	6	Termination Date	
29	1	Status on Termination Date	0—open 1—recovery 2—death 3—exhausted 4—death or recovery
30	6	Date of Disability	
36	4	Amount of Monthly Indemnity	
40	3	Company Code	

2. *Termination Coding*

Several companies were able to code the cause of claim terminations as deaths or recoveries. In order to be able to use this information in subsequent processing, a special field was created to indicate the extent of termination coding.

3. *Year Claim Closed*

The original input coding instructions requested that the year closed be given in column 2 of the record and that, for claims open on December 31, this field be left blank. This proved unnecessary since the open claims could be detected by a claim status of 0. Accordingly, the appropriate year code was included in each output record whether the claim was closed or open.

In the original submission, several companies included records for claims closed in both 1975 and 1976 but only for those open on December 31, 1976. In subsequent processing, it would be necessary to treat these claims differently from those of companies that handled each year separately. A special code was used to indicate the claims where the exposure period could extend over the two years.

4. *Days of Disability*

For other than lifetime benefit periods, the duration of disability was tested against the length of the benefit period. The record was rejected if the duration of disability exceeded the benefit period (except for those coded "exhausted" that fell within the permissible range as explained below).

The benefit period in months was converted to days using either a 360-day year or a 365-day year. Some companies appeared to use one measure and some the other, so the appropriate one was selected.

5. *Status of Claim*

Several tests were performed on the relationship between the claim status

code, the benefit period, and the duration of disability. The record was rejected if the claim status showed a death or recovery, but the duration of disability equaled the benefit period. The record also was rejected if the claim was coded a limit claim, but the duration did not equal the benefit period. A small leeway was permitted here, from 29.8 to 30.7 times the number of months in the benefit period. If the duration fell within this range, it was arbitrarily set equal to the days in the benefit period.

6. *Termination Date and Date of Disability*

In order to calculate the exposure period for each claim, it is necessary to know these two dates. Most records did not contain either date, although some did contain one or the other or possibly the month and year incurred. The following routine was used to develop both dates based on the information available:

1. If the claim status indicated an open claim, the termination date was set to 12/31 of the exposure year. The date of disability was calculated as the termination date minus the duration of disability.
2. For closed claims, if the month closed was given, the termination date was established based on the date incurred, if given. If only the month and year incurred were given, the day was arbitrarily made 1. The date of disability was calculated as the date incurred plus the elimination period, and the termination date was calculated as the date of disability plus the duration of disability. The resulting termination date was checked against the year-claim-closed field since these years should be the same. If the termination date exceeded the year closed, the dates were adjusted as follows. The termination date was set to 12/30 of the exposure year, and the date of disability recalculated to equal the termination date minus the duration of disability.
3. When the termination year was prior to the year closed, the following additional procedures were performed. If the day of the month incurred was not given but had been arbitrarily made 1, it was changed to 30 and the comparison made again. This may have advanced the calculated termination year to be equal to the year-claim-closed field. If not, this claim was rejected.
4. If neither the termination date nor the date incurred were given, the termination date was arbitrarily set to 12/30 of the exposure year, and the date of disability calculated as the termination date minus the duration of disability.
5. As a further validation of each company's data, the termination rates for each company were compared to the termination rates for all companies combined. A preliminary table of termination rates was constructed from the data for all companies. This table was used as the basis for expected terminations. Ratios of actual to expected terminations were calculated for every value of the input categories being analyzed. Each contributing company was asked to review the actual to expected ratios based on its data and compare them to the ratios for all companies combined. As a result of this review, several obvious errors and inconsistencies were detected and corrected.

APPENDIX B

DEVELOPMENT OF TERMINATION RATES

Introduction

After termination experience data were solicited, collected, and edited, the data were analyzed, and termination rates were developed. The purpose of this Appendix B is to explain the analysis and development of the smooth weekly, monthly, and annual termination rates.

The following is an outline of the major steps in this process:

I. Summarization of Edited Data into Usable Form
   a. Reformat File
   b. Summarize Reformatted File
II. Analysis of Data
   a. Approach to Problem
   b. Identify Significant Variables
   c. Identify Significant Interactions
   d. Determine the Best Model
   e. Analyze Contingency Table
III. Graduated Termination Rates
IV. Weekly Termination Rates
V. Ultimate Termination Rates

Steps I, II, and III were completed using monthly and annual data with the intention of replacing the first three months with weekly data for the first 13 weeks in Step IV. Step V was done in parallel with the other work and actually was completed first.

Summarization of Edited Data into Usable Form

The overall objective of this summarization was to produce the number of (a) terminations from disability and (b) exposures to termination in contingency table form so that they could be analyzed using Everyman's Contingency Table Analysis (ECTA). An explanation of the ECTA Program is given on page 484. The collection and editing of the data for analysis are described in Appendix A. These edited data with generally one record per claim were reformatted to have one record per exposure month. Then, the data were summarized into a number of different arrays, i.e., contingency tables. The values in the arrays represent either terminations or exposures. The positions of the values in the arrays represent the variables that may

affect the termination from disability. The ECTA program then reads the arrays and analyzes the effects of the variables.

REFORMAT FILE

The *input* data are in the form described in Exhibit A-1 Appendix A. This is the coded output from the editing procedures described in Appendix A. The data represent all the disability claims that terminated during a particular experience year (or observation period) plus all the claims that were still outstanding at the end of the period. There is one record per claim with the following exceptions:

1. If a company contributed data separately for different years of experience and a single claim was observed in two or more of the years, the result would be more than one record for that claim. The exposure months, however, do not overlap.
2. If a claimant has more than one policy with different contributing companies (or with the same contributing company, and the company contributes data separately for different policies), then there would be more than one record for that claimant. In this case, exposure months would overlap.

In addition to the fields in Exhibit A-1, there was a field for Age to Expiration of Coverage. However, there was widespread confusion over its meaning. No attempt was made to correct the data in this field because it was agreed that such an age would have little or no effect on termination rates.

The editing procedures described in Appendix A did not detect all errors in the input. In a few cases, the edit program had assigned incorrect codes. Before creating an output record, the following situations had to be correct:

1. One company contributed data observed in 1975 and 1976 combined only for those claims with dates of disablement in 1975 and data observed in 1976 for all other claims. However, one "Experience Year Code" (1—1975, 1976 combined) was found on all the records for that company.
2. Another company had "His Occ. Period" and "Indemnity Provision" miscoded.
3. Another company had "His Occ. Period" and "Indemnity Provision," and "Renewal Provision" miscoded.
4. The editing program miscoded some termination dates.

One company's data were in error and could not be corrected. Thus, all of that company's data were ignored.

Any record that had a date of termination before or the same day as the date of disability was ignored. In addition, there was only one record with the sex coded as unknown. This record was ignored.

For every input record used, the number of complete months of exposure was calculated, and one output record was written for every month of exposure. The format of the output records is shown in Exhibit B-1.

EXHIBIT B-1

REFORMATTED DATA FOR PRODUCING MONTHLY TERMINATION RATES
(Logical Record Length of 50, all fields in Binary form)

Beginning Position	Field Length	Description
1	2	Elimination Period Code: 1—0 day; 2—7 day; 3—14 day; 4—30 day; 5—60; 6—90; 7—180; 8—360
3	2	Age at Disablement: 1—20–24; 2—25–29; 3—30–34; 4—35–39; 5—40–44; 6—45–49; 7—50–54; 8—55–59; 9—60–64; 10—65–69; 11—70–74; 12—75–79
5	2	Occ. Class Code

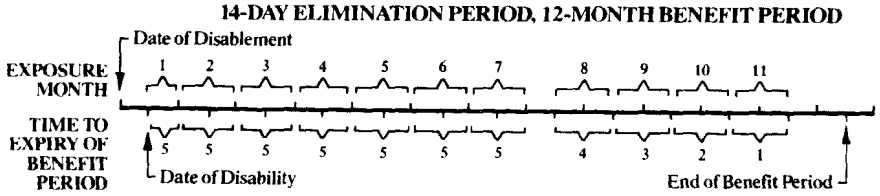
	4 Class Manual	5 Class Manual	Bureau Manual	NY Class Code
1		4A		1
2		3A		1
3	3A		A & B	1
4	2A	2A	C & D	2
5	A	A	D & E	3
6	B	B	F & G	4
7	C	C	H & I	4
9	—Unknown			

7	2	Sex 1—male 2—female
9	2	Benefit Period: 1—1–12 months; 2—13–24 months; 3—25–60 months; 4—to age 65; 5—Lifetime; 6—Other
11	2	Days to Expiration of Benefit Period: 1—30–59 days; 2—60–89; 3—90–119; 4—120–149; 5—150 (157, 164) & greater
13	2	Type 1—accident, 2—sickness, 3—unknown
15	2	Renewal Provision: 1—unknown; 2—Non Can; 3—G.R.; 4—Nonrenewable for stated reasons only; 5—C.R.; 6—All Other
19	2	Impairment 1—standard, 2—substandard, 3—unknown
21	2	His. Occ. Period: 1—0 yrs.; 2—1 yr.; 3—2 yrs. Etc.; 12—to age 55; 14—to age 65; 15—Lifetime
23	2	Indemnity Provision: 1—complete reduction; 2—pro rata for new occ.; 3—pro rata for reg. occ.; 6—1 for 2 offset; 8—others; 9—no reduction

25	2	Experience Year	1—1973 2—1974	3—1975 4—1976	5—1977 6—1978
27	2	Duration from Disablement	1-month 1 (0 day EP) 2-month 1 (7 day EP) 3-month 1 (14 day EP) 5-month 2 6-month 3, etc.		27-month 24 28-year 3 29-year 4 30-year 5, etc.
29	2	Company Code (1 through 21)			
31	2	Monthly Indemnity Amount			
33	2	Termination Indicator		0—exposure month only 1— exposure month and termination from death or recovery during month.	
35	2	Status Code	0—open 1—recovery 2—death	3—exhausted benefit period 4—death or recovery	
37	2	Benefit period in months or 965—to age 65, 999—Lifetime			

There was much concern over the terminations that occurred near the end of the benefit period. Some of the data indicated that there was some sort of "reverse selection period" which began a few months before benefits were scheduled to run out. Therefore, exposure months within 5 months from the end of the benefit period were specifically identified by the field "Time to Expiration of Benefit Period." This field may be considered the compliment of "Exposure Month" which measures from the date of disablement.

A dilemma arose with 7- and 14-day elimination periods. If exposure months were measured from date of disablement, then the months at the end of the benefit period would not be accurate. On the other hand, measuring exposure months from the date of disability was not desirable in the first few months of the benefit period. The solution was a combinatin of the two definitions and can best be understood with an illustration.



If a termination occurred between exposure months 7 and 8 in this illustration, it was ignored and other codes were changed so that it would be treated as "exhausted" without creating any records for months 8, 9, 10, and 11 (the last month of the benefit period was always ignored).

A point was defined for each claim, (and for 7- and 14-day elimination periods, each exposure month), as the date from which the exposure was to be measured.

Exposure months were then measured in two ways:

1. *From the date of disablement.* This was the way almost every exposure month was defined. This way of measuring exposure month is used when either the elimination period was 0, 1, 2, 3, 6, or 12 months or the end of the exposure month is more than 5 months from the end of the benefit period. In this case, DMD is defined to be the "Day of the Month of Disablement."
2. *From the date of disability.* This was used only when both the elimination period was 7 or 14 days, and the end of the exposure month is within 5 months of the end of the benefit period. In this case, DMD is defined to be the "Day of the Month of Disability."

All calculations assume 30 days in every month. The calculations result in a month being included as an exposure month if:

1. the beginning of the month was in the experience period (the month begins on the first day after DMD);
2. the end of the month (occurring on DMD) was within the experience period;
3. the termination date had not occurred before the beginning of the month;
4. the end of the month was not the end of the expiration of the benefit period or later;
5. the end of the month was after the end of the elimination period; and
6. for two companies that contributed data only for experience observed after the first year of disablement, the end of the month was more than 12 months after disablement.

Similarly, the calculation results in a month being included as a termination if it is included as an exposure month, and the termination occurs during that month.

Some *output fields* will be explained here in more detail:

Days to Expiration of Benefit Period. For the values 1, 2, 3, and 4, the value indicates the number of months between the end of the month of disablement (occurring on DMD) and the end of the benefit period. The end of the benefit period was calculated using the "Benefit Period in Months" from the input record and was determined as exactly that number of months after the date of disability. The value of 5 indicates that the end of the month of disablement was 5 or more months before the end of the benefit period. "To Age 65 and Lifetime" benefits were all coded with a 5 in this field. It should be pointed out that if the elimination period was 7 or 14 days, the definition of DMD is different when this value is 5 than when it is 4. Therefore, there may be 7 or 14 days between the end of the month when this value is 5 and the beginning of the month when it is 4. If a termination occurred during the 7 or 14 days that are between months, then the termination was ignored by changing the Status Code to 3 (exhausted), and no exposure record was written for

month 4. Any termination due to recovery or death after the month when this value is 1 was also ignored by changing the Status Code to 3. That is, no records were written for experience within 30 days of the end of the "Benefit Period."

Experience Year. This indicates the year of the day at the beginning of the month of disablement.

Duration from Disablement. During the first month following disablement (month 1), only claims with zero-day elimination periods can be exposed to terminate for a complete month. These exposure months were identified with a 1 in this field. Claims with 7- and 14-day elimination periods can only be exposed to terminate for 23 or 16 days of the first month of disablement. However, these incomplete exposure months were still of some interest, so they were identified with 2 (month 1, 7-day elimination period) and 3 (month 1, 14-day elimination period) in this field. There were no output records with 4 in this field. For the second through the twenty-fourth months, this field contained 3 plus the number of months from the date of disablement to the day (DMD) at the end of the month of exposure, which was almost always an integral number. When it was not an integral number, then any fractional parts of a month were ignored. For any month of exposure greater than twenty-four, this field contained 26 plus the number of years from the date of disablement to the day at the beginning of the month of exposure, where fractional parts of a year were ignored. If a claim was observed throughout its third year of disablement without a termination, then the output file would contain twelve records (one for each exposure month), all of them having a 28 in this field.

Termination Indicator. There was a value of zero in this field unless a termination due to death or recovery occurred during the month of disablement represented by the output record, in which case there was a value of one in this field. Therefore, the number of terminations could be determined by adding the values in this field, and the number of exposure months could be determined by counting the records.

Status Code. All of the output records that were generated from a single claim record (input record) had the same value in this field. The value was the same as that read from the input file or 3 (exhausted), if it had been changed (see the description of *Days to Expiration of Benefit Period*).

The output file contained about 870,000 records. It was split into four separate tape files to make further processing more efficient:

1. Records with duration for months 1, 2, and 3.
2. Records with duration for months 4 through 24.

3. Records with duration for years 3 through 10.
4. Records with duration for years greater than 10.

SUMMARIZE REFORMATTED FILE

The next step in processing data into a contingency table required reading the proper exposure month tape, which was in the form described in Exhibit B-1. Note that again the output file of the prior step becomes the input file for the current step.

A number of different contingency tables were created because different factors needed to be analyzed. Construction of the contingency tables differed by:

1. The selection process
   a. All contingency tables selected only data for ages 20 through 64. Older ages were not used in any analysis.
   b. Most analysis was done for a particular duration, so the records with the proper duration code had to be selected.
   c. When company was a variable of interest in the anlaysis, the proper companies had to be selected.
2. Variables of interest
   a. Initially all possible variables were of interest.
   b. After the initial analysis, only the variables judged to be significant were of interest.
   c. The variables of interest changed from one duration to another.

A contingency table is defined as a set of counts or frequencies obtained by classifying observations in two or more different ways. To illustrate this, a fairly simple contingency table is shown in Table B-1. A brief description of that contingency table is as follows:

1. Dimensions	4
2. Classifications (or variables)	Elimination period, age, type, status
3. Categories (or levels)	0,7,14, and 30 days (for elimination period), 20–39 and 40–64 (for age), accident and sickness (for type), and on (claim not terminated at the end of the month) and off (claim terminated before the end of the month)
4. Counts (or values)	Number of male claims observed during exposure month 2.

The contingency table is then a four dimensional array with 32 cells. The first dimension represents elimination period (which has 4 possible values), the second dimension represents age (with 2 possible values), the third di-

TABLE B-1

ILLUSTRATIVE 4-DIMENSIONAL CONTINGENCY TABLE

ELIMINATION PERIOD						
0-day	7-day	14-day	30-day	AGE	TYPE	STATUS
50	65	55	50	<40	accident	(on)
40	60	50	50	≥40	accident	not terminated
5	50	40	60	<40	sickness	not terminated
3	70	45	75	≥40	sickness	not terminated
40	45	40	30	<40	accident	(off) terminated
30	20	22	15	≥40	accident	(off) terminated
2	20	30	30	<40	sickness	(off) terminated
4	34	25	37	≥40	sickness	(off) terminated

mension represents type (with 2 possible values), and the fourth dimension represents status. The cells represent all possible combinations of the values of the variables ($4 \times 2 \times 2 \times 2 = 32$). The value 50 in the first cell represents the observed number of exposure months for 0-day elimination period, age less than 40, accident claims that did not terminate. The cell containing 22 in Table B-1 shows that there were 22 exposure months observed for a 14-day elimination period, age greater than or equal to 40, accident claims in which terminations occurred. The observed data in our example do not include all the data because our selection process excluded (1) female data, (2) durations other than month 2, (3) ages greater than 64, and (4) data where the type was unknown.

The data in Table B-1 may also be used to calculate crude termination rates. For example, the crude termination rate for 30-day elimination period, age less than 40, accident claims is .375 or $30 \div (50 + 30)$. However, when termination rates were to be calculated, the form of the contingency tables was altered slightly by having the final variable be "exposed versus terminated" instead of "not terminated versus terminated." Contingency tables for the calculation of termination rates do not have the same requirements as those used to analyze the data. The latter requires that the cell counts be mutually exclusive. That is, an exposure month with a termination can only be assigned to one cell when the data are being analyzed. A violation of this approach would result in unreliable conclusions.

The actual creation of the contingency tables was a simple programming task. There were different programs for the different contingency tables. The IF statements determined the selection process, and an array set up in programs was defined by the variables of interest. Each contingency table was written into a disk file where it could be read and analyzed by the ECTA program.

Analysis of Data

The objective of the data analysis was to determine the best form of a table of monthly and annual termination rates. This involved:

1. identification of significant variables,
2. identification of significant interactions among the variables,
3. determination of the best model, and
4. analyzation of the contingency table.

APPROACH TO PROBLEM

The Committee spent a great deal of time experimenting with approaches to the first step, resulting in the selection of Contingency Table analysis. We then spent an even greater amount of time learning to use and modify the tool. The result was an approach which was used with slight variations for each of the next three steps. Consequently, most of the description will be of the approach and its application to identify the significant variables. With this as a foundation, the variations for identifying the most significant interactions and the best model are described.

Our objective was accomplished by analyzing a large number of runs of the ECTA program purchased from the University of Chicago (Department of Statistics) where it was developed under the direction of Professor Leo Goodman. Not every analysis technique incorporated in ECTA was used in this analysis; the ones that were used will be described here. The concept of modeling was used a great deal and also will be described.

The ECTA program reads a contingency table and develops another contingency table (array of numbers) with the same dimensions. The new contingency table contains the expected values of the cell counts under the proposed model. Unlike the original contingency table, the counts in the new table need not be integers. The new contingency table is similar to the original table in other ways, too. The similarities are defined by the model. The model tells which totals and subtotals in the new array must be the same as those in the original array. The totals and subtotals are identified by the number of its dimension. For example, if the original array has four dimensions, a 4 by 2 by 2 by 2 array, then ECTA will produce a new four-dimensional array with the same four dimensions. Since the last dimension has 2 possible values, we can divide all the cells into those that have a fourth-dimension value of "not terminated" or "terminated." Totals for each group of cells can be calculated by adding all the numbers in all the "on" cells and adding all the numbers in the "off" cells. For the array in Table B-1, these two totals are 768 and 424, respectively. To have ECTA produce an array with the same totals for "on" and "off," a model of 4 must be specified, signifying that the totals for all the levels of the fourth

TABLE B-2

TWO SAMPLE MODELS

PART a—MODEL 4

ELIMINATION PERIOD				AGE	TYPE	STATUS
0-day	7-day	14-day	30-day			
48	48	48	48	<40	accident	on (not terminated)
48	48	48	48	≥40		
48	48	48	48	<40	sickness	
48	48	48	48	≥40		
26.5	26.5	26.5	26.5	<40	accident	off (terminated)
26.5	26.5	26.5	26.5	≥40		
26.5	26.5	26.5	26.5	<40	sickness	
26.5	26.5	26.5	26.5	≥40		

PART b—MODEL 2

ELIMINATION PERIOD				AGE	TYPE	STATUS
0-day	7-day	14-day	30-day			
38.25	38.25	38.25	38.25	<40	accident	on (not terminated)
36.25	36.25	36.25	36.25	≥40		
38.25	38.25	38.25	38.25	<40	sickness	
36.25	36.25	36.25	36.25	≥40		
38.25	38.25	38.25	38.25	<40	accident	off (terminated)
36.25	36.25	36.25	36.25	≥40		
38.25	38.25	38.25	38.25	<40	sickness	
36.25	36.25	36.25	36.25	≥40		

dimension must be preserved in the new array. When this is done with the given array, the result is the array in Table B-2 Part a. If the model of 2 had been specified, where we are concerned about preserving the totals for all the levels of the second dimension, then the result would be the array in Table B-2 Part b. In the new array, the totals of 612 for ages less than 40 and 580 for ages greater than 39 are the same as those in the original array.

In our analysis, we were interested in preserving termination rates. In the examples in Table B-2, the first model does not preserve termination rates for any of the individual cells although the overall termination rate of the entire set of data is preserved (424 ÷ 1,192). The second model in Table B-2 does not preserve any termination rates at all; in fact, all the termination rates of the new contingency table in Table B-2 Part b are equal to .5. To preserve the termination rates of the two age groups, we must specify a model of (2, 4). This model will preserve the overall totals of the age groups (612 for young ages and 580 for old ages) and the overall totals of the ons and offs (768 for ons and 424 for offs) and will also preserve all the subtotals involving the age groups and on/off (375 for young ons, 393 for old ons, 237 for young offs, and 187 for old offs). Therefore, the termination rates for young ages (237 ÷ 612) and for old ages (187 ÷ 580) are preserved.

In the same manner, the model (1, 4) will preserve termination rates for each of the four elimination periods (dimension 1), and the model (3, 4) will preserve termination rates for accident and sickness (dimension 3).

All of these models can also be combined in one model (1, 4), (2, 4), (3, 4). In basic terms this model preserves:

1. the overall totals of each elimination period,
2. the overall totals of the ons and offs,
3. the subtotals involving all the combinations of elimination period and on/off,
4. the overall totals of each age group,
5. the subtotals involving all combinations of ages and on/off,
6. the overall totals of accident and sickness, and
7. the subtotals of all combinations of accident/sickness and on/off.

Notice that this model does not preserve the values in each individual cell, only certain totals and subtotals. Likewise, every individual termination rate is not preserved, but the termination rates for each of the four elimination periods, for each age group, and for accident/sickness are preserved. However, termination rates for any combination of elimination period and age (or elimination period and accident/sickness or age and accident/sickness) are not necessarily preserved. An example of this is shown in Table B-3.

The model that preserves the value in each individual cell is called the

TABLE B-3

TWO MODELS FOR ANALYSIS OF MONTHLY TERMINATION RATES

PART a—MODEL: (1,4), (2,4), (3,4), (1,2,3)

ELIMINATION PERIOD						
0-day	7-day	14-day	30-day	AGE	TYPE	STATUS
48.11	71.19	56.40	52.17	<40	accident	on
42.08	56.52	47.32	46.21	≥40		
3.67	44.67	40.89	57.89	<40	sickness	
4.14	72.62	45.38	78.72	≥40		
41.89	38.81	38.60	27.83	<40	accident	off
27.92	23.48	24.68	18.79	≥40		
3.33	25.33	29.11	32.11	<40	sickness	
2.86	31.38	24.62	33.28	≥40		

PART b—MODEL: (1,2,4), (3,4), (1,2,3)

ELIMINATION PERIOD						
0-day	7-day	14-day	30-day	AGE	TYPE	STATUS
51.10	70.71	55.13	52.19	<40	accident	on
39.16	56.93	48.51	46.28	≥40		
3.90	44.29	39.87	57.81	<40	sickness	
3.84	73.07	46.49	78.72	≥40		
38.90	39.29	39.87	27.81	<40	accident	off
30.84	23.07	23.49	18.72	≥40		
3.10	25.71	30.13	32.19	<40	sickness	
3.16	30.93	23.51	33.28	≥40		

saturated model; in this example, it is (1, 2, 3, 4). This preserves every total and subtotal possible including the subtotals involving all combinations of all values of the four variables. For example, the total number of 0-day EP, young age, accident, ons will remain the same. In fact, each cell will remain the same, yielding the identical array as was used for input. This makes the saturated model uninteresting.

One model that is of interest, though, is similar to the saturated model. That is, a model preserving the subtotals of all the combinations of all the values of all except one variable. In this model the status variable is not included. In the example, this model would be (1, 2, 3) and would preserve the total number of 0-day EP, young age, accidents, the total number of 0-day EP, young age, sicknesses, and so on until all combinations of the four elimination periods, two age groups, and two types are exhausted. Since status is the only variable not mentioned in the model, the total number of 0-day EP, young age, accidents is merely the ons plus the offs for that combination of EP, age, and type. Now, the ons plus offs are merely the total exposures, so the model (1, 2, 3) preserves the exposures for each combination of the four elimination periods, two age groups, and two types.

By specifying a model such as (1, 4), (2, 4), (3, 4), (1, 2, 3), we will be assured that the new array is similar to the original array in the following ways:

1. The termination rates for 0-day, 7-day, 14-day, and 30-day elimination periods are the same as in the original array.
2. The termination rates for younger ages and older ages are the same as in the original array.
3. The termination rates for accident and sickness are the same as in the original array.
4. The exposures for each combination of elimination period, age group, and type are the same as in the original array.

By specifying the model (1, 2, 4), (3, 4), (1, 2, 3) we will be assured that the new array will be similar to the original array in the following ways:

1. The termination rates for each combination of the four elimination periods and two age groups will be the same as in the original array.
2. The termination rates for each type (accident and sickness) is the same as in the original array.
3. The exposures for each combination of elimination period, age group, and type are the same as in the original array.

These two models are typical of the ones used in the analysis of monthly termination rates and are shown in Table B-3. The second one differs from the first because it not only preserves the termination rates of the younger ages and older ages but also preserves the termination rates of each elimination period within the younger ages and each elimination period within

the older ages. We refer to this as the interaction of elimination period and age group. Since two variables are involved, it is called a two-way interaction. Terms signifying the other possible two-way interactions in our example are (1, 3, 4) and (2, 3, 4).

Once the ECTA program creates a new array, it also compares it with the original array by calculating a χ^2 value. To calculate a χ^2 value, the arrays are compared cell by cell; an amount equal to:

$$\frac{(a - e)^2}{e} \text{ for Pearson } \chi^2$$

or

$$a \times \ln (a \div e) \text{ for Likelihood Ratio } \chi^2$$

is calculated for each cell, where a is the number in the cell of the original array, e is the number in the same cell of the new array, and ln is the natural log function. The χ^2 value is merely the sum of the amounts for all the cells. In our analysis the Likelihood Ratio χ^2 was used.

A χ^2 value is small if the numbers in the cells of the new array are close to the numbers in the corresponding cells of the original array. Conversely, the χ^2 is large if the numbers of the new array are not close to or different from the corresponding numbers of the original array. Therefore, the χ^2 value can be thought of as a measure of how different the two arrays are, or as a measure of fit between the two arrays. These χ^2 values have a χ^2 distribution, so it can be determined if the two arrays are statistically significantly different with a certain level of confidence. For example, the χ^2 value for the array in Table B-2 Part a (compared to the original array) is 282.68. Based on the χ^2 distribution with 30 degrees of freedom, one can say that the new array is significantly different than the original at the 99 percent confidence level.

Comparing the array in Table B-3 Part a with the original array produces a χ^2 value of 9.36 with 10 degrees of freedom. Basing a conclusion on this result, one cannot say that the two arrays are different at a 95 percent confidence level — not even with 80 percent confidence. Such a result may be sufficient to say that the model produces a satisfactory fit to the raw data. Since the model that produced the array in Table B-3 Part a only preserved the termination rates for the levels of each variable, it was not necessary to preserve interactions among variables to obtain a satisfactory fit.

The desired model in our analysis was "the simplest model with a satisfactory fit." In the array used in our examples, other models may be tested:

Model	χ^2	Degrees of Freedom	Levels of Significance
(4),(1,2,3)	22.98	15	92
(1,4),(1,2,3)	14.27	12	72
(2,4),(1,2,3)	17.51	14	77
(3,4),(1,2,3)	22.35	14	93
(1,4),(2,4),(1,2,3)	9.45	11	43
(1,4),(3,4),(1,2,3)	14.27	11	78
(2,4),(3,4),(1,2,3)	17.23	13	81

"Level of Significance" is defined here to be the largest confidence level for which it can be said that the two arrays are different. That is, if it can be said that the arrays are significantly different at a 92 percent confidence level but not with 93 percent confidence, then the level of significance is 92. If a satisfactory fit were defined by a level of significance of 75 or less, then the model (1,4), (1,2,3) would be the simplest model that produces a satisfactory fit.

This approach is somewhat in contrast to the usual statistical analysis whereby the null hypothesis is attempted to be disproven using large confidence intervals. In this case, we are trying to show similarities between the sets of arrays rather than differences. From a statistical perspective, it is as if we were attempting to not reject the null hypothesis rather than the classical rejection of the null hypothesis as our proof.

An interpretation of our example would be that to satisfactorily predict a termination, one need only know the elimination period. Therefore, only four termination rates need to be derived—one for each elimination period. In this example, further observations could be made:

1. Knowledge of whether it is an accident or sickness case adds very little to predicting the number of terminations.
2. The best fit to the raw data can be achieved if the termination rate of elimination periods and age groups are preserved. (A very close fit may not be desirable because the random errors inherent in the raw data will also be reproduced.)

The actual data in our analysis were considerably more complex than the example we have been using here, so the χ^2 values are not used directly. Instead, the difference between χ^2 values was used. This difference has a χ^2 distribution since likelihood ratio χ^2 values had been used. Having the difference of two χ^2 values equal another χ^2 value is the direct result of using the Likelihood Ratio χ^2.

First, the χ^2 value and degrees of freedom for a basic model were recorded. Then, the model was changed slightly and the resulting χ^2 and degrees of freedom were recorded. Using the difference between the χ^2 values as the χ^2 value for the change and the difference between the degrees

of freedom as the degrees of freedom for the change, it can be determined if the change in the model produced a significantly different array to represent the raw data. A high level of confidence, resulting from a large change in the χ^2 values, would indicate that the change in the model had a large impact on trying to reproduce the original array.

To determine the important variables, a basic model was agreed upon which produced one χ^2 value. Then this model was altered to eliminate one of the variables without changing any other part of the model. The resulting χ^2 value was compared with the value for the basic model to determine if the elimination of that variable made significant difference. If the level of confidence is great, then the variable is important for maintaining a close fit to the original data. In other words, if we wanted to come up with a model that would reflect the termination rates of the experience data, then this variable needed to be included in the model.

IDENTIFY SIGNIFICANT VARIABLES

Determining which variables were the most important became the first priority in the analysis because recognizing all variables would have required an array with 15 dimensions: duration, elimination period, age, class, sex, benefit period, time to expiration of benefit period, type, renewal provision, impairment, his occ., indemnity provision, observation period, company, and status.

If all levels of all variables were used, the contingency table would require 6.4×10^{11} cells. Even if only two levels of all variables were used, there would be 32,768 cells. To reduce the number of variables, data for the second month of disablement were tested to determine the least important variables, which were then eliminated from any further study.

1. Month 2 was chosen because it contains the most exposure months and therefore more cells would contain data in them.
2. Elimination period was variable 1 and had 2 levels: less than 30 days and 30 days.
3. Age was variable 2 and had 2 levels: under 40, and 40 through 64.
4. Class was variable 3 and had 2 levels: white collar (Occ. class = 1, 2, 3, 4—see Exhibit B-1) and blue collar (Occ. class = 5, 6, 7).
5. Sex was variable 4 and had 2 levels: male and female.
6. Benefit period was variable 5 and had 2 levels: 2 years or less and greater than 2 years (to age 65 is assumed to be greater than 2 years).
7. Time to expiration of benefit period was not a variable in this test because virtually all the data are in the category of "more than 5 months to expiry," since the test concerns month 2 data only. This is to say that there was virtually no data with a benefit period less than 7 months.
8. Type was variable 6 and had 2 levels: accident and sickness.
9. Renewal provision was variable 7 and had 2 levels: Noncancelable and others.

10. Impairment was variable 8 and had 2 levels: standard and substandard.
11. His occ. period was variable 9 and had 2 levels: one year and others.
12. Indemnity provision was variable 10 and had 2 levels: some reduction and no reduction.
13. Observation period was variable 11 and had 2 levels: 1975–76 and 1973–74 –77–78.
14. Company was variable 12 and had 5 levels.
15. Status was variable 13 and had two levels—on/off.

The basic model was chosen to preserve the termination rates of all levels of all the variables as well as all 2-way interactions, all 3-way interactions that include sex or company, and all 4-way interactions that include sex and company. This can be written as:

(1, 2, 4, 12, 13)
(1, 3, 4, 12, 13)
(1, 5, 4, 12, 13)
(1, 6, 4, 12, 13)
(1, 7, 4, 12, 13)
(1, 8, 4, 12, 13)
(1, 9, 4, 12, 13)
(1, 10, 4, 12, 13)
(1, 11, 4, 12, 13)
(2, 3, 4, 12, 13)
(2, 5, 4, 12, 13)
(2, 6, 4, 12, 13)
(2, 7, 4, 12, 13)
(2, 8, 4, 12, 13)
(2, 9, 4, 12, 13)
(2, 10, 4, 12, 13)
(2, 11, 4, 12, 13)
(3, 5, 4, 12, 13)
(3, 6, 4, 12, 13)
(3, 7, 4, 12, 13)
(3, 8, 4, 12, 13)
(3, 9, 4, 12, 13)
(3, 10, 4, 12, 13)
(3, 11, 4, 12, 13)
(5, 6, 4, 12, 13)
(5, 7, 4, 12, 13)
(5, 8, 4, 12, 13)
(5, 9, 4, 12, 13)
(5, 10, 4, 12, 13)

(5, 11, 4, 12, 13)
(6, 7, 4, 12, 13)
(6, 8, 4, 12, 13)
(6, 9, 4, 12, 13)
(6, 10, 4, 12, 13)
(6, 11, 4, 12, 13)
(7, 8, 4, 12, 13)
(7, 9, 4, 12, 13)
(7, 10, 4, 12, 13)
(7, 11, 4, 12, 13)
(8, 9, 4, 12, 13)
(8, 10, 4, 12, 13)
(8, 11, 4, 12, 13)
(9, 10, 4, 12, 13)
(9, 11, 4, 12, 13)
(10, 11, 4, 12, 13)
(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12)

This was chosen as the basic model because it was decided that 3-way interactions would be too complex except that, within each company, termination rates may differ completely between male rates and female rates. This model produced $\chi^2 = 782$, with 9,905 degrees of freedom.

The model was then changed to ignore elimination period (variable 1). This was done by removing 1 from all the terms of the model except the final term, which insured that the total exposures were preserved for each cell. The χ^2 value for this model is 1,020 with 9,960 degrees of freedom. The difference between the two models has a χ^2 value of 238 with 55 degrees of freedom. This means that by ignoring elimination period, we have produced an array that is statistically different, beyond the 99 percent level of confidence, from the basic array. Therefore, the inclusion of elimination period as a variable is necessary if we wish to produce an array that fits the basic model closely. In other words, elimination period is a statistically significant variable. The effects of ignoring the other variables are shown in Exhibit B-2.

When indemnity provision was ignored by eliminating 10 from all the terms of the basic model except the last term, the χ^2 value changed to 798 with 9,960 degrees of freedom. The difference of 16 in the χ^2 value with 55 degrees of freedom translates into no change in the array because of the elimination of indemnity provision (0 percent confidence that the two arrays are different). Therefore, indemnity provision can be eliminated as a variable without affecting fit. In other words, it was not found to be a statistically significant variable.

EXHIBIT B-2

MONTH 2
EFFECTS OF VARIABLE ELIMINATION IN CONTINGENCY TABLE ANALYSIS

VARIABLE MISSING	CHI-SQUARED VALUE	DEGREES OF FREEDOM	LEVEL OF SIGNIFICANCE
Basic Model	782	9,905	—
Elimination Period	1,020	9,960	100
Age	990	9,960	100
Class	846	9,960	81
Sex	871	9,960	100
Benefit Period	877	9,960	100
Accident/Sickness	891	9,960	100
Renewal Provision	812	9,960	0
Impairment	835	9,960	44
His Occ.	802	9,960	0
Indemnity Provision	798	9,960	0
Observation Year	810	9,960	0
Company	1,316	10,173	100

Because of this analysis of month 2 data, five variables were eliminated because they were statistically unimportant: renewal provision, impairment, his occ., indemnity provision, and observation period.

Twelve new arrays were produced for analysis of the remaining variables.

1. The first six arrays contained data for the first six months of disablement.
2. The last six arrays contained data for the last six quarters of the first two years of disablement. That is, the seventh array contained data for months 7, 8, and 9; the eighth array contained data for months 10, 11, and 12; and so on until the last array for months 22, 23, and 24.

The following variables were included in the arrays:

1. Elimination period was in the first seven arrays and had 3 levels in the first array (0, 7, and 14 days); 4 levels in the next two arrays (0, 7, 14, and 30 days); 5 levels in the next three arrays (0, 7, 14, 30, and 90 days); and 2 levels in the seventh array (0, 7, 14, 30, and 90 days combined and 180 days).
2. Age was a variable with 5 levels in all twelve arrays. The levels were 20–29, 30–39, 40–49, 50–59, and 60–64.
3. Class was a variable with 4 levels in all arrays. The levels were the 4 classes defined, in the New York Study.
4. Sex was a variable with 2 levels in all arrays. The levels were male and female.
5. Benefit period was in the first six arrays and had 6 levels (1–12 months, 13–24 months, 25–60 months, to age 65, lifetime, and other).
6. Time to expiration of benefit period was a variable in the last 5 arrays. It had 2 levels (within 5 months from the end of the benefit period and more than 5 months).
7. Type was a variable with 2 levels in all arrays. The levels were accident and sickness.
8. Duration was a variable in the last 6 arrays. The 3 levels were the first, second, and third months of the quarter.
9. Company was a variable in all arrays. In the first eight arrays there were 5 companies, and in the last four arrays there were 6.

The basic model used was essentially the same as that used for the month 2 data, namely, the model that preserves the termination rates of all levels of all variables as well as all 2-way interactions, all 3-way interactions that include sex or company, and all 4-way interactions that include sex and company.

The tedious process of eliminating each variable from the basic model and calculating the level of significance was done for each array to determine the important variables at each duration.

IDENTIFY SIGNIFICANT INTERACTIONS

To determine the important interactions, the basic model was also changed to exclude interactions. One-by-one every interaction (that did not involve company) was eliminated while being careful to still keep other interactions in the model. For example, to determine the importance of the age-sex interaction, the terms involving this interaction had to be changed so that the model no longer preserved the male termination rates by age and female termination rates by age while not changing the interactions of age with other variables or sex with other variables.

DETERMINE THE BEST MODEL

Once we had the levels of significance for each variable and interaction, the simplest model with a satisfactory fit needed to be determined. This required model was produced by simplifying the basic model through the elimination of unimportant variables and interactions. The rules for determining which variables and interactions should be eliminated were:

1. It does not have a high level of significance, and it also has no hope of being significant in later durations, or
2. there is no logic to support its inclusion.

(Other considerations were also made, such as reducing the number of variables to a manageable number and the reasonableness of the factors that would be produced, and so on.)

Exhibit B-3 shows the levels of significance of the variables and interactions tested in the twelve arrays. The rules for eliminating variables and interactions left room for judgment concerning what a high level of confi-

EXHIBIT B-3

LEVEL OF CONFIDENCE OF VARIABLES AND INTERACTIONS

Month	1	2	3	4	5	6	7,8,9	10,11,12	13,14,15	16,17,18	19,20,21	22,23,24
EP	100	100	80	0	0	0	0					
AGE	100	100	100	100	14	63	91	22	0	0	0	0
CLASS	83	45	40	1	0	0	0	0	0	0	0	0
SEX	1	0	0	0	0	0	0	9	0	0	0	0
BP	0	16	0	0	0	0						
EXP	0							0	0	0	0	30
A/S	100	100	98	24	0	0	100	66	55	0	0	0
DUR							55	1	0	0	0	0
CO	100	100	1	0	0	0	0	2	0	0	0	0
EP-AGE	99	55	100	83	74	61	53					
EP-CLASS	85	97	92	100	52	62	54					
EP-SEX	95	39	83	95	70	80	56					
EP-A/S	19	54	98	53	13	17	0					
AGE-CLASS	99	91	98	92	66	59	66	48	98	45	35	89
AGE-SEX	100	65	75	4	53	95	83	89	90	78	69	24
AGE-EXP								47	2	0	24	87
AGE-A/S	100	100	100	100	65	99	100	40	96	100	53	30
CLASS-SEX	24	86	94	46	67	24	39	18	15	27	40	27
CLASS-EXP								18	0	15	47	15
CLASS-A/S	31	31	46	31	67	67	83	86	88	94	27	100
SEX-EXP								29	31	0	3	100
SEX-A/S	95	84	100	43	84	16	89	16	88	98	31	31
EXP-A/S								84	19	66	31	66
SEX-EP-AGE	2	9	41	22	0	3	53					
SEX-EP-CLASS	6	0	44	4	0	11	8					
SEX-EP-A/S	12	13	31	83	17	2	29					
SEX-AGE-CLASS	0	6	4	21	1	1	16	2	0	0	0	0
SEX-AGE-EXP								40	0	0	53	1
SEX-AGE-A/S	87	13	6	59	4	6	28	59	41	0	0	2
SEX-CLASS-EXP								3	0	3	0	0
SEX-CLASS-A/S	24	13	5	18	31	3	54	13	5	1	11	0
SEX-EXP-A/S								56	3	19	3	56

dence was. The variables and interactions that remained in the simplified model are enclosed in boxes in Exhibit B-3. Some comments on the selection of this model are:

1. Elimination period was included as a variable in months 4, 5, and 6 so that the difference between 90 days and less than 90 days could be quantified.
2. Age and sex were included as variables for all durations because of their significance in later durations.
3. His Occ. period also had some hope of being significant at the end of one year or two years of disability. However, further tests were conducted, but no evidence of significance was found.
4. Benefit period was not found to be significant, and no logic was found to support its inclusion.
5. Time to expiration of benefit period was not found to be significant although the two levels showed very different termination rates. To avoid distortion, only data more than 5 months from the end of the benefit period were included.
6. Company was included in the steps to identify significant interactions to avoid distortions. Once these determinations were made, extensive studies of all the companies demonstrate that little distortion of the termination rates result from combining the data of all companies.
7. No 3-way interactions were significant enough to be included in the model.

The model can be stated as follows:

I. In months 1, 2, and 3 the terms of the model are:
   A. (elimination period, age, status)
   B. (age, class, status)
   C. (age, sex, status)
   D. (age, type, status)
   E. (elimination period, age, class, sex, type)

II. In months 4, 5, and 6 the terms are:
   A. (eliminatin period, status)
   B. (age, type, status)
   C. (sex, status)
   D. (elimination period, age, sex, type)

III. In months 7 through 12 the terms are:
   A. (age, type, status)
   B. (sex, status)
   C. (age, sex, type)

IV. In months 13 through 24 the terms are:
   A. (age, status)
   B. (sex, status)
   C. (age, sex)

The determination of this model marks the completion of the analysis of the variables. Some analysis included studying some factors produced by

different models but the ultimate determination of the factors is a completely different step in the process of developing an experience table.

ANALYZE CONTINGENCY TABLE

By this time, you should have some feel for what contingency table analysis is and its potential to the actuary. At this point, we will (1) give a description of both the analysis and the modifications made to it so that the remainder of this section will be clearer and (2) give a source for further reference.

Brief Description of Application—You already have noted that a contingency table is a multidimensional array of mutually exclusive counts or frequencies. If one of those dimensions has only two values depicting change of status, we can model the odds of change of status. Specifically, we have shown how the probability of terminating claims status can be computed by dividing a cell for off claims by the sum of that cell and the corresponding cell for on claims. The odds for terminating claims status is a simpler calculation; namely, the quotient of an "off" cell and its corresponding "on" cell.

Thus, once we have a model that produces acceptable cell counts, we can divide the mathematical expression for that model for the "off" cells by the mathematical expression for the "on" cells, simplify the algebra, and have a mathematical model for an array with one less dimension which contains the odds of terminating claims for each combination of variable values. Since we are not interested in the cell counts per se, but only interested in being able to produce a reasonable fit, this model is more interesting. The only drawback is that it is in terms of odds, and we are used to dealing in probabilities.

Our approach was to use the contingency tables with mutually exclusive counts to perform all of the analysis. This maintains the validity of the statistical tests used to decide upon the best model. Once the model was chosen, we reran ECTA with exposures instead of "ons,"and the resulting model produced probabilities that are exactly equivalent to the odds already produced.

We made one other change in the form of the model. The model used by ECTA is called a log-linear model. The name comes from the fact that the model works with the logarithm of the values, rather than the values themselves, and limits itself to linear relationships. The resulting model is translated back to antilog values for output. This results in the model being a multiplicative model.

Specifically, the model for the "odds" (or "probabilities") is an overall average "odds" (or "probabilities") and a set of factors for each variable

and interaction defined in the model. The set of factors for each variable is a vector whose length is equal to the number of values that that variable assumes in the model. The set of factors for each interaction defined in the model is an array whose rank is equal to the number of variables in the interaction and whose shape is defined by the number of values each such variable assumes in the model.

As an illustration, consider the variables sex, cause, and occupational class. The factors for each of these variables would be a vector length 2 representing male and female, a vector length 2 for accident and sickness, and a vector length 4 for the four occupational classes. If the model had an interaction between cause and occupational class, it would be a 2 by 4 matrix with a row for each cause and a column for each class. If the model had a three-way interaction among these three variables, the set of factors would be a 2 by 2 by 4 array with a plane for each sex, a row for each cause, and a column for each occupational class.

The mathematical form of the model is that the "odds" (or "probability") for each cell is equal to the product of the overall average "odds" (or "probability") and the factor from each set of factors corresponding to the value of each variable that identifies the cell. As an aside, we found this form to be simple conceptually and, thus, appealing—if the data could be represented without involving high-level interactions. This was the case for termination rates. Incidence rates, however, required so many high-level interactions that use of the method was limited to establishing the statistical significance of the variables.

The form of the model did have one aspect with which we were uncomfortable. Because the model dealt with logarithms, rather than values, the overall average was a geometric mean. Similarly, if you multiplied each factor along any dimension in a set of factors, the product was one. We modified the ECTA result so that the overall average is an arithmetic mean and the mean of each set of factors is equal to 1. This modified model produces exactly the same results, and it is easier to interpret the model's parameters. The overall average rate is a simple average of all the rates defined by the model.

For a better understanding of how the model reproduces the crude data, consider the following:

1. Think of the original contingency table as two arrays, one of "offs" and one of "ons."
2. Replace the "ons" with exposures.
3. Expand any model into its full array of probabilities. It will be the same size and shape as either the "ons" or "offs."
4. The element by element multiplication of points 2 and 3 yields an array of expected "offs" based upon the model.

5. Summarize the array of actual "offs" and the array of expected "offs" as many times as you have sets of factors in the model with the summarizations conforming to the shape of each set of factors.
6. Divide, element by element, each summarization of actual "offs" by the corresponding summarization of expected "offs." Each quotient will be equal to one.

To the extent that the model is reasonably simple, it does produce some smoothing. However, the precise fit, particularly, when it applies to relatively sparse areas of the contingency table, does retain some of the anomalies usually found in crude data. Hence, we still have a need for graduation, which is considered in the next step.

Source for Additional Information—Contingency Table Analysis is a relatively new field developed by statisticians. Our Committee learned of this area through its request for technical assistance from Mr. Tappin Roy, then of the Travelers Research Corporation. Mr. Roy recommended the technique as most appropriate for our problem and with assistance from a Committee member, Mr. William Daniels, produced an APL program implementing the tool. The limited APL workspace size limited our application of the tool. A statistical expert, Mr. Edward Seligman, was added to the Committee, and he guided us in the learning process of adapting the tool to our problem. In addition, Mr. Seligman presented a paper at the Fourteenth Actuarial Research Conference at the University of Iowa in 1979 entitled "Applications of Multi-Dimensional Contingency Tables to the Analysis of Termination Counts in Disability Income Claim Data." A more extensive unpublished paper, together with a bibliography may be obtained by contacting Mr. Seligman. Mr. Frank Knorr, who actually applied the technique to our problem, has also presented a paper to the American Statistical Association which is published in the *ASA 1983 Proceedings of the Social Statistics Section*, August 15–18, 1983, Toronto.

Graduated Termination Rates

The goal of this step was to build an experience table of termination rates for all durations (month 1 to the final age of the table). The termination rates were to be smooth and vary according to the variables and interactions defined by the model.

A modification of the ECTA program was used to produce a termination rate and modification factors for each of the twelve arrays, representing the first six months and the last six quarters of the first two years of disablement. The ultimate table, developed by Mr. John H. Miller was used for termination rates after 10 years of disablement. The latest Group LTD experience was used to get smooth rates between the first and eleventh years. The technique that was used to smooth the termination rates in the 10-year select

EXHIBIT B-4

EXAMPLE OF OUTPUT FROM ECTA PROGRAM FOR UNGRADUATED DATA FOR THIRD QUARTER

Estimated lambda effects, their standard errors, and the standardized values are followed by the corresponding Tau Parameter of the multiplicative model.

Variables where each level of the effect is the difference between that level of the variable, and the average effect: 1—age

Variables of only two levels where the single effect shown is the difference of the first level, and the average effect: 2—sex, 3—type, 4—exposure/"off."

	Effect	Standard Error	Standardized Value	Tau Parm	
Grand Mean Effect	5.78603			325.71802	
Effect for Variables				Overall Rate	
4 1,4	1.06619	0.01740	61.29123	0.11855	
For Levels of Var 1 (by age group)				Age Factors (For age only)	
20s	−0.14010	0.03232	−4.33482	1.32340	
30s	−0.08111	0.02665	−3.04393	1.17612	
40s	−0.01008	0.02696	−0.37400	1.02037	
50s	0.08002	0.02668	2.99884	0.85210	
60s	0.15127	0.05347	2.82925	0.73893	
				Sex Factors	
				Male	Female
2,4	0.01720	0.01740	0.98862	0.96619	1.03499
			Average Factor = 1.00059 Adjusted Factors = 0.966 − Male = 1.034 − Female Adjusted Rate = 0.11862		
				Type Factors (for type only)	
				Accident	Sickness
3,4	−0.06524	0.01740	−3.75050	1.13938	0.87767
1,3,4 For Levels of Var 1 (by age group)				Age/Type Factors (For Interactions)	
				Accident	Sickness
20s	0.03848	0.03232	1.19049	0.92593	1.07999
30s	0.06462	0.02665	2.42498	0.87877	1.13796
40s	0.00160	0.02696	0.05953	0.99680	1.00321
50s	−0.03914	0.02668	−1.46683	1.08143	0.92470
60s	−0.06556	0.05347	−1.22614	1.14010	0.87711

Age Group	Age Only × Type Only × Age/Type Interaction			
			Adjusted Factors	
	Accident	Sickness	Accident	Sickness
20s	1.39617	1.254	1.352	1.214
30s	1.178	1.175	1.140	1.137
40s	1.159	0.89842	1.122	0.870
50s	1.050	0.69155	1.016	0.669
60s	0.960	0.569	0.929	0.551
			Average Factor = 1.033 Adjusted Rate = 0.123	

period was the Whittaker-Henderson Type B Multidimensional Graduation Method. Although some smoothing was achieved through grouping and use of the ECTA program to produce termination rates and factors, the ultimate termination rates did not need to be smoothed because they had been defined by a formula.

In the analysis of the termination experience in the first 2 years of disablement, twelve arrays were used to represent the termination experience in the first six months and the last six quarters of the 2 years. Twelve new arrays needed to be produced to derive the termination rates and factors for the same twelve periods. The new arrays differ from the other arrays in three ways:

1. Only the variables defined in the model for that period were used.
2. The "on" cells of the variable status were changed to include "ons" plus "offs." This changed the variable from "on/off" to "exposures/off."
3. To eliminate cells with zeros, the value of .01 was added to each "off" cell and another value added to each "exposure" cell so that the ratio of .01 to that value was approximately the same as the ratio of the total number of "offs" to the total number of exposures. This assigned a termination rate, which was equal to the overall termination rate, to any cell that has no exposures.

Once the twelve new arrays were set up, the ECTA program was used again. This time the part designed for log-linear analysis was used. There were 2 slight changes made to the ECTA program that simplified the output (an annotated copy of which is included as Exhibit B-4) for our application. These were:

1. The printing of the log-linear data was suppressed unless it involved the variable exposure/off.
2. The formula for the Tau Parameter was changed from e^{u} to e^{-2u}. This value and its reciprocal were printed under the heading of Tau Parm.

We also converted the geometric output of ECTA to the more easily understood arithmetic output described earlier. Both sets of factors for the average monthly termination rate in the third quarter (applicable to the eighth month of disablement) are as follows:

	Arithmetic		Geometric	
Rate		0.123	Rate	0.119
Male		0.966	Male	0.966
Female		1.034	Female	1.035
Age	Accident	Sickness	Accident	Sickness
20–29	1.352	1.214	1.396	1.254
30–39	1.140	1.137	1.178	1.175
40–49	1.122	0.870	1.159	0.898
50–59	1.016	0.669	1.050	0.692
60–64	0.929	0.551	0.960	0.569

The routine, which makes this conversion, takes each set of geometric factors and performs these 3 steps:

1. determines the average of the set of geometric factors,
2. divides every geometric factor of the set by the average from step 1 to produce the corresponding arithmetic set, and
3. multiplies the overall rate by the average from step 1 to produce a partial conversion to an arithmetic mean.

This will not affect the specific termination rates at all.

To smooth the termination rates, every specific termination rate was calculated. For month 2 there were 320 specific rates that depend on age, sex, elimination period, class, and type. These form a five-dimensional array of termination rates. Similar arrays were formed for the other durations in the first two years of disablement.

Then all arrays were combined into one six-dimensional array of termination rates. Similarly a six-dimensional array of weights were formed from the exposures of the corresponding termination rates. The six dimensions are:

1. Elimination period—5 levels: 0, 7, 14, 30, and 90 days. In month 1, the only elimination periods with any exposures were 0, 7, and 14 days; the termination rates for 7 and 14 days did not represent a full month termination rate, so they were adjusted by dividing them by .75 and .5, respectively, for graduation purposes. The exposures were not adjusted in month 1; they were merely the denominator of the termination rate calculation and not complete exposure months for 7 and 14 days. In months 2 and 3, the only elimination periods with any exposures were 0, 7, 14, and 30 days. In months 4, 5, and 6, all elimination periods had exposures; however, 0, 7, 14, and 30 days all had the same termination rates. Durations greater than 6 months had the same set of termination rates for all elimination periods.
2. Age at disablement—5 levels: 20–29, 30–39, 40–49, 50–59, 60–64.
3. Class—4 levels: The four New York Study classifications. Durations greater than three months had the same termination rates for all classes.
4. Sex—2 levels: male and female.
5. Type—2 levels: accident and sickness. Durations greater than 12 months had the same termination rates for both types.
6. Duration of disablement—24 levels: one for each month in the first 2 years of disablement. For durations greater than 6 months, termination rates had only been calculated for the third, fourth, fifth, sixth, seventh, and eighth quarters. They were used to represent the termination rates of months 8, 11, 14, 17, 20, and 23, respectively. The weights for these months were set equal to one-third of the exposure months of the entire quarter, while the weights for months 7, 9, 10, 12, 13, 15, 16, 18, 19, 21, 22, and 24 were set equal to zero.

Using the Whittaker-Henderson Type B graduation method, smooth termination rates were created for all months, including those months that had

weights of zero. The graduation was done in four different parts:

1. Months 1 through 6—graduations of three dimensions at the same time: age (minimizing fourth differences), duration (minimizing fourth differences) and class (minimizing second differences). This was done for each elimination period, sex, and type. These had the effect of forcing the class factors to converge as duration increases and within each duration, the class factors would be near the least-squares straight line.
2. Months 1 through 24—graduations of two dimensions at the same time: age (minimizing fourth differences) and duration (minimizing fourth differences). This was done for each elimination period, class, sex, and type. The termination rates that were graduated in this part were made up of graduated rates from the first part and the ungraduated termination rates for each quarter after month 6. Interpolated and extrapolated termination rates were created where the weights were equal to zero.
3. Years 3 through 10—graduation of two dimensions at the same time: age and duration for male and female separately. The values that were graduated were the logarithms of the coefficients of selection. Using large smoothness factors insured that the coefficients of selection could be written as an exponentially decreasing function of age and duration. Coefficients of selection are defined as the ratio of the select termination rate to the ultimate termination for the same attained age. Large coefficients of selection represent large differences from the ultimate rates which occur in the early part of the select period. The ungraduated coefficients of selection were the ratio of the latest Group LTD termination rates (for years 1974-78)[2] to the ultimate termination rates developed by Mr. John H. Miller. For year 11 these were fixed at 1, and for year 2 these were based on the graduated rates from the second part of this graduation.
4. Months 13 through 24—graduation of two dimensions at the same time: age (minimizing fourth differences) and duration (minimizing third differences). This was done for male and female separately. These used termination rates from the third and fourth quarters as well as from the third year of disablement. This was done to produce termination rates that graded smoothly from the first year to the third year.

Once the four parts of the graduation were completed, the graduated termination rates were multiplied by the actual exposures for each cell of the six-dimensional array (For month 1, elimination periods 7 and 14 days, the termination rates were first adjusted by multiplying them by .75 and .5, respectively). The new set of terminations and exposures were summarized the same as before so that it could be used as input for the ECTA program to produce new termination rates and factors for the first six months and the last six quarters of the first two years of disablement. Termination rates and factors were also produced by the ECTA program for years 3 through 10.

The duration rates and factors for the graduated termination rates are shown in Exhibits B-5a to B-5c. They represent the results of the gathering, analyzing, and processing of the termination rate data. The quarterly termination rates shown in this exhibit are actually monthly rates to be used

[2] *Transactions of the Society of Actuaries, 1980 Reports*, page 163.

EXHIBIT B-5a

FACTORS FOR CALCULATION OF MONTHLY TERMINATION RATES
BASED ON GRADUATED DATA
(average = 1)

First Quarter:	MONTH 1				MONTH 2				MONTH 3			
Duration Rate:	.345				.387				.333			
Age: 20–29	1.148				1.101				1.089			
EP: 0,7,14,30	1.396	1.017	.609		1.047	1.071	.989	.893	1.004	1.065	1.008	.919
Class: 1,2,3,4	.983	.990	1.003	1.012	.983	.998	1.010	1.003	.983	.992	1.010	1.012
Sex: M,F	1.079	.922			1.056	.946			1.041	.960		
Cause: A,S	.893	1.111			.901	1.100			.918	1.081		
Age: 30–39	.988				1.031				1.070			
EP: 0,7,14,30	1.390	1.015	.613		1.109	1.047	.969	.879	1.114	1.034	.973	.885
Class: 1,2,3,4	1.090	1.003	.970	.932	1.030	1.012	.989	.964	1.007	1.009	.999	.982
Sex: M,F	1.127	.883			1.042	.959			1.009	.991		
Cause: A,S	.931	1.066			.936	1.060			.948	1.046		
Age: 40–49	.982				1.002				1.025			
EP: 0,7,14,30	1.379	1.004	.625		1.124	1.022	.970	.889	1.141	1.011	.965	.889
Class: 1,2,3,4	1.107	1.017	.958	.916	1.053	1.019	.977	.949	1.038	1.007	.991	.962
Sex: M,F	1.064	.935			1.019	.980			.997	1.002		
Cause: A,S	1.002	.990			.995	.997			1.007	.985		
Age: 50–59	.978				.965				.942			
EP: 0,7,14,30	1.342	1.000	.645		1.085	1.008	.982	.922	1.070	1.011	.986	.930
Class: 1,2,3,4	1.106	1.025	.968	.900	1.068	1.022	.976	.934	1.051	1.016	.984	.950
Sex: M,F	.994	1.001			.998	1.001			.998	1.002		
Cause: A,S	1.068	.929			1.066	.930			1.079	.919		
Age: 60–64	.904				.900				.875			
EP: 0,7,14,30	1.273	1.031	.659		1.068	1.008	.975	.944	1.068	1.001	.974	.952
Class: 1,2,3,4	1.190	1.054	.940	.837	1.125	1.051	.962	.875	1.087	1.041	.974	.905
Sex: M,F	.980	1.015			1.004	.995			.999	1.001		
Cause: A,S	1.141	.869			1.158	.856			1.166	.851		

Second Quarter:	Month 4		Month 5		Month 6	
Duration Rate:	.236		.208		.182	
EP:						
<90	1.172		1.109		1.051	
90	.828		.891		.949	
Sex:						
Male	.989		.981		.975	
Female	1.011		1.019		1.025	
Age:						
20–29 A,S	1.082	1.186	1.103	1.182	1.149	1.173
30–39 A,S	1.039	1.103	1.065	1.123	1.089	1.134
40–49 A,S	1.012	.989	1.045	.993	1.061	.989
50–59 A,S	1.017	.857	.980	.837	.970	.809
60–64 A,S	.981	.732	.971	.701	.963	.663

EXHIBIT B-5b

FACTORS FOR CALCULATION OF QUARTERLY TERMINATION RATES
BASED ON GRADUATED DATA
(average = 1)

Quarter:	Third	Fourth	Fifth	Sixth	Seventh	Eighth
Duration Rate:	.124	.066	.048	.032	.021	.016
Sex:						
Male	.943	.931	.975	.984	.997	1.009
Female	1.057	1.069	1.025	1.016	1.003	.991
Age:						
20–29 A,S	1.259 1.262	1.534 1.344	1.625	1.825	2.042	2.098
30–39 A,S	1.127 1.240	1.247 1.248	1.292	1.303	1.289	1.217
40–49 A,S	1.019 1.048	1.054 .966	.937	.835	.720	.679
50–59 A,S	.869 .820	.831 .676	.629	.542	.463	.487
60–64 A,S	.706 .651	.602 .499	.517	.496	.486	.519

EXHIBIT B-5c

FACTORS FOR DETERMINATION OF ANNUAL TERMINATION RATES
BASED ON GRADUATED DATA
(average = 1)

Year:	3	4	5	6	7	8	9	10
Duration Rate:	.123	.084	.062	.050	.045	.042	.042	.043
Sex:								
Male	1.080	1.129	1.179	1.200	1.212	1.210	1.204	1.200
Female	.920	.871	.821	.800	.788	.790	.796	.800
Age:								
20–29	2.085	1.832	1.554	1.262	.994	.776	.617	.524
30–39	1.164	1.103	1.017	.909	.792	.696	.631	.582
40–49	.727	.757	.767	.754	.741	.737	.739	.751
50–59	.536	.616	.697	.832	.984	1.103	1.182	1.226
60–64	.489	.691	.965	1.244	1.489	1.688	1.830	1.918

for each month of the quarter. These were subsequently changed to produce a different rate for each month of the quarter.

One last note should be pointed out. Although time to expiration of benefit period was not determined to be an important variable, the factors produced by data within 5 months from the end of the benefit period were dramatically different. Therefore, the data used in the graduation process represented only data (exposures and terminations) that were not near the end of the benefit period, that is, more than 5 months from the end. The actual termination rates for claims exposed near the end of the benefit period have been measured to be 16 percent and 236 percent greater than the termination in Exhibits B-5b for the fourth and eighth quarters, respectively.

Weekly Termination Rates

In order to study weekly termination rates in the first three months of disablement, the data had to be changed to a more manageable form. It was to be in a form that was flexible enough so that it would allow the easy study of weekly as well as daily or monthly termination rates. The form of the data is very similar to that used in the analysis of monthly termination rates in the first two years of disablement.

The input data for this reformatting were the same as the input data used for the summarization of data to produce monthly termination rates. The format of the records of the input file can be found in Exhibit A-1. The file contains one record per disability claim, except when the claim was observed in more than one experience period or if data were submitted separately for different policies owned by the same claimant.

The selection process required calculating the duration in days from the date of disablement to the first day of exposure for each input record. The first day of exposure is the later of the first day after the elimination period expires or January 1 of the first experience year for that record. Each month is assumed to have 30 days. If the duration is greater than 90 days, the input record is not used. This eliminates all records with elimination periods greater than or equal to 90 days. Since most of the data are for experience years 1975 and 1976, most of the selected records have dates of disablement in 1975 and 1976.

The same corrections to certain fields were made to this data as were made to the data used for monthly termination rates.

There was one output record for each input record selected. The format is shown in Exhibit B-6. This format is similar to the file used in the analysis of the termination rates of the first two years (Exhibit B-1). However, instead of having a duration field, this output required two duration fields: (a) the duration from date of disablement to the first day of exposure to termination (which was used in the selection process) and (b) the duration to the last day of exposure. The duration b is measured as the number of days from the date of disablement to the earlier of the termination date or the date 90 days after disablement or the date at the end of the experience period. If the termination date was more than 90 days after disablement, then the status code was made equal to 3 (exhausted). Also if the status code is 1, 2, or 4, then a 1 appears as the termination indicator signifying that the disability terminated at duration b because of death or recovery. The output file containing almost 150,000 records was used to generate terminations and exposures for weekly termination rates.

Exposures were calculated differently than for monthly termination rates.

EXHIBIT B-6

REFORMATTED DATA FOR PRODUCING WEEKLY TERMINATION RATES
(Logical Record Length of 50, all fields in Binary form)

Beginning Position	Field Length	Description
1	2	Elimination Period Code 1—0 day, 2—7 day, 3—14 day, 4—30 day, 5—60 day
3	2	Age Group at Disablement 1—20–24, 2—25–29, 3—30–34, 4—35–39, 5—40–44, 6—45–49, 7—50–54, 8—55–59, 9—60–64, 10—65–69, 11—70–74, 12—75–79
5	2	Occ. Class Code

Occ. Class Code	4 Class Manual	5 Class Manual	Bureau Manual	NY Class Code
1		4A		1
2		3A		1
3	3A		A & B	1
4	2A	2A	C & D	2
5	A	A	D & E	3
6	B	B	F & G	4
7	C	C	H & I	4
9 —Unknown				

7	2	Sex 1—male 2—female
9	2	Benefit Period 1—1–12 months 2—13–24 months 3—25–60 months 4—to age 65 5—Lifetime 6—Other
13	2	Type 1—accident, 2—sickness, 3—unknown
15	2	Renewal Provision 1 — unknown 2 — 1 year 3 — G.R. 4 — Non Renewable for Stated Reasons only 5 — C.R. 6 — Other
19	2	Impairment 1—standard, 2—substandard, 3—unknown
21	2	His. Occ. Period in years or 1—0 year, 2—1 year, 3—2 year, Etc., 12—to age 55, 14—to age 65, 15—Lifetime

EXHIBIT B-6—*Continued*

23	2	Indemnity Provision	1 — complete reduction 2 — pro rata for new occ. 3 — pro rata for regular occ. 6 — 1 for 2 offset 8 — others 9 — no reduction
25	2	Experience Year	1—1973 3—1975 5—1977 2—1974 4—1976 6—1978
29	2	Company Code (1 through 21)	
31	2	Monthly Indemnity Amount	
33	2	Termination Indicator	0—exposure days only 1—the last day is an exposure and a termination
35	2	Status Code	0—open 3—reached 90 days without 1—recovery termination 2—death 4—death or recovery
37	2	Benefit Period in Months or	965—to age 65 999—Lifetime
41	2	Duration at First Day of Exposure (1 through 90)	
43	2	Duration at Last Day of Exposure (1 through 90)	

For each 7-day period, the number of days of exposure was calculated and then divided by 7. That is:

Exposure = A. One plus
B. the difference between
1. the latest of
a. the first day in the 7-day period,
b. the first day after the end of the elimination period,
c. the first day of the experience period, and
2. the earliest of
a. the last day in the 7-day period,
b. the termination date,
c. the last day of the experience period,
d. 90 days after the date of disablement.
C. divided by seven
D. zero if (B2) minus (B1) is negative.

This yields an exposure value of one (one week's exposure) if a claim was exposed to termination for the entire week and did not terminate. This also yields a value of 0.7143 for 30-day EP claims exposed for the entire fifth week. Terminations in the middle of the week also resulted in fractional exposure weeks.

If a termination occurred during a 7-day period, it was counted as one termination for that week. These exposures and terminations were passed to the ECTA program to produce rates and factors. The model used was the same as the model used for the first three months of the monthly termination rates.

The graduation process was also similar to that used for monthly termination rates; however, no adjustment was needed for 7-day and 14-day EP since all the rates are true weekly termination rates. Even week 5 for 30-day EP claims needed no adjustment before graduation since 0.7143 of a week's worth of terminations were divided by 0.7143 of a week's worth of exposure resulting in a weekly termination rate. The graduated rates were multiplied by the exposures to get smooth terminations. The smooth terminations and exposures were passed to the ECTA program to produce the smooth rates and factors found in Exhibit B-7.

EXHIBIT B-7

FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES BASED ON GRADUATED DATA
(AVERAGE = 1)

Week:	1	2	3	4	5
Duration Rate:	.139	.120	.117	.125	.118*
Age: 20–29	1.019	1.138	1.127	1.105	1.048
EP: 0,7,14,30	1.000	1.053 .941	1.131 1.066 .788	1.061 1.074 .849	1.156 1.246 1.036 .597
Class: 1,2,3,4	.978 .981 .995 1.011	.951 .968 1.012 1.053	.963 .983 1.009 1.036	.983 .997 1.005 1.009	1.006 1.006 1.000 .984
Sex: M,F	1.154 .859	1.142 .858	1.101 .897	1.079 .922	1.060 .942
Cause: A,S	1.034 .957	.956 1.018	.912 1.074	.894 1.098	.884 1.112
Age: 30–39	1.014	.961	.959	.997	.985
EP: 0,7,14,30	1.000	1.062 .934	1.176 1.067 .757	1.130 1.049 .815	1.249 1.191 .985 .608
Class: 1,2,3,4	1.111 1.030 .957 .882	1.046 .999 .977 .960	1.006 .998 .995 .991	1.007 1.001 .996 .991	1.007 1.003 .997 .988
Sex: M,F	1.101 .901	1.190 .824	1.146 .862	1.090 .913	1.055 .946
Cause: A,S	.995 .994	1.044 .933	.996 .984	.960 1.023	.937 1.050
Age: 40–49	1.027	.894	.898	.943	.962
EP: 0,7,14,30	1.000	1.082 .916	1.218 1.053 .741	1.185 1.023 .797	1.298 1.123 .938 .652
Class: 1,2,3,4	1.215 1.070 .934 .796	1.135 1.029 .951 .884	1.061 1.017 .977 .939	1.041 1.011 .984 .960	1.025 1.009 .990 .972
Sex: M,F	1.038 .955	1.146 .856	1.110 .890	1.063 .936	1.033 .966
Cause: A,S	.977 1.013	1.132 .860	1.090 .898	1.046 .939	1.014 .970
Age: 50–59	1.016	.949	.942	.948	.977
EP: 0,7,14,30	1.000	1.136 .873	1.263 1.001 .751	1.228 .988 .797	1.298 1.056 .897 .725
Class: 1,2,3,4	1.243 1.080 .936 .769	1.193 1.057 .935 .832	1.120 1.039 .959 .887	1.086 1.028 .970 .918	1.060 1.023 .979 .938
Sex: M,F	.972 1.020	1.002 .978	1.000 .988	1.000 .995	.997 1.001
Cause: A,S	1.031 .960	1.191 .817	1.171 .836	1.142 .860	1.118 .879
Age: 60–64	.924	1.058	1.072	1.007	1.028
EP: 0,7,14,30	1.000	1.109 .894	1.210 .958 .819	1.210 .965 .827	1.257 1.004 .867 .815
Class: 1,2,3,4	1.205 1.072 .938 .797	1.185 1.066 .941 .825	1.167 1.057 .949 .847	1.143 1.049 .955 .868	1.120 1.044 .962 .885
Sex: M,F	.908 1.092	.850 1.153	.873 1.132	.922 1.080	.955 1.045
Cause: A,S	1.245 .794	1.300 .749	1.266 .773	1.257 .781	1.245 .790

*Use .084 for 30-day elimination periods to allow for the short week from 30 to 35 days.

EXHIBIT B-7—*Continued*

FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES BASED ON GRADUATED DATA
(AVERAGE = 1)

Week:	6				7				8				9			
Duration Rate:	.123				.126				.125				.122			
Age:20–29	1.060				1.066				1.073				1.079			
EP: 0,7,14,30	1.076	1.210	1.048	.689	1.018	1.177	1.053	.760	.980	1.147	1.054	.820	.958	1.118	1.049	.873
Class: 1,2,3,4	.992	1.008	1.007	.990	.986	1.010	1.009	.993	.983	1.009	1.010	.997	.978	1.007	1.012	1.004
Sex: M,F	1.036	.965			1.022	.978			1.012	.988			1.004	.995		
Cause: A,S	.878	1.118			.874	1.125			.871	1.129			.870	1.131		
Age: 30–39	1.019				1.043				1.058				1.066			
EP: 0,7,14,30	1.164	1.153	.998	.701	1.119	1.121	1.006	.759	1.082	1.099	1.013	.807	1.051	1.082	1.017	.848
Class: 1,2,3,4	.999	1.003	1.002	.994	.996	1.001	1.003	.998	.993	1.000	1.004	1.003	.990	.999	1.005	1.006
Sex: M,F	1.019	.981			.994	1.005			.978	1.022			.967	1.033		
Cause: A,S	.925	1.062			.916	1.073			.912	1.078			.913	1.078		
Age: 40–49	.988				1.007				1.019				1.024			
EP: 0,7,14,30	1.206	1.096	.962	.738	1.172	1.073	.974	.783	1.143	1.057	.983	.818	1.113	1.046	.990	.851
Class: 1,2,3,4	1.015	1.006	.995	.983	1.010	1.003	.996	.990	1.006	1.000	.997	.995	1.004	.999	.998	.998
Sex: M,F	1.005	.995			.984	1.016			.969	1.031			.959	1.042		
Cause: A,S	1.002	.981			.989	.994			.982	1.001			.981	1.003		
Age: 50–59	.969				.964				.961				.957			
EP: 0,7,14,30	1.220	1.052	.930	.786	1.196	1.041	.946	.814	1.171	1.031	.957	.841	1.147	1.021	.964	.869
Class: 1,2,3,4	1.041	1.018	.985	.956	1.030	1.013	.989	.968	1.023	1.009	.991	.976	1.020	1.007	.993	.981
Sex: M,F	.995	1.005			.990	1.010			.984	1.016			.976	1.024		
Cause: A,S	1.111	.884			1.098	.895			1.089	.902			1.084	.908		
Age: 60–64	.965				.920				.890				.874			
EP: 0,7,14,30	1.196	1.031	.896	.849	1.191	1.031	.910	.857	1.180	1.024	.917	.876	1.166	1.010	.919	.907
Class: 1,2,3,4	1.090	1.040	.971	.906	1.071	1.037	.977	.921	1.058	1.033	.980	.933	1.048	1.028	.982	.944
Sex: M,F	.988	1.012			1.011	.988			1.025	.975			1.024	.976		
Cause: A,S	1.260	.780			1.253	.785			1.245	.790			1.236	.796		

EXHIBIT B-7—*Continued*

FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES BASED ON GRADUATED DATA
(AVERAGE = 1)

Week:	10				11				12				13			
Duration Rate:	.117				.109				.099				.086			
Age: 20–29	1.086				1.096				1.110				1.133			
EP: 0,7,14,30	.951	1.087	1.038	.921	.963	1.051	1.018	.964	.996	1.008	.985	1.007	1.059	.949	.935	1.050
Class: 1,2,3,4	.972	1.002	1.013	1.013	.966	.994	1.015	1.026	.957	.982	1.017	1.045	.944	.964	1.021	1.074
Sex: M,F	.997	1.002			.990	1.008			.984	1.013			.975	1.018		
Cause: A,S	.871	1.131			.876	1.127			.884	1.118			.897	1.104		
Age: 30–39	1.068				1.062				1.049				1.027			
EP: 0,7,14,30	1.025	1.069	1.019	.885	1.003	1.058	1.017	.920	.985	1.049	1.008	.955	.971	1.038	.989	.992
Class: 1,2,3,4	.986	.997	1.006	1.010	.981	.996	1.007	1.015	.974	.994	1.009	1.022	.962	.993	1.012	1.032
Sex: M,F	.961	1.040			.958	1.042			.959	1.039			.967	1.026		
Cause: A,S	.919	1.072			.930	1.060			.950	1.040			.984	1.006		
Age: 40–49	1.022				1.012				.993				.962			
EP: 0,7,14,30	1.083	1.040	.995	.882	1.048	1.039	.998	.914	1.007	1.043	.997	.951	.952	1.054	.989	.995
Class: 1,2,3,4	1.002	.999	.999	1.000	1.001	1.000	1.000	.999	1.000	1.003	1.000	.995	1.000	1.008	1.001	.989
Sex: M,F	.951	1.050			.946	1.055			.943	1.057			.942	1.053		
Cause: A,S	.986	.999			.998	.989			1.020	.969			1.058	.935		
Age: 50–59	.953				.948				.941				.932			
EP: 0,7,14,30	1.121	1.013	.967	.900	1.090	1.005	.966	.938	1.052	.997	.959	.989	.999	.988	.943	1.062
Class: 1,2,3,4	1.019	1.005	.993	.982	1.022	1.006	.992	.980	1.031	1.009	.989	.971	1.048	1.015	.984	.953
Sex: M,F	.966	1.034			.953	1.048			.935	1.066			.908	1.092		
Cause: A,S	1.082	.910			1.086	.909			1.094	.904			1.110	.891		
Age: 60–64	.871				.881				.907				.946			
EP: 0,7,14,30	1.147	.987	.917	.951	1.119	.956	.913	1.017	1.079	.914	.906	1.114	1.024	.853	.894	1.265
Class: 1,2,3,4	1.043	1.022	.984	.953	1.041	1.016	.984	.961	1.043	1.009	.982	.967	1.052	.998	.978	.972
Sex: M,F	1.008	.991			.975	1.024			.920	1.083			.844	1.175		
Cause: A,S	1.223	.806			1.210	.816			1.193	.829			1.166	.849		

Ultimate Termination Rates—Durations 11 and Higher

For this purpose the new termination data collected from writers of individual disability insurance did not include sufficient exposures at the longer durations to be of any value. It was therefore necessary to rely upon the published data with respect to Group LTD insurance, the most recent study of experience under individual Waiver of Premium benefits, the experience under Social Security, and the study by Mutual of Omaha of its termination experience. From an analysis of all of these data, the target values at quinquennial ages were developed and from these the following formulas were devised for the development of graduated values.

For all terminations (death and recovery):

$$\text{the termination rate } q_x^t = 1.022 - p_x^t$$
$$\text{where } 10^4 \operatorname{colog} p_x^t = 10^{.040(x-7.6)}$$

For terminations due to death only:

$$q_x^d = 1.007 - p_x^d$$
$$\text{where } 10^4 \operatorname{colog} p_x^d = 10^{.035(x+4.0)}$$

The resulting values and comparisons with other data are presented in the accompanying table, Exhibit B-8, and the full set of Ultimate Termination Rates in Exhibit B-9.

With respect to the comparisons with experience under Benefit 2 and the Group Waiver of Premium benefits, it should be noted that there has been a considerable passage of time between the experience years involved and the present, the experience of which we are endeavoring to reflect.

Ultimate rates for females are .67 times the corresponding male rates. The factor of .67 was set empirically by reviewing the relationship of female to male death rates from several mortality tables and the ratios of recovery rates and total termination rates for Group LTD experience. Using the flat ratio leaves a practical working formula for generating rates at all ages with a minimum amount of conservatism.

EXHIBIT B-8

COMPARISON OF DISABILITY TERMINATION RATES PER 1,000

AGE (x)	CAUSE*	DTS ULTIMATE RATE (Males)	ORDINARY WAIVER 1969–74	OASDI 1973–76	OASDI 1975–78	OASDI 1973–77	GROUP WAIVER 1955–64	BEN. 2&3 ($x + ½$) 1930–50	MUTUAL OF OMAHA 1970–77
Duration (Years)		11+ (1)	11+ (2)	6+ (3)	6+ (4)	11+ (5)	(6)	(7)	(8)
22	D	8.9						. . .	
	R	14.0						. . .	
	T	22.9						. . .	. . .
27	D	9.8	. . .	9.9	9.7		16	. . .	
	R	13.6	. . .	34.0	33.9		20	. . .	
	T	23.4	. . .	43.9	43.6		36	. . .	. . .
32	D	11.2	19.7	12.6	12.7		17	12.6	
	R	12.9	19.7	19.6	20.4		19	52.8	
	T	24.1	39.4	32.2	33.1	63.1	36	65.4	. . .
37	D	13.2	13.6	16.0	15.9		18	15.5	
	R	12.2	6.8	11.3	12.4		18	46.3	
	T	25.4	20.4	27.3	28.3	21.3	36	61.8	40
42	D	16.3	12.8	21.9	21.0		26	19.1	
	R	11.2	12.8	8.0	8.8		16	39.8	
	T	27.5	25.6	29.9	29.8	25.1	42	58.9	49
47	D	20.9	18.1	28.8	27.9		33	22.2	
	R	9.7	9.8	5.4	6.3		14	33.3	
	T	30.6	27.9	34.2	34.2	29.9	47	55.5	42
52	D	27.8	37.7	39.0	37.6		39	25.8	
	R	7.8	6.6	3.1	3.7		12	26.8	
	T	35.6	44.3	42.1	41.3	38.5	51	52.6	64
57	D	37.9	37.1	51.6	48.1		46	33.4	
	R	5.7	4.6	1.6	1.9		7	20.2	
	T	43.6	41.7	53.2	50.0	49.5	53	53.6	64
62	D	52.9	67.2	54.2	60.8		58	47.7	
	R	3.0	3.7	1.4	.8		5	13.7	
	T	55.9	70.9	55.6	61.6	61.7	63	61.4	52

*D = death; R = recovery; T = death and recovery.

(1) Rates based on the DTS formula for graduating the ultimate rates.

(2) Data provided by Mr. John H. Cook, from contributions to the intercompany Disability Waiver of Premium study.

(3) Actuarial Study No. 75 (Social Security).

(4) Actuarial Study No. 81 (Social Security).

(5) Data supplied by Mr. Francisco R. Bayo for ultimate experience after first 10 years of disablement.

(6) *TSA 1968 Reports*, page 194.

(7) *TSA 1952 Reports*, page 106.

(8) Derived from recent termination study by Mutual of Omaha.

EXHIBIT B-9

ULTIMATE TERMINATION RATES FOR
DURATION 11 YEARS AND OVER
BY ATTAINED AGE

ATTAINED AGE	MALE	FEMALE	ATTAINED AGE	MALE	FEMALE
30	.0238	.0160	65	.0665	.0446
31	.0240	.0161	66	.0707	.0474
32	.0242	.0162	67	.0753	.0504
33	.0244	.0163	68	.0802	.0538
34	.0246	.0165	69	.0857	.0574
35	.0249	.0167	70	.0916	.0614
36	.0251	.0168	71	.0986	.0657
37	.0254	.0170	72	.1051	.0704
38	.0258	.0173	73	.1127	.0755
39	.0261	.0175	74	.1210	.0811
40	.0265	.0178	75	.1301	.0871
41	.0270	.0181	76	.1398	.0937
42	.0275	.0184	77	.1504	.1008
43	.0280	.0188	78	.1619	.1085
44	.0286	.0192	79	.1743	.1168
45	.0292	.0196	80	.1878	.1258
46	.0299	.0200	81	.2022	.1355
47	.0306	.0205	82	.2178	.1459
48	.0315	.0211	83	.2345	.1571
49	.0324	.0217	84	.2525	.1691
50	.0334	.0224	85	.2717	.1820
51	.0345	.0231	86	.2922	.1958
52	.0357	.0239	87	.3140	.2104
53	.0370	.0248	88	.3372	.2259
54	.0384	.0257	89	.3618	.2424
55	.0400	.0268	90	.3877	.2598
56	.0417	.0279	91	.4149	.2780
57	.0436	.0292	92	.4435	.2971
58	.0456	.0306	93	.4732	.3171
59	.0479	.0321	94	.5041	.3378
60	.0503	.0337	95	.5360	.3591
61	.0530	.0355	96	.5686	.3801
62	.0559	.0375	97	.6020	.4033
63	.0592	.0397	98	.6357	.4259
64	.0627	.0420	99	.6695	.4486

APPENDIX C

DEVELOPMENT OF INCIDENCE RATES

Only five companies furnished data in the age and class detail that the Committee requested, and because of the inadequate amount of data, many of the cells were deemed too small for our purpose. Accordingly, we approached the construction of incidence rates by using the 1976–79 industry data as our underlying base, and the results of the 1976 New York study (data base 1967–73) as a source of relationship among occupation classes. The SOA data are by class groups I (N.Y. classes 1 and 2) and II (N.Y. classes 3 and 4).

The basic assumption was that the ratio of the incidence rate for class 1 (or 2) to the incidence rate for classes 1 and 2 combined is the same for the SOA data as for the New York study. Ratios of the New York study incidence rates for each decennial age group by sex, cause, and elimination period were calculated for class 1 and class 2 and multiplied by the SOA corresponding incidence rate for class group I to obtain the generated SOA rates for class 1 and for class 2.

The same process was followed to determine rates for classes 3 and 4 from SOA class group II. Incidence rates were calculated separately, by identical methods, for accident and sickness.

Crude incidence rates determined by this method appeared to be in good shape for males, but not quite as good for females, as evidenced by the "crude rate" graphs. We tried several different graduating approaches on these crude rates, without success. Mechanical graduating methods did not seem to improve them, so a multidimensional graphic method was used to obtain graduated rates for both males and females. These graduated rates were then applied against SOA exposure distribution for each cell (based upon the New York exposure distribution) and modified very slightly so that the final graduated rates produce the same number of claims as the SOA data for each class group (I and II) and each cause (accident and sickness). This method worked well for the male rates and classes 1, 2, and 3, for females, but the volume of data was so small for female class 4, that we could not produce class 4 results by this method. Accordingly, by studying the male results and the results for females at classes 1, 2, and 3, we concluded that our best estimate for female class 4 was to generate class 4 incidence rates by dividing the class 3 accident rates by .80 and the class 3 sickness rates by .96.

Summaries of the data for the five responding companies, the SOA and the New York study are included here as Exhibit C-1. The generated crude

incidence rates are in the outer column, labeled Generated Four Occ.

Graphs of the crude data and graduated data are included in Exhibit C-2. Associated with each set of crude and graduated rates is a corresponding set of implied 90-day rates. The implied 90-day rate is the probability of becoming disabled and remaining disabled through the ninetieth day. This 90-day point was a reference point that was used to provide another dimension to the graduation. It was used to evaluate the logical consistency between tables at that point in time. Graphs of the imputed rates also are included.

Incidence rates were determined from exposures in 10-year age groupings. The rates for each age group were not assigned to the central age of the age group. Rather, they were assigned to a more precise weighted age determined from the exposure distribution of the DTS quinquennial age data. These weighted ages are 25.5, 34.5, 44.5, 54.0, and 62.2. Rates for ages 25, 35, 45, 55, and 62 were determined by interpolating with a fourth degree polynomial. Final graduated rates are shown in Exhibit C-3.

EXHIBIT C-1

(TWO OCC. DATA)

				SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
M	A I	0	25	17,458	732	41.93	56,930	2,552	44.83	2,565	153	59.65	3,310	193	58.31
M	A I	0	35	37,477	1,526	40.72	186,901	6,618	35.41	13,714	506	36.90	15,435	621	40.23
M	A I	0	45	65,199	2,024	31.40	318,283	9,325	29.30	22,216	640	28.81	24,765	732	29.56
M	A I	0	55	122,488	2,913	23.78	348,733	9,877	28.32	33,045	738	22.33	40,073	977	24.38
M	A I	0	65	75,058	1,824	24.30	222,122	5,802	26.12	15,587	395	25.34	18,026	498	27.63
M	A I	7	25	12,266	429	34.97	24,409	828	33.92	2,511	101	40.22	6,014	296	49.22
M	A I	7	35	28,473	999	35.09	48,282	1,251	25.91	8,066	246	30.50	15,201	560	36.84
M	A I	7	45	31,534	869	27.56	68,142	1,495	21.94	9,531	244	25.60	20,631	554	26.85
M	A I	7	55	43,783	954	21.79	70,062	1,490	21.27	9,431	250	26.51	30,166	709	23.50
M	A I	7	65	12,216	291	23.82	23,082	501	21.71	3,196	85	26.60	8,018	191	23.82
M	A I	14	25	32,128	719	22.38	34,517	507	14.69	13,885	319	22.97	15,485	352	22.73
M	A I	14	35	62,807	1,266	20.16	88,201	1,087	12.32	22,610	512	22.64	28,025	598	21.34
M	A I	14	45	59,886	936	15.63	117,876	1,233	10.46	19,131	320	16.73	27,640	448	16.21
M	A I	14	55	58,930	855	14.51	75,616	900	11.90	16,778	255	15.20	25,382	398	15.68
M	A I	14	65	19,126	304	15.89	18,399	215	11.69	4,747	82	17.27	6,877	115	16.72
M	A I	30	25	99,448	626	6.29	86,601	391	4.51	24,603	164	6.67	26,336	175	6.64
M	A I	30	35	251,216	1,363	5.43	317,233	1,248	3.93	70,721	354	5.01	76,128	395	5.19
M	A I	30	45	207,831	1,174	5.65	338,883	1,458	4.30	62,968	346	5.49	70,601	403	5.71
M	A I	30	55	140,200	825	5.88	163,626	841	5.14	42,742	264	6.18	48,717	303	6.22
M	A I	30	65	35,831	248	6.92	39,217	213	5.43	9,431	59	6.26	13,584	91	6.70
M	A I	90	25	25,036	28	1.12	21,392	14	0.65	4,971	6	1.21	5,489	6	1.09
M	A I	90	35	107,948	70	0.65	127,416	82	0.64	24,278	7	0.29	26,487	9	0.34
M	A I	90	45	103,727	82	0.79	161,078	153	0.95	22,991	18	0.78	26,733	23	0.86
M	A I	90	55	61,504	67	1.09	80,774	124	1.54	13,367	17	1.27	16,914	19	1.12
M	A I	90	65	12,314	19	1.54	18,165	53	2.92	2,744	4	1.46	3,516	4	1.14
SUBTOTAL				1,723,884	21,143		3,055,940	48,258		475,829	6,085		599,553	8,670	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

				SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
M	A II	0	25	13,180	1,301	98.71	78,842	8,955	113.58	4,958	459	92.58	4,958	459	92.58
M	A II	0	35	46,605	4,155	89.15	159,583	14,278	89.47	27,230	1,680	61.70	27,230	1,680	61.70
M	A II	0	45	79,933	4,617	57.76	206,100	14,273	69.25	43,638	2,077	47.60	43,638	2,077	47.60
M	A II	0	55	110,270	5,154	46.74	180,441	10,149	56.25	56,272	2,108	37.46	56,272	2,108	37.46
M	A II	0	65	50,557	1,995	39.46	57,527	2,868	49.85	23,636	731	30.93	23,636	731	30.93
M	A II	7	25	17,251	1,005	58.26	48,975	3,216	65.67	6,654	450	67.63	10,056	673	66.93
M	A II	7	35	42,449	2,484	58.52	81,946	4,644	56.67	20,104	1,213	60.34	28,429	1,731	60.89
M	A II	7	45	46,823	2,186	46.69	95,479	4,281	44.84	19,824	1,052	53.07	34,497	1,629	47.22
M	A II	7	55	57,136	2,285	39.99	92,544	3,432	37.09	16,773	853	50.86	42,552	1,732	40.70
M	A II	7	65	15,616	561	35.92	25,498	897	35.18	5,247	233	44.41	10,957	411	37.51
M	A II	14	25	45,785	2,215	48.38	43,906	1,656	37.72	31,756	1,423	44.81	33,356	1,502	45.03
M	A II	14	35	76,494	3,613	47.23	70,813	2,561	36.17	40,986	1,910	46.60	47,386	2,121	44.76
M	A II	14	45	57,670	2,296	39.81	61,024	2,219	36.36	26,056	1,064	40.84	33,666	1,299	38.58
M	A II	14	55	44,945	1,532	34.09	37,372	1,359	36.36	16,048	579	36.08	22,021	749	34.01
M	A II	14	65	12,973	359	27.67	7,213	281	38.96	3,506	93	26.53	4,730	131	27.70
M	A II	30	25	64,810	1,560	24.07	44,920	764	17.01	28,778	723	25.12	31,996	798	24.94
M	A II	30	35	104,274	2,528	24.24	84,453	1,479	17.51	44,949	1,033	22.98	49,673	1,153	23.21
M	A II	30	45	67,675	1,552	22.93	73,003	1,283	17.57	30,298	632	20.86	34,485	726	21.05
M	A II	30	55	41,190	769	18.67	40,778	706	17.31	17,578	294	16.73	20,422	340	16.65
M	A II	30	65	9,721	145	14.92	7,515	115	15.30	3,571	45	12.60	5,119	76	14.85
M	A II	90	25	5,481	28	5.11	5,662	22	3.89	1,637	7	4.28	1,723	8	4.64
M	A II	90	35	9,687	42	4.34	11,558	53	4.59	3,155	16	5.07	3,494	19	5.44
M	A II	90	45	7,826	38	4.86	12,968	52	4.01	3,135	12	3.83	3,673	14	3.81
M	A II	90	55	6,077	33	5.43	8,585	30	3.49	2,539	15	5.91	3,070	16	5.21
M	A II	90	65	1,514	8	5.28	2,027	11	5.43	699	4	5.72	846	5	5.91
SUBTOTAL				1,035,942	42,361		1,538,732	79,584		479,027	18,706		577,885	22,188	
PAGE TOTAL				2,759,826	63,604		4,594,672	127,842		954,856	24,791		1,177,438	30,858	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

				SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
M	S I	0	25	31						2			5		
M	S I	0	35	100	10	100.00				4			23	5	217.39
M	S I	0	45	932	114	122.32				14	1	71.43	792	83	104.80
M	S I	0	55	7,108	887	124.79				183	26	142.08	6,752	971	143.81
M	S I	0	65	2,613	361	138.16				246	34	138.21	2,795	467	167.08
M	S I	7	25	19,869	974	49.02	59,143	2,461	41.61	4,392	209	47.59	8,446	456	53.99
M	S I	7	35	50,413	2,156	42.77	135,539	6,238	46.02	18,563	868	46.76	26,864	1,412	52.56
M	S I	7	45	68,623	3,746	54.59	213,466	11,405	53.43	27,716	1,521	54.88	39,942	2,387	59.76
M	S I	7	55	102,255	7,893	77.19	212,835	17,083	80.26	38,338	2,954	77.05	59,897	4,950	82.64
M	S I	7	65	39,373	4,321	109.75	76,896	7,910	102.87	16,816	1,868	111.08	21,801	2,501	114.72
M	S I	14	25	35,067	766	21.84	38,071	663	17.41	14,084	306	21.73	15,765	354	22.45
M	S I	14	35	66,125	1,655	25.03	90,135	1,964	21.79	23,226	628	27.04	28,835	794	27.54
M	S I	14	45	64,453	2,281	35.39	113,551	3,868	34.06	19,982	791	39.59	28,741	1,150	40.01
M	S I	14	55	65,444	3,718	56.81	82,985	4,682	56.42	17,987	1,086	60.38	26,752	1,655	61.86
M	S I	14	65	22,361	2,019	90.29	25,031	1,929	77.06	5,321	481	90.40	7,483	697	93.14
M	S I	30	25	104,766	769	7.34	102,001	540	5.29	25,021	190	7.59	26,867	208	7.74
M	S I	30	35	259,395	1,930	7.44	406,690	2,638	6.49	73,014	697	9.55	78,751	768	9.75
M	S I	30	45	219,588	3,197	14.56	492,383	5,879	11.94	65,634	1,170	17.83	73,653	1,326	18.00
M	S I	30	55	153,677	4,304	28.01	287,360	7,187	25.01	45,016	1,409	31.30	51,329	1,635	31.85
M	S I	30	65	41,347	1,991	48.15	76,676	2,986	38.94	10,328	549	53.16	14,526	833	57.35
M	S I	90	25	25,282	39	1.54	22,033	20	0.91	4,991	1	0.20	5,509	1	0.18
M	S I	90	35	108,782	159	1.46	130,767	190	1.45	24,356	55	2.26	26,577	65	2.45
M	S I	90	45	105,050	321	3.06	167,903	646	3.85	23,214	81	3.49	27,029	107	3.96
M	S I	90	55	62,806	567	9.03	89,378	948	10.61	13,607	131	9.63	17,219	172	9.99
M	S I	90	65	12,748	199	15.61	22,595	407	18.01	2,851	48	16.84	3,635	71	19.53
SUBTOTAL				1,638,208	44,377		2,845,438	79,644		474,906	15,104		599,988	23,068	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

				SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
M	S II	0	25	9	1	111.11									
M	S II	0	35	366	22	60.11									
M	S II	0	45	1,520	182	119.74				24	1	41.67	24	1	41.67
M	S II	0	55	3,133	438	139.80				39	7	179.49	39	7	179.49
M	S II	0	65	1,883	264	140.20				35	7	200.00	35	7	200.00
M	S II	7	25	25,836	1,248	48.30	114,671	6,636	57.87	11,374	604	53.10	14,776	815	55.16
M	S II	7	35	77,993	4,125	52.89	219,588	13,668	62.24	46,613	2,423	51.98	54,938	3,049	55.50
M	S II	7	45	105,712	7,087	67.04	278,218	21,020	75.55	62,440	4,530	72.55	77,113	5,668	73.50
M	S II	7	55	134,308	12,293	91.53	252,512	25,797	102.16	71,553	6,717	93.87	97,332	9,477	97.37
M	S II	7	65	47,456	5,398	113.75	76,478	9,682	126.60	28,282	3,285	116.15	33,992	4,064	119.56
M	S II	14	25	46,941	1,468	31.27	47,999	1,286	26.79	31,925	1,053	32.98	33,525	1,115	33.26
M	S II	14	35	78,022	2,968	38.04	78,354	2,809	35.85	41,475	1,760	42.44	47,875	2,008	41.94
M	S II	14	45	59,814	3,057	51.11	69,296	3,986	57.52	26,676	1,560	58.48	34,286	1,987	57.95
M	S II	14	55	47,775	3,564	74.60	44,017	3,665	83.26	16,734	1,345	80.38	22,707	1,818	80.06
M	S II	14	65	14,147	1,498	105.89	9,145	1,103	120.61	3,719	373	100.30	4,943	526	106.41
M	S II	30	25	65,690	993	15.12	51,099	569	11.14	28,843	505	17.51	32,061	577	18.00
M	S II	30	35	105,435	1,827	17.33	97,211	1,749	17.99	45,169	903	19.99	49,893	1,027	20.58
M	S II	30	45	69,284	2,038	29.42	89,875	2,421	26.94	30,622	1,035	33.80	34,809	1,174	33.73
M	S II	30	55	43,746	2,146	49.06	56,678	2,407	42.47	18,216	991	54.40	21,060	1,142	54.23
M	S II	30	65	10,756	743	69.08	12,247	722	58.95	3,867	259	66.98	5,415	399	73.68
M	S II	90	25	5,556	19	3.42	5,813	16	2.75	1,636	3	1.83	1,722	4	2.32
M	S II	90	35	9,859	36	3.65	11,543	59	5.11	3,155	16	5.07	3,494	18	5.15
M	S II	90	45	7,939	67	8.44	13,598	115	8.46	3,162	29	9.17	3,700	34	9.19
M	S II	90	55	6,248	117	18.73	9,657	190	19.67	2,612	72	27.57	3,143	82	26.09
M	S II	90	65	1,483	60	40.46	2,286	83	36.31	724	38	52.49	871	42	48.22
SUBTOTAL				970,911	51,659		1,540,285	97,983		478,895	27,516		577,753	35,041	
PAGE TOTAL				2,609,119	96,036		4,385,723	177,627		953,801	42,620		1,177,741	58,109	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

				SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
F	A 1	0	25	3,445	107	31.06	12,002	352	29.33	337	8	23.74	421	9	21.38
F	A 1	0	35	4,830	144	29.81	14,709	457	31.07	388	14	36.08	464	20	43.10
F	A 1	0	45	5,687	144	25.32	23,031	797	34.61	506	16	31.62	554	18	32.49
F	A 1	0	55	8,809	258	29.29	23,595	971	41.15	869	40	46.03	890	40	44.94
F	A 1	0	65	4,095	162	39.56	7,627	273	35.79	502	27	53.78	502	27	53.78
F	A 1	7	25	4,090	97	23.72	10,603	248	23.39	1,216	31	25.49	2,375	69	29.05
F	A 1	7	35	9,778	222	22.70	14,852	367	24.71	2,973	61	20.52	5,662	129	22.78
F	A 1	7	45	10,957	276	25.19	24,078	528	21.93	3,805	62	16.29	8,008	168	20.98
F	A 1	7	55	14,846	359	24.18	26,782	740	27.63	4,983	126	25.29	11,592	290	25.02
F	A 1	7	65	1,665	39	23.42	2,512	66	26.27	601	15	24.96	957	24	25.08
F	A 1	14	25	11,772	208	17.67	8,597	101	11.75	5,056	77	15.23	5,751	89	15.48
F	A 1	14	35	16,940	338	19.95	10,350	137	13.24	5,353	114	21.30	6,826	137	20.07
F	A 1	14	45	12,817	222	17.32	13,508	165	12.21	4,302	68	15.81	6,096	96	15.75
F	A 1	14	55	11,788	231	19.60	11,044	191	17.29	3,383	62	18.33	5,202	90	17.30
F	A 1	14	65	3,028	82	27.08	2,673	40	14.96	687	14	20.38	732	15	20.49
F	A 1	30	25	20,955	130	6.20	14,351	54	3.76	6,567	32	4.87	6,759	32	4.73
F	A 1	30	35	29,841	231	7.74	20,106	98	4.87	8,760	61	6.96	9,076	64	7.05
F	A 1	30	45	21,428	161	7.51	26,844	159	5.92	7,905	66	8.35	8,192	68	8.30
F	A 1	30	55	16,839	164	9.74	21,188	158	7.46	6,845	54	7.89	6,985	55	7.87
F	A 1	30	65	3,015	31	10.28	4,024	36	8.95	899	6	6.67	901	6	6.66
F	A 1	90	25	3,370	6	1.78	2,581	1	0.39	852	1	1.17	911	2	2.20
F	A 1	90	35	6,862	4	0.58	4,195	11	2.62	1,574			1,717		
F	A 1	90	45	5,193	7	1.35	6,578	9	1.37	1,376	2	1.45	1,710	2	1.17
F	A 1	90	55	4,007	9	2.25	6,196	15	2.42	1,189	6	5.05	1,616	8	4.95
F	A 1	90	65	556	2	3.60	1,026	3	2.92	135			146		
SUBTOTAL				236,613	3,634		313,052	5,977		71,063	963		94,045	1,458	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

				SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
F	A II	0	25	207	12	57.97	2,013	115	57.13	16	2	125.00	16	2	125.00
F	A II	0	35	706	38	53.82	2,875	174	60.52	38			38		
F	A II	0	45	1,127	44	39.04	4,236	292	68.93	55	2	36.36	55	2	36.36
F	A II	0	55	1,818	73	40.15	3,688	223	60.47	109	2	18.35	109	2	18.35
F	A II	0	65	995	33	33.17	900	49	54.44	41			41		
F	A II	7	25	689	12	17.42	2,822	126	44.65	345	8	23.19	374	9	24.06
F	A II	7	35	2,095	70	33.41	3,792	174	45.89	1,056	46	43.56	1,116	51	45.70
F	A II	7	45	2,312	80	34.60	4,414	252	57.09	1,206	32	26.53	1,245	36	28.92
F	A II	7	55	2,414	107	44.32	2,806	127	45.26	1,231	42	34.12	1,262	44	34.87
F	A II	7	65	258	15	58.14	123			55	4	72.73	57	4	70.18
F	A II	14	25	2,033	59	29.02	1,362	23	16.89	1,435	34	23.69	1,438	34	23.64
F	A II	14	35	3,106	94	30.26	1,411	34	24.10	1,537	56	36.43	1,546	57	36.87
F	A II	14	45	2,638	103	39.04	1,650	54	32.73	1,409	51	36.20	1,423	51	35.84
F	A II	14	55	1,833	59	32.19	1,161	38	32.73	891	29	32.55	902	29	32.15
F	A II	14	65	440	8	18.18	222	12	54.05	128	3	23.44	128	3	23.44
F	A II	30	25	1,931	27	13.98	1,507	9	5.97	871	14	16.07	883	14	15.86
F	A II	30	35	2,993	59	19.71	1,649	23	13.95	1,168	27	23.12	1,182	27	22.84
F	A II	30	45	2,229	45	20.19	2,038	60	29.44	1,094	29	26.51	1,116	29	25.99
F	A II	30	55	1,799	34	18.90	1,332	37	27.78	843	23	27.28	852	23	27.00
F	A II	30	65	196	5	25.51	174	2	11.49	51	2	39.22	53	2	37.74
F	A II	90	25	169			89			44			44		
F	A II	90	35	200	1	5.00	94	3	31.91	52			52		
F	A II	90	45	113	1	8.85	183	4	21.86	32	1	31.25	32	1	31.25
F	A II	90	55	97			188	3	15.96	37			37		
F	A II	90	65	13			45			8			8		
SUBTOTAL				32,411	979		40,774	1,834		13,752	407		14,009	420	
PAGE TOTAL				269,024	4,613		353,826	7,811		84,815	1,370		108,054	1,878	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

					SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C	OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
F	S	I	0	25	1											
F	S	I	0	35	37	3	81.08									
F	S	I	0	45	228	39	171.05				2			2		
F	S	I	0	55	599	101	168.61				11	2	181.82	11	2	181.82
F	S	I	0	65	481	82	170.48				9			9		
F	S	I	7	25	5,823	379	65.09	17,182	1,394	81.13	1,432	112	78.21	2,664	216	81.08
F	S	I	7	35	12,823	1,115	86.95	22,701	2,441	107.53	3,193	300	93.96	5,941	645	108.57
F	S	I	7	45	14,515	1,459	100.52	35,777	4,173	116.64	4,138	446	107.78	8,375	971	115.94
F	S	I	7	55	19,869	1,893	95.27	38,883	4,347	111.80	5,630	494	87.74	12,257	1,181	96.35
F	S	I	7	65	3,417	349	102.14	6,140	642	104.56	1,014	96	94.67	1,370	148	108.03
F	S	I	14	25	12,447	554	44.51	10,190	375	36.80	5,128	253	49.34	5,827	290	49.77
F	S	I	14	35	17,468	1,112	63.66	12,100	729	60.25	5,421	439	80.98	6,899	529	76.68
F	S	I	14	45	13,286	1,029	77.45	16,557	1,254	75.74	4,367	364	83.35	6,172	498	80.69
F	S	I	14	55	12,271	873	71.14	14,309	1,102	77.01	3,490	298	85.39	5,310	436	82.11
F	S	I	14	65	3,184	260	81.66	3,671	262	71.37	723	62	85.75	768	67	87.24
F	S	I	30	25	21,726	345	15.88	16,703	188	11.26	6,603	96	14.54	6,802	97	14.26
F	S	I	30	35	30,512	681	22.32	23,752	589	24.80	8,853	251	28.35	9,181	255	27.77
F	S	I	30	45	22,107	724	32.75	33,201	1,114	33.55	7,995	300	37.52	8,285	309	37.30
F	S	I	30	55	17,783	624	35.09	27,292	939	34.41	6,925	250	36.10	7,067	256	36.22
F	S	I	30	65	3,235	145	44.82	5,626	199	35.37	934	42	44.97	936	42	44.87
F	S	I	90	25	3,376	6	1.78	2,653	4	1.51	851	3	3.53	910	3	3.30
F	S	I	90	35	6,899	24	3.48	4,359	20	4.59	1,570	4	2.55	1,713	4	2.34
F	S	I	90	45	5,179	25	4.83	6,764	58	8.57	1,351	6	4.44	1,685	7	4.15
F	S	I	90	55	3,909	46	11.77	6,461	79	12.23	1,147	13	11.33	1,574	15	9.53
F	S	I	90	65	537	11	20.48	1,072	18	16.79	128	3	23.44	139	4	28.78
SUBTOTAL					231,712	11,879		305,393	19,927		70,915	3,834		93,897	5,975	

EXHIBIT C-1—*Continued*

(TWO OCC. DATA)

					SOA Two Occ. Data			New York Study			Four Company Decennial			Five Company Original		
S	C	OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate
F	S	II	0	25												
F	S	II	0	35	12											
F	S	II	0	45	33	4	121.21									
F	S	II	0	55	133	20	150.38				2			2		
F	S	II	0	65	45	14	311.11									
F	S	II	7	25	817	63	77.11	4,765	552	115.84	350	34	97.14	379	40	105.54
F	S	II	7	35	2,727	319	116.98	6,159	991	160.90	1,090	141	129.36	1,150	151	131.30
F	S	II	7	45	3,224	412	127.79	7,842	1,418	180.82	1,240	193	155.65	1,279	201	157.15
F	S	II	7	55	3,498	456	130.36	5,670	973	171.60	1,328	172	129.52	1,359	179	131.71
F	S	II	7	65	468	54	115.38	801	128	159.80	87	10	114.94	89	10	112.36
F	S	II	14	25	2,052	125	60.92	1,466	70	47.75	1,438	114	79.28	1,441	115	79.81
F	S	II	14	35	3,122	305	97.69	1,597	166	103.94	1,542	181	117.38	1,551	183	117.99
F	S	II	14	45	2,669	356	133.38	1,972	235	119.17	1,422	219	154.01	1,436	221	153.90
F	S	II	14	55	1,888	198	104.87	1,551	164	105.74	912	122	133.77	923	122	132.18
F	S	II	14	65	452	43	95.13	320	41	128.13	136	13	95.59	136	13	95.59
F	S	II	30	25	1,948	51	26.18	1,620	34	20.99	878	34	38.72	890	35	39.33
F	S	II	30	35	2,993	146	48.78	1,859	87	46.80	1,169	67	57.31	1,183	67	56.64
F	S	II	30	45	2,250	122	54.22	2,366	167	70.58	1,106	75	67.81	1,128	75	66.49
F	S	II	30	55	1,872	115	61.43	1,663	98	58.93	843	61	72.36	853	61	71.51
F	S	II	30	65	214	16	74.77	253	16	63.24	52	1	19.23	54	1	18.52
F	S	II	90	25	167			92	3	32.61	44			44		
F	S	II	90	35	199			94	4	42.55	52	1	19.23	52	1	19.23
F	S	II	90	45	113	1	8.85	183	5	27.32	32			32		
F	S	II	90	55	97	1	10.31	186	6	32.26	37			37		
F	S	II	90	65	13			44	5	113.64	8			8		
SUBTOTAL					31,006	2,821		40,503	5,163		13,768	1,438		14,026	1,475	
PAGE TOTAL					262,718	14,700		345,896	25,090		84,683	5,272		107,923	7,450	

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	A 1	0	25	35,614	1,186	33.30	1,344	57	42.41	1,875	78	41.60	0.7429	41.93	31.15
M	A 1	0	35	128,713	3,308	25.70	7,185	202	28.11	8,471	275	32.46	0.7258	40.72	29.55
M	A 1	0	45	211,797	4,833	22.82	10,119	226	22.33	12,099	289	23.89	0.7789	31.04	24.18
M	A 1	0	55	209,773	4,757	22.68	11,264	215	19.09	16,101	365	22.67	0.8007	23.78	19.04
M	A 1	0	65	154,607	3,736	24.16	4,461	111	24.88	6,120	168	27.45	0.9251	24.30	22.48
M	A 1	7	25	11,888	309	25.99	1,013	23	22.70	2,452	83	33.85	0.7662	34.97	26.80
M	A 1	7	35	24,775	465	18.77	3,258	64	19.64	6,529	185	28.34	0.7244	35.09	25.42
M	A 1	7	45	32,992	544	16.49	3,577	61	17.05	8,909	189	21.21	0.7516	27.56	20.71
M	A 1	7	55	30,868	528	17.11	2,992	69	23.06	12,698	271	21.34	0.8043	21.79	17.53
M	A 1	7	65	10,662	184	17.26	938	17	18.12	3,147	57	18.11	0.7951	23.82	18.94
M	A 1	14	25	18,468	161	8.72	5,061	68	13.44	5,923	81	13.68	0.5935	22.38	13.28
M	A 1	14	35	59,394	443	7.46	10,094	148	14.66	13,077	178	13.61	0.6052	20.16	12.20
M	A 1	14	45	84,604	566	6.69	9,074	86	9.48	13,947	130	9.32	0.6396	15.63	10.00
M	A 1	14	55	49,249	389	7.90	7,705	87	11.29	12,413	157	12.65	0.6636	14.51	9.63
M	A 1	14	65	12,139	99	8.16	1,937	26	13.42	3,142	38	12.09	0.6979	15.89	11.09
M	A 1	30	25	62,194	216	3.47	14,501	58	4.00	15,607	64	4.10	0.7692	6.29	4.84
M	A 1	30	35	249,604	769	3.08	47,429	172	3.63	51,288	195	3.80	0.7831	5.43	4.25
M	A 1	30	45	260,512	899	3.45	40,329	160	3.97	45,885	188	4.10	0.8021	5.65	4.53
M	A 1	30	55	119,037	490	4.12	25,056	134	5.35	29,209	160	5.48	0.8009	5.88	4.71
M	A 1	30	65	28,444	124	4.36	5,314	23	4.33	9,095	52	5.72	0.8026	6.92	5.56
M	A 1	90	25	16,883	8	0.47	3,989	1	0.25	4,382	1	0.23	0.7240	1.12	0.81
M	A 1	90	35	109,295	55	0.50	20,667	4	0.19	22,537	6	0.27	0.7819	0.65	0.51
M	A 1	90	45	134,900	104	0.77	17,837	13	0.73	20,989	18	0.86	0.8116	0.79	0.64
M	A 1	90	55	64,408	71	1.10	9,207	8	0.87	11,856	9	0.76	0.7181	1.09	0.78
M	A 1	90	65	14,487	33	2.28	1,905	2	1.05	2,457	2	0.81	0.7807	1.54	1.20

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	A 2	0	25	21,316	1,366	64.08	1,221	96	78.62	1,435	115	80.14	1.4296	41.93	59.94
M	A 2	0	35	58,188	3,310	56.88	6,529	304	46.56	6,964	346	49.68	1.6065	40.72	65.41
M	A 2	0	45	106,486	4,492	42.18	12,097	414	34.22	12,666	443	34.98	1.4398	31.04	44.70
M	A 2	0	55	138,960	5,120	36.85	21,781	523	24.01	23,972	612	25.53	1.3009	23.78	30.94
M	A 2	0	65	67,515	2,066	30.60	11,126	284	25.53	11,906	330	27.72	1.1715	24.30	28.47
M	A 2	7	25	12,521	519	41.45	1,498	78	52.07	3,562	213	59.80	1.2219	34.97	42.74
M	A 2	7	35	23,507	786	33.44	4,808	182	37.85	8,672	375	43.24	1.2905	35.09	45.28
M	A 2	7	45	35,150	951	27.06	5,954	183	30.74	11,722	365	31.14	1.2332	27.56	33.98
M	A 2	7	55	39,194	962	24.54	6,439	181	28.11	17,468	438	25.07	1.1541	21.79	25.15
M	A 2	7	65	12,420	317	25.52	2,258	68	30.12	4,871	134	27.51	1.1759	23.82	28.01
M	A 2	14	25	16,049	346	21.56	8,824	251	28.45	9,562	271	28.34	1.4678	22.38	32.85
M	A 2	14	35	28,807	644	22.36	12,516	364	29.08	14,948	420	28.10	1.8140	20.16	36.56
M	A 2	14	45	33,272	667	20.05	10,057	234	23.27	13,693	318	23.22	1.9165	15.63	29.95
M	A 2	14	55	26,367	511	19.38	9,073	168	18.52	12,969	241	18.58	1.6283	14.51	23.62
M	A 2	14	65	6,260	116	18.53	2,810	56	19.93	3,735	77	20.62	1.5858	15.89	25.21
M	A 2	30	25	24,407	175	7.17	10,102	106	10.49	10,729	111	10.35	1.5881	6.29	10.00
M	A 2	30	35	67,629	479	7.08	23,292	182	7.81	24,840	200	8.05	1.8004	5.43	9.77
M	A 2	30	45	78,371	559	7.13	22,639	186	8.22	24,716	215	8.70	1.6579	5.65	9.36
M	A 2	30	55	44,589	351	7.87	17,686	130	7.35	19,508	143	7.33	1.5316	5.88	9.01
M	A 2	30	65	10,773	89	8.26	4,117	36	8.74	4,489	39	8.69	1.5211	6.92	10.53
M	A 2	90	25	4,509	6	1.33	982	5	5.09	1,107	5	4.52	2.0333	1.12	2.27
M	A 2	90	35	18,121	27	1.49	3,611	3	0.83	3,950	3	0.76	2.3152	0.65	1.50
M	A 2	90	45	26,178	49	1.87	5,154	5	0.97	5,744	5	0.87	1.9706	0.79	1.56
M	A 2	90	55	16,366	53	3.24	4,160	9	2.16	5,058	10	1.98	2.1095	1.09	2.30
M	A 2	90	65	3,678	20	5.44	839	2	2.38	1,059	2	1.89	1.8637	1.54	2.88

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	A 3	0	25	62,163	6,927	111.43	3,829	354	92.45	3,829	354	92.45	0.9811	98.71	96.84
M	A 3	0	35	126,406	11,221	88.77	21,313	1,270	59.59	21,313	1,270	59.59	0.9922	89.15	88.45
M	A 3	0	45	164,959	11,417	69.21	34,297	1,569	45.75	34,297	1,569	45.75	0.9994	57.76	57.73
M	A 3	0	55	144,940	8,201	56.58	44,472	1,657	37.26	44,472	1,657	37.26	1.0060	46.74	47.02
M	A 3	0	65	46,918	2,357	50.24	19,053	596	31.28	19,053	596	31.28	1.0077	39.46	39.76
M	A 3	7	25	37,802	2,395	63.36	4,908	330	67.24	8,113	545	67.18	0.9648	58.26	56.21
M	A 3	7	35	65,195	3,482	53.41	15,075	868	57.58	22,980	1,341	58.36	0.9424	58.52	55.15
M	A 3	7	45	82,038	3,527	42.99	14,938	759	50.81	29,208	1,314	44.99	0.9589	46.69	44.77
M	A 3	7	55	84,901	3,019	35.56	13,403	651	48.57	38,907	1,515	38.94	0.9589	39.99	38.35
M	A 3	7	65	24,230	839	34.63	4,373	199	45.51	10,011	372	37.16	0.9843	35.92	35.36
M	A 3	14	25	34,096	1,268	37.19	23,782	1,031	43.35	25,302	1,102	43.55	0.9860	48.38	47.70
M	A 3	14	35	57,321	2,011	35.08	30,978	1,368	44.16	37,220	1,571	42.21	0.9701	47.23	45.82
M	A 3	14	45	51,112	1,827	35.75	20,448	802	39.22	27,908	1,032	36.98	0.9830	39.81	39.14
M	A 3	14	55	32,650	1,178	36.08	13,387	451	33.69	19,272	618	32.07	0.9922	34.09	33.82
M	A 3	14	65	6,471	266	41.11	3,153	85	26.96	4,354	123	28.25	1.0552	27.67	29.20
M	A 3	30	25	33,568	573	17.07	20,600	488	23.69	23,748	562	23.67	1.0036	24.07	24.16
M	A 3	30	35	66,115	1,090	16.49	33,536	716	21.35	38,186	834	21.84	0.9414	24.24	22.82
M	A 3	30	45	58,505	1,004	17.16	22,982	440	19.15	27,114	534	19.69	0.9765	22.93	22.39
M	A 3	30	55	33,147	562	16.95	13,815	211	15.27	16,637	257	15.45	0.9793	18.67	18.28
M	A 3	30	65	6,311	87	13.79	2,910	34	11.68	4,458	65	14.58	0.9008	14.92	13.44
M	A 3	90	25	4,678	19	4.06	1,250	6	4.80	1,334	7	5.25	1.0453	5.11	5.34
M	A 3	90	35	9,610	41	4.27	2,389	11	4.60	2,726	14	5.14	0.9304	4.34	4.03
M	A 3	90	45	10,906	40	3.67	2,456	9	3.66	2,993	11	3.68	0.9147	4.86	4.44
M	A 3	90	55	7,311	27	3.69	2,012	13	6.46	2,531	14	5.53	1.0568	5.43	5.74
M	A 3	90	65	1,740	7	4.02	573	4	6.98	720	5	6.94	0.7413	5.28	3.92

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	A 4	0	25	16,679	2,028	121.59	1,129	105	93.00	1,129	105	93.00	1.0705	98.71	105.67
M	A 4	0	35	33,177	3,057	92.14	5,917	410	69.29	5,917	410	69.29	1.0299	89.15	91.82
M	A 4	0	45	41,141	2,856	69.42	9,341	508	54.38	9,341	508	54.38	1.0024	57.76	57.90
M	A 4	0	55	35,501	1,948	54.87	11,800	451	38.22	11,800	451	38.22	0.9756	46.74	45.60
M	A 4	0	65	10,609	511	48.17	4,583	135	29.46	4,583	135	29.46	0.9661	39.46	38.12
M	A 4	7	25	11,173	821	73.48	1,746	120	68.73	1,943	128	65.88	1.1190	58.26	65.19
M	A 4	7	35	16,751	1,162	69.37	5,029	345	68.60	5,449	390	71.57	1.2241	58.52	71.63
M	A 4	7	45	13,441	754	56.10	4,886	293	59.97	5,289	315	59.56	1.2511	46.69	58.41
M	A 4	7	55	7,643	413	54.04	3,370	202	59.94	3,645	217	59.53	1.4571	39.99	58.27
M	A 4	7	65	1,268	58	45.74	874	34	38.90	946	39	41.23	1.3002	35.92	46.71
M	A 4	14	25	9,810	388	39.55	7,974	392	49.16	8,054	400	49.66	1.0486	48.38	50.73
M	A 4	14	35	13,492	550	40.76	10,008	542	54.16	10,166	550	54.10	1.1272	47.23	53.24
M	A 4	14	45	9,912	392	39.55	5,608	262	46.72	5,758	267	46.37	1.0876	39.81	43.30
M	A 4	14	55	4,722	181	38.33	2,661	128	48.10	2,749	131	47.65	1.0541	34.09	35.93
M	A 4	14	65	742	15	20.22	353	8	22.66	376	8	21.28	0.5189	27.67	14.36
M	A 4	30	25	11,352	191	16.83	8,178	235	28.74	8,248	236	28.61	0.9893	24.07	23.81
M	A 4	30	35	18,338	389	21.21	11,413	317	27.78	11,487	319	27.77	1.2113	24.24	29.37
M	A 4	30	45	14,498	279	19.24	7,316	192	26.24	7,371	192	26.05	1.0950	22.93	25.11
M	A 4	30	55	7,631	144	18.87	3,763	83	22.06	3,785	83	21.93	1.0899	18.67	20.35
M	A 4	30	65	1,204	28	23.26	661	11	16.64	661	11	16.64	1.5197	14.92	22.67
M	A 4	90	25	984	3	3.05	387	1	2.58	389	1	2.57	0.7846	5.11	4.01
M	A 4	90	35	1,948	12	6.16	766	5	6.53	768	5	6.51	1.3434	4.34	5.82
M	A 4	90	45	2,062	12	5.82	679	3	4.42	680	3	4.41	1.4513	4.86	7.05
M	A 4	90	55	1,274	3	2.35	527	2	3.80	539	2	3.71	0.6739	5.43	3.66
M	A 4	90	65	287	4	13.94	126	0	0.00	126	0	0.00	2.5683	5.28	13.57

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	S 1	0	25	0	0	0.00	2	0	0.00	2	0	0.00	0.0000	0.00	0.00
M	S 1	0	35	*0*	*0*	*0.00*	*1*	*0*	*0.00*	*11*	3	272.73	*0.0000*	*100.00*	*0.00*
M	S 1	0	45	0	0	0.00	4	0	0.00	557	50	89.77	0.0000	122.32	0.00
M	S 1	0	55	0	0	0.00	35	5	142.86	4,332	618	142.66	0.0000	124.79	0.00
M	S 1	0	65	0	0	0.00	34	3	88.24	1,698	297	174.91	0.0000	138.16	0.00
M	S 1	7	25	30,351	1,078	35.52	1,841	54	29.33	3,661	148	40.43	0.8536	49.02	41.84
M	S 1	7	35	70,920	2,684	37.85	7,733	294	38.02	11,867	552	46.52	0.8223	42.77	35.17
M	S 1	7	45	107,525	4,787	44.52	10,509	484	46.06	16,716	895	53.54	0.8333	54.59	45.49
M	S 1	7	55	96,031	6,544	68.14	11,830	790	66.78	22,179	1,718	77.46	0.8490	77.19	65.53
M	S 1	7	65	36,326	3,084	84.90	4,494	495	110.15	6,846	799	116.71	0.8253	109.75	90.58
M	S 1	14	25	20,675	298	14.41	5,166	98	18.97	6,094	121	19.86	0.8277	21.84	18.08
M	S 1	14	35	57,833	1,054	18.22	10,429	226	21.67	13,573	302	22.25	0.8364	25.03	20.93
M	S 1	14	45	72,747	2,094	28.78	9,542	308	32.28	14,627	492	33.64	0.8450	35.39	29.91
M	S 1	14	55	47,795	2,334	48.83	8,270	441	53.33	13,120	739	56.33	0.8655	56.81	49.17
M	S 1	14	65	14,981	1,028	68.62	2,142	171	79.83	3,377	289	85.58	0.8904	90.29	80.40
M	S 1	30	25	75,220	314	4.17	14,851	86	5.79	16,041	95	5.92	0.7885	7.34	5.79
M	S 1	30	35	327,115	1,762	5.39	49,519	393	7.94	53,618	433	8.08	0.8304	7.44	6.18
M	S 1	30	45	389,990	3,838	9.84	42,595	657	15.42	48,470	753	15.54	0.8242	14.56	12.00
M	S 1	30	55	208,467	4,282	20.54	26,566	718	27.03	31,017	866	27.92	0.8213	28.01	23.00
M	S 1	30	65	54,481	1,943	35.66	5,850	279	47.69	9,669	538	55.64	0.9158	48.15	44.10
M	S 1	90	25	17,406	14	0.80	4,009	0	0.00	4,402	0	0.00	0.8861	1.54	1.37
M	S 1	90	35	112,542	148	1.32	20,741	40	1.93	22,623	47	2.08	0.9051	1.46	1.32
M	S 1	90	45	140,529	446	3.17	18,040	56	3.10	21,265	76	3.57	0.8249	3.06	2.52
M	S 1	90	55	70,191	570	8.12	9,353	83	8.87	12,067	110	9.12	0.7656	9.03	6.91
M	S 1	90	65	17,268	257	14.88	1,969	33	16.76	2,533	44	17.37	0.8262	15.61	12.90

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	S 2	0	25	0	0	0.00	0	0	0.00	3	0	0.00	0.0000	0.00	0.00
M	S 2	0	35	0	0	0.00	3	0	0.00	12	2	166.67	0.0000	100.00	0.00
M	S 2	0	45	0	0	0.00	10	1	100.00	235	33	140.43	0.0000	122.32	0.00
M	S 2	0	55	0	0	0.00	148	21	141.89	2,420	353	145.87	0.0000	124.79	0.00
M	S 2	0	65	0	0	0.00	212	31	146.23	1,097	170	154.97	0.0000	138.16	0.00
M	S 2	7	25	28,792	1,383	48.03	2,551	155	60.76	4,785	308	64.37	1.1544	49.02	56.59
M	S 2	7	35	64,619	3,554	55.00	10,830	574	53.00	14,997	860	57.34	1.1950	42.77	51.11
M	S 2	7	45	105,941	6,618	62.47	17,207	1,037	60.27	23,226	1,492	64.24	1.1692	54.59	63.83
M	S 2	7	55	116,804	10,539	90.23	26,508	2,164	81.64	37,718	3,232	85.69	1.1241	77.19	86.77
M	S 2	7	65	40,570	4,826	118.95	12,322	1,373	111.43	14,955	1,702	113.81	1.1564	109.75	126.91
M	S 2	14	25	17,396	365	20.98	8,918	208	23.32	9,671	233	24.09	1.2048	21.84	26.32
M	S 2	14	35	32,302	910	28.17	12,797	402	31.41	15,262	492	32.24	1.2929	25.03	32.36
M	S 2	14	45	40,804	1,774	43.48	10,440	483	46.26	14,114	658	46.62	1.2763	35.39	45.17
M	S 2	14	55	35,190	2,348	66.72	9,717	645	66.38	13,632	916	67.19	1.1826	56.81	67.19
M	S 2	14	65	10,050	901	89.65	3,179	310	97.51	4,106	408	99.37	1.1633	90.29	105.04
M	S 2	30	25	26,781	226	8.44	10,170	104	10.23	10,826	113	10.44	1.5940	7.34	11.70
M	S 2	30	35	79,575	876	11.01	23,495	304	12.94	25,133	335	13.33	1.6971	7.44	12.63
M	S 2	30	45	102,393	2,041	19.93	23,039	513	22.27	25,183	573	22.75	1.6694	14.56	24.31
M	S 2	30	55	78,893	2,905	36.82	18,450	691	37.45	20,312	769	37.86	1.4723	28.01	41.23
M	S 2	30	65	22,195	1,043	46.99	4,478	270	60.29	4,857	295	60.74	1.2067	48.15	58.11
M	S 2	90	25	4,627	6	1.30	982	1	1.02	1,107	1	0.90	1.4285	1.54	2.20
M	S 2	90	35	18,225	42	2.30	3,615	15	4.15	3,954	18	4.55	1.5861	1.46	2.32
M	S 2	90	45	27,374	200	7.31	5,174	25	4.83	5,764	31	5.38	1.8990	3.06	5.80
M	S 2	90	55	19,187	378	19.70	4,254	48	11.28	5,152	62	12.03	1.8574	9.03	16.77
M	S 2	90	65	5,327	150	28.16	882	15	17.01	1,102	27	24.50	1.5632	15.61	24.40

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	S 3	0	25	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	111.11	0.00
M	S 3	0	35	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	60.11	0.00
M	S 3	0	45	0	0	0.00	24	1	41.67	24	1	41.67	0.0000	119.74	0.00
M	S 3	0	55	0	0	0.00	36	5	138.89	36	5	138.89	0.0000	139.80	0.00
M	S 3	0	65	0	0	0.00	30	7	233.33	30	7	233.33	0.0000	140.20	0.00
M	S 3	7	25	87,874	5,149	58.60	8,532	477	55.91	11,737	685	58.36	1.0125	48.30	48.91
M	S 3	7	35	171,912	10,660	62.01	35,795	1,854	51.79	43,700	2,435	55.72	0.9962	52.89	52.69
M	S 3	7	45	225,869	16,827	74.50	48,413	3,540	73.12	62,683	4,635	73.94	0.9861	67.04	66.11
M	S 3	7	55	211,043	21,269	100.78	56,622	5,309	93.76	82,126	8,029	97.76	0.9865	91.53	90.29
M	S 3	7	65	65,120	8,205	126.00	22,919	2,667	116.37	28,557	3,432	120.18	0.9953	113.75	113.21
M	S 3	14	25	37,526	1,022	27.23	23,936	780	32.59	25,456	840	33.00	1.0165	31.27	31.79
M	S 3	14	35	64,112	2,310	36.03	31,406	1,353	43.08	37,648	1,596	42.39	1.0050	38.04	38.23
M	S 3	14	45	58,519	3,359	57.40	20,963	1,224	58.39	28,423	1,641	57.73	0.9979	51.11	51.00
M	S 3	14	55	38,691	3,262	84.31	13,983	1,107	79.17	19,868	1,573	79.17	1.0126	74.60	75.54
M	S 3	14	65	8,237	1,011	122.74	3,343	339	101.41	4,544	487	107.17	1.0176	105.89	107.76
M	S 3	30	25	39,222	449	11.45	20,648	374	18.11	23,796	444	18.66	1.0281	15.12	15.54
M	S 3	30	35	77,435	1,354	17.49	33,688	634	18.82	38,338	756	19.72	0.9719	17.33	16.84
M	S 3	30	45	74,195	1,963	26.46	23,221	788	33.93	27,353	923	33.74	0.9822	29.42	28.89
M	S 3	30	55	47,887	1,973	41.20	14,334	756	52.74	17,156	905	52.75	0.9702	49.06	47.59
M	S 3	30	65	10,783	615	57.03	3,151	212	67.28	4,699	352	74.91	0.9674	69.08	66.83
M	S 3	90	25	4,807	15	3.12	1,250	3	2.40	1,334	4	3.00	1.1337	3.42	3.88
M	S 3	90	35	9,580	49	5.11	2,389	11	4.60	2,726	13	4.77	1.0007	3.65	3.65
M	S 3	90	45	11,488	98	8.53	2,479	24	9.68	3,016	29	9.62	1.0087	8.44	8.51
M	S 3	90	55	8,317	159	19.12	2,062	55	26.67	2,581	65	25.18	0.9717	18.73	18.20
M	S 3	90	65	1,971	72	36.53	593	34	57.34	740	38	51.35	1.0061	40.46	40.71

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
M	S 4	0	25	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	111.11	0.00
M	S 4	0	35	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	60.11	0.00
M	S 4	0	45	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	119.74	0.00
M	S 4	0	55	0	0	0.00	3	2	666.67	3	2	666.67	0.0000	139.80	0.00
M	S 4	0	65	0	0	0.00	5	0	0.00	5	0	0.00	0.0000	140.20	0.00
M	S 4	7	25	26,797	1,487	55.49	2,842	127	44.69	3,039	130	42.78	0.9589	48.30	46.32
M	S 4	7	35	47,676	3,008	63.09	10,818	569	52.60	11,238	614	54.64	1.0136	52.89	53.61
M	S 4	7	45	52,349	4,193	80.10	14,027	990	70.58	14,430	1,033	71.59	1.0602	67.04	71.07
M	S 4	7	55	41,469	4,528	109.19	14,931	1,408	94.30	15,206	1,448	95.23	1.0688	91.53	97.83
M	S 4	7	65	11,358	1,477	130.04	5,363	618	115.23	5,435	632	116.28	1.0272	113.75	116.84
M	S 4	14	25	10,473	264	25.21	7,989	273	34.17	8,069	275	34.08	0.9409	31.27	29.42
M	S 4	14	35	14,242	499	35.04	10,069	407	40.42	10,227	412	40.29	0.9773	38.04	37.18
M	S 4	14	45	10,777	627	58.18	5,713	336	58.81	5,863	346	59.01	1.0114	51.11	51.69
M	S 4	14	55	5,326	403	75.67	2,751	238	86.51	2,839	245	86.30	0.9088	74.60	67.79
M	S 4	14	65	908	92	101.32	376	34	90.43	399	39	97.74	0.8401	105.89	88.95
M	S 4	30	25	11,877	120	10.10	8,195	131	15.99	8,265	133	16.09	0.9073	15.12	13.72
M	S 4	30	35	19,776	395	19.97	11,481	269	23.43	11,555	271	23.45	1.1102	17.33	19.24
M	S 4	30	45	15,680	458	29.21	7,401	247	33.37	7,456	251	33.66	1.0843	29.42	31.90
M	S 4	30	55	8,791	434	49.37	3,882	235	60.54	3,904	237	60.71	1.1625	49.06	57.03
M	S 4	30	65	1,464	107	73.09	716	47	65.64	716	47	65.64	1.2398	69.08	85.64
M	S 4	90	25	1,006	1	0.99	386	0	0.00	388	0	0.00	0.3611	3.42	1.24
M	S 4	90	35	1,963	10	5.09	766	5	6.53	768	5	6.51	0.9967	3.65	3.64
M	S 4	90	45	2,110	17	8.06	683	5	7.32	684	5	7.31	0.9527	8.44	8.04
M	S 4	90	55	1,340	31	23.13	550	17	30.91	562	17	30.25	1.1758	18.73	22.02
M	S 4	90	65	315	11	34.92	131	4	30.53	131	4	30.53	0.9618	40.46	38.91

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	A 1	0	25	9,563	239	24.99	262	5	19.08	328	6	18.29	0.8521	31.06	26.47
F	A 1	0	35	11,455	295	25.75	314	10	31.85	376	15	39.89	0.8289	29.81	24.71
F	A 1	0	45	17,635	516	29.26	393	9	22.90	430	11	25.58	0.8455	25.32	21.41
F	A 1	0	55	17,666	659	37.30	662	24	36.25	678	24	35.40	0.9065	29.29	26.55
F	A 1	0	65	5,632	179	31.78	330	12	36.36	330	12	36.36	0.8879	39.56	35.13
F	A 1	7	25	8,046	176	21.87	752	23	30.59	1,628	50	30.71	0.9352	23.72	22.18
F	A 1	7	35	11,010	250	22.71	1,446	31	21.44	3,533	78	22.08	0.9189	22.70	20.86
F	A 1	7	45	18,381	363	19.75	1,299	27	20.79	4,637	105	22.64	0.9006	25.19	22.69
F	A 1	7	55	20,698	559	27.01	1,270	37	29.13	6,967	176	25.26	0.9775	24.18	23.64
F	A 1	7	65	1,837	43	23.41	195	7	35.90	488	15	30.74	0.8909	23.42	20.87
F	A 1	14	25	6,384	59	9.24	2,817	32	11.36	3,177	37	11.65	0.7867	17.67	13.90
F	A 1	14	35	7,747	76	9.81	2,934	48	16.36	3,834	60	15.65	0.7411	19.95	14.79
F	A 1	14	45	10,382	101	9.73	2,303	26	11.29	3,604	44	12.21	0.7964	17.32	13.79
F	A 1	14	55	8,414	106	12.60	1,937	30	15.49	3,358	52	15.49	0.7284	19.60	14.27
F	A 1	14	65	2,108	25	11.86	487	9	18.48	528	9	17.05	0.7925	27.08	21.46
F	A 1	30	25	11,771	33	2.80	4,795	14	2.92	4,949	14	2.83	0.7451	6.20	4.62
F	A 1	30	35	16,279	62	3.81	5,911	38	6.43	6,187	41	6.63	0.7814	7.74	6.05
F	A 1	30	45	21,901	106	4.84	4,864	35	7.20	5,122	36	7.03	0.8171	7.51	6.14
F	A 1	30	55	16,780	98	5.84	3,744	23	6.14	3,867	24	6.21	0.7832	9.74	7.63
F	A 1	30	65	3,472	28	8.06	632	6	9.49	634	6	9.46	0.9014	10.28	9.27
F	A 1	90	25	2,375	1	0.42	711	1	1.41	768	2	2.60	1.0867	1.78	1.93
F	A 1	90	35	3,676	8	2.18	1,314	0	0.00	1,453	0	0.00	0.8300	0.58	0.48
F	A 1	90	45	5,815	8	1.38	977	2	2.05	1,286	2	1.56	1.0055	1.35	1.36
F	A 1	90	55	5,445	15	2.75	693	3	4.33	1,089	5	4.59	1.1379	2.25	2.56
F	A 1	90	65	914	3	3.28	87	0	0.00	96	0	0.00	1.1225	3.60	4.04

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	A 2	0	25	2,439	113	46.33	75	3	40.00	93	3	32.26	1.5797	31.06	49.07
F	A 2	0	35	3,254	162	49.78	74	4	54.05	88	5	56.82	1.6024	29.81	47.77
F	A 2	0	45	5,396	281	52.08	113	7	61.95	124	7	56.45	1.5048	25.32	38.10
F	A 2	0	55	5,929	312	52.62	207	16	77.29	212	16	75.47	1.2787	29.29	37.45
F	A 2	0	65	1,995	94	47.12	172	15	87.21	172	15	87.21	1.3164	39.56	52.08
F	A 2	7	25	2,557	72	28.16	464	8	17.24	747	19	25.44	1.2039	23.72	28.55
F	A 2	7	35	3,842	117	30.45	1,527	30	19.65	2,129	51	23.95	1.2324	22.70	27.98
F	A 2	7	45	5,697	165	28.96	2,506	35	13.97	3,371	63	18.69	1.3208	25.19	33.27
F	A 2	7	55	6,084	181	29.75	3,713	89	23.97	4,625	114	24.65	1.0767	24.18	26.04
F	A 2	7	65	675	23	34.07	406	8	19.70	469	9	19.19	1.2969	23.42	30.38
F	A 2	14	25	2,213	42	18.98	2,239	45	20.10	2,574	52	20.20	1.6154	17.67	28.54
F	A 2	14	35	2,603	61	23.43	2,419	66	27.28	2,992	77	25.74	1.7704	19.95	35.32
F	A 2	14	45	3,126	64	20.47	1,999	42	21.01	2,492	52	20.87	1.6761	17.32	29.03
F	A 2	14	55	2,630	85	32.32	1,446	32	22.13	1,844	38	20.61	1.8688	19.60	36.62
F	A 2	14	65	565	15	26.55	200	5	25.00	204	6	29.41	1.7741	27.08	48.04
F	A 2	30	25	2,580	21	8.14	1,772	18	10.16	1,810	18	9.94	2.1632	6.20	13.42
F	A 2	30	35	3,827	36	9.41	2,849	23	8.07	2,889	23	7.96	1.9299	7.74	14.94
F	A 2	30	45	4,943	53	10.72	3,041	31	10.19	3,070	32	10.42	1.8102	7.51	13.60
F	A 2	30	55	4,408	60	13.61	3,101	31	10.00	3,118	31	9.94	1.8253	9.74	17.78
F	A 2	30	65	552	8	14.49	267	0	0.00	267	0	0.00	1.6200	10.28	16.66
F	A 2	90	25	206	0	0.00	141	0	0.00	143	0	0.00	0.0000	1.78	0.00
F	A 2	90	35	519	3	5.78	260	0	0.00	264	0	0.00	2.2044	0.58	1.28
F	A 2	90	45	763	1	1.31	399	0	0.00	424	0	0.00	0.9579	1.35	1.29
F	A 2	90	55	751	0	0.00	496	3	6.05	527	3	5.69	0.0000	2.25	0.00
F	A 2	90	65	112	0	0.00	48	0	0.00	50	0	0.00	0.0000	3.60	0.00

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	A 3	0	25	2,008	115	57.27	15	2	133.33	15	2	133.33	1.0025	57.97	58.12
F	A 3	0	35	2,854	174	60.97	38	0	0.00	38	0	0.00	1.0074	53.82	54.22
F	A 3	0	45	4,157	283	68.08	51	2	39.22	51	2	39.22	0.9876	39.04	38.56
F	A 3	0	55	3,568	214	59.98	101	2	19.80	101	2	19.80	0.9919	40.15	39.83
F	A 3	0	65	'865	47	54.34	37	0	0.00	37	0	0.00	0.9980	33.17	33.10
F	A 3	7	25	2,820	126	44.68	343	8	23.32	372	9	24.19	1.0007	17.42	17.43
F	A 3	7	35	3,787	174	45.95	1,054	46	43.64	1,114	51	45.78	1.0013	33.41	33.46
F	A 3	7	45	4,414	252	57.09	1,204	31	25.75	1,243	35	28.16	1.0000	34.60	34.60
F	A 3	7	55	2,806	127	45.26	1,229	42	34.17	1,260	44	34.92	1.0000	44.32	44.32
F	A 3	7	65	123	0	0.00	55	4	72.73	57	4	70.18	0.0000	58.14	0.00
F	A 3	14	25	1,362	23	16.89	1,390	34	24.46	1,393	34	24.41	1.0000	29.02	29.02
F	A 3	14	35	1,411	34	24.10	1,482	56	37.79	1,491	57	38.23	1.0000	30.26	30.26
F	A 3	14	45	1,649	54	32.75	1,366	51	37.34	1,379	51	36.98	1.0006	39.04	39.07
F	A 3	14	55	1,161	38	32.73	868	29	33.41	879	29	32.99	1.0000	32.19	32.19
F	A 3	14	65	222	12	54.05	127	3	23.62	127	3	23.62	1.0000	18.18	18.18
F	A 3	30	25	1,507	9	5.97	828	13	15.70	840	13	15.48	1.0000	13.98	13.98
F	A 3	30	35	1,644	23	13.99	1,125	26	23.11	1,138	26	22.85	1.0030	19.71	19.77
F	A 3	30	45	2,028	59	29.09	1,066	29	27.20	1,088	29	26.65	0.9882	20.19	19.95
F	A 3	30	55	1,327	37	27.88	838	23	27.45	847	23	27.15	1.0038	18.90	18.97
F	A 3	30	65	174	2	11.49	49	2	40.82	51	2	39.22	1.0000	25.51	25.51
F	A 3	90	25	89	0	0.00	43	0	0.00	43	0	0.00	0.0000	0.00	0.00
F	A 3	90	35	90	3	33.33	51	0	0.00	51	0	0.00	1.0444	5.00	5.22
F	A 3	90	45	183	4	21.86	32	1	31.25	32	1	31.25	1.0000	8.85	8.85
F	A 3	90	55	186	3	16.13	35	0	0.00	35	0	0.00	1.0108	0.00	0.00
F	A 3	90	65	43	0	0.00	8	0	0.00	8	0	0.00	0.0000	0.00	0.00

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	A 4	0	25	5	0	0.00	1	0	0.00	1	0	0.00	0.0000	57.97	0.00
F	A 4	0	35	21	0	0.00	0	0	0.00	0	0	0.00	0.0000	53.82	0.00
F	A 4	0	45	79	9	113.92	4	0	0.00	4	0	0.00	1.6527	39.04	64.52
F	A 4	0	55	120	9	75.00	8	0	0.00	8	0	0.00	1.2404	40.15	49.81
F	A 4	0	65	35	2	57.14	4	0	0.00	4	0	0.00	1.0496	33.17	34.81
F	A 4	7	25	2	0	0.00	2	0	0.00	2	0	0.00	0.0000	17.42	0.00
F	A 4	7	35	5	0	0.00	2	0	0.00	2	0	0.00	0.0000	33.41	0.00
F	A 4	7	45	0	0	0.00	2	1	500.00	2	1	500.00	0.0000	34.60	0.00
F	A 4	7	55	0	0	0.00	2	0	0.00	2	0	0.00	0.0000	44.32	0.00
F	A 4	7	65	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	58.14	0.00
F	A 4	14	25	0	0	0.00	45	0	0.00	45	0	0.00	0.0000	29.02	0.00
F	A 4	14	35	0	0	0.00	55	0	0.00	55	0	0.00	0.0000	30.26	0.00
F	A 4	14	45	1	0	0.00	43	0	0.00	44	0	0.00	0.0000	39.04	0.00
F	A 4	14	55	0	0	0.00	23	0	0.00	23	0	0.00	0.0000	32.19	0.00
F	A 4	14	65	0	0	0.00	1	0	0.00	1	0	0.00	0.0000	18.18	0.00
F	A 4	30	25	0	0	0.00	43	1	23.26	43	1	23.26	0.0000	13.98	0.00
F	A 4	30	35	5	0	0.00	43	1	23.26	44	1	22.73	0.0000	19.71	0.00
F	A 4	30	45	10	1	100.00	28	0	0.00	28	0	0.00	3.3967	20.19	68.57
F	A 4	30	55	5	0	0.00	5	0	0.00	5	0	0.00	0.0000	18.90	0.00
F	A 4	30	65	0	0	0.00	2	0	0.00	2	0	0.00	0.0000	25.51	0.00
F	A 4	90	25	0	0	0.00	1	0	0.00	1	0	0.00	0.0000	0.00	0.00
F	A 4	90	35	4	0	0.00	1	0	0.00	1	0	0.00	0.0000	5.00	0.00
F	A 4	90	45	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	8.85	0.00
F	A 4	90	55	2	0	0.00	2	0	0.00	2	0	0.00	0.0000	0.00	0.00
F	A 4	90	65	2	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original			New York Ratios	SOA Two Occ.	Generated Four Occ.
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate			
F	S 1	0	25	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00
F	S 1	0	35	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	81.08	0.00
F	S 1	0	45	0	0	0.00	2	0	0.00	2	0	0.00	0.0000	171.05	0.00
F	S 1	0	55	0	0	0.00	9	1	111.11	9	1	111.11	0.0000	168.61	0.00
F	S 1	0	65	0	0	0.00	2	0	0.00	2	0	0.00	0.0000	170.48	0.00
F	S 1	7	25	13,158	1,010	76.76	918	76	82.79	1,851	144	77.80	0.9461	65.09	61.58
F	S 1	7	35	16,976	1,733	102.09	1,615	142	87.93	3,748	404	107.79	0.9494	86.95	82.55
F	S 1	7	45	26,946	2,926	108.59	1,551	165	106.38	4,915	566	115.16	0.9310	100.52	93.58
F	S 1	7	55	29,330	3,093	105.46	1,752	155	88.47	7,462	729	97.69	0.9433	95.27	89.87
F	S 1	7	65	4,362	413	94.68	455	51	112.09	748	94	125.67	0.9055	102.14	92.49
F	S 1	14	25	7,619	246	32.29	2,870	140	48.78	3,233	158	48.87	0.8774	44.51	39.05
F	S 1	14	35	8,958	443	49.45	2,992	228	76.20	3,897	286	73.39	0.8208	63.66	52.25
F	S 1	14	45	12,379	819	66.16	2,347	189	80.53	3,656	281	76.86	0.8735	77.45	67.66
F	S 1	14	55	10,533	701	66.55	2,022	162	80.12	3,444	261	75.78	0.8642	71.14	61.48
F	S 1	14	65	2,783	169	60.73	519	47	90.56	560	52	92.86	0.8509	81.66	69.48
F	S 1	30	25	13,822	124	8.97	4,828	62	12.84	4,988	63	12.63	0.7971	15.88	12.66
F	S 1	30	35	19,468	427	21.93	5,990	145	24.21	6,277	149	23.74	0.8845	22.32	19.74
F	S 1	30	45	27,440	837	30.50	4,946	162	32.75	5,207	168	32.26	0.9091	32.75	29.77
F	S 1	30	55	22,034	691	31.36	3,811	118	30.96	3,936	123	31.25	0.9115	35.09	31.98
F	S 1	30	65	4,865	157	32.27	662	27	40.79	664	27	40.66	0.9124	44.82	40.89
F	S 1	90	25	2,442	4	1.64	706	3	4.25	763	3	3.93	1.0864	1.78	1.93
F	S 1	90	35	3,820	19	4.97	1,310	4	3.05	1,449	4	2.76	1.0840	3.48	3.77
F	S 1	90	45	5,995	50	8.34	954	4	4.19	1,263	5	3.96	0.9726	4.83	4.70
F	S 1	90	55	5,697	67	11.76	653	7	10.72	1,049	9	8.58	0.9618	11.77	11.32
F	S 1	90	65	955	14	14.66	80	2	25.00	89	3	33.71	0.8731	20.48	17.88

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	S 2	0	25	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00
F	S 2	0	35	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	81.08	0.00
F	S 2	0	45	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	171.05	0.00
F	S 2	0	55	0	0	0.00	2	1	500.00	2	1	500.00	0.0000	168.61	0.00
F	S 2	0	65	0	0	0.00	7	0	0.00	7	0	0.00	0.0000	170.48	0.00
F	S 2	7	25	4,024	384	95.43	514	36	70.04	813	72	88.56	1.1762	65.09	76.56
F	S 2	7	35	5,725	708	123.67	1,578	158	100.13	2,193	241	109.90	1.1501	86.95	100.00
F	S 2	7	45	8,831	1,247	141.21	2,587	281	108.62	3,460	405	117.05	1.2106	100.52	121.69
F	S 2	7	55	9,553	1,254	131.27	3,878	339	87.42	4,795	452	94.26	1.1742	95.27	111.87
F	S 2	7	65	1,778	229	128.80	559	45	80.50	622	54	86.82	1.2318	102.14	125.81
F	S 2	14	25	2,571	129	50.18	2,258	113	50.04	2,594	132	50.89	1.3634	44.51	60.68
F	S 2	14	35	3,142	286	91.02	2,429	211	86.87	3,002	243	80.95	1.5108	63.66	96.18
F	S 2	14	45	4,178	435	104.12	2,020	175	86.63	2,516	217	86.25	1.3747	77.45	106.47
F	S 2	14	55	3,776	401	106.20	1,468	136	92.64	1,866	175	93.78	1.3789	71.14	98.10
F	S 2	14	65	888	93	104.73	204	15	73.53	208	15	72.12	1.4674	81.66	119.83
F	S 2	30	25	2,881	64	22.21	1,775	34	19.15	1,814	34	18.74	1.9737	15.88	31.34
F	S 2	30	35	4,284	162	37.82	2,863	106	37.02	2,904	106	36.50	1.5249	22.32	34.04
F	S 2	30	45	5,76:	277	48.08	3,049	138	45.26	3,078	141	45.81	1.4330	32.75	46.93
F	S 2	30	55	5,258	248	47.17	3,114	132	42.39	3,131	133	42.48	1.3709	35.09	48.10
F	S 2	30	65	761	42	55.19	272	15	55.15	272	15	55.15	1.5603	44.82	69.94
F	S 2	90	25	211	0	0.00	145	0	0.00	147	0	0.00	0.0000	1.78	0.00
F	S 2	90	35	539	1	1.86	260	0	0.00	264	0	0.00	0.4044	3.48	1.41
F	S 2	90	45	769	8	10.40	397	2	5.04	422	2	4.74	1.2132	4.83	5.86
F	S 2	90	55	764	12	15.71	494	6	12.15	525	6	11.43	1.2846	11.77	15.12
F	S 2	90	65	117	4	34.19	48	1	20.83	50	1	20.00	2.0361	20.48	41.71

EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	S 3	0	25	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00
F	S 3	0	35	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00
F	S 3	0	45	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	121.21	0.00
F	S 3	0	55	0	0	0.00	2	0	0.00	2	0	0.00	0.0000	150.38	0.00
F	S 3	0	65	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	311.11	0.00
F	S 3	7	25	4,762	551	115.71	348	34	97.70	377	40	106.10	0.9988	77.11	77.02
F	S 3	7	35	6,135	990	161.37	1,088	141	129.60	1,148	151	131.53	1.0029	116.98	117.32
F	S 3	7	45	7,772	1,412	181.68	1,235	193	156.28	1,274	201	157.77	1.0047	127.79	128.40
F	S 3	7	55	5,549	957	172.46	1,318	171	129.74	1,349	178	131.95	1.0050	130.36	131.01
F	S 3	7	65	774	125	161.50	83	9	108.43	85	9	105.88	1.0106	115.38	116.61
F	S 3	14	25	1,466	70	47.75	1,392	114	81.90	1,395	115	82.44	1.0000	60.92	60.92
F	S 3	14	35	1,595	166	104.08	1,487	179	120.38	1,496	181	120.99	1.0013	97.69	97.82
F	S 3	14	45	1,971	235	119.23	1,379	218	158.09	1,392	219	157.33	1.0005	133.38	133.45
F	S 3	14	55	1,548	164	105.94	889	117	131.61	900	117	130.00	1.0019	104.87	105.08
F	S 3	14	65	315	41	130.16	135	13	96.30	135	13	96.30	1.0159	95.13	96.64
F	S 3	30	25	1,616	34	21.04	835	32	38.32	847	33	38.96	1.0025	26.18	26.25
F	S 3	30	35	1,855	87	46.90	1,126	66	58.61	1,139	66	57.95	1.0022	48.78	48.89
F	S 3	30	45	2,349	167	71.09	1,077	74	68.71	1,099	74	67.33	1.0072	54.22	54.61
F	S 3	30	55	1,656	98	59.18	838	61	72.79	848	61	71.93	1.0042	61.43	61.69
F	S 3	30	65	251	16	63.75	50	1	20.00	52	1	19.23	1.0080	74.77	75.36
F	S 3	90	25	92	3	32.61	43	0	0.00	43	0	0.00	1.0000	0.00	0.00
F	S 3	90	35	90	4	44.44	51	1	19.61	51	1	19.61	1.0444	0.00	0.00
F	S 3	90	45	183	5	27.32	32	0	0.00	32	0	0.00	1.0000	8.85	8.85
F	S 3	90	55	184	6	32.61	35	0	0.00	35	0	0.00	1.0109	10.31	10.42
F	S 3	90	65	42	5	119.05	8	0	0.00	8	0	0.00	1.0476	0.00	0.00

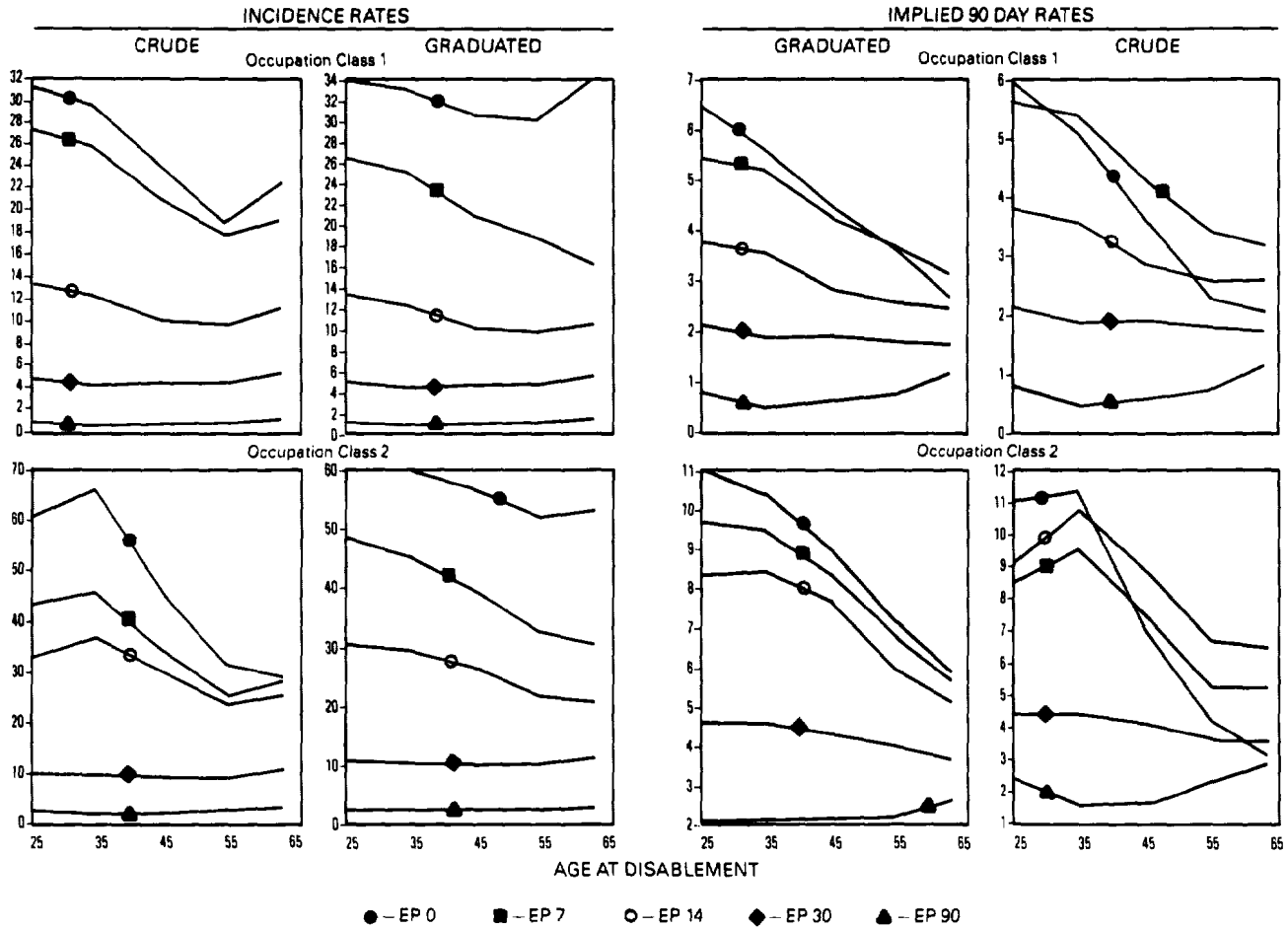
EXHIBIT C-1—*Continued*

(FOUR OCC. DATA)

				New York Study			Four Company Decennial			Five Company Original				SOA	Generated
S	C OC	EP	X	Exposure	Claims	Rate	Exposure	Claims	Rate	Exposure	Claims	Rate	New York Ratios	Two Occ.	Four Occ.
F	S 4	0	25	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00
F	S 4	0	35	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00
F	S 4	0	45	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	121.21	0.00
F	S 4	0	55	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	150.38	0.00
F	S 4	0	65	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	311.11	0.00
F	S 4	7	25	3	1	333.33	2	0	0.00	2	0	0.00	2.8774	77.11	221.88
F	S 4	7	35	24	1	41.67	2	0	0.00	2	0	0.00	0.2590	116.98	30.29
F	S 4	7	45	70	6	85.71	5	0	0.00	5	0	0.00	0.4740	127.79	60.58
F	S 4	7	55	121	16	132.23	10	1	100.00	10	1	100.00	0.7706	130.36	100.45
F	S 4	7	65	27	3	111.11	4	1	250.00	4	1	250.00	0.6953	115.38	80.23
F	S 4	14	25	0	0	0.00	46	0	0.00	46	0	0.00	0.0000	60.92	0.00
F	S 4	14	35	2	0	0.00	55	2	36.36	55	2	36.36	0.0000	97.69	0.00
F	S 4	14	45	1	0	0.00	43	1	23.26	44	2	45.45	0.0000	133.38	0.00
F	S 4	14	55	3	0	0.00	23	5	217.39	23	5	217.39	0.0000	104.87	0.00
F	S 4	14	65	5	0	0.00	1	0	0.00	1	0	0.00	0.0000	95.13	0.00
F	S 4	30	25	4	0	0.00	43	2	46.51	43	2	46.51	0.0000	26.18	0.00
F	S 4	30	35	4	0	0.00	43	1	23.26	44	1	22.73	0.0000	48.78	0.00
F	S 4	30	45	17	0	0.00	29	1	34.48	29	1	34.48	0.0000	54.22	0.00
F	S 4	30	55	7	0	0.00	5	0	0.00	5	0	0.00	0.0000	61.43	0.00
F	S 4	30	65	2	0	0.00	2	0	0.00	2	0	0.00	0.0000	74.77	0.00
F	S 4	90	25	0	0	0.00	1	0	0.00	1	0	0.00	0.0000	0.00	0.00
F	S 4	90	35	4	0	0.00	1	0	0.00	1	0	0.00	0.0000	0.00	0.00
F	S 4	90	45	0	0	0.00	0	0	0.00	0	0	0.00	0.0000	8.85	0.00
F	S 4	90	55	2	0	0.00	2	0	0.00	2	0	0.00	0.0000	10.31	0.00
F	S 4	90	65	2	0	0.00	0	0	0.00	0	0	0.00	0.0000	0.00	0.00

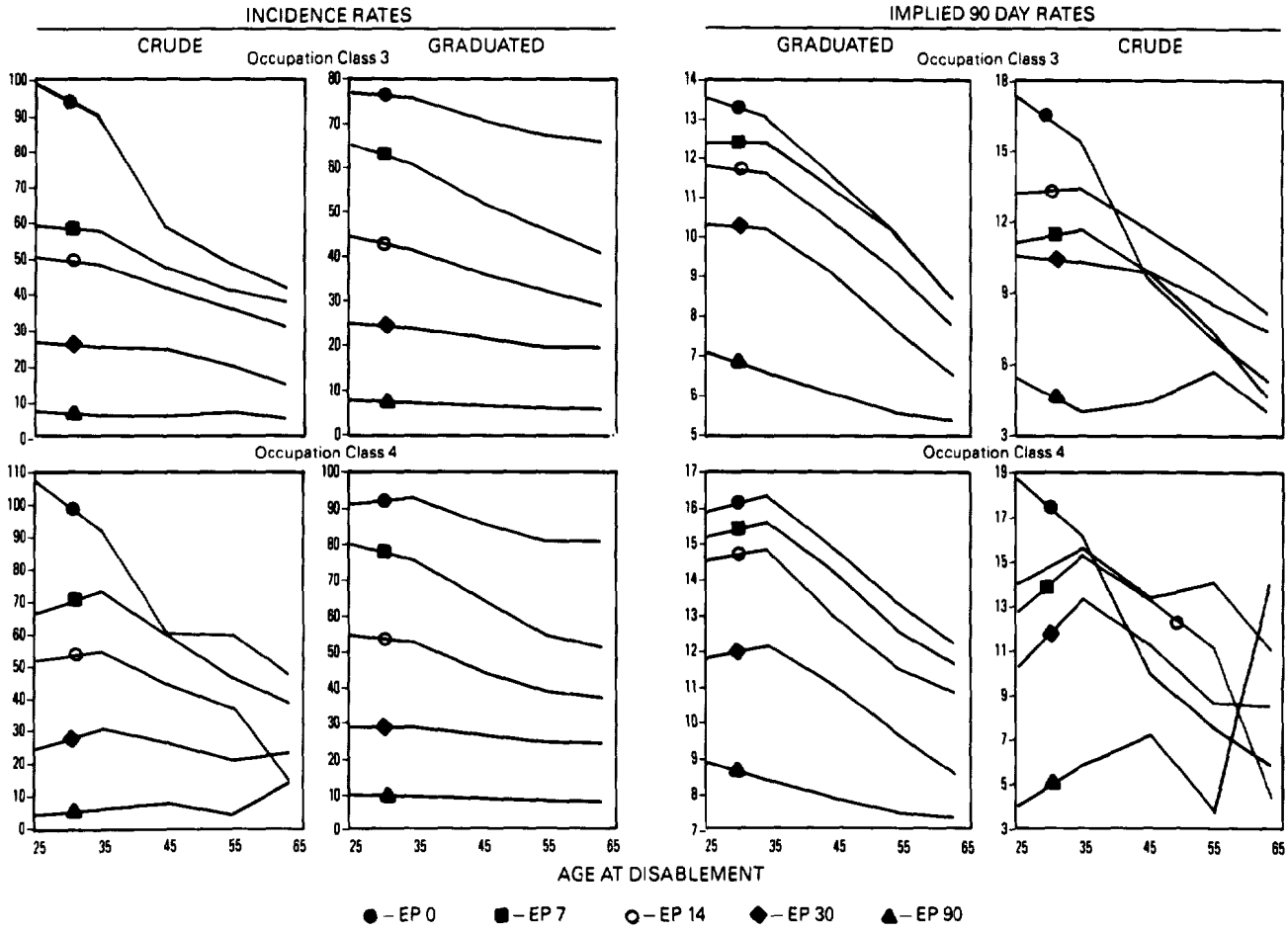
EXHIBIT C-2

RATES PER 1000
ACCIDENT - MALE



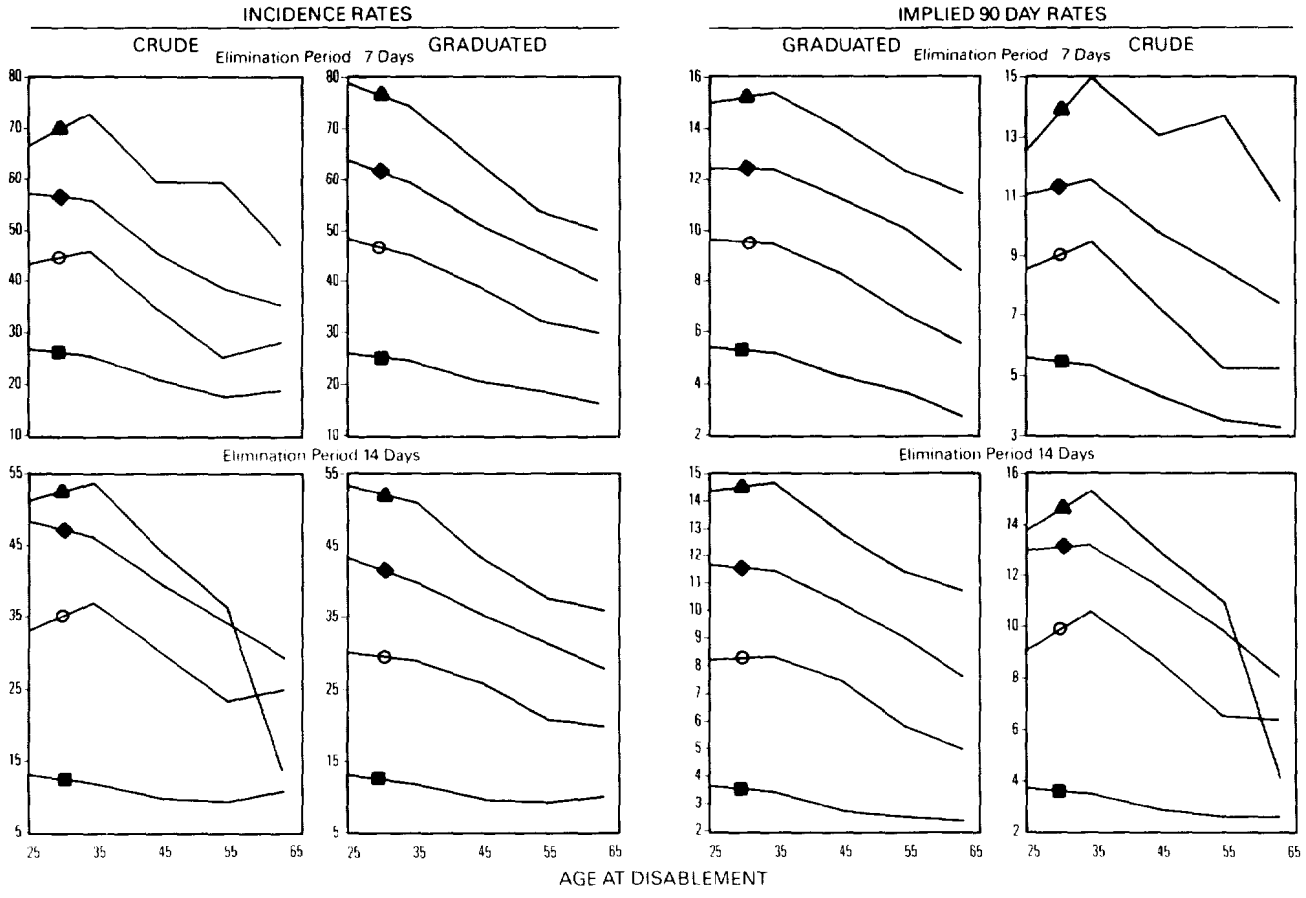
RATES PER 1000
ACCIDENT - MALE

Exhibit C-2 (Continued)



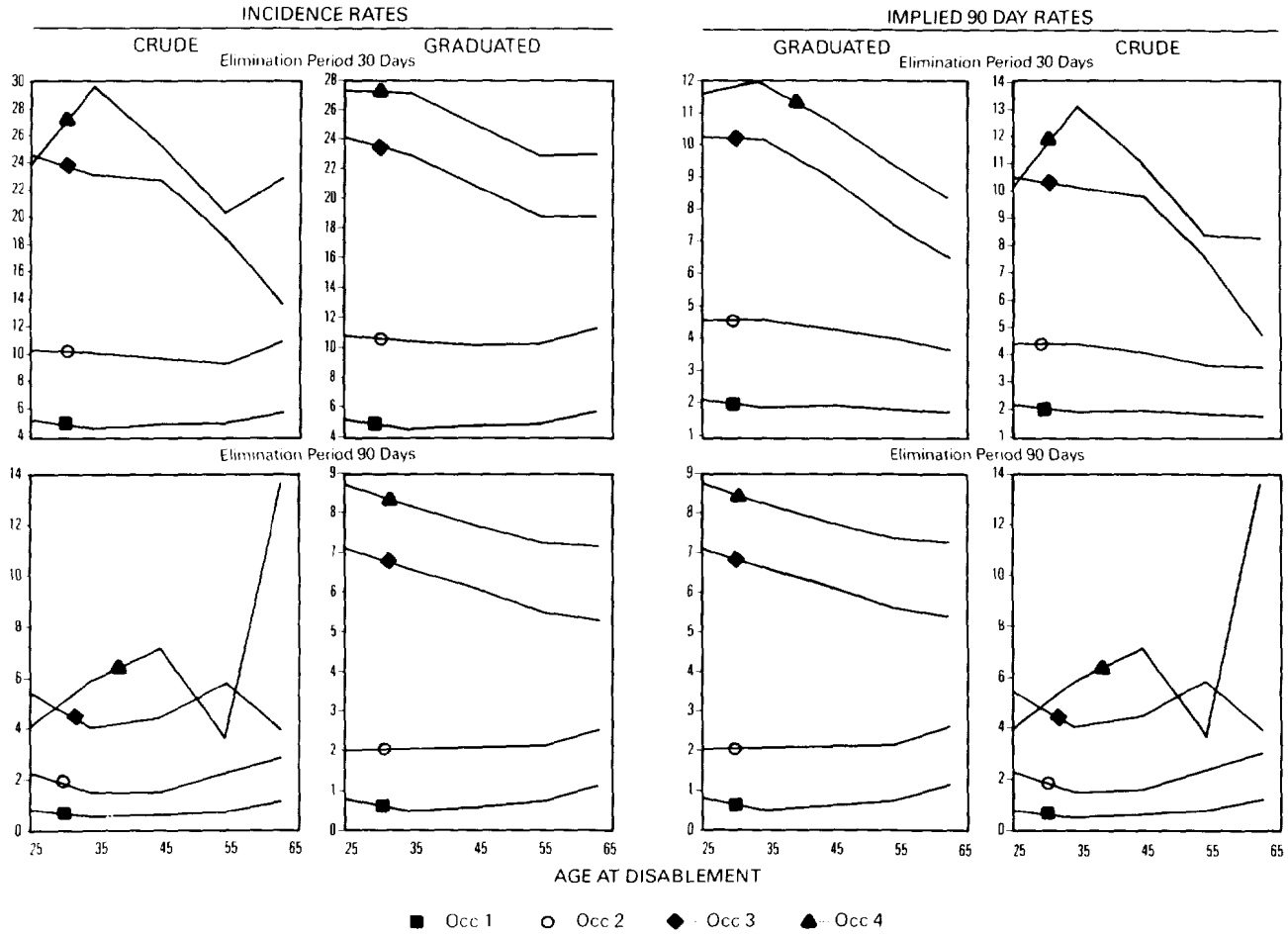
RATES PER 1000
ACCIDENT - MALE

Exhibit C-2 (Continued)



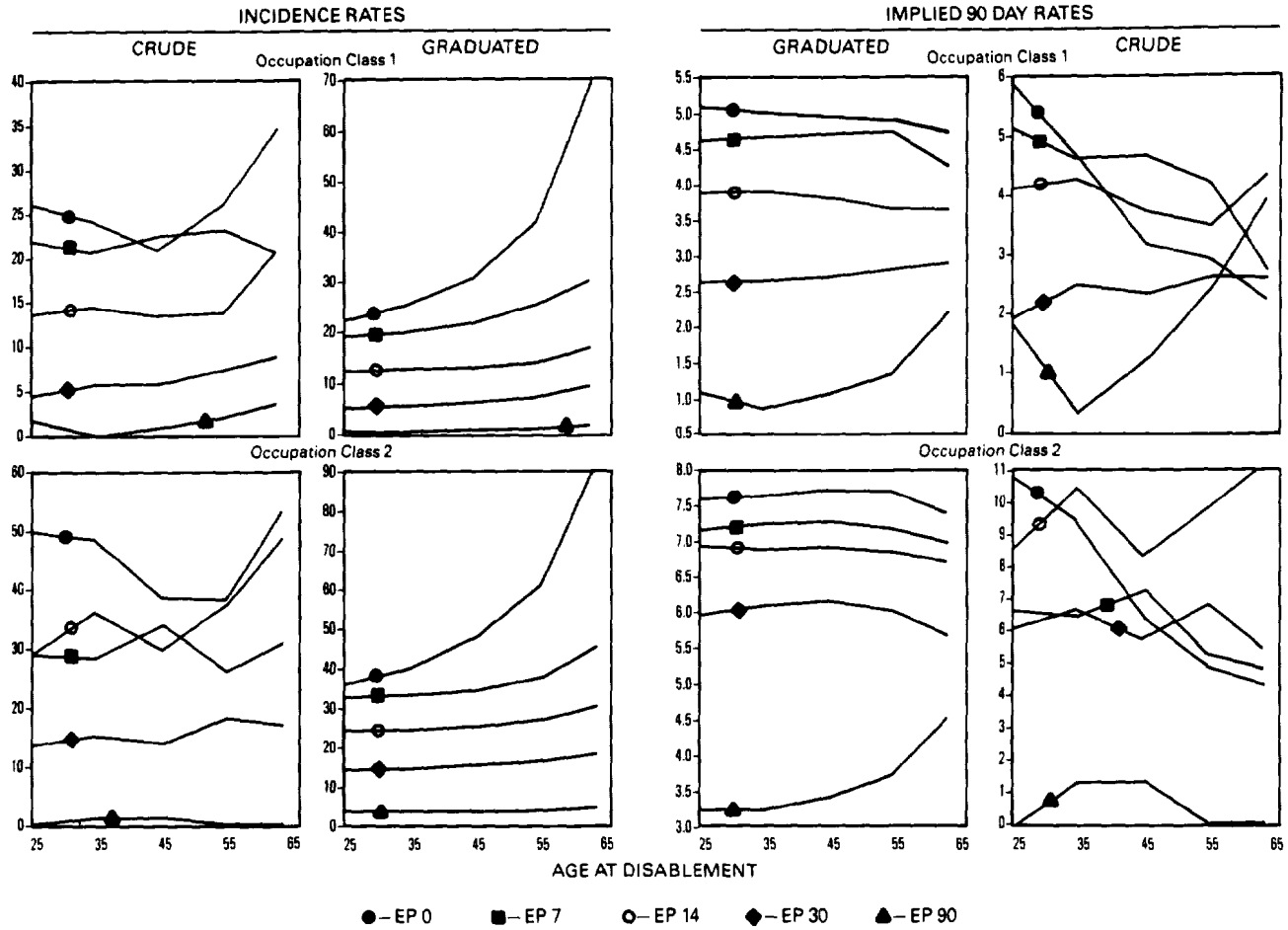
RATES PER 1000
ACCIDENT - MALE

Exhibit C-2 (Continued)



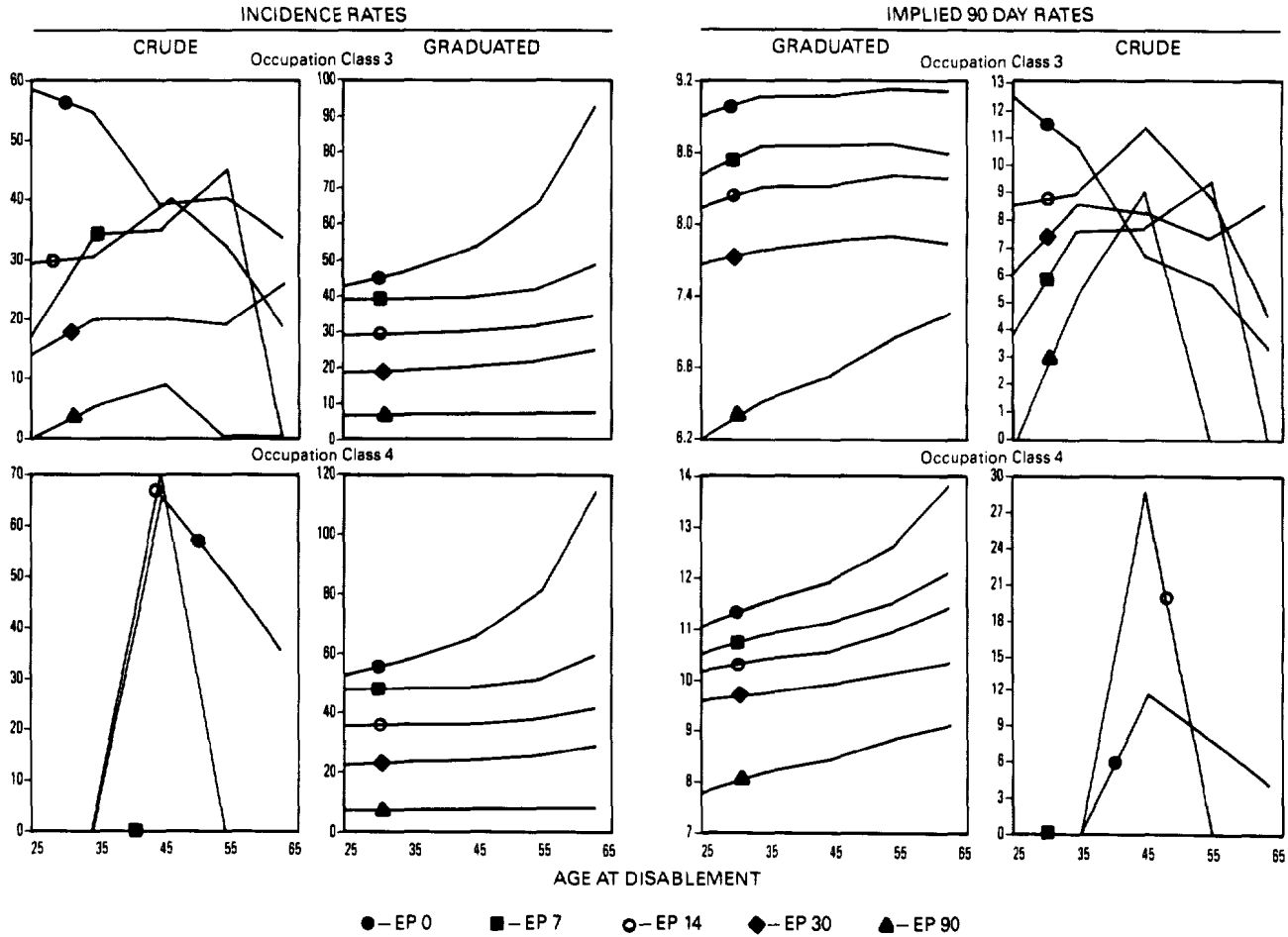
RATES PER 1000
ACCIDENT - FEMALE

Exhibit C-2 (Continued)



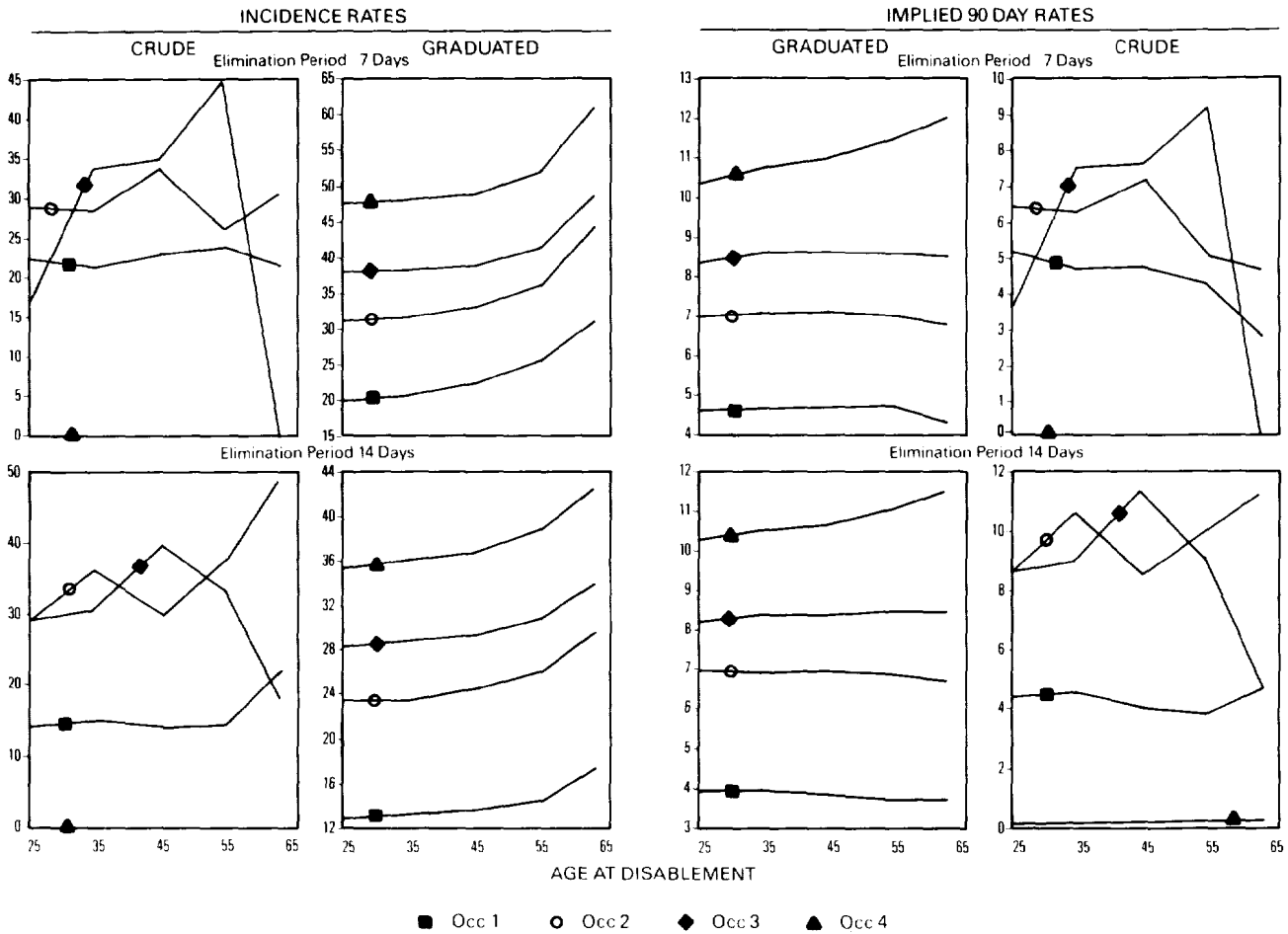
RATES PER 1000
ACCIDENT - FEMALE

Exhibit C-2 (Continued)



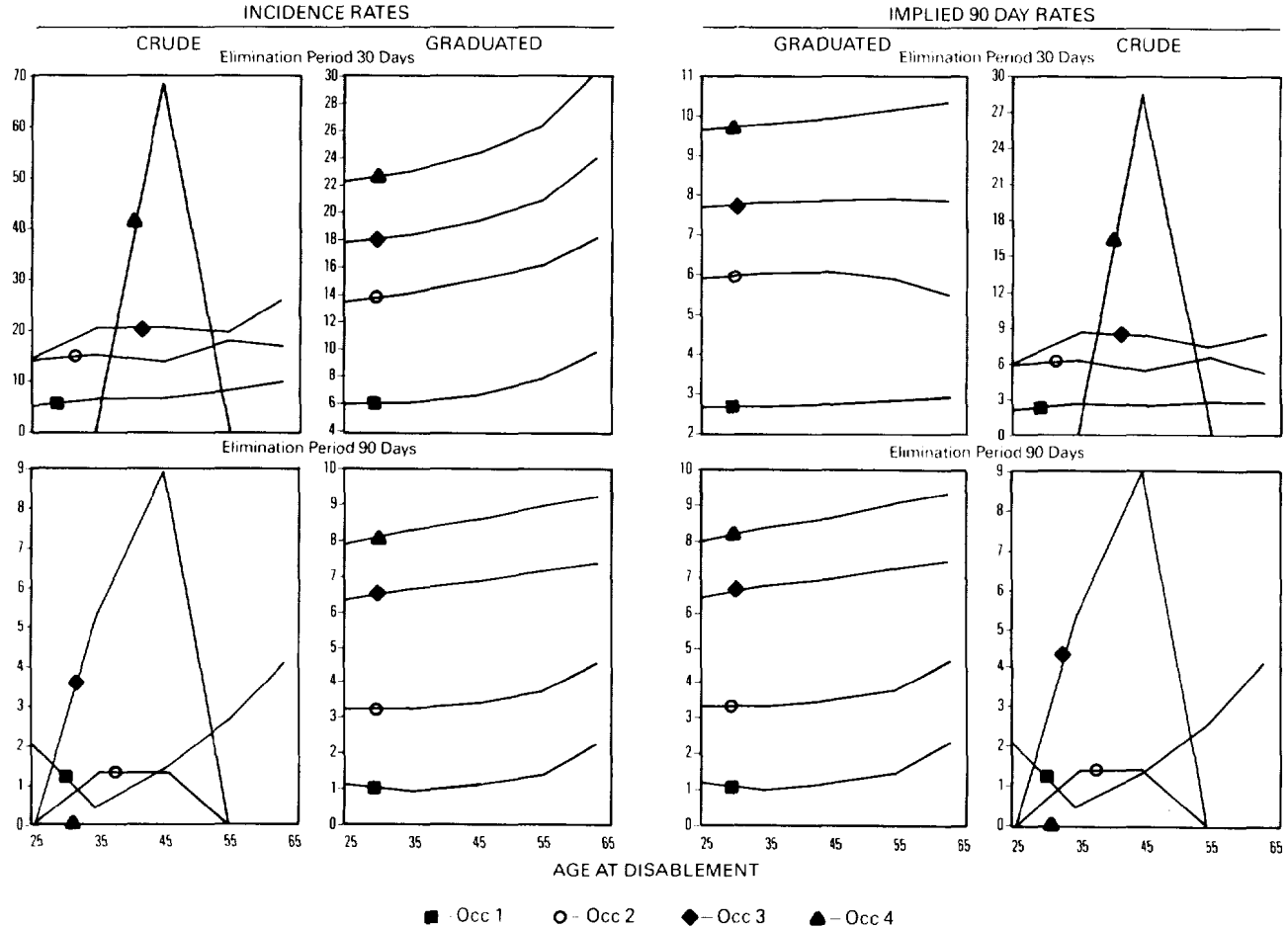
RATES PER 1000
ACCIDENT - FEMALE

Exhibit C-2 (Continued)



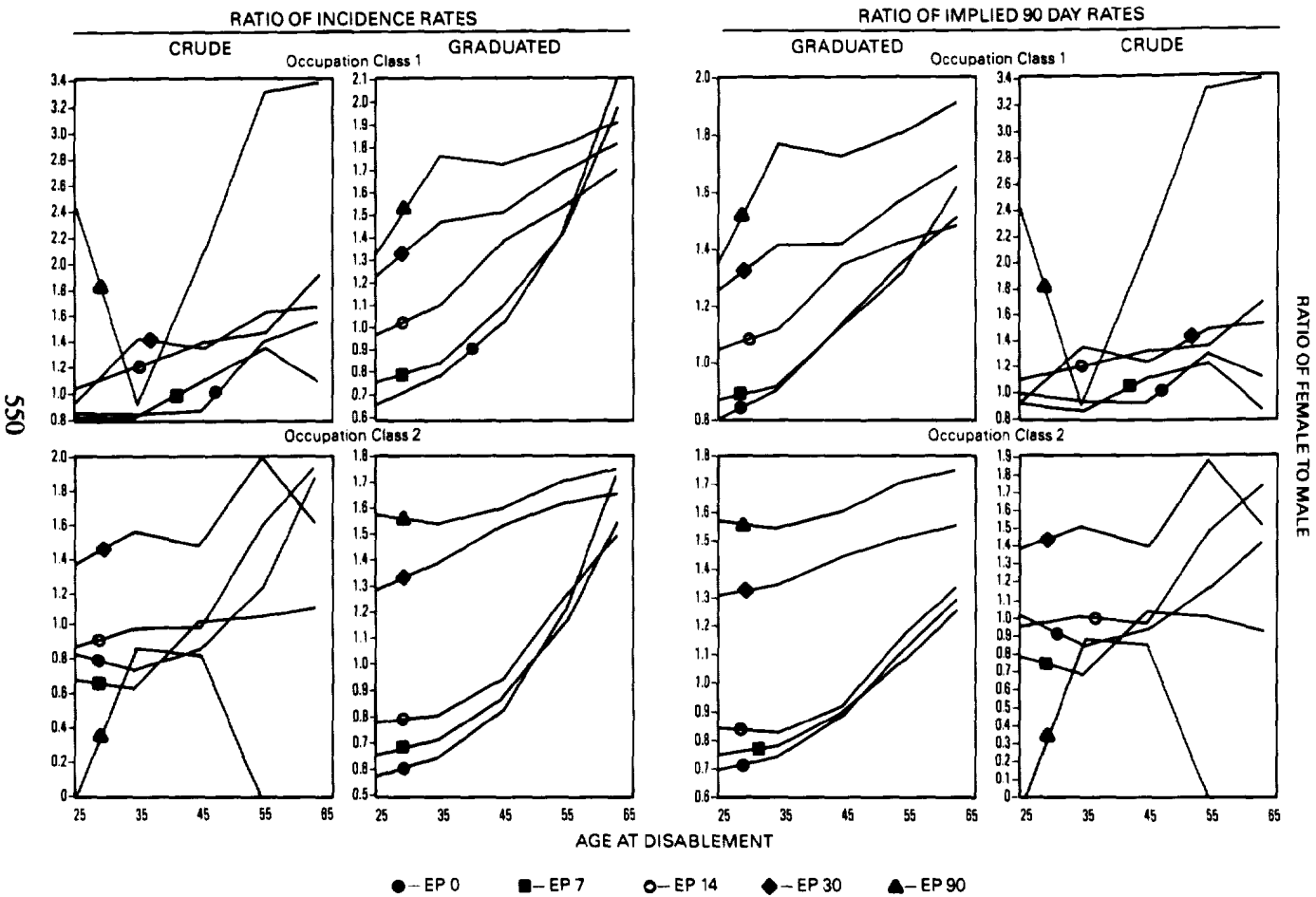
RATES PER 1000
ACCIDENT - FEMALE

Exhibit C-2 (Continued)



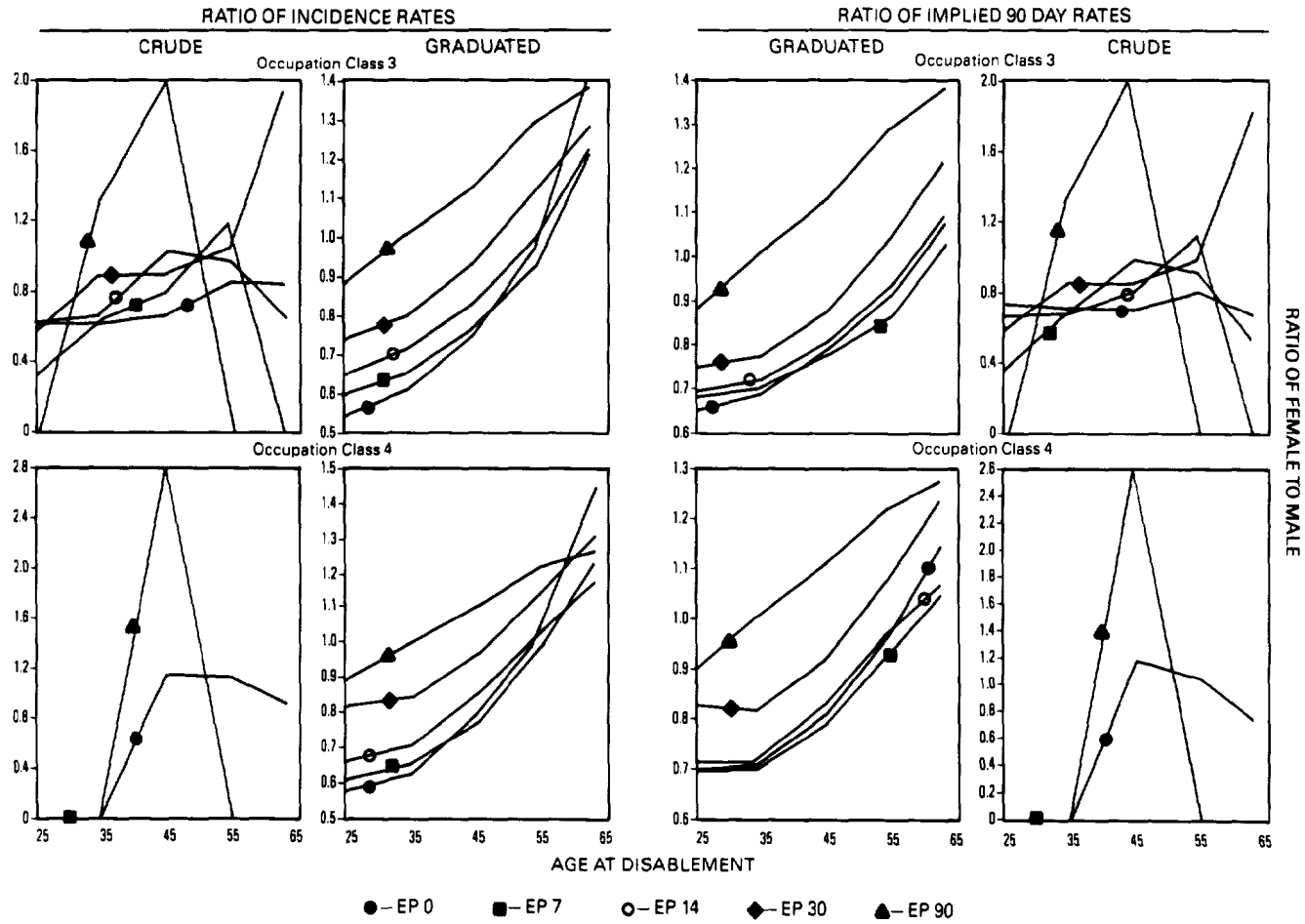
RATIO OF FEMALE TO MALE ACCIDENT

Exhibit C-2 (Continued)



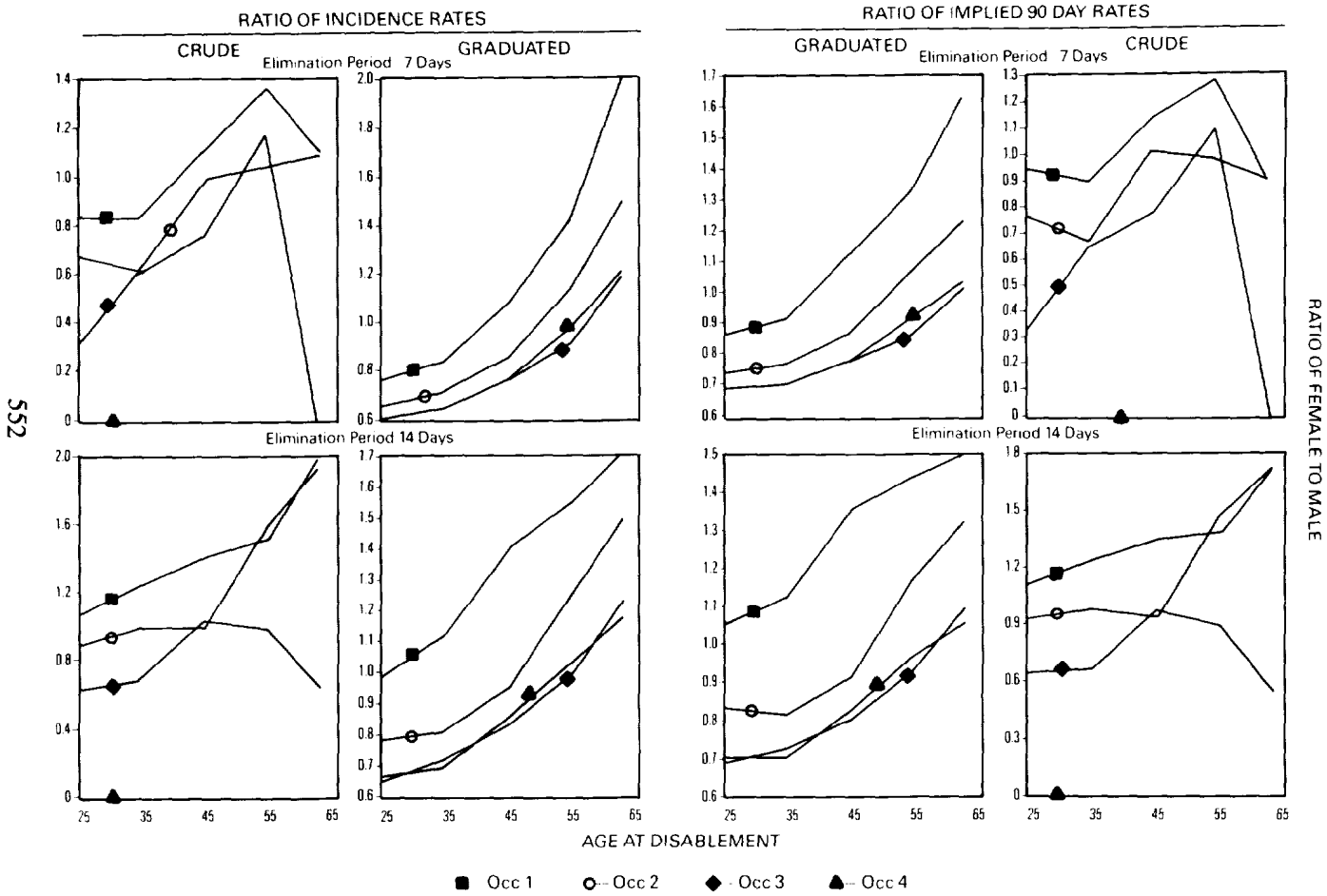
RATIO OF FEMALE TO MALE ACCIDENT

Exhibit C-2 (Continued)



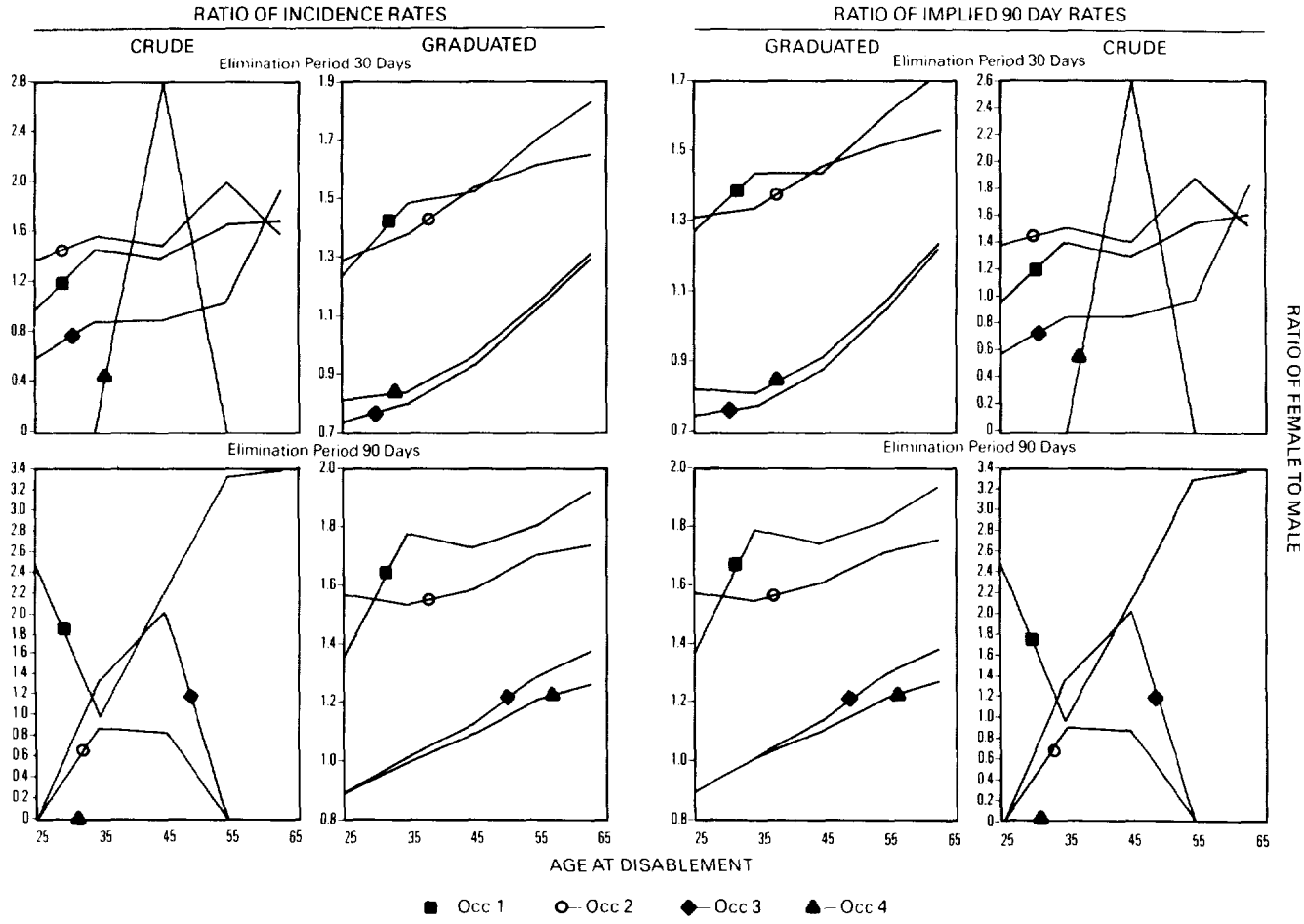
RATIO OF FEMALE TO MALE ACCIDENT

Exhibit C-2 (Continued)



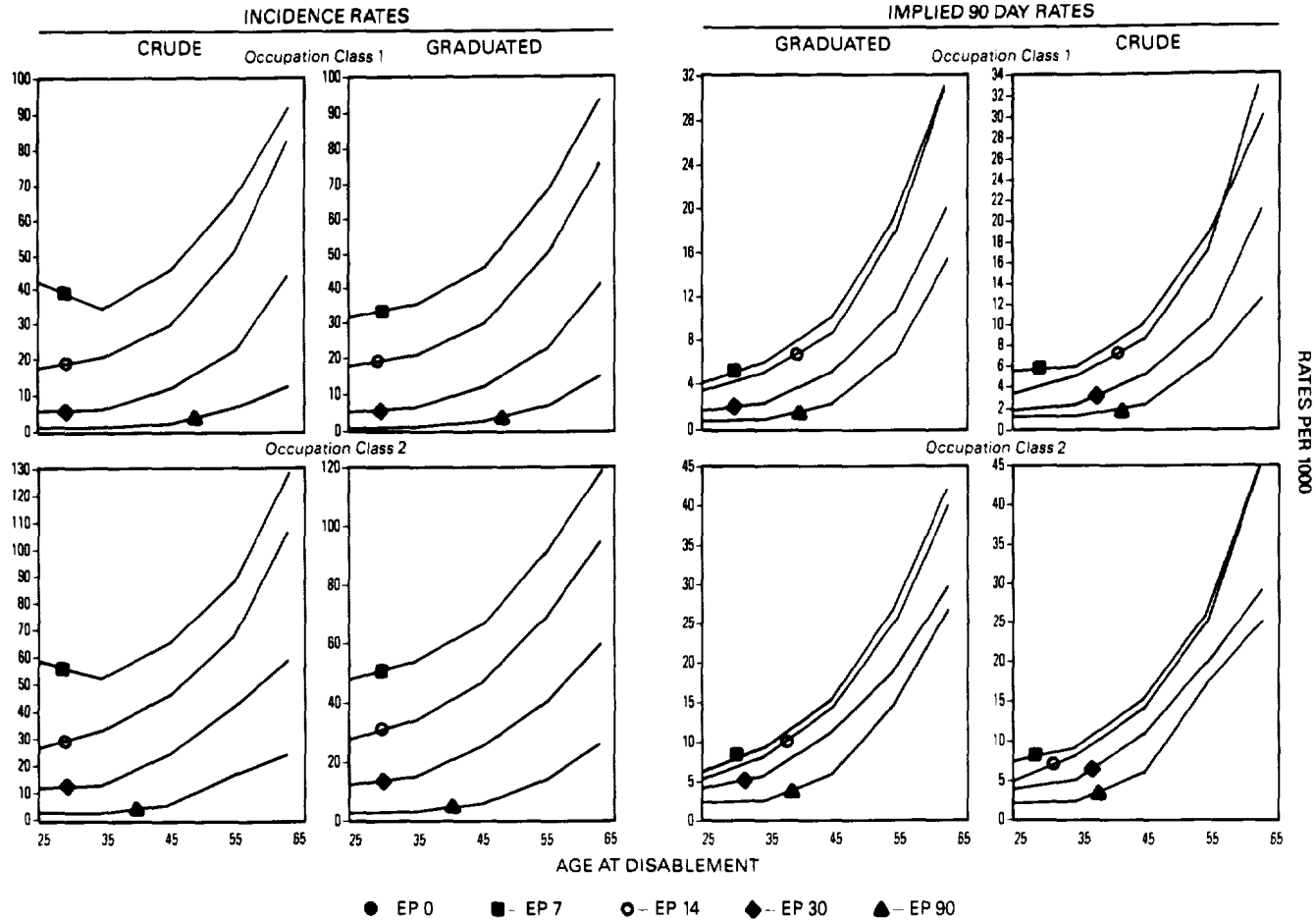
RATIO OF FEMALE TO MALE ACCIDENT

Exhibit C-2 (Continued)



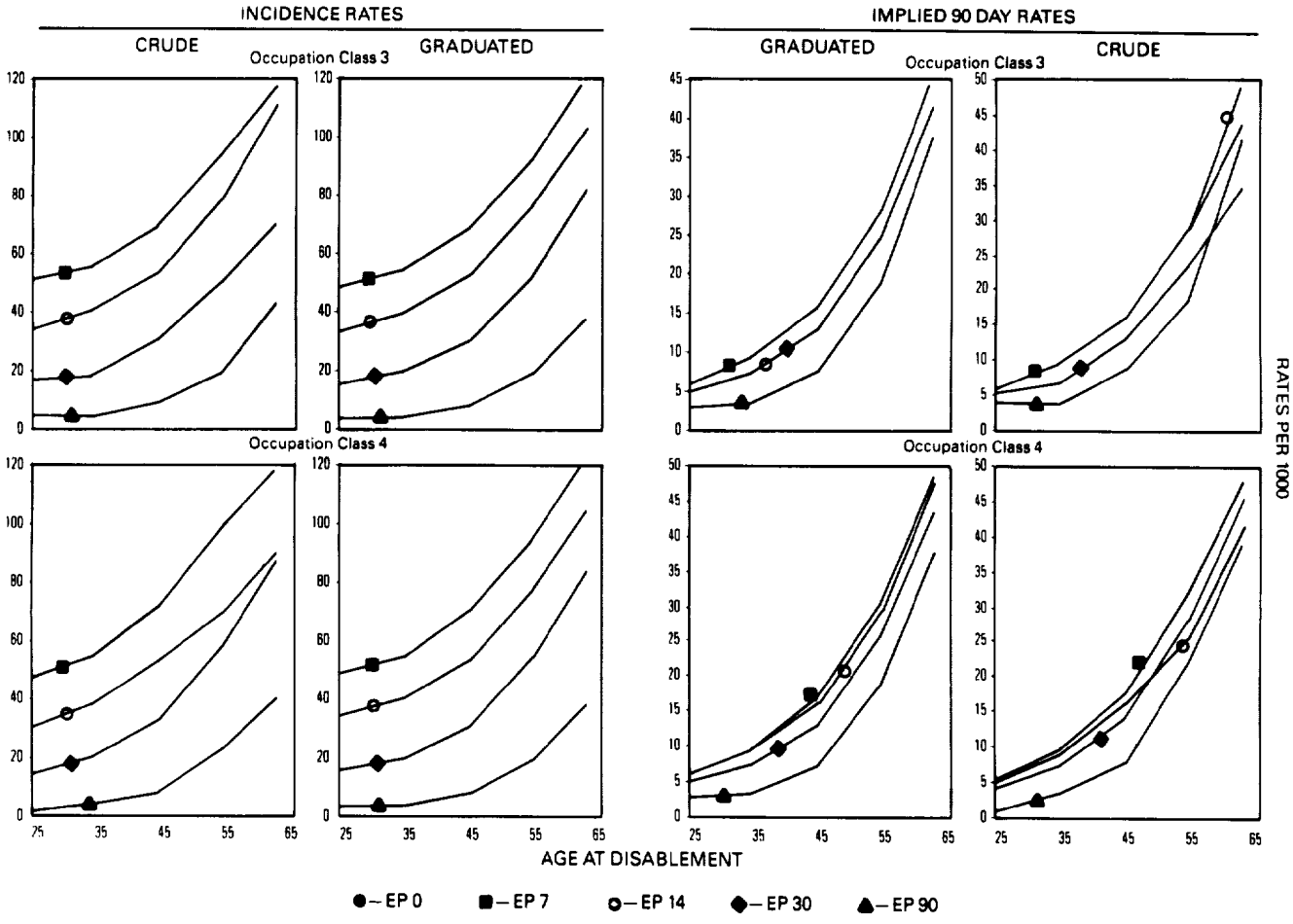
RATES PER 1000
SICKNESS - MALE

Exhibit C-2 (Continued)



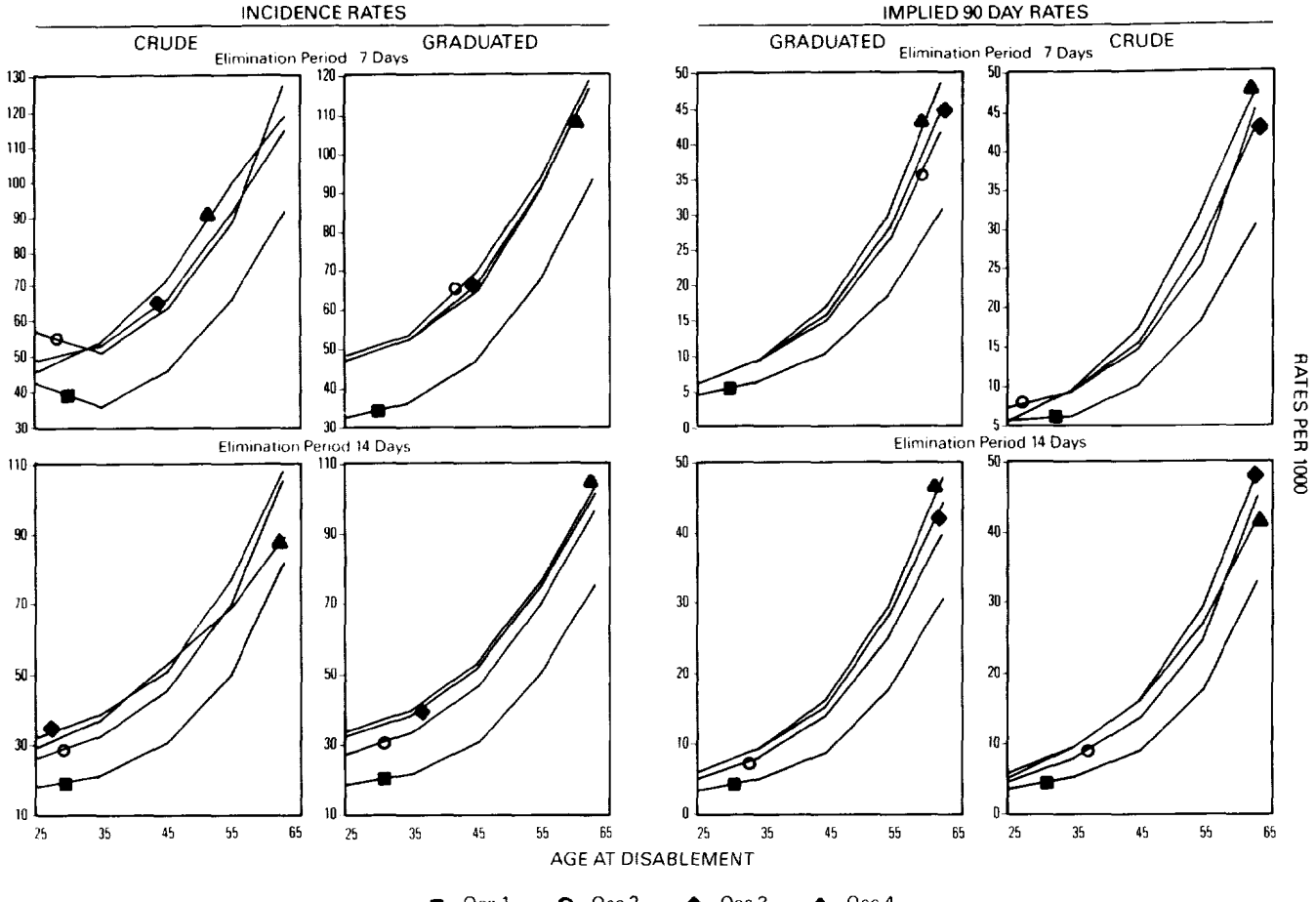
RATES PER 1000
SICKNESS – MALE

Exhibit C-2 (Continued)



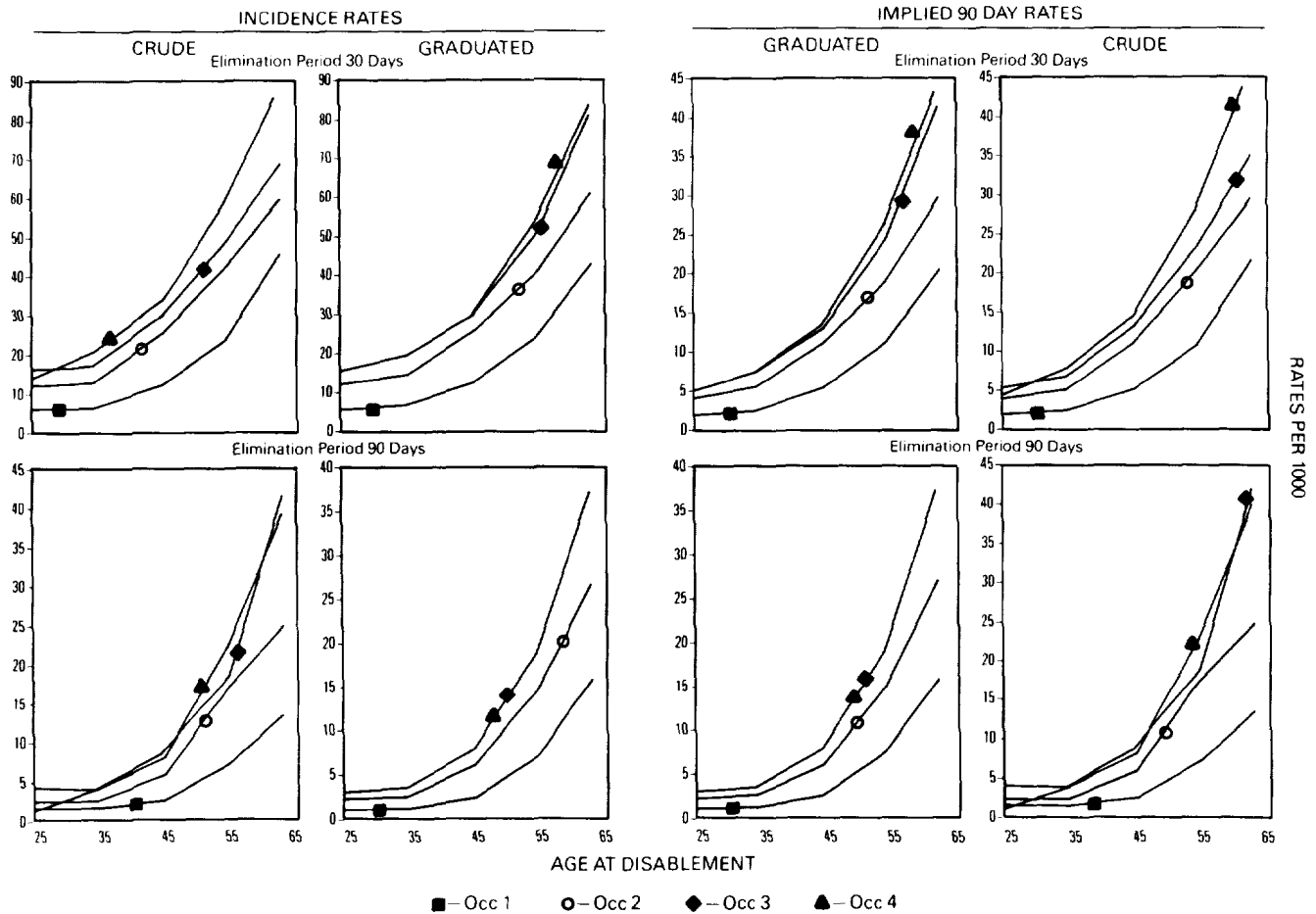
RATES PER 1000
SICKNESS – MALE

Exhibit C-2 (Continued)



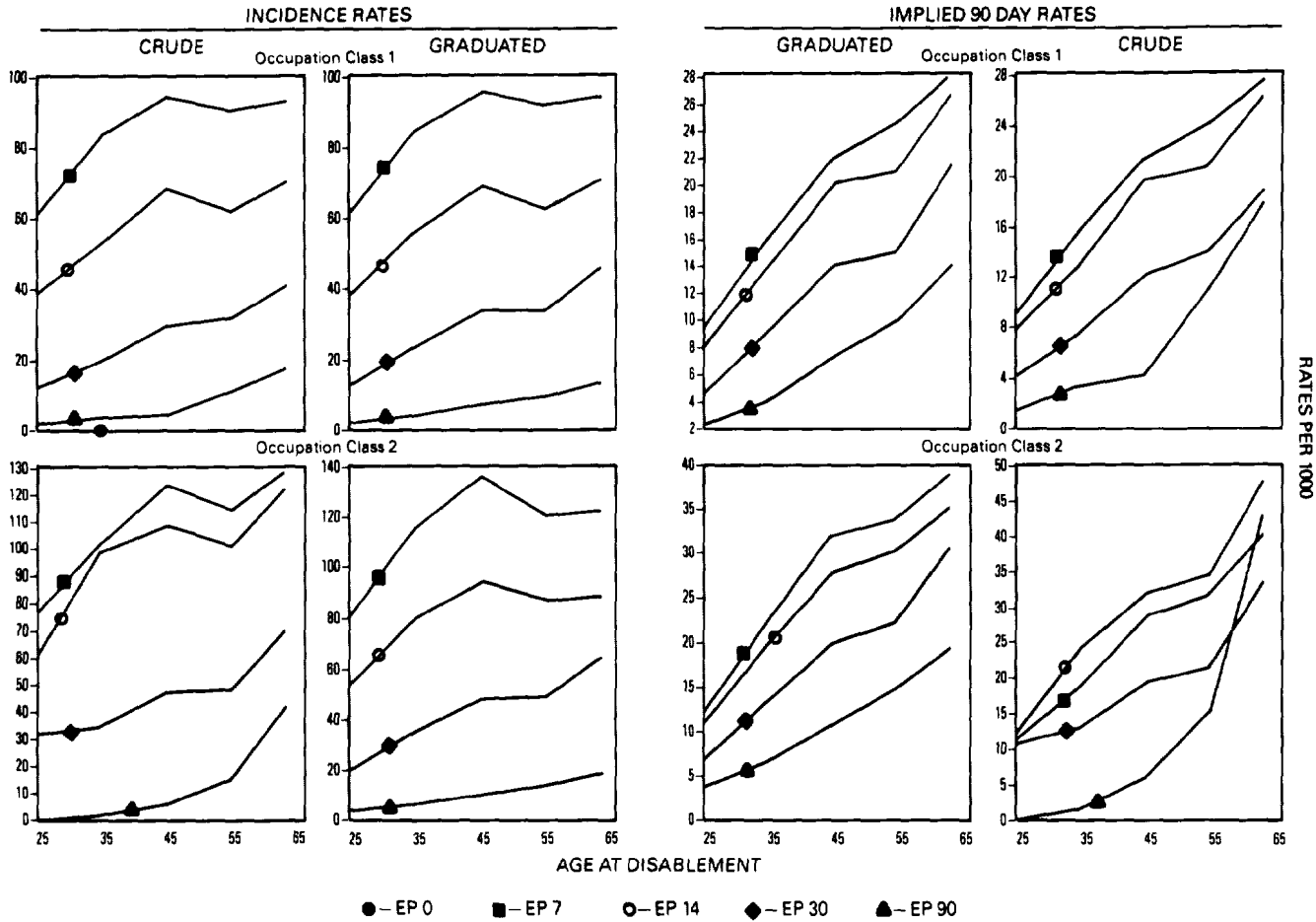
RATES PER 1000
SICKNESS - MALE

Exhibit C-2 (Continued)



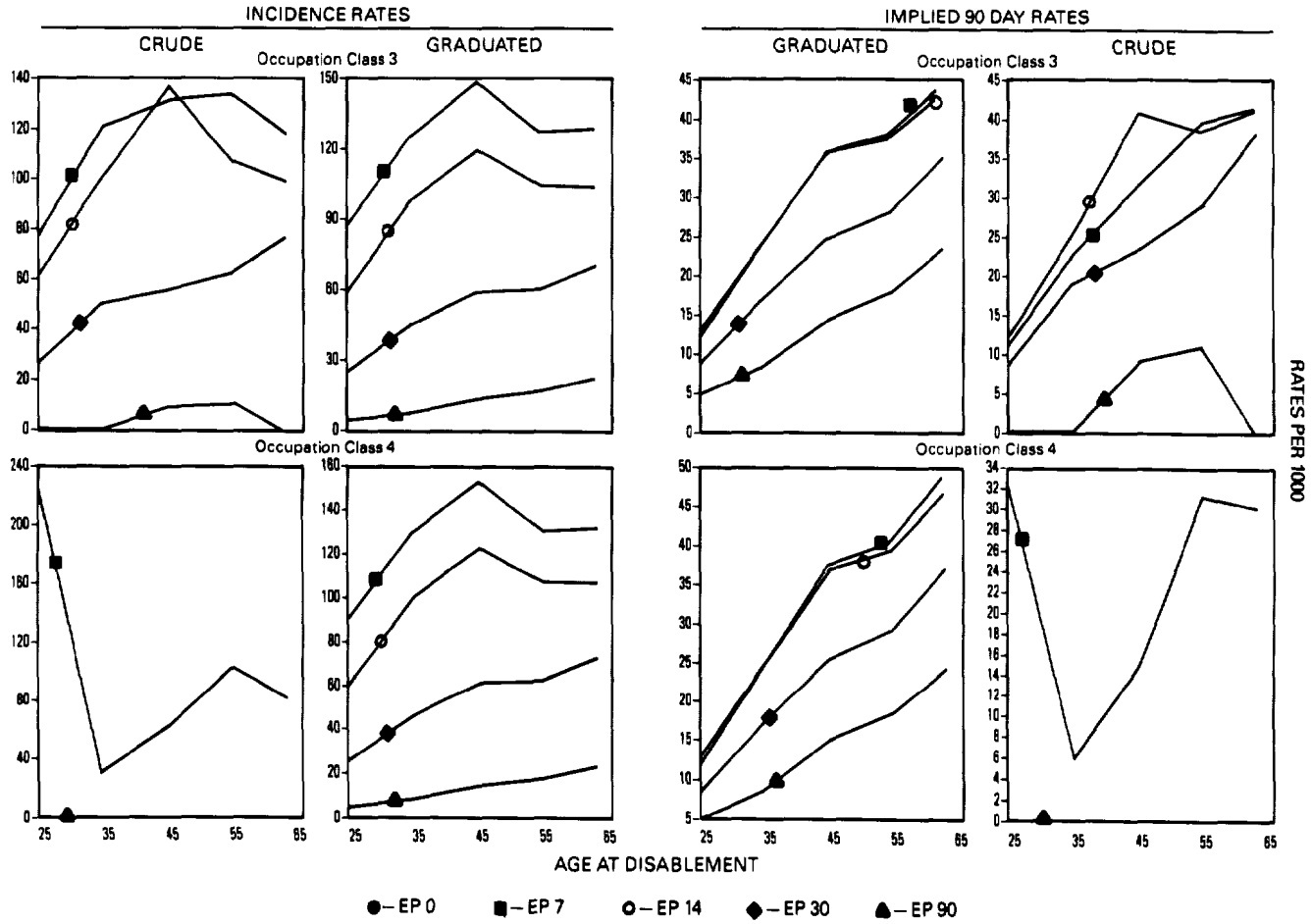
RATES PER 1000
SICKNESS - FEMALE

Exhibit C-2 (Continued)



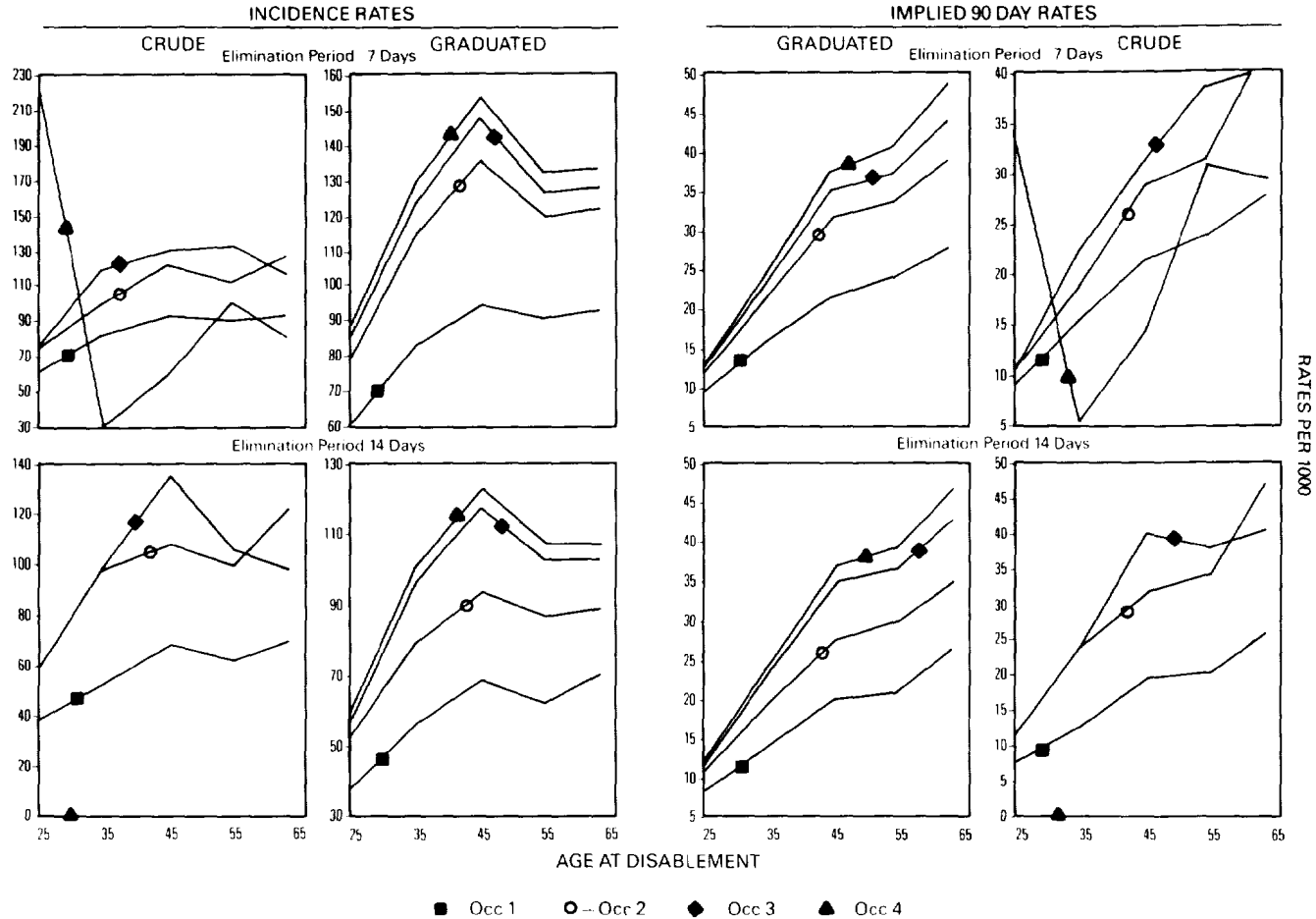
RATES PER 1000
SICKNESS - FEMALE

Exhibit C-2 (Continued)



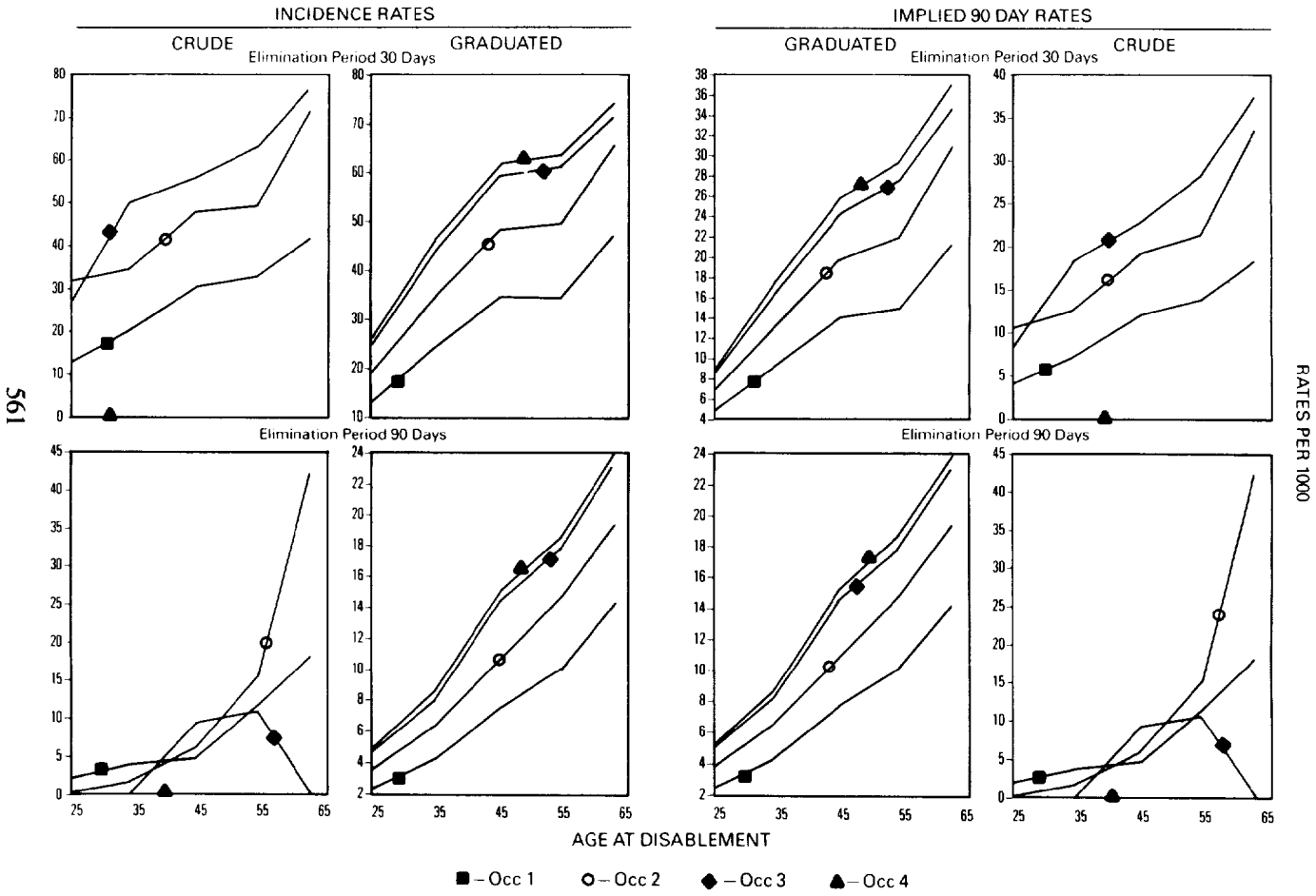
RATES PER 1000
SICKNESS - FEMALE

Exhibit C-2 (Continued)



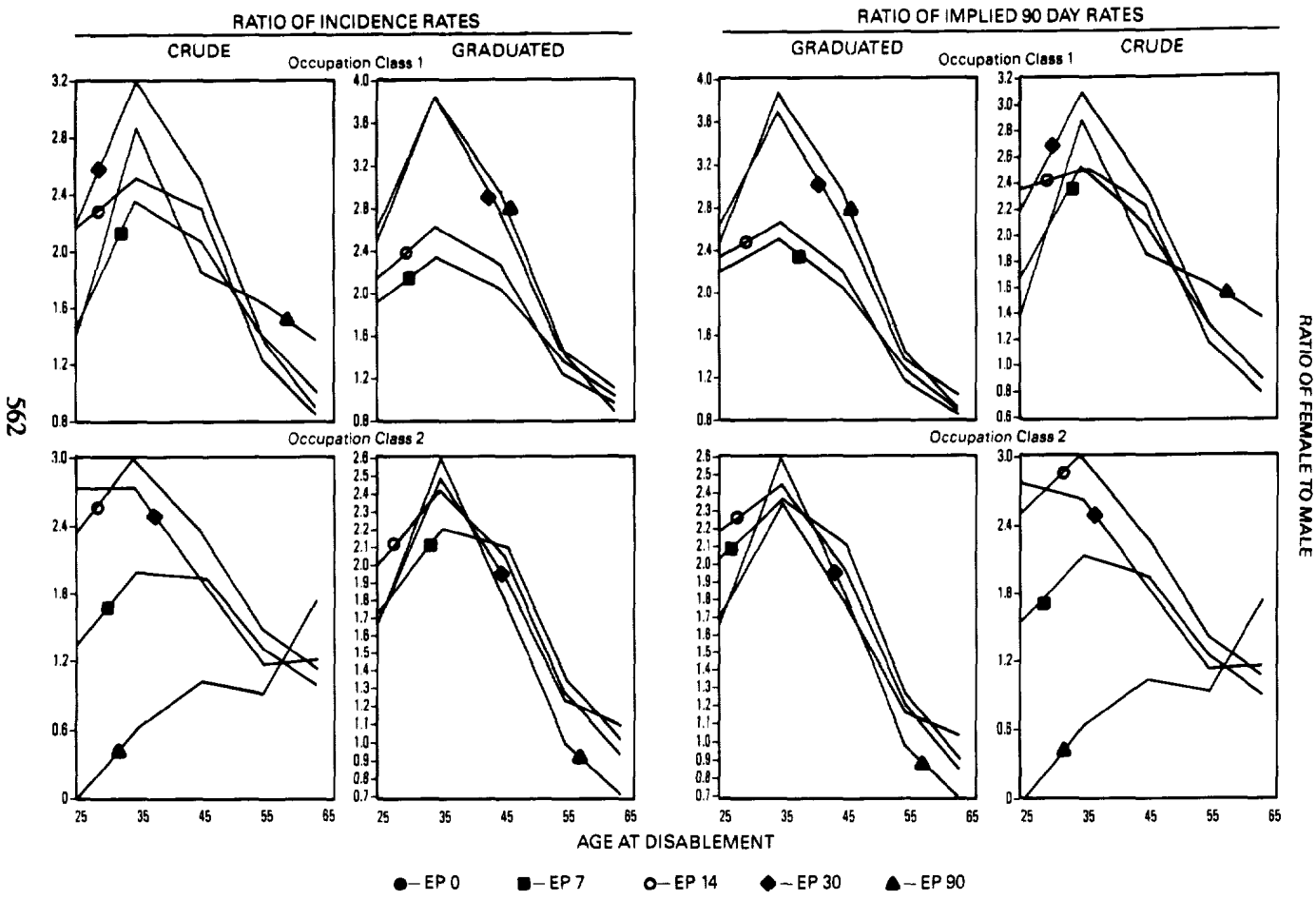
RATES PER 1000
SICKNESS - FEMALE

Exhibit C-2 (Continued)



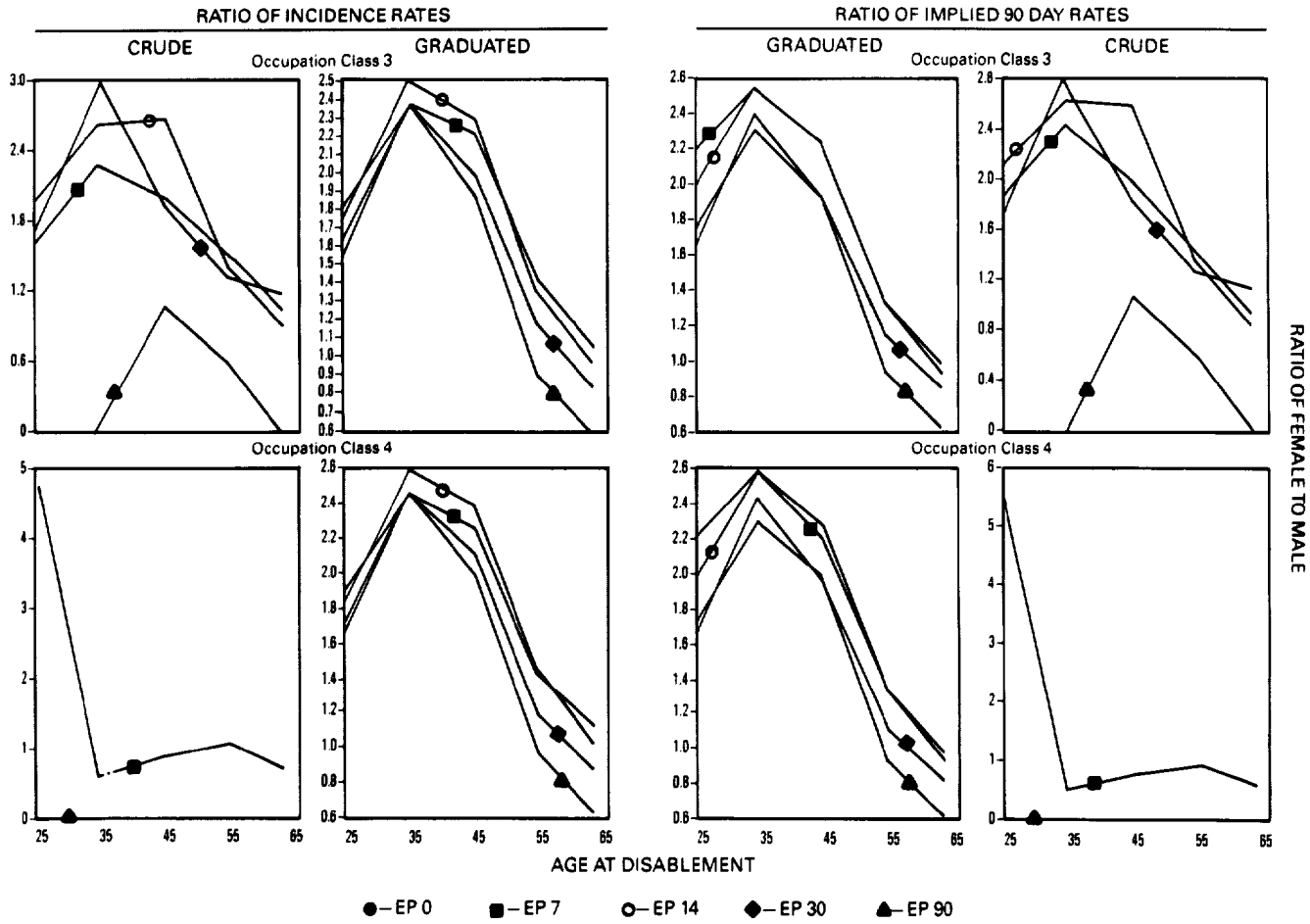
RATIO OF FEMALE TO MALE SICKNESS

Exhibit C-2 (Continued)



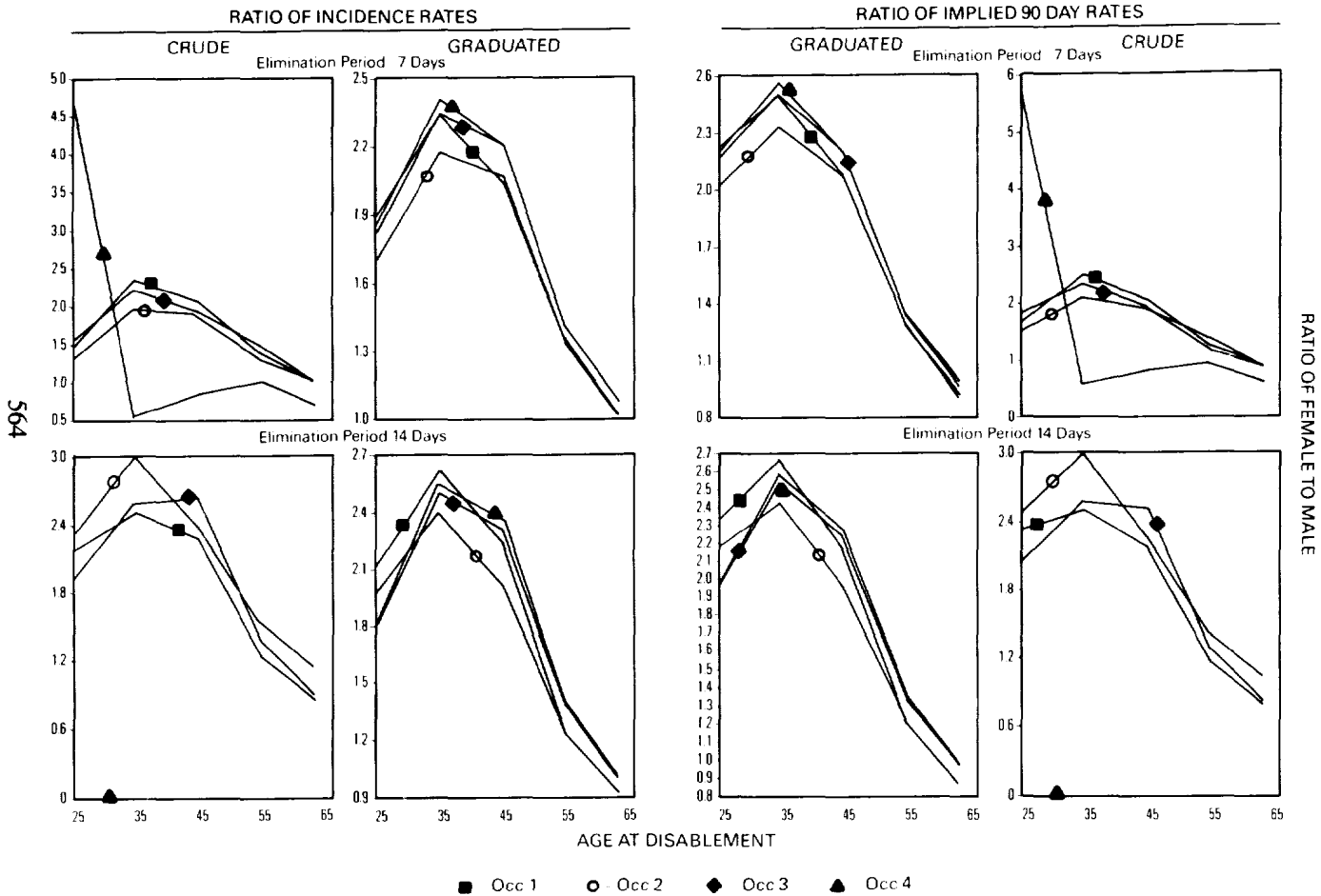
RATIO OF FEMALE TO MALE SICKNESS

Exhibit C-2 (Continued)



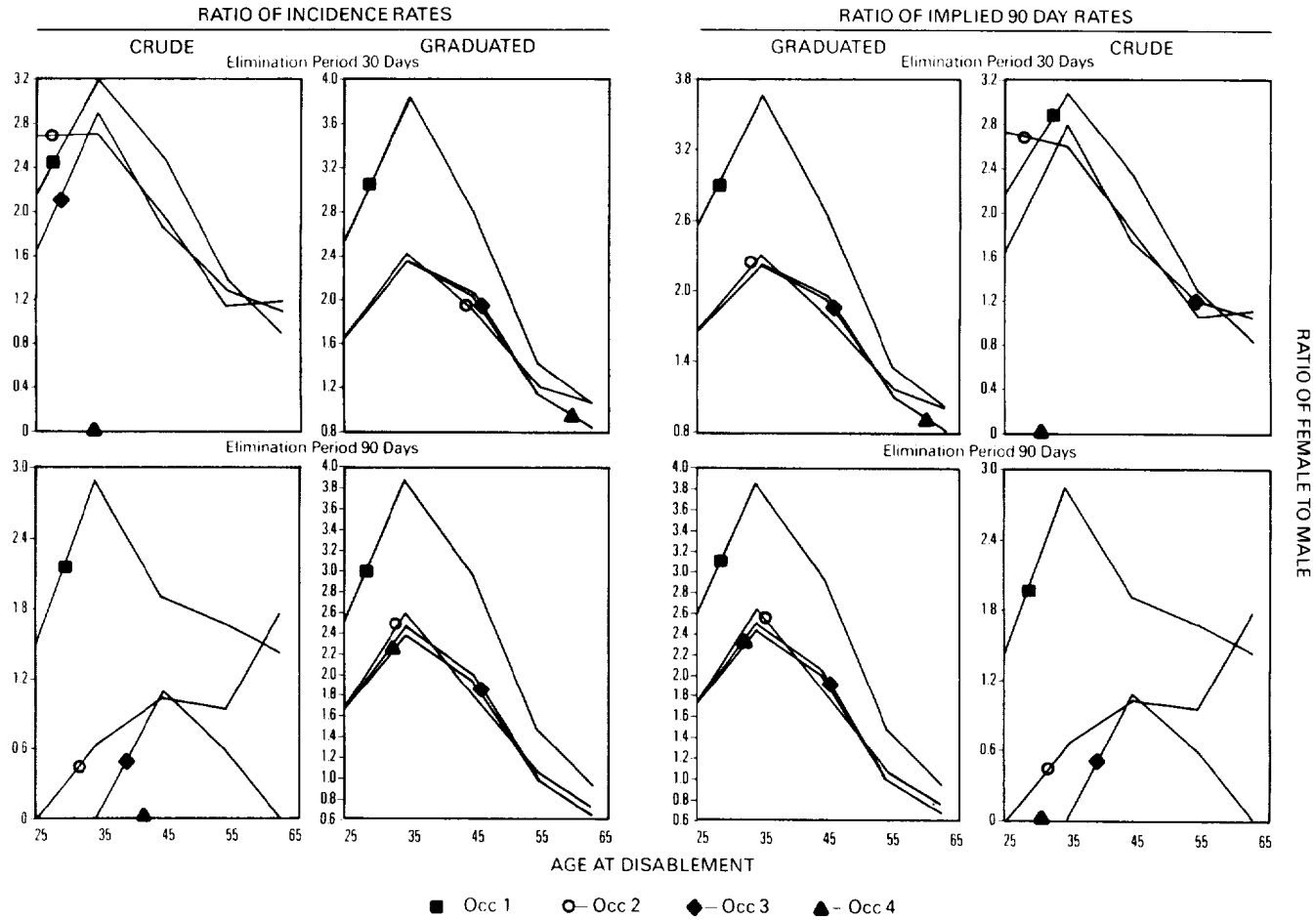
RATIO OF FEMALE TO MALE SICKNESS

Exhibit C-2 (Continued)



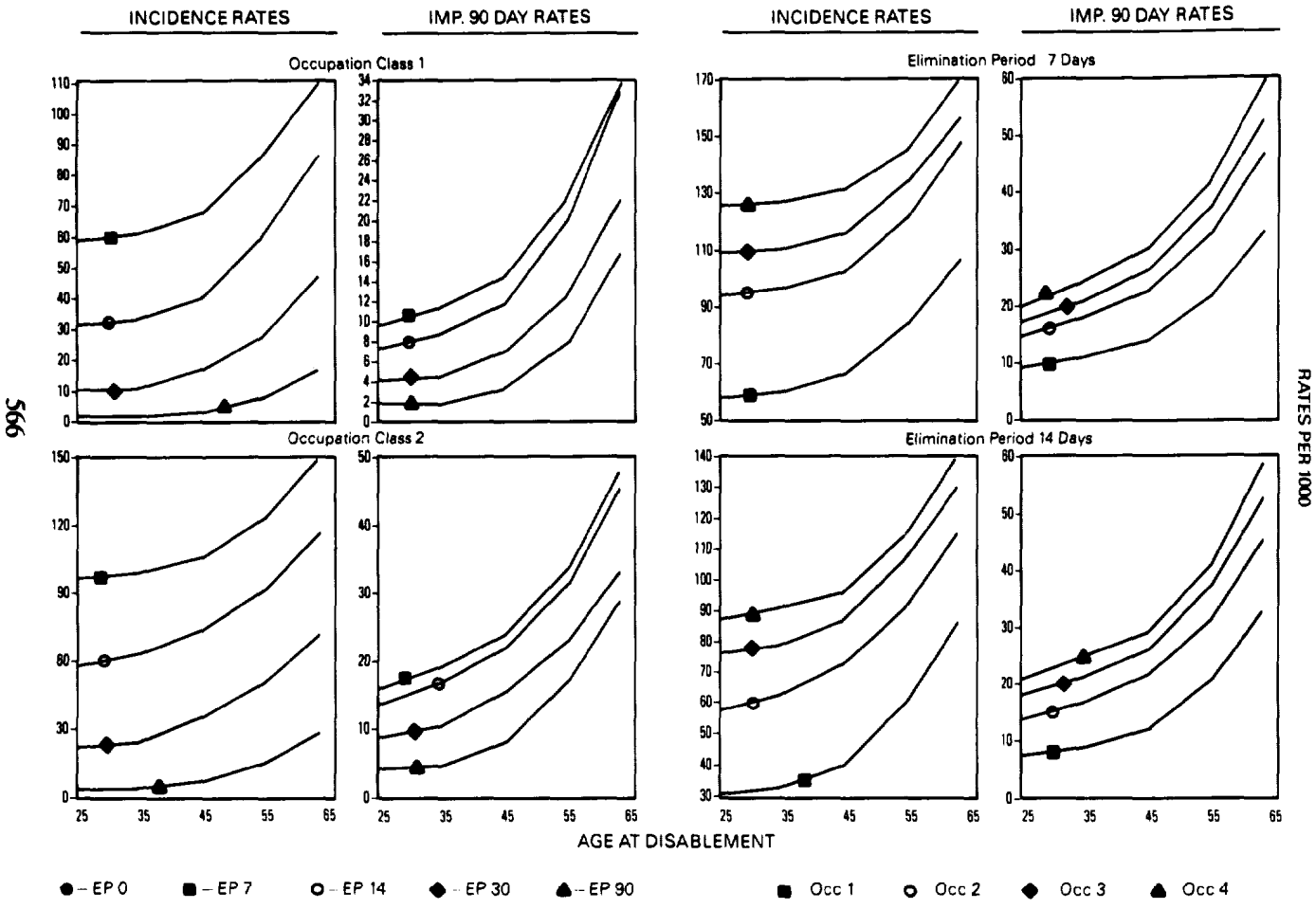
RATIO OF FEMALE TO MALE SICKNESS

Exhibit C-2 (Continued)



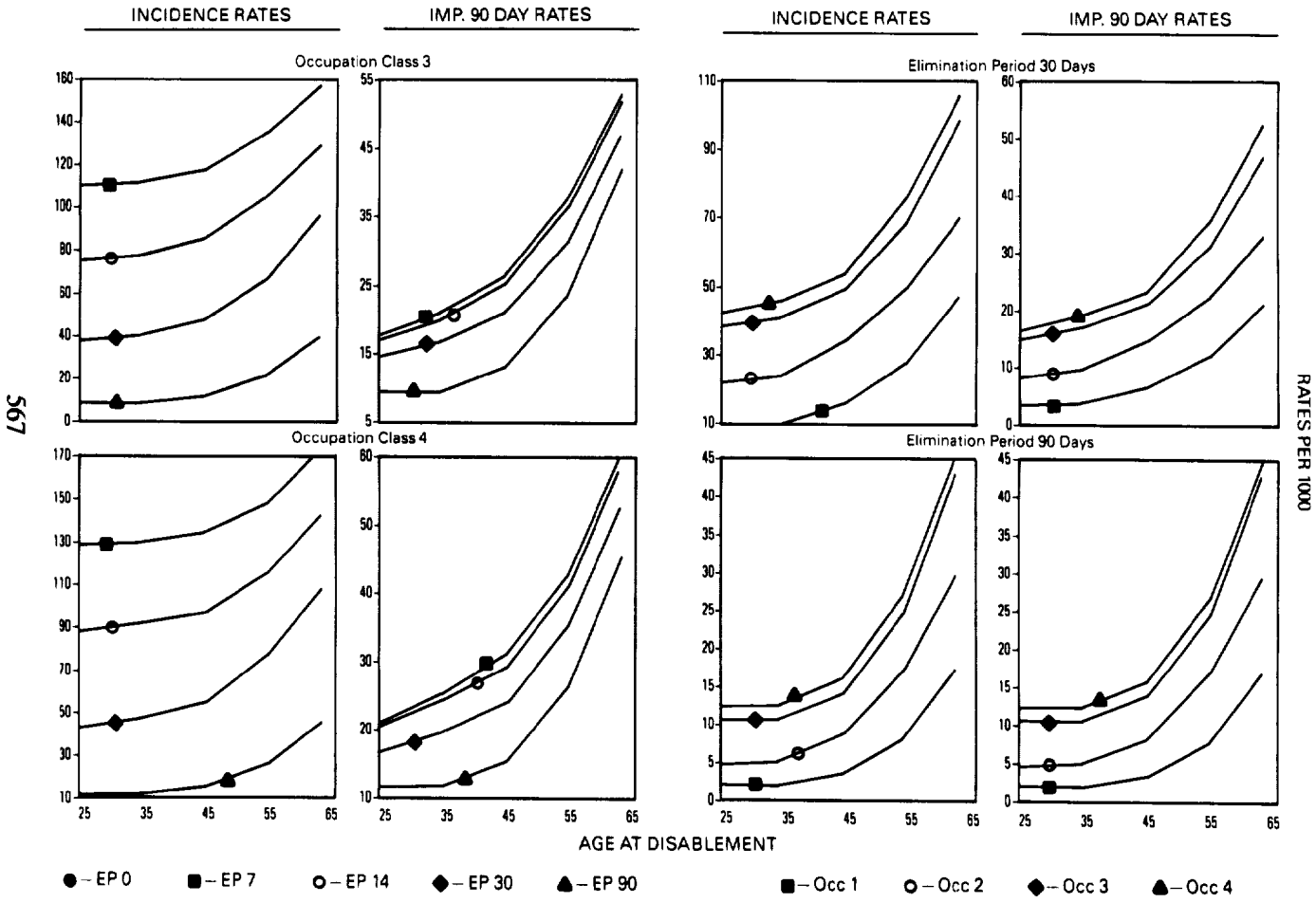
GRADUATED RATES PER 1000
TOTAL ACCIDENT & SICKNESS - MALE

Exhibit C-2 (Continued)



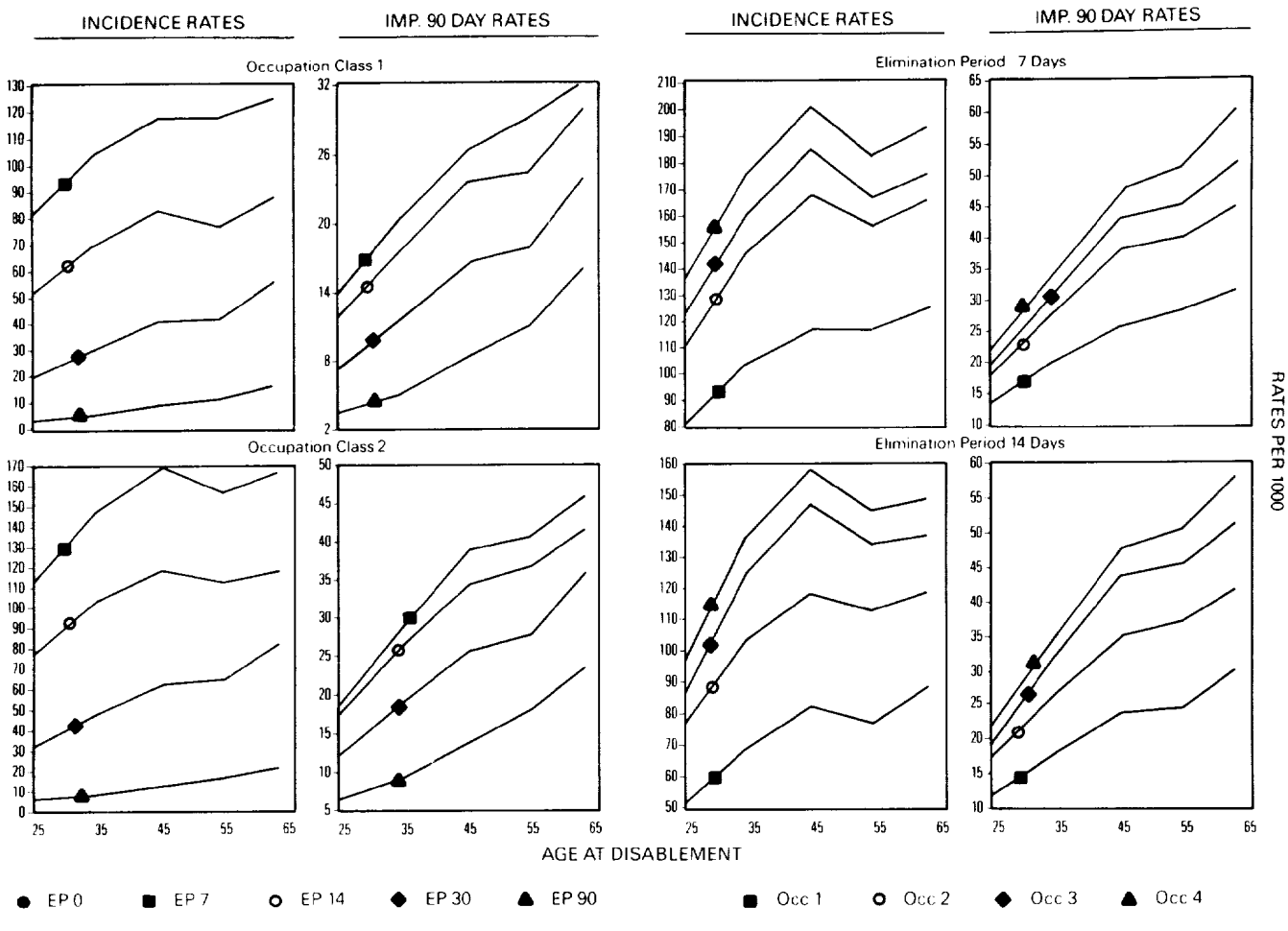
GRADUATED RATES PER 1000
TOTAL ACCIDENT & SICKNESS - MALE

Exhibit C-2 (Continued)



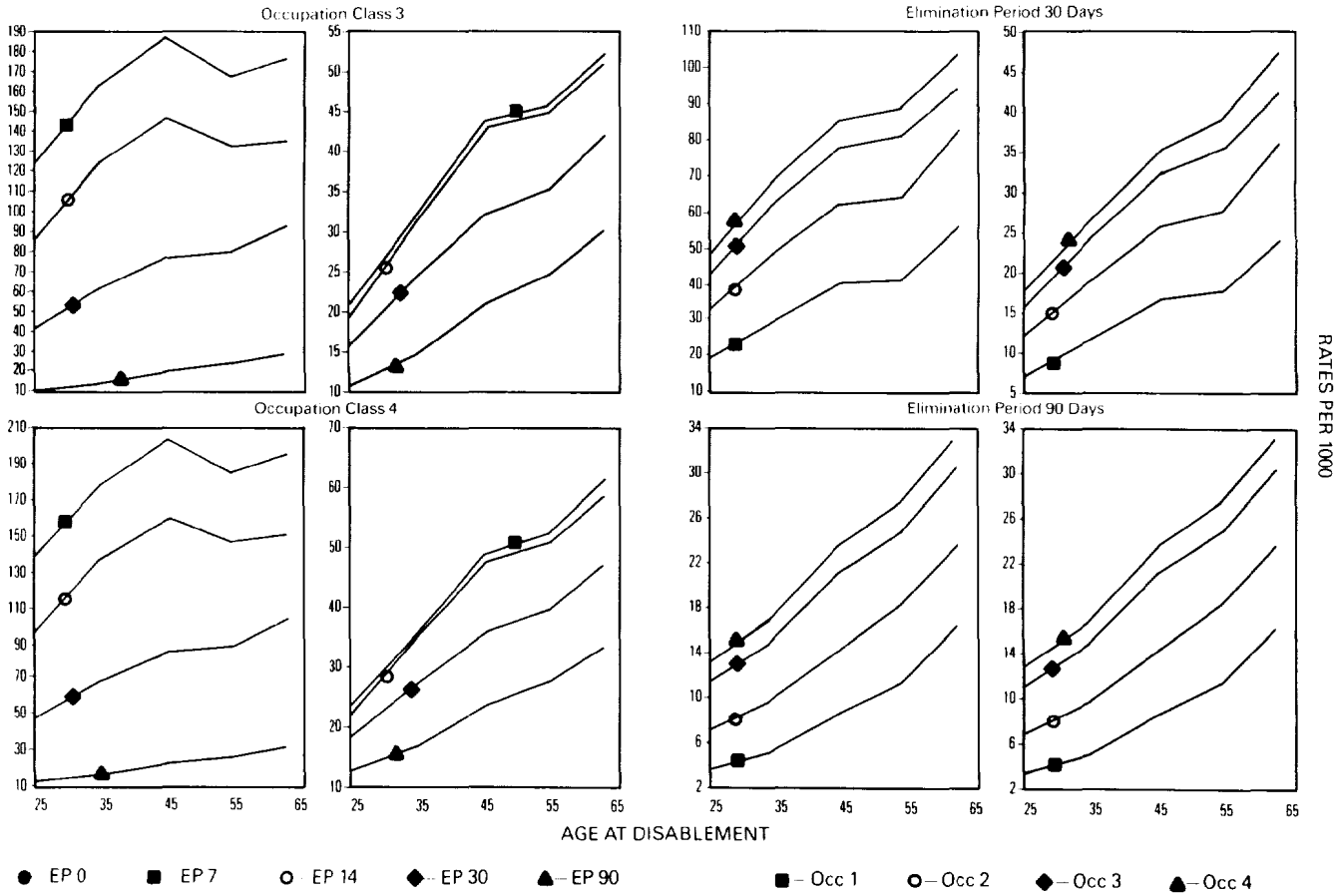
GRADUATED RATES PER 1000
TOTAL ACCIDENT & SICKNESS - FEMALE

Exhibit C-2 (Continued)



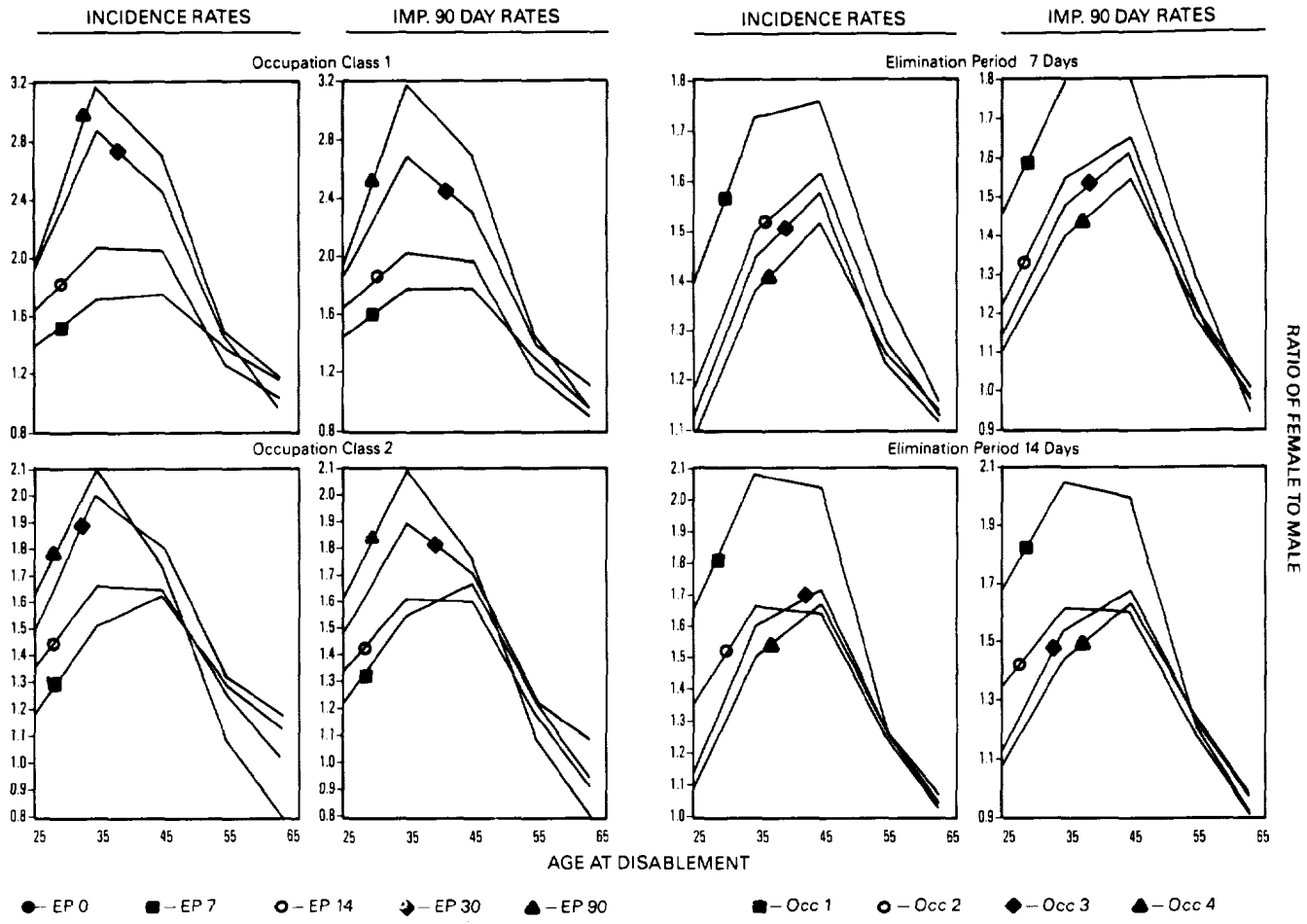
GRADUATED RATES PER 1000
TOTAL ACCIDENT & SICKNESS - FEMALE

Exhibit C-2 (Continued)



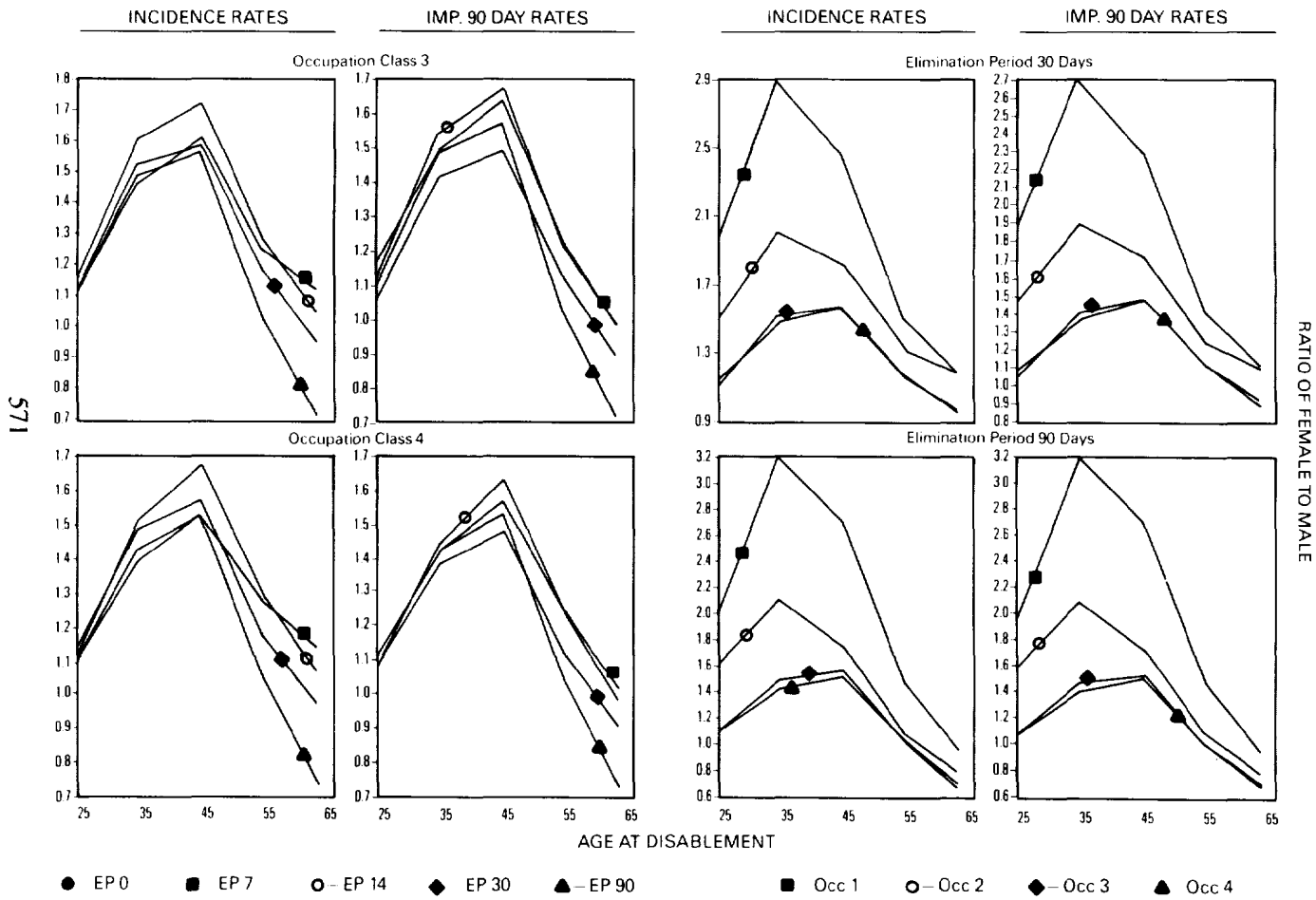
RATIOS OF FEMALE TO MALE
TOTAL ACCIDENT & SICKNESS

Exhibit C-2 (Continued)



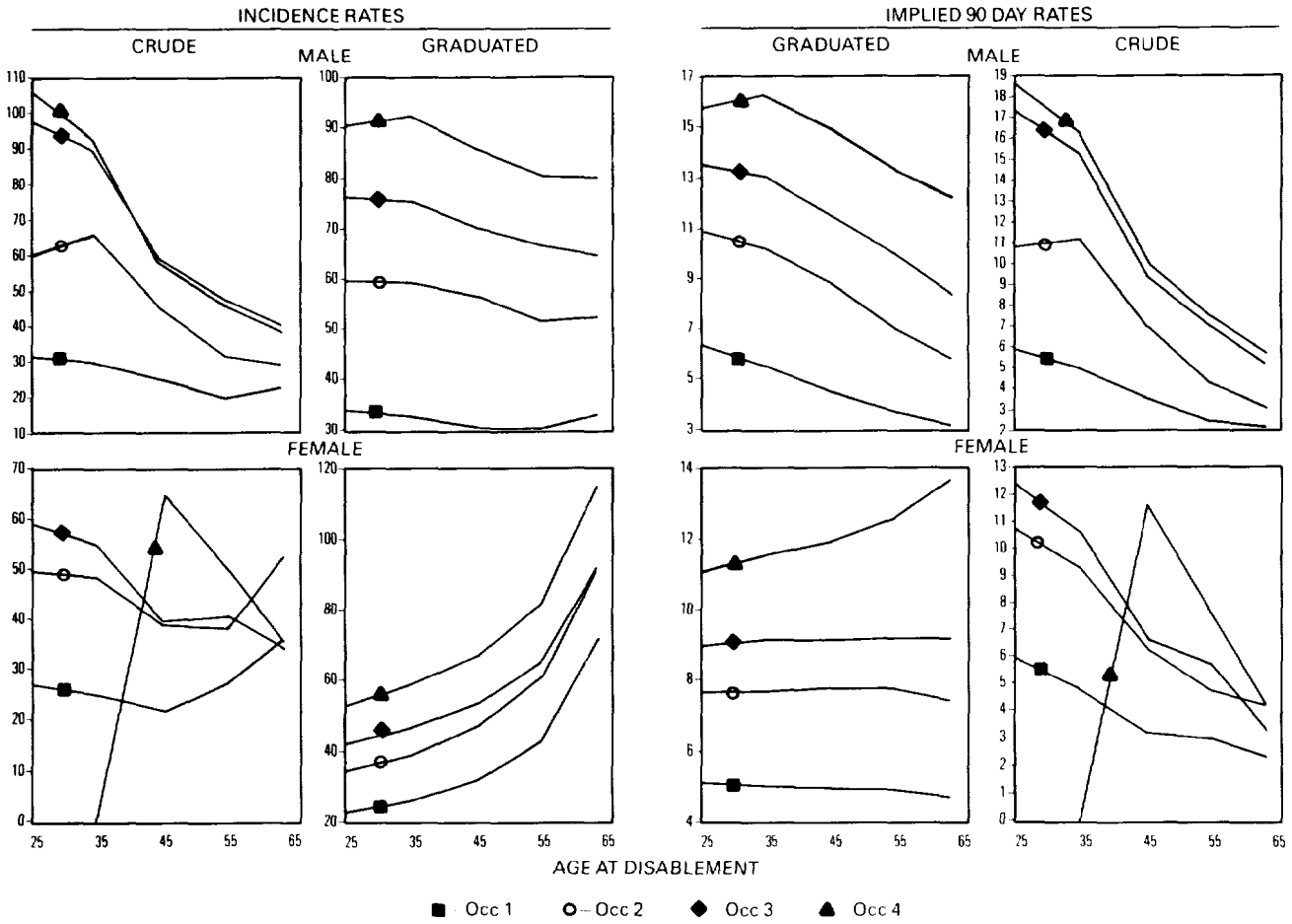
RATIOS OF FEMALE TO MALE
TOTAL ACCIDENT & SICKNESS

Exhibit C-2 (Continued)



RATES PER 1000
ELIMINATION PERIOD 0 DAYS – ACCIDENT ONLY

Exhibit C-2 (Continued)



RATIOS OF FEMALE TO MALE INCIDENCE RATES
ELIMINATION PERIOD 0 DAYS – ACCIDENT ONLY

Exhibit C-2 (Continued)

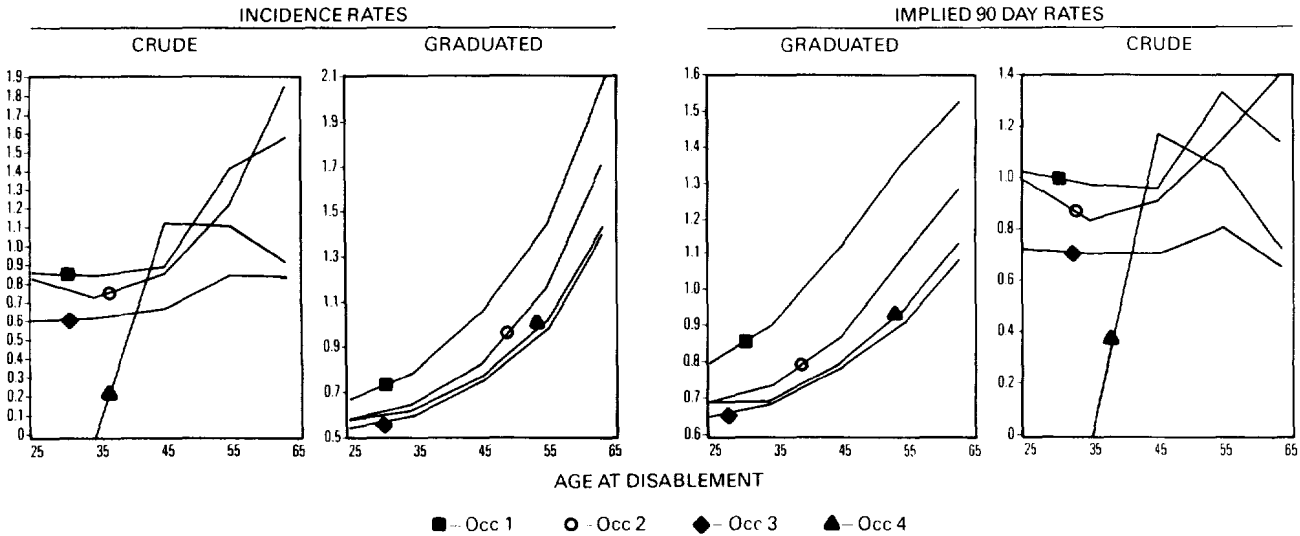


EXHIBIT C-3

INCIDENCE OF DISABILITY
(Rates per 1,000 lives exposed)

	MALE-ACCIDENT						MALE-SICKNESS					
		ELIMINATION PERIOD						ELIMINATION PERIOD				
	AGE	0-day	7-day	14-day	30-day	90-day	AGE	0-day	7-day	14-day	30-day	90-day
Class 1	25	33.97	25.84	13.13	4.90	.86	25	...	32.26	18.22	5.51	1.01
	35	32.88	24.42	11.99	4.23	.51	35	...	36.11	21.55	6.48	1.13
	45	30.40	20.40	9.86	4.50	.65	45	...	47.12	31.19	12.63	2.70
	55	30.19	18.32	9.63	4.71	.80	55	...	69.48	52.75	25.11	7.78
	62	33.45	16.11	10.39	5.47	1.18	62	...	91.52	74.06	41.24	15.20
Class 2	25	59.96	47.98	30.01	10.48	2.07	25	...	46.61	27.01	12.17	2.23
	35	59.96	44.62	28.83	10.14	2.09	35	...	52.79	33.37	14.47	2.56
	45	56.74	38.49	25.67	9.86	2.14	45	...	65.97	46.91	25.40	6.21
	55	51.66	31.31	20.50	10.03	2.20	55	...	92.99	71.27	41.37	15.74
	62	52.84	29.85	19.86	10.92	2.57	62	...	116.81	93.05	58.54	25.94
Class 3	25	75.80	62.68	42.87	23.69	7.04	25	...	46.83	32.22	14.75	2.99
	35	74.78	58.37	39.59	22.57	6.48	35	...	52.72	38.32	18.70	3.52
	45	69.76	50.41	34.61	20.49	5.97	45	...	67.05	51.53	29.45	7.83
	55	66.37	44.27	30.51	18.49	5.46	55	...	92.60	76.39	52.66	20.07
	62	65.04	39.98	27.96	18.56	5.30	62	...	116.23	98.78	78.56	36.04
Class 4	25	89.42	77.60	52.59	27.03	8.73	25	...	48.20	33.28	15.07	3.04
	35	91.59	73.24	50.53	26.93	8.17	35	...	53.75	39.27	19.33	3.59
	45	84.64	62.13	42.61	24.78	7.68	45	...	70.03	52.71	30.13	7.97
	55	79.77	52.03	37.34	22.78	7.27	55	...	95.01	77.91	55.87	20.45
	62	79.95	49.76	36.11	22.96	7.20	62	...	119.16	101.41	81.62	36.63

	FEMALE-ACCIDENT						FEMALE SICKNESS					
		ELIMINATION PERIOD						ELIMINATION PERIOD				
	AGE	0-day	7-day	14-day	30-day	90-day	AGE	0-day	7-day	14-day	30-day	90-day
Class 1	25	23.06	19.92	12.96	6.00	1.14	25	...	61.10	39.29	14.03	2.55
	35	26.28	20.87	13.39	6.21	.91	35	...	84.38	56.89	24.75	4.37
	45	32.36	22.77	13.78	6.83	1.11	45	...	94.57	68.33	34.14	7.64
	55	45.05	26.77	14.82	8.06	1.46	55	...	90.28	61.49	34.23	10.31
	62	69.00	31.56	17.54	9.91	2.25	62	...	93.06	69.44	45.30	13.85
Class 2	25	35.05	31.48	23.39	13.40	3.22	25	...	80.97	53.57	20.03	3.75
	35	39.36	32.01	23.36	14.02	3.20	35	...	116.02	80.05	35.34	6.60
	45	47.46	33.55	24.40	15.02	3.40	45	...	134.18	92.93	47.62	10.81
	55	62.53	37.10	26.13	16.11	3.75	55	...	117.29	84.93	49.00	14.95
	62	88.91	44.31	29.27	17.88	4.46	62	...	120.40	87.53	63.15	18.86
Class 3	25	41.93	38.01	27.94	17.63	6.19	25	...	86.64	57.85	24.83	5.03
	35	46.30	38.45	28.54	18.20	6.54	35	...	124.79	96.77	44.67	8.43
	45	53.01	39.08	29.09	19.24	6.75	45	...	145.58	116.19	58.44	14.43
	55	66.71	41.96	30.86	20.99	7.08	55	...	122.98	99.89	59.99	17.86
	62	90.05	48.12	33.60	23.74	7.26	62	...	125.95	101.06	69.18	22.76
Class 4	25	52.41	47.52	34.93	22.04	7.74	25	...	90.24	60.26	25.86	5.23
	35	57.87	48.07	35.67	22.75	8.17	35	...	130.00	100.81	46.53	8.79
	45	66.26	48.86	36.36	24.05	8.45	45	...	151.65	121.04	60.87	15.03
	55	83.39	52.45	38.58	26.25	8.85	55	...	128.10	104.05	62.49	18.61
	62	112.57	60.16	42.00	29.67	9.08	62	...	131.20	105.27	72.07	23.71

APPENDIX D

COMPARATIVE EXHIBITS DETERMINED FROM THE DTS BASIC TABLE

Exhibit D-1 is a comparison of the final results of the DTS Basic Table to material collected and published by the Society of Actuaries on individual loss of time experience. The Society data are published biannually in the *Reports*, and we refer to that study as the SOA data. The SOA occupation group I data include the same combined occupations as the DTS includes in occupation classes 1 and 2—basically the so-called white collar group. Many of the policies and claims from the DTS have also been included in the SOA data shown here, since there is an overlapping of contributing companies and exposure years.

It was most encouraging for the Committee to find that our final DTS Basic Table compares well with the SOA's somewhat broader classification in both incidence rates and first-year claim costs for both males and females. The DTS class 1 is slightly lower than the SOA I, and the DTS class 2 is correspondingly higher than SOA I in nearly each corresponding cell.

Exhibit D-2 illustrates the high selectivity by elimination period. As an example, a block of policies having 7-day elimination periods, exposed at age 37, will experience about 2.5 times the amount of claims during the sixth month of disablement as will a corresponding block of policies having 30-day elimination periods (500/207). This implies that net premiums and active life reserves will vary significantly depending upon the elimination period defining the particular table used to calculate them. This is illustrated in Exhibit D-3.

Exhibit D-3 shows the effect of calculating net premiums and active life reserves for policies having 30-day elimination periods using an improper table (7-day elimination period). Values based on the 7-day e.p. table are highly excessive versus the correct values as determined on a 30-day e.p. table. As you would expect, a table designed for policies with a particular elimination period produces inconsistent results when applied to policies with other elimination periods.

Exhibit D-4 compares values from the DTS Basic Table by class and to the corresponding values from the 1964 CDT for three different policies; 2-year benefits with a 7-day e.p.; 60-month benefits with 30-day e.p.; and benefits to age 65 with 90-day e.p. This table illustrates that a table designed for any particular occupation class will produce incorrect results when used for any other occupation class.

The exhibit also shows that the 1964 CDT produces very conservative net premiums and reserves for the policies illustrated in occupation class 1 for all of the illustrated ages and elimination periods. It is, correspondingly,

much more representative of class 2 net premiums and reserves. Looking at class 3 and 4, the 1964 CDT produces much lower net premiums, and the active life reserves are generally inadequate.

Exhibit D-5 illustrates that the 1964 CDT generally produces active life reserves that are highly excessive for policies on female lives.

Exhibit D-6 compares claim reserves for class 1 to the corresponding claim reserves for class 2. The DTS analysis found that the effect of class on termination rate tended to disappear after three months for both accident and sickness. The effect on claim reserves is minimal. A reading of the exhibit shows claim reserves differing by class in the fourth and ninth month. The difference is not caused by the occupation class effect, but, rather, by the nature of construction. Since accident and sickness continuance tables are constructed separately, then added together, the combined table shows a difference by class until the thirteenth month.

Exhibit D-7 illustrates the general inadequacy of the 1964 table for claim reserves.

Exhibit D-8 compares net premiums, active life reserves, and claim reserves between the standard DTS table and a modified table. The modification employed was to reduce termination rates during the first year by setting them at 95 percent of the standard DTS Basic Table rate, then grading to 100 percent of the DTS termination rates in the eighteenth month. The result is a 9–10 percent increase in the net premiums for the policies illustrated, with a generally 6–8 percent higher active life reserve in the early durations, particularly for the lower ages. The very early duration claim reserves are increased by about 10 percent. The effect on claim reserve grades off, of course, during the 18-month period.

Exhibit D-9 compares values calculated at 3 percent, with those at a more reasonable, but still conservative, rate of 6 percent. Calculations are based upon the DTS Basic Table with 1958 CSO Mortality.

EXHIBIT D-1

COMPARISON OF SOCIETY OF ACTUARIES SOA* DATA TO THE DISABILITY TABLE STUDY RESULTS (SOA—Occ. Group I: DTS—Classes 1 and 2)

AGE		ELIMINATION PERIOD: 14 Days				ELIMINATION PERIOD: 30 DAYS			
		SOA-Grp I		DTS		SOA-Grp I		DTS	
SOA	DTS	1976–77	1978–79	CL 1	CL 2	1976–77	1978–79	CL 1	CL 2
		Rates of Disablement—MALES							
<30	25	.051	.049	.031	.057	.015	.013	.010	.023
30-39	35	.052	.046	.034	.062	.013	.012	.011	.025
40-49	45	.056	.051	.041	.073	.021	.019	.017	.035
50-59	55	.073	.066	.062	.092	.035	.031	.030	.051
60-69	62	.109	.096	.084	.113	.058	.049	.047	.069
		Claim Costs per $100 per month—MALES (12 Month Benefit at 0% interest)							
<30	25	12.40	11.50	6.69	12.26	4.50	3.40	2.86	6.11
30-39	35	12.80	11.30	7.93	14.83	4.00	3.80	3.16	7.22
40-49	45	14.90	14.70	10.94	19.44	7.00	6.20	5.44	11.23
50-59	55	21.90	20.00	19.42	28.79	13.30	12.10	10.58	18.33
60-69	62	42.90	33.80	30.31	41.14	24.90	19.80	18.13	27.16
		Rates of Disablement—FEMALES							
<30	25	.067	.065	.052	.077	.027	.020	.020	.033
30-39	35	.094	.080	.070	.103	.033	.026	.031	.049
40-49	45	.111	.090	.082	.117	.041	.040	.041	.063
50-59	55	.096	.084	.076	.111	.050	.045	.042	.065
60-69	62	.116	.099	.087	.117	.054	.054	.055	.081
		Claim Costs per $100 per Month—FEMALES (12 Month Benefit at 0% Interest)							
<30	25	15.00	13.80	11.19	16.40	6.60	5.30	5.25	8.79
30-39	35	22.40	19.90	16.44	24.17	10.30	7.70	8.48	13.57
40-49	45	31.20	26.40	21.48	30.92	11.60	12.30	12.22	18.71
50-59	55	28.20	25.50	22.38	33.06	21.00	18.70	14.00	21.59
60-69	65	40.50	32.90	27.74	38.06	20.50	23.00	19.80	29.32

*1981 *Reports*, pages 193–98.

EXHIBIT D-2

DISABILITY CONTINUANCE TABLES
100,000 LIVES EXPOSED
ACCIDENT AND SICKNESS COMBINED—MALE
DTS BASIC TABLE VERSUS 1964 CDT

	TIME FROM DISABLEMENT	AGE AT DISABLEMENT			
		27	37	47	57
Class 1:					
7-day EP	7 days	5,911	6,108	7,048	9,323
	30 days	3,516	3,793	4,593	6,379
	90 days	1,002	1,174	1,585	2,522
	6 months	407	500	739	1,342
30-day EP	7 days	. . .	. . .	. . .	. . .
	30 days	970	1,162	1,901	3,372
	90 days	386	486	826	1,521
	6 months	157	207	386	812
90-day EP	7 days	. . .	. . .	. . .	. . .
	30 days	. . .	. . .	. . .	. . .
	90 days	166	181	402	1,036
	6 months	83	94	225	641
Class 2:					
7-day EP	7 days	9,548	9,810	10,726	13,003
	30 days	5,669	6,161	7,130	9,127
	90 days	1,597	1,906	2,472	3,654
	6 months	651	813	1,148	1,935
30-day EP	7 days	. . .	. . .	. . .	. . .
	30 days	2,184	2,630	3,797	5,575
	90 days	851	1,093	1,658	2,542
	6 months	345	465	773	1,349
90-day EP	7 days	. . .	. . .	. . .	. . .
	30 days	. . .	. . .	. . .	. . .
	90 days	429	501	975	2,065
	6 months	215	261	544	1,274
1964 CDT:	7 days	10,679	12,621	14,957	18,115
	30 days	3,877	5,029	6,918	9,816
	90 days	657	981	1,676	3,110
	6 months	161	245	515	1,327

EXHIBIT D-3*

	Male—Benefit to Age 65—30-Day Elimination Period						Female—Benefit to Age 65—30-Day Elimination Period					
	7-Day E.P. Table			30-Day E.P. Table			7-Day E.P. Table			30-Day E.P. Table		
Age	30	40	50	30	40	50	30	40	50	30	40	50
Class 1:												
NLP	39.34	48.64	56.90	19.80	26.72	33.78	59.82	69.44	67.16	36.75	44.13	43.35
5 yr. rsv.	85	67	−1	61	54	10	107	13	−67	82	12	−30
10	155	94	−34	115	80	−9	160	−26	−97	123	−9	−43
15	199	66	...	152	68	...	149	−86	...	116	−37	...
20	199	3	...	159	22	...	83	−107	...	75	−47	...
Class 2:												
NLP	60.56	73.33	82.66	38.24	49.09	57.14	84.83	99.08	93.66	57.07	67.41	66.00
5 yr. rsv.	120	82	−15	100	71	−8	162	7	−100	116	16	−50
10	212	106	−61	180	91	−41	237	−62	−134	172	−16	−72
15	262	62	...	224	58	...	209	−145	...	162	−61	...
20	251	−19	...	215	−5	...	100	−158	...	101	−78	...
Class 3:												
NLP	68.99	82.99	92.68	56.77	69.09	79.43	94.66	111.12	105.14	71.42	83.81	81.84
5 yr. rsv.	132	87	−21	114	86	−5	187	10	−110	138	20	−71
10	233	110	−72	205	117	−51	274	−68	−145	206	−22	−104
15	285	59	...	260	79	...	243	−159	...	195	−87	...
20	269	−28	...	257	−4	...	119	−172	...	118	−113	...
Class 4:												
NLP	78.55	93.78	103.46	63.08	76.38	87.93	105.19	123.92	118.78	78.72	92.11	90.18
5 yr. rsv.	146	89	−24	122	95	−7	209	20	−116	149	23	−77
10	253	110	−77	221	131	−60	311	−58	−156	223	−22	−113
15	305	55	...	283	87	00	285	−158	...	212	−92	...
20	283	−34	...	282	−8	...	154	−179	...	130	−122	...

*Illustrating the need for separate tables by elimination period for active life reserves. Net premiums and reserves for a Benefit to Age 65 (2-year minimum) policy with a 30-day elimination period. Calculations are based on a 7-day elimination period table versus a 30-day elimination period table. DTS Basic Table with 1958 CSO Mortality and 3 percent interest rate.

EXHIBIT D-4

COMPARISON OF MALE ACTIVE LIFE TERMINAL RESERVES BY CLASS
PER $100 MONTHLY INCOME
(DTS Basic Table 1958 CSO Mortality Interest Rate 3%)

DURATION (years)	ISSUE AGE 30					ISSUE AGE 40				
	1964 CDT	Class 1	Class 2	Class 3	Class 4	1964 CDT	Class 1	Class 2	Class 3	Class 4
EP 7/24 Month:										
NLP	22.85	20.63	31.47	35.70	40.48	29.73	25.61	38.13	42.98	48.40
5 yr. rsv.	57	41	56	61	67	70	51	65	71	76
10	114	83	111	121	132	127	92	118	128	136
15	166	121	160	174	188	159	112	143	154	168
20	204	149	194	210	226	133	93	119	127	142
EP 30/60 Month:										
NLP	21.02	13.83	25.43	37.33	41.39	29.64	19.96	35.05	49.37	54.50
5 yr. rsv.	71	51	81	100	109	89	63	91	122	134
10	143	102	160	200	218	162	115	162	222	245
15	210	149	227	292	320	196	143	194	274	301
20	259	184	271	359	394	133	122	159	229	248
EP 90/To Age 65:										
NLP	22.80	10.91	24.67	40.38	45.18	32.80	15.88	34.28	51.77	56.87
5 yr. rsv.	84	41	81	99	103	91	47	82	94	94
10	166	83	160	189	194	112	75	122	141	138
15	232	117	218	255	259	117	70	98	112	105
20	225	131	232	270	270	56	30	23	22	13

EXHIBIT D-5

COMPARISON OF FEMALE ACTIVE LIFE TERMINAL RESERVES
PER $100 MONTHLY INCOME
(DTS Basic Tables 1958 CSO Mortality Interest Rate 3%)

DURATION (years)	ISSUE AGE 30			ISSUE AGE 40			ISSUE AGE 50		
	1964 CDT	DTS		1964 CDT	DTS		1964 CDT	DTS	
		Cl 1	Cl 2		Cl 1	Cl 2		Cl 1	Cl 2
EP 7/24 Month Maximum:									
NLP	22.85	30.45	42.99	29.73	35.12	49.75	40.92	38.90	53.92
5 yr. rsv.	57	46	70	70	28	32	67	17	20
10	114	78	112	127	43	47	83	22	33
15	166	94	128	159	48	54	0	0	0
20	204	96	124	133	39	51	...	...	...
EP 30/60 Month Maximum:									
NLP	21.02	22.43	34.62	29.64	29.14	44.34	43.93	36.19	54.79
5 yr. rsv.	71	63	91	89	47	70	80	41	59
10	143	112	162	162	80	119	68	60	82
15	210	142	208	196	99	145	0	0	0
20	259	156	229	133	91	130	...	...	...
EP 90/To Age 65:									
NLP	22.80	20.58	34.18	32.80	26.61	42.19	42.72	28.47	43.97
5 yr. rsv.	84	60	81	91	25	31	36	(18)	(35)
10	166	100	133	112	21	20	11	(33)	(61)
15	232	110	144	117	(3)	(21)	0	0	0
20	225	90	111	56	(25)	(53)	...	...	...

EXHIBIT D-6

DISABILITY INCOME CLAIM RESERVES
PER $100/MONTH BENEFIT, 3% INTEREST RATE
COMPARING RESERVES BY OCCUPATION CLASS AND SEX
(DTS Basic Table)

		60-MONTH BENEFIT—30-DAY ELIMINATION PERIOD				TO AGE 65 BENEFIT—30-DAY ELIMINATION PERIOD			
		Male		Female		Male		Female	
AGES	MONTHS	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
27	2	545	539	484	486	1,052	1,039	1,018	1,023
	4	975	975	887	891	2,165	2,166	2,214	2,223
	9	1,903	1,903	1,872	1,868	5,207	5,206	5,949	5,935
	18	2,572	2,572	2,698	2,698	9,211	9,211	11,354	11,354
	42	1,661	1,661	1,711	1,711	14,187	14,187	16,990	16,990
	66	...	...	...	...	16,251	16,251	18,588	18,588
37	2	694	690	607	607	1,480	1,472	1,379	1,381
	4	1,234	1,235	1,121	1,125	2,969	2,971	2,934	2,946
	9	2,454	2,454	2,396	2,396	6,993	6,993	7,603	7,603
	18	3,112	3,112	3,120	3,120	10,999	10,999	12,693	12,693
	42	1,732	1,732	1,764	1,764	13,319	13,319	15,226	15,226
	66	...	...	...	...	13,786	13,786	15,386	15,386
47	2	921	920	823	819	1,833	1,832	1,713	1,703
	4	1,625	1,623	1,512	1,505	3,521	3,516	3,466	3,449
	9	3,018	3,017	2,966	2,962	7,383	7,380	7,774	7,762
	18	3,448	3,448	3,513	3,513	9,975	9,975	10,954	10,952
	42	1,766	1,766	1,789	1,789	10,220	10,220	11,209	11,209
	66	...	...	...	...	9,537	9,537	10,323	10,323
57	2	1,243	1,242	1,108	1,105	1,614	1,613	1,451	1,446
	4	2,134	2,125	2,005	1,992	2,854	2,841	2,713	2,695
	9	3,468	3,465	3,429	3,425	4,861	4,857	4,882	4,875
	18	3,576	3,576	3,633	3,633	5,419	5,419	5,603	5,603
	42	1,774	1,774	1,795	1,794	4,052	4,052	4,189	4,189
	66	...	...	...	...	2,199	2,199	2,243	2,243

EXHIBIT D-7

COMPARISON OF CLAIM RESERVES PER $100 MONTHLY BENEFIT 1964 CDT VERSUS MALE VERSUS FEMALE (DTS Basic Table Interest Rate 3%)

DURATION SINCE DISABLEMENT (Months)	60 MONTH BENEFIT					TO AGE 65 BENEFIT					LIFETIME BENEFIT				
	1964 CDT	DTS Class 1				1964 CDT	DTS Class 1				1964 CDT	DTS Class 1			
		1 Month EP		3 Month EP*			1 Month EP		3 Month EP			1 Month EP		3 Month EP	
		Male	Female	Male	Female		Male	Female	Male	Female		Male	Female	Male	Female
Age 27:															
4	824	975	887	1,073	985	1,631	2,165	2,214	2,357	2,430	1,665	2,238	2,348	2,436	2,578
9	2,499	1,903	1,872	1,948	1,919	5,579	5,207	5,949	5,220	5,958	5,714	5,409	6,361	5,422	6,371
18	2,712	2,572	2,698	2,654	2,791	7,654	9,211	11,354	9,211	11,354	7,863	9,617	12,229	9,617	12,228
42	1,559	1,661	1,711	1,815	1,875	10,099	14,187	16,990	14,187	16,990	10,460	14,953	18,533	14,953	18,533
66	...	...	...	...	...	11,439	16,251	18,588	16,251	18,588	11,948	17,276	20,518	17,276	20,518
Age 37:															
4	903	1,234	1,121	1,362	1,245	1,908	2,969	2,934	3,219	3,203	2,023	3,194	3,294	3,463	3,598
9	2,735	2,454	2,396	2,519	2,463	6,433	6,993	7,603	6,994	7,604	6,873	7,582	8,638	7,583	8,639
18	2,885	3,112	3,120	3,225	3,322	8,490	10,999	12,693	10,999	12,693	9,127	12,022	14,580	12,022	14,580
42	1,598	1,732	1,764	1,899	1,937	10,529	13,319	15,226	13,319	15,226	11,542	14,822	17,902	14,822	17,902
66	...	...	...	...	...	11,251	13,786	15,386	13,786	15,386	12,599	15,640	18,545	15,640	18,545
Age 47:															
4	1,173	1,625	1,512	1,795	1,674	2,301	3,521	3,466	3,806	3,755	2,673	4,183	4,428	4,524	4,799
9	3,016	3,018	2,966	3,111	3,059	6,303	7,383	7,774	7,392	7,781	7,542	8,908	10,142	8,919	10,151
18	3,051	3,448	3,513	3,581	3,653	7,834	9,975	10,954	9,975	10,952	9,463	12,256	14,616	12,256	14,616
42	1,623	1,766	1,789	1,939	1,967	8,705	10,220	11,209	10,220	11,209	11,117	13,174	15,849	13,174	15,849
66	...	...	...	...	...	8,496	9,537	10,323	9,537	10,323	11,600	13,047	15,656	13,047	15,656
Age 57:															
4	1,702	2,134	2,005	2,329	2,196	2,330	2,854	2,713	3,038	2,897	3,682	4,845	5,225	5,162	5,585
9	3,363	3,468	3,429	3,577	3,539	4,312	4,861	4,882	4,865	4,885	7,596	8,716	10,038	8,723	10,045
18	3,212	3,576	3,633	3,716	3,779	4,482	5,419	5,603	5,419	5,603	8,889	10,517	12,595	10,517	12,595
42	1,628	1,774	1,795	1,947	1,973	3,384	4,052	4,189	4,052	4,189	9,479	10,357	12,684	10,357	12,684
66	...	...	...	...	...	1,651	2,199	2,243	2,199	2,243	9,527	9,691	12,005	9,691	12,005

*Shown only to compare male to female. Not comparable to 1964 CDT one month EP because benefit period is two months longer.

EXHIBIT D-8

EFFECT OF LOWERING TERMINATION RATES FROM DISABLEMENT BY 5% IN YEAR 1, GRADING TO STANDARD AT END OF 18 MONTHS
MALE—EP 30 DAYS—1958 CSO MORTALITY—3% INTEREST RATE

	VALUES PER $100 PER MONTH					
	Class 1			Class 2		
AGE	30	40	50	30	40	50
DTS Basic Table:						
60 Month NLP	13.83	19.96	30.07	25.43	35.05	49.30
Res. 5 year	51	63	60	81	91	77
10 year	102	115	76	160	162	95
To Age 65 NLP	19.80	26.72	33.78	38.24	49.09	57.14
Res. 5 year	61	54	10	100	71	−8
10 year	115	80	−9	180	91	−41
DTS Valuation Table:						
60 Month NLP	15.07	21.72	32.61	27.74	38.15	53.46
Res. 5 year	55	67	65	88	98	83
10 year	111	123	81	173	174	101
To Age 65 NLP	21.89	29.38	36.83	42.36	54.07	62.33
Res. 5 year	66	57	9	109	74	−13
10 year	125	85	−12	195	94	−49
Ratio Valuation/Basic:						
60 Month NLP	1.09	1.09	1.08	1.09	1.09	1.08
Res. 5 year	1.08	1.06	1.08	1.09	1.08	1.08
10 year	1.09	1.07	1.07	1.08	1.07	1.06
To Age 65 NLP	1.11	1.10	1.09	1.11	1.10	1.09
Res. 5 year	1.08	1.06	.90	1.09	1.04	—
10 year	1.08	1.06	—	1.08	1.03	—

CLAIM RESERVES
(CLASS 1)

	AGE 30		AGE 40		AGE 50	
	60 Month BP	To Age 65	60 Month BP	To Age 65	60 Month BP	To Age 65
DTS Basic Table:						
2 Month	587	1,186	751	1,601	1,008	1,872
4 Month	1,046	2,425	1,334	3,178	1,771	3,530
9 Month	2,065	5,836	2,624	7,306	3,175	7,029
18 Month	2,755	10,017	3,234	11,007	3,509	9,036
DTS Valuation Table:						
2 Month	642	1,322	819	1,771	1,091	2,040
4 Month	1,115	2,610	1,416	3,395	1,860	3,720
9 Month	2,112	5,983	2,673	7,451	3,217	7,127
18 Month	2,755	10,017	3,244	11,007	3,509	9,036
Ratio Valuation/Basic:						
2 Month	1.09	1.11	1.09	1.11	1.08	1.09
4 Month	1.07	1.08	1.06	1.07	1.05	1.05
9 Month	1.02	1.03	1.02	1.02	1.01	1.01
18 Month	1.00	1.00	1.00	1.00	1.00	1.00

EXHIBIT D-9

COMPARISON OF VALUES FOR INTEREST RATES OF 3% AND 6%
MALE—EP 30 DAYS—1958 CSO MORTALITY—DTS BASIC TABLE

	VALUES PER $100 PER MONTH					
	Class 1			Class 2		
AGE	30	40	50	30	40	50
3% Interest:						
60 Month NLP	13.83	19.96	30.07	25.43	35.05	49.30
Res. 5 year	51	63	60	81	91	77
10 year	102	115	76	160	162	95
To Age 65 NLP	19.80	26.72	33.78	38.24	49.09	57.14
Res. 5 year	61	54	10	100	71	−8
10 year	115	80	−9	180	91	−41
6% Interest:						
60 Month NLP	10.45	16.55	26.80	20.08	29.85	44.42
Res. 5 year	36	51	54	60	75	69
10 year	78	98	72	124	140	89
To Age 65 NLP	14.77	22.09	30.43	29.34	41.29	51.81
Res. 5 year	46	49	16	79	69	4
10 year	93	80	0	152	101	−25
Ratio 6/3:						
60 Month NLP	.76	.83	.89	.79	.85	.90
Res. 5 year	.71	.81	.90	.74	.82	.90
10 year	.76	.85	.95	.78	.86	.94
To Age 65 NLP	.75	.83	.90	.77	.84	.91
Res. 5 year	.75	.91	1.60	.79	.97	—
10 year	.81	1.00	—	.84	1.11	—

CLAIM RESERVES
(Class 1)

	AGE 30		AGE 40		AGE 50	
	60 Month BP	To Age 65	60 Month BP	To Age 65	60 Month BP	To Age 65
3% Interest:						
2 Month	587	1,186	751	1,601	1,008	1,872
4 Month	1,046	2,425	1,334	3,178	1,771	3,530
9 Month	2,065	5,836	2,624	7,306	3,175	7,029
18 Month	2,755	10,017	3,234	11,007	3,509	9,036
6% Interest:						
2 Month	565	961	717	1,318	958	1,626
4 Month	1,001	1,916	1,268	2,578	1,675	3,043
9 Month	1,968	4,502	2,490	5,855	3,005	6,038
18 Month	2,636	7,622	3,087	8,797	3,346	7,791
Ratio 6/3:						
2 Month	.96	.81	.96	.82	.95	.87
4 Month	.96	.79	.95	.81	.95	.86
9 Month	.95	.77	.95	.80	.95	.86
18 Month	.96	.76	.95	.80	.95	.86

APPENDIX E

DTS BASIC TABLE

The DTS Basic Table has been defined, in pieces, in Appendixes B and C of this study. This appendix illustrates the calculation. The DTS Basic Table includes the incidence rates (probability of becoming disabled), and the termination rates (probability of termination of disability by recovery or death). Incidence rates vary by:

1. Cause: accident and sickness
2. Sex: male and female
3. Class: occupation class 1, 2, 3, and 4 where, in a 5-class manual, class 1 is 4A and 3A, class 2 is 2A, class 3 is A, and class 4 is B
4. E.P.: elimination periods of 0 days, 7 days, 14 days, 30 days, and 90 days.

Each of these 72 cells will produce its own unique continuance table. A table for accident and sickness combined is obtained by adding the accident continuance table and the sickness continuance table cell by cell (i.e., for each age and duration). Values for individual ages were obtained by Lagrange interpolation with adjustment for end values.

Termination from disability rates are for each week during the first 13 weeks of disablement. They are then expressed as monthly factors until the twenty-fourth month, yearly through the tenth year, and by attained age thereafter.

The termination rate for any particular duration since disablement is the product of the factors corresponding to the profile of each claim. Rates for the 10-year age groups are appropriate for individual ages 25, 35, 45, 55, and 62. Values for individual ages were determined by Lagrange interpolation as shown in Exhibit E-1.

As an example:

		Factors
The probability of terminating from claim in week 2,	.120	duration rate
for claimants age 35 at disablement,	.961	
with 7-day elimination periods,	.934	
in occupation class 3,	.977	
who are male claimants,	1.190	
disabled from accidents,	1.044	
is	.1307	

The incidence rate for that same group is .05837 or 5,837 for each 100,000 lives exposed. Terminations during the second week of disablement are 763, leaving 5,074 disabled lives at end of the second week.

The corresponding sickness incidence rate is .05272, and the corresponding termination rate is .1168, leaving 4,656 disabled lives at the end of the second week of disablement, out of the 5,272 that entered week 2, disabled.

The combined accident and sickness table, then, has 11,109 lives disabled at the end of 7 days of whom 9,730 are still disabled at the end of 14 days. See Exhibit E-2.

The one week entries for individual ages may be obtained by multiplying by 100 the appropriate rates per 1,000 shown in Exhibit E-3. These rates for individual ages, as well as the termination rates for individual ages were obtained by the following Lagrange Interpolation Formula, modified for the end points. The aggregate tables are easily constructed for any particular mix of business. The DTS Basic Table is shown in Exhibits E-4a-c and E-5. Illustrative continuance tables for combined accident and sickness are shown in Exhibits E-6a and b.

At the time the exposure draft of this report was distributed, a diskette containing a series of programs was made available to perform a variety of calculations. The software functioned on an IBM-PC or IBM-compatible PC.

The program first builds a continuance table for either the experience or the valuation table (margins added). Then, the software can be used to compute any of the following:

1. Claim cost for $100 per month
2. Claim cost for $1,000 lump sum
3. Disabled life reserves per $100 per month
4. Disabled life pure endowment of $1,000
5. NLP method net premiums and reserves
6. 1-year FPT net premiums and reserves
7. 2-year FPT net premiums and reserves

Copies of the diskette have been distributed to over 300 individuals. The software is essentially the official working version of the Committee's report and is incorporated into the NAIC recommendation that considers the Committee's DTS Valuation Table to be the "1985 Commissioners Individual Disability Tables A."

The software originally sent out has not been altered. To obtain a copy of the diskette, contact the Research Department of the Society of Actuaries.

EXHIBIT E-1

5-point Lagrange Interpolation Formula

Used for incidence rates and termination rates. Given points $F(a)$, $F(b)$, $F(c)$, $F(d)$, and $F(e)$, then:

$$F(x) = \frac{(x-b)}{(a-b)}\frac{(x-c)}{(a-c)}\frac{(x-d)}{(a-d)}\frac{(x-e)}{(a-e)}F(a)$$
$$+ \frac{(x-a)}{(b-a)}\frac{(x-c)}{(b-c)}\frac{(x-d)}{(b-d)}\frac{(x-e)}{(b-e)}F(b)$$
$$\vdots$$
$$+ \frac{(x-a)}{(e-a)}\frac{(x-b)}{(e-b)}\frac{(x-c)}{(e-c)}\frac{(x-d)}{(e-d)}F(e)$$

for $a<x<e$;

a,b,c,d, and e are ages 25,35,45,55, and 62, respectively.

When $x \leq 25$:

for incidence rates, $F(x) = F(25)$

for termination rates, $F(x) = F(25) + (25-x)[F(25) - F(26)]$.

When $x \geq 62$:

$F(x) = F(62) + (x-62)\ [F(62) - F(61)]$.

EXHIBIT E-2

DTS CONTINUANCE TABLE*
NUMBER OF PERSONS ALIVE & DISABLED AT THE END OF THE
DURATION FROM DATE OF DISABLEMENT
100,000 LIVES EXPOSED TO DISABLEMENT
MALE—CLASS 3—7-DAY ELIMINATION PERIOD—AGE 35

DURATION	ACCIDENT	SICKNESS	COMBINED
1 (Weeks)	5,837.00	5,272.00	11,109.00
2	5,073.90	4,656.04	9,729.94
3	4,384.01	4,030.60	8,414.61
4	3,786.69	3,445.39	7,232.08
5	3,270.06	2,918.64	6,188.70
6	2,823.74	2,461.28	5,285.02
7	2,443.84	2,073.39	4,517.23
8	2,125.76	1,754.41	3,880.17
9	1,860.35	1,495.77	3,356.12
10	1,639.57	1,288.70	2,928.27
11	1,459.41	1,127.31	2,586.72
12	1,313.26	1,003.72	2,316.99
13	1,197.33	913.13	2,110.46
4 (Months)	857.02	637.62	1,494.64
5	650.48	475.58	1,126.07
6	518.37	375.00	893.37
7	435.15	310.51	745.66
8	377.81	265.49	643.29
9	338.48	236.05	574.52
10	309.83	215.44	525.27
11	286.09	198.92	485.01
12	265.21	184.81	450.02
13	247.50	172.47	419.97
14	232.54	162.04	394.58
15	219.86	153.21	373.07
16	209.22	145.79	355.01
17	200.63	139.81	340.44
18	193.43	134.79	328.22
19	187.46	130.63	318.10
20	182.40	127.11	309.51
21	178.02	124.05	302.06
22	174.24	121.42	295.66
23	170.82	119.03	289.85
24	167.72	116.87	284.60
3 (Years)	141.79	98.80	240.59
4	126.96	88.47	215.42
5	117.52	81.89	199.41
6	111.11	77.42	188.53
7	106.31	74.08	180.39
8	102.55	71.46	174.01
9	99.28	69.18	168.46
10	96.30	67.10	163.40

*Illustrating the results of the preceding sample of construction.

EXHIBIT E-3

DTS BASIC TABLE
INCIDENCE OF DISABILITY
RATES PER 1,000 LIVES EXPOSED

	MALE—ACCIDENT						MALE—SICKNESS					
		ELIMINATION PERIOD						ELIMINATION PERIOD				
	AGE	0-day	7-day	14-day	30-day	90-day	AGE	0-day	7-day	14-day	30-day	90-day
Class 1:	25	33.97	25.84	13.13	4.90	.86	25	. . .	32.26	18.22	5.51	1.01
	35	32.88	24.42	11.99	4.23	.51	35	. . .	36.11	21.55	6.48	1.13
	45	30.40	20.40	9.86	4.50	.65	45	. . .	47.12	31.19	12.63	2.70
	55	30.19	18.32	9.63	4.71	.80	55	. . .	69.48	52.75	25.11	7.78
	62	33.45	16.11	10.39	5.47	1.18	62	. . .	91.52	74.06	41.24	15.20
Class 2:	25	59.96	47.98	30.01	10.48	2.07	25	. . .	46.61	27.01	12.17	2.23
	35	59.96	44.62	28.83	10.14	2.09	35	. . .	52.79	33.37	14.47	2.56
	45	56.74	38.49	25.67	9.86	2.14	45	. . .	65.97	46.91	25.40	6.21
	55	51.66	31.31	20.50	10.03	2.20	55	. . .	92.99	71.27	41.37	15.74
	62	52.84	29.85	19.86	10.92	2.57	62	. . .	116.81	93.05	58.54	25.94
Class 3:	25	75.80	62.68	42.87	23.69	7.04	25	. . .	46.83	32.22	14.75	2.99
	35	74.78	58.37	39.59	22.57	6.48	35	. . .	52.72	38.32	18.70	3.52
	45	69.76	50.41	34.61	20.49	5.97	45	. . .	67.05	51.53	29.45	7.83
	55	66.37	44.27	30.51	18.49	5.46	55	. . .	92.60	76.39	52.66	20.07
	62	65.04	39.98	27.96	18.56	5.30	62	. . .	116.23	98.78	78.56	36.04
Class 4:	25	89.42	77.60	52.59	27.03	8.73	25	. . .	48.20	33.28	15.07	3.04
	35	91.59	73.24	50.53	26.93	8.17	35	. . .	53.75	39.27	19.33	3.59
	45	84.64	62.13	42.61	24.78	7.68	45	. . .	70.03	52.71	30.13	7.97
	55	79.77	52.03	37.34	22.78	7.27	55	. . .	95.01	77.91	55.87	20.45
	62	79.95	49.76	36.11	22.96	7.20	62	. . .	119.16	101.41	81.62	36.63

EXHIBIT E-3—*Continued*

	Female—Accident						Female—Sickness					
		Elimination Period						Elimination Period				
	Age	0-day	7-day	14-day	30-day	90-day	Age	0-day	7-day	14-day	30-day	90-day
Class 1:	25	23.06	19.92	12.96	6.00	1.14	25	. . .	61.10	39.29	14.03	2.55
	35	26.28	20.87	13.39	6.21	.91	35	. . .	84.38	56.89	24.75	4.37
	45	32.36	22.77	13.78	6.83	1.11	45	. . .	94.57	68.33	34.14	7.64
	55	45.05	26.77	14.82	8.06	1.46	55	. . .	90.28	61.49	34.23	10.31
	62	69.00	31.56	17.54	9.91	2.25	62	. . .	93.06	69.44	45.30	13.85
Class 2:	25	35.05	31.48	23.39	13.40	3.22	25	. . .	80.97	53.57	20.03	3.75
	35	39.36	32.01	23.36	14.02	3.20	35	. . .	116.02	80.05	35.34	6.60
	45	47.46	33.55	24.40	15.02	3.40	45	. . .	134.18	92.93	47.62	10.81
	55	62.53	37.10	26.13	16.11	3.75	55	. . .	117.29	84.93	49.00	14.95
	62	88.91	44.31	29.27	17.88	4.46	62	. . .	120.40	87.53	63.15	18.86
Class 3:	25	41.93	38.01	27.94	17.63	6.19	25	. . .	86.64	57.85	24.83	5.03
	35	46.30	38.45	28.54	18.20	6.54	35	. . .	124.79	96.77	44.67	8.43
	45	53.01	39.08	29.09	19.24	6.75	45	. . .	145.58	116.19	58.44	14.43
	55	66.71	41.96	30.86	20.99	7.08	55	. . .	122.98	99.89	59.99	17.86
	62	90.05	48.12	33.60	23.74	7.26	62	. . .	125.95	101.06	69.18	22.76
Class 4:	25	52.41	47.52	34.93	22.04	7.74	25	. . .	90.24	60.26	25.86	5.23
	35	57.87	48.07	35.67	22.75	8.17	35	. . .	130.00	100.81	46.53	8.79
	45	66.26	48.86	36.36	24.05	8.45	45	. . .	151.65	121.04	60.87	15.03
	55	83.39	52.45	38.58	26.25	8.85	55	. . .	128.10	104.05	62.49	18.61
	62	112.57	60.16	42.00	29.67	9.08	62	. . .	131.20	105.27	72.07	23.71

EXHIBIT E-4a

DTS BASIC TABLE
FACTORS FOR CALCULATION OF WEEKLY TERMINATION RATES

Week:	1	2	3	4	5
Duration Rate:	.139	.120	.117	.125	.118*
Age: 25	1.019	1.138	1.127	1.105	1.048
EP: 0,7,14,30	1.000	1.053 .941	1.131 1.066 .788	1.061 1.074 .849	1.156 1.246 1.036 .597
Class: 1,2,3,4	.978 .981 .995 1.011	.951 .968 1.012 1.053	.963 .983 1.009 1.036	.983 .997 1.005 1.009	1.006 1.006 1.000 .984
Sex: M,F	1.154 .859	1.142 .858	1.101 .897	1.079 .922	1.060 .942
Cause: A,S	1.034 .957	.956 1.018	.912 1.074	.894 1.098	.884 1.112
Age: 35	1.014	.961	.959	.997	.985
EP: 0,7,14,30	1.000	1.062 .934	1.176 1.067 .757	1.130 1.049 .815	1.249 1.191 .985 .608
Class: 1,2,3,4	1.111 1.030 .957 .882	1.046 .999 .997 .960	1.006 .998 .995 .991	1.007 1.001 .996 .991	1.007 1.003 .997 .988
Sex: M,F	1.101 .901	1.190 .824	1.146 .862	1.090 .913	1.055 .946
Cause: A,S	.995 .994	1.044 .933	.996 .984	.960 1.023	.937 1.050
Age: 45	1.027	.894	.898	.943	.962
EP: 0,7,14,30	1.000	1.082 .916	1.218 1.053 .741	1.185 1.023 .797	1.298 1.123 .938 .652
Class: 1,2,3,4	1.215 1.070 .934 .796	1.135 1.029 .951 .884	1.061 1.017 .977 .939	1.041 1.011 .984 .960	1.025 1.009 .990 .972
Sex: M,F	1.038 .955	1.146 .856	1.110 .890	1.063 .936	1.033 .966
Cause: A,S	.977 1.013	1.132 .860	1.090 .898	1.046 .939	1.014 .970
Age: 55	1.016	.949	.942	.948	.977
EP: 0,7,14,30	1.000	1.136 .873	1.263 1.001 .751	1.228 .988 .797	1.298 1.056 .897 .725
Class: 1,2,3,4	1.243 1.080 .936 .769	1.193 1.057 .935 .832	1.120 1.039 .959 .887	1.086 1.028 .970 .918	1.060 1.023 .979 .938
Sex: M,F	.972 1.020	1.002 .978	1.000 .988	1.000 .995	.997 1.001
Cause: A,S	1.031 .960	1.191 .817	1.171 .836	1.142 .860	1.118 .879
Age: 62	.924	1.058	1.072	1.007	1.028
EP: 0,7,14,30	1.000	1.109 .894	1.210 .958 .819	1.210 .965 .827	1.257 1.004 .867 .815
Class: 1,2,3,4	1.205 1.072 .938 .797	1.185 1.066 .941 .825	1.167 1.057 .949 .847	1.143 1.049 .955 .868	1.120 1.044 .962 .885
Sex: M,F	.908 1.092	.850 1.153	.873 1.132	.922 1.080	.955 1.045
Cause: A,S	1.245 .794	1.300 .749	1.266 .773	1.257 .781	1.245 .790

Class 1 includes the two lowest premium classes of a 5-class manual or the lowest premium class of a 4-class manual.
*Use .084 for 30-day elimination periods to allow for the short week from 30 to 35 days.

EXHIBIT E-4a—*(Continued)*

DTS BASIC TABLE
FACTORS FOR DETERMINATION OF WEEKLY TERMINATION RATES

Week:	6	7	8	9
Duration Rate:	.123	.126	.125	.122
Age: 25	1.060	1.066	1.073	1.079
EP: 0,7,14,30	1.076 1.210 1.048 .689	1.018 1.177 1.053 .760	.980 1.147 1.054 .820	.958 1.118 1.049 .873
Class: 1,2,3,4	.992 1.008 1.007 .990	.986 1.010 1.009 .993	.983 1.009 1.010 .997	.978 1.007 1.012 1.004
Sex: M,F	1.036 .965	1.022 .978	1.012 .988	1.004 .995
Cause: A,S	.878 1.118	.874 1.125	.871 1.129	.870 1.131
Age: 35	1.019	1.043	1.058	1.066
EP: 0,7,14,30	1.164 1.153 .998 .701	1.119 1.121 1.006 .759	1.082 1.099 1.013 .807	1.051 1.082 1.017 .848
Class: 1,2,3,4	.999 1.003 1.002 .994	.996 1.001 1.003 .998	.993 1.000 1.004 1.003	.990 .999 1.005 1.006
Sex: M,F	1.019 .981	.994 1.005	.978 1.022	.967 1.033
Cause: A,S	.925 1.062	.916 1.073	.912 1.078	.913 1.078
Age: 45	.988	1.007	1.019	1.024
EP: 0,7,14,30	1.206 1.096 .962 .738	1.172 1.073 .974 .783	1.143 1.057 .983 .818	1.113 1.046 .990 .851
Class: 1,2,3,4	1.015 1.006 .995 .983	1.010 1.003 .996 .990	1.006 1.000 .997 .995	1.004 .999 .998 .998
Sex: M,F	1.005 .995	.984 1.016	.969 1.031	.959 1.042
Cause: A,S	1.002 .981	.989 .994	.982 1.001	.981 1.003
Age: 55	.969	.964	.961	.957
EP: 0,7,14,30	1.220 1.052 .930 .786	1.196 1.041 .946 .814	1.171 1.031 .957 .841	1.147 1.021 .964 .869
Class: 1,2,3,4	1.041 1.018 .985 .956	1.030 1.013 .989 .968	1.023 1.009 .991 .976	1.020 1.007 .993 .981
Sex: M,F	.995 1.005	.990 1.010	.984 1.016	.976 1.024
Cause: A,S	1.111 .884	1.098 .895	1.089 .902	1.084 .908
Age: 62	.965	.920	.890	.874
EP: 0,7,14,30	1.196 1.031 .896 .849	1.191 1.031 .910 .857	1.180 1.024 .917 .876	1.166 1.010 .919 .907
Class: 1,2,3,4	1.090 1.040 .971 .906	1.071 1.037 .977 .921	1.058 1.033 .980 .933	1.048 1.028 .982 .944
Sex: M,F	.988 1.012	1.011 .988	1.025 .975	1.024 .976
Cause: A,S	1.260 .780	1.253 .785	1.245 .790	1.236 .796

EXHIBIT E-4a—(*Continued*)

DTS BASIC TABLE
FACTORS FOR DETERMINATION OF WEEKLY TERMINATION RATES

Week:	10	11	12	13
Duration Rate:	.117	.109	.099	.086
Age: 25	1.086	1.096	1.110	1.133
EP: 0,7,14,30	.951 1.087 1.038 .921	.963 1.051 1.018 .964	.996 1.008 .985 1.007	1.059 .949 .935 1.050
Class: 1,2,3,4	.972 1.002 1.013 1.013	.966 .994 1.015 1.026	.957 .982 1.017 1.045	.944 .964 1.021 1.074
Sex: M,F	.997 1.002	.990 1.008	.984 1.013	.975 1.018
Cause: A,S	.871 1.131	.876 1.127	.884 1.118	.987 1.104
Age: 35	1.068	1.062	1.049	1.027
EP: 0,7,14,30	1.025 1.069 1.019 .885	1.003 1.058 1.017 .920	.985 1.049 1.008 .955	.971 1.038 .989 .992
Class: 1,2,3,4	.986 .997 1.006 1.010	.981 .996 1.007 1.015	.974 .994 1.009 1.002	.962 .993 1.012 1.032
Sex: M,F	.961 1.040	.958 1.042	.959 1.039	.967 1.026
Cause: A,S	.919 1.072	.930 1.060	.950 1.040	.984 1.006
Age: 45	1.022	1.012	.993	.962
EP: 0,7,14,30	1.083 1.040 .995 .882	1.048 1.039 .998 .914	1.007 1.043 .997 .951	.952 1.054 .989 .995
Class: 1,2,3,4	1.002 .999 .999 1.000	1.001 1.000 1.000 .999	1.000 1.003 1.000 .995	1.000 1.008 1.001 .989
Sex: M,F	.951 1.050	.946 1.055	.943 1.057	.942 1.053
Cause: A,S	.986 .999	.998 .989	1.020 .969	1.058 .935
Age: 55	.953	.948	.941	.932
EP: 0,7,14,30	1.121 1.013 .967 .900	1.090 1.005 .966 .938	1.052 .997 .959 .989	.999 .988 .943 1.062
Class: 1,2,3,4	1.019 1.005 .993 .982	1.022 1.006 .992 .980	1.031 1.009 .989 .971	1.048 1.015 .984 .953
Sex: M,F	.966 1.034	.953 1.048	.935 1.066	.908 1.092
Cause: A,S	1.082 .910	1.086 .909	1.094 .904	1.110 .891
Age: 62	.871	.881	.907	.946
EP: 0,7,14,30	1.147 .987 .917 .951	1.119 .956 .913 1.017	1.079 .914 .906 1.114	1.024 .853 .894 1.265
Class: 1,2,3,4	1.043 1.022 .984 .953	1.041 1.016 .984 .961	1.043 1.009 .982 .967	1.052 .998 .978 .972
Sex: M,F	1.008 .991	.975 1.024	.920 1.083	.844 1.175
Cause: A,S	1.223 .806	1.210 .816	1.193 .829	1.166 .849

EXHIBIT E-4b

DTS BASIC TABLE
FACTORS FOR CALCULATION OF MONTHLY TERMINATION RATES

Month:		4		5		6	
Duration Rate:		.236		.208		.182	
<90d EP		1.172		1.109		1.051	
90d EP		.828		.891		.949	
Male:		.989		.981		.975	
Female:		1.011		1.019		1.025	
Age: 25	A,S	1.082	1.186	1.103	1.182	1.149	1.173
35	A,S	1.039	1.103	1.065	1.123	1.089	1.134
45	A,S	1.012	.989	1.045	.993	1.061	.989
55	A,S	1.017	.857	.980	.837	.970	.809
62	A,S	.981	.732	.971	.701	.963	.663
Month:		7		8		9	
Duration Rate:		.153		.124		.095	
Male:		.947		.943		.939	
Female:		1.053		1.057		1.061	
Age: 25	A,S	1.204	1.218	1.259	1.262	1.351	1.289
35	A,S	1.108	1.187	1.127	1.240	1.167	1.243
45	A,S	1.040	1.019	1.019	1.048	1.031	1.021
55	A,S	.920	.815	.869	.820	.856	.772
62	A,S	.835	.657	.706	.651	.671	.600
Month:		10		11		12	
Duration Rate:		.075		.066		.060	
Male:		.935		.931		.945	
Female:		1.065		1.069		1.055	
Age: 25	A,S	1.442	1.317	1.534	1.344	1.626	1.371
35	A,S	1.207	1.245	1.247	1.248	1.287	1.251
45	A,S	1.042	.993	1.054	.966	1.066	.939
55	A,S	.844	.724	.831	.676	.818	.628
62	A,S	.637	.550	.602	.499	.567	.448

EXHIBIT E-4b—*Continued*

DTS BASIC TABLE
FACTORS FOR CALCULATION OF MONTHLY TERMINATION RATES
SECOND YEAR OF DISABLEMENT

Month:	13	14	15	16	17	18
Duration Rate:	.054	.048	.043	.038	.032	.028
Male:	.960	.975	.978	.981	.984	.988
Female:	1.040	1.025	1.022	1.019	1.016	1.012
Age: 25	1.558	1.625	1.692	1.758	1.825	1.897
35	1.288	1.292	1.296	1.299	1.303	1.298
45	.971	.937	.903	.869	.835	.797
55	.658	.629	.600	.571	.542	.516
62	.524	.517	.510	.503	.496	.493
Month:	19	20	21	22	23	24
Duration Rate:	.024	.021	.019	.017	.016	.015
Male:	.993	.997	1.001	1.005	1.009	1.013
Female:	1.007	1.003	.999	.995	.991	.987
Age: 25	1.970	2.042	2.061	2.079	2.098	2.117
35	1.294	1.289	1.265	1.241	1.217	1.193
45	.758	.720	.706	.693	.679	.665
55	.489	.463	.471	.479	.487	.495
62	.489	.486	.497	.508	.519	.530

EXHIBIT E-4c

DTS BASIC TABLE
FACTORS FOR CALCULATION OF
ANNUAL TERMINATION RATES
YEARS 3 THROUGH 10

Year:	3	4	5	6
Duration Rate:	.123	.084	.062	.050
Male:	1.080	1.129	1.179	1.200
Female:	.920	.871	.821	.800
Age: 25	2.085	1.832	1.554	1.262
35	1.164	1.103	1.017	.909
45	.727	.757	.767	.754
55	.536	.616	.697	.832
62	.489	.691	.965	1.244
Year:	7	8	9	10
Duration Rate:	.045	.042	.042	.043
Male:	1.212	1.210	1.204	1.200
Female:	.788	.790	.796	.800
Age: 25	.994	.776	.617	.524
35	.792	.696	.631	.582
45	.741	.737	.739	.751
55	.984	1.103	1.182	1.226
62	1.489	1.688	1.830	1.918

EXHIBIT E-5

DTS BASIC TABLE
ULTIMATE TERMINATION RATES FOR
DURATION 11 YEARS AND OVER
BY ATTAINED AGE

ATTAINED AGE	MALE	FEMALE	ATTAINED AGE	MALE	FEMALE
30	.0238	.0160	65	.0665	.0446
31	.0240	.0161	66	.0707	.0474
32	.0242	.0162	67	.0753	.0504
33	.0244	.0163	68	.0802	.0538
34	.0246	.0165	69	.0857	.0574
35	.0249	.0167	70	.0916	.0614
36	.0251	.0168	71	.0986	.0657
37	.0254	.0170	72	.1051	.0704
38	.0258	.0173	73	.1127	.0755
39	.0261	.0175	74	.1210	.0811
40	.0265	.0178	75	.1301	.0871
41	.0270	.0181	76	.1398	.0937
42	.0275	.0184	77	.1504	.1008
43	.0280	.0188	78	.1619	.1085
44	.0286	.0192	79	.1743	.1168
45	.0292	.0196	80	.1878	.1258
46	.0299	.0200	81	.2022	.1355
47	.0306	.0205	82	.2178	.1459
48	.0315	.0211	83	.2345	.1571
49	.0324	.0217	84	.2525	.1691
50	.0334	.0224	85	.2717	.1820
51	.0345	.0231	86	.2922	.1958
52	.0357	.0239	87	.3140	.2104
53	.0370	.0248	88	.3372	.2259
54	.0384	.0257	89	.3618	.2424
55	.0400	.0268	90	.3877	.2598
56	.0417	.0279	91	.4149	.2780
57	.0436	.0292	92	.4435	.2971
58	.0456	.0306	93	.4732	.3171
59	.0479	.0321	94	.5041	.3378
60	.0503	.0337	95	.5360	.3591
61	.0530	.0355	96	.5686	.3801
62	.0559	.0375	97	.6020	.4033
63	.0592	.0397	98	.6357	.4259
64	.0627	.0420	99	.6695	.4486

EXHIBIT E-6a

DTS CONTINUANCE TABLE (BASIC TABLE)
NUMBER OF PERSONS ALIVE & DISABLED AT THE END OF THE
DURATION FROM DATE OF DISABLEMENT
100,000 LIVES EXPOSED TO DISABLEMENT
Sex: Male Cause: Combined Class: 1 EP: 30-day

DURATION	AGES AT DISABLEMENT			
	27	37	47	57
4 Week (30-day)	970.30	1,162.16	1,901.25	3,372.00
5	916.80	1,099.34	1,796.17	3,172.94
6	833.30	1,000.06	1,634.45	2,889.74
7	748.66	900.40	1,475.48	2,623.05
8	667.91	806.50	1,327.83	2,379.27
9	593.92	721.02	1,194.02	2,159.40
10	528.07	645.49	1,076.22	1,963.71
11	471.57	581.25	975.77	1,792.87
12	424.20	528.07	892.28	1,645.22
3 Month	385.98	486.00	825.95	1,520.86
4	267.37	344.90	605.51	1,168.27
5	199.06	260.13	471.26	951.46
6	156.47	206.70	385.54	811.37
7	129.27	172.72	330.32	719.17
8	110.35	149.13	291.65	653.67
9	97.50	133.45	266.22	610.99
10	88.21	122.31	248.43	581.63
11	80.55	113.29	234.24	558.82
12	73.85	105.49	222.22	540.10
13	68.08	98.78	211.80	523.07
14	63.11	93.13	203.19	508.76
15	58.82	88.37	196.09	496.75
16	55.17	84.39	190.27	486.80
17	52.17	81.20	185.73	478.93
18	49.61	78.54	182.03	472.39
19	47.44	76.35	179.08	467.06
20	45.57	74.50	176.67	462.63
21	43.93	72.90	174.55	458.56
22	42.51	71.52	172.69	454.84
23	41.21	70.27	170.98	451.28
24	40.02	69.15	169.40	447.89

EXHIBIT E-6a—*Continued*

Duration	Ages at Disablement			
	27	37	47	57
3 Year	30.20	59.53	154.23	417.19
4	25.51	53.81	143.80	392.75
5	22.90	50.05	136.10	371.70
6	21.30	47.45	130.04	351.47
7	20.21	45.46	124.66	330.53
8	19.43	43.87	119.74	309.76
9	18.82	42.45	114.94	288.87
10	18.30	41.13	110.12	268.22
11	17.84	39.87	105.32	248.03
12	17.38	38.62	100.51	228.13
13	16.92	37.37	95.70	208.58
14	16.47	36.12	90.88	189.48
15	16.03	34.87	86.07	170.79
16	15.59	33.63	81.26	152.84
17	15.15	32.38	76.45	135.62
18	14.72	31.14	71.65	119.21
19	14.29	29.90	66.89	103.70
20	13.86	28.65	62.16	89.20
21	13.44	27.40	57.48	75.79
22	13.01	26.15	52.87	63.57
23	12.59	24.90	48.34	52.49
24	12.17	23.65	43.91	42.63
25	11.75	22.39	39.58	34.01
26	11.33	21.14	35.42	26.60
27	10.91	19.89	31.43	20.37
28	10.49	18.64	27.63	15.22
29	10.07	17.40	24.03	11.09
30	9.65	16.17	20.67	7.85
31	9.23	14.95	17.56	5.38
32	8.81	13.75	14.73	3.57
33	8.39	12.58	12.16	2.28
34	7.97	11.42	9.88	1.39
35	7.55	10.30	7.88	0.82
36	7.12	9.22	6.17	0.45
37	6.70	8.18	4.72	0.24
38	6.28	7.19	3.53	0.12
39	5.86	6.25	2.57	0.06
40	5.45	5.38	1.82	0.02
41	5.04	4.57	1.25	0.01
42	4.64	3.83	0.83	0.00

EXHIBIT E-6b

DTS CONTINUANCE TABLE (BASIC TABLE)
NUMBER OF PERSONS ALIVE & DISABLED AT THE END OF THE
DURATION FROM DATE OF DISABLEMENT
100,000 LIVES EXPOSED TO DISABLEMENT
Sex: Male Cause: Combined Class: 3 EP:7-day

DURATION	AGES AT DISABLEMENT			
	27	37	47	57
1 Week	11,027.45	11,153.01	12,026.30	14,212.98
2	9,476.60	9,810.86	10,815.26	13,005.77
3	8,064.23	8,517.64	9,585.30	11,751.55
4	6,824.12	7,348.04	8,428.65	10,526.79
5	5,756.71	6,310.26	7,369.39	9,373.49
6	4,852.04	5,406.22	6,419.79	8,309.58
7	4,097.55	4,634.51	5,588.29	7,357.03
8	3,483.66	3,991.30	4,880.64	6,534.52
9	2,987.65	3,460.05	4,285.85	5,836.00
10	2,589.83	3,025.01	3,792.95	5,252.59
11	2,277.14	2,676.58	3,393.46	4,779.26
12	2,034.06	2,400.87	3,076.46	4,405.68
13	1,851.62	2,189.41	2,834.39	4,126.64
4 Month	1,289.26	1,558.31	2,072.62	3,146.38
5	963.66	1,177.19	1,608.39	2,549.78
6	758.90	936.10	1,312.01	2,165.26
7	627.82	783.46	1,123.01	1,915.43
8	536.45	677.89	991.70	1,739.76
9	473.98	607.19	904.84	1,624.86
10	428.55	556.72	843.74	1,545.47
11	390.96	515.59	794.77	1,483.49
12	357.97	479.94	753.03	1,432.31
13	330.02	449.38	717.72	1,387.15
14	305.91	423.69	688.57	1,349.20
15	285.13	402.04	664.49	1,317.37
16	267.40	383.94	644.79	1,290.98
17	252.89	369.42	629.38	1,270.10
18	240.46	357.31	616.84	1,252.76
19	229.96	347.34	606.84	1,238.64
20	220.88	338.94	598.69	1,226.89
21	212.94	331.66	591.50	1,216.07
22	206.05	325.39	585.19	1,206.22
23	199.74	319.72	579.39	1,196.79
24	193.97	314.59	574.06	1,187.78

EXHIBIT E-6b—*Continued*

Duration	Ages at Disablement			
	27	37	47	57
3 Year	146.40	270.81	522.64	1,106.36
4	123.67	244.79	487.31	1,041.56
5	111.01	227.70	461.21	985.74
6	103.26	215.86	440.66	932.09
7	97.95	206.82	422.43	876.56
8	94.18	199.58	405.76	821.46
9	91.21	193.15	389.49	766.08
10	88.71	187.14	373.16	711.32
11	86.46	181.41	356.89	657.76
12	84.23	175.70	340.61	605.00
13	82.03	170.00	324.30	553.15
14	79.85	164.33	307.99	502.49
15	77.70	158.66	291.66	452.94
16	75.56	152.99	275.36	405.34
17	73.45	147.33	259.06	359.66
18	71.35	141.68	242.81	316.14
19	69.26	136.01	226.67	275.01
20	67.19	130.34	210.64	236.56
21	65.13	124.65	194.78	200.98
22	63.08	118.97	179.16	168.58
23	61.04	113.27	163.80	139.20
24	59.00	107.57	148.80	113.06
25	56.97	101.87	134.13	90.20
26	54.93	96.18	120.03	70.55
27	52.90	90.48	106.50	54.01
28	50.87	84.81	93.62	40.37
29	48.83	79.17	81.44	29.40
30	46.80	73.57	70.05	20.81
31	44.76	68.03	59.52	14.28
32	42.72	62.58	49.92	9.46
33	40.67	57.21	41.22	6.04
34	38.62	51.97	33.48	3.70
35	36.58	46.85	26.71	2.16
36	34.53	41.92	20.89	1.20
37	32.49	37.20	15.99	0.63
38	30.45	32.70	11.96	0.31
39	28.43	28.44	8.71	0.15
40	26.42	24.47	6.16	0.06
41	24.43	20.79	4.23	0.03
42	22.47	17.44	2.80	0.01