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SPECIAL REPORT

How to Prepare a Life Expectancy Report for an Attorney in a Tort Case

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The purpose of this methodology article is to describe a suitable format for a legally acceptable report on the life expectancy of the principal in a tort case that is being advocated or defended by an attorney. Life insurance medical directors and underwriters are clearly skilled and experienced in mortality risk classification for life insurance. However, the judicial system is accustomed to measuring excess mortality only in terms of reduced life expectancy. The analyst preparing the report must convert the excess mortality into a figure for reduced life expectancy and compare this with the life expectancy of persons matched by age, sex and race in the latest Decennial US Life Tables. This process is different from the life insurance underwriting process. A life table projected to age 109 must be constructed as an essential part of the report, and the entire process must be presented clearly and convincingly. There are good reasons why the excess death rate (EDR) should be used as the index of excess mortality in constructing the life table, in preference to the mortality ratio (MR), which is used most of the time in life insurance risk classification. All of these considerations are discussed in this article, which is based on a sample of 40 cases handled by the author, a retired life insurance medical director.

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BACKGROUND

In the 15 years that I have been involved, the court system personnel (attorneys, their staff and judges) all have employed life expectancy as their index of reduced survival in assessing damages in tort cases. I believe this practice goes back a century or more. Life expectancy is usually derived from population life tables. However, attorneys and the courts recognize that many injuries and medical conditions are associated with excess mortality and reduced life expectancy. For medical assistance in quantifying reduced life expectancy, they have generally turned to physicians board certified in the specialty involved. As all American Academy of Insurance Medicine (AAIM) members know, most physicians, no matter what their medical expertise and experience in their specialty, have no expertise in mortality risk appraisal. There are exceptions, in those interested in follow-up studies, clinical trials and clinical decision-making, but as far as I know they constitute a small minority. Providing an expert opinion on life expectancy represents an opportunity for life insurance medical directors to utilize their skill in medicine and mortality risk appraisal to render a valuable service to attorneys in providing a truly expert opinion

on reduced life expectancy. However, the preparation of a good report is a very different procedure from rating a life insurance application, as I will explain in this article.

METHODS

Life expectancy (å) is defined as the average number of years lived by a group of persons from their starting age until all have died. It is a standard feature in column 7 of the Decennial US Life Tables (see an extract of the 1989–91 Decennial Tables for the US white male population in Table 1).[1] A method was published in the *Journal of Insurance Medicine* in 1992 to adapt this format to a spreadsheet computer program to calculate life expectancy in a defined group at increased mortality risk.[2] I will not repeat the detailed instructions for the spreadsheet program developed prior to 1992, because both hardware and software are long outmoded. I should mention that virtually all of the life tables for my mortality articles are prepared with a pocket calculator, because they are short tables. However, the average life expectancy table is over 50 lines (starting age about 55, with annual data through age 109). It would be too time consuming to attempt this calculation process by hand. But, it can be done in less than an hour with a spreadsheet program, which can be readily constructed by any reader familiar with computerized spreadsheets.

The life expectancy chosen for this article, shown in Table 2, in which the decimal EDR values are those derived for the fictitious case example created for this article. The columns are numbered numerically from the left, as I explain the derivation of the variable in each column. Age, in the left hand column 1, is for the last birthday and starts with age used as the starting age in the report. All attained ages from the starting age to age 109 (the highest shown in the Decennial US Life Tables) must have data calculated to make the most accurate calculation of life expectancy. In column 2, the annual population mortality rate, q′, is transferred from the appropriate column and rows in the reference US Life Table that I've stored in Microsoft Excel. If desired, the corresponding age can also be transferred from the reference table. In column 3, the decimal EDR is inserted in the top row of the age sequence for EDR (generally a quinquennial interval, except for the last, which is carried to age 109). The same EDR is copied into the remaining years of the sequence. All EDR values that are tailored to the individual case must be calculated in advance and inserted into the appropriate attained age intervals. In column 4, also an insertion, the projected annual mortality rate of the group at increased risk is derived from the data in columns 2 and 3: proj. q = q′ + EDR = 0.01053 + 0.030 = 0.0450. This is done in accordance with the formula method of Microsoft Excel, or whatever spreadsheet program is utilized. In column 5, ''Cohort'' is used to designate the number alive at the start and the survivors alive at the start of each subsequent year of attained age. The arbitrary number of 1000.0 is used for the starting age, instead of the ''100,000 born alive'' for age 0–1 in the US Life Table. A decimal place is carried for reference when survivors become very few because of attrition by death.

Deaths (d) are shown in column 6. They are derived as the product of projected q and Cohort: d = (proj. q) × (Cohort) = (0.0450) × (1000.0) = 45.0. Deaths during a year of attained age must be subtracted from the Cohort to obtain the number of survivors alive at the start of the next year of attained age: $\text{Cohort}_{61} = \text{Cohort}_{60} - d_{60} = 1000.0 - 45.0 = 955.0$. This attrition is the basis of linking the life table calculations for one year of age with those for the next year.

L in column 7 and T in column 8 are auxiliary variables needed for the life table calculation of life expectancy. L is the average number exposed to risk during the full year of attained age or the number at risk at the midpoint of the year, approximated as: L = Cohort − 0.5d = 1000.0 − 0.5(45.0) = 977.5. T is the sum total of all values of L from the current year through age 109: T = Σ L =

Table 1. Life Tables for White Males, United States, 1989–1991

Age interval	Proportion dying	Of 100,000 born alive		Stationary population		Average remaining lifetime
Period of life between two ages (1)	Proportion of persons alive at beginning of age interval dying during interval (2)	Number living at beginning of age interval (3)	Number dying during age interval (4)	In the age interval (5)	In this and all subsequent age intervals (6)	Average number of years of life remaining at beginning of age interval (7)
x to $x + t$	${}_tq_x$	l_x	${}_td_x$	${}_tL_x$	T_x	$\mathring{e}_0$
Days						
0–1	.00302	100,000	302	273	7,271,574	72.72
1–7	.00134	99,698	134	1,638	7,271,301	72.93
7–28	.00100	99,564	99	5,725	7,269,663	73.01
28–365	.00329	99,465	327	91,684	7,263,938	73.03
Years						
0–1	.00862	100,000	862	99,320	7,271,574	72.72
1–2	.00066	99,138	66	99,105	7,172,254	72.35
2–3	.00049	99,072	48	99,049	7,073,149	71.39
3–4	.00037	99,024	37	99,005	6,974,100	70.43
4–5	.00032	98,987	31	98,972	6,875,095	69.45
5–6	.00028	98,956	27	98,943	6,776,123	68.48
6–7	.00026	98,929	26	98,915	6,677,180	67.49
7–8	.00024	98,903	24	98,891	6,578,265	66.51
8–9	.00022	98,879	22	98,868	6,479,374	65.53
9–10	.00019	98,857	18	98,848	6,380,506	64.54
10–11	.00016	98,839	16	98,831	6,281,658	63.55
11–12	.00017	98,823	17	98,815	6,182,827	62.56
12–13	.00024	98,806	23	98,794	6,084,012	61.58
13–14	.00039	98,783	38	98,764	5,985,218	60.59
14–15	.00059	98,745	59	98,716	5,886,454	59.61
15–16	.00081	98,686	80	98,646	5,787,738	58.65
Years—Continued						
53–54	.00753	89,433	674	89,096	2,162,879	24.18
54–55	.00831	88,759	737	88,390	2,073,783	23.36
55–56	.00913	88,022	804	87,620	1,985,393	22.56
56–57	.01004	87,218	875	86,781	1,897,773	21.76
57–58	.01109	86,343	957	85,865	1,810,992	20.97
58–59	.01231	85,386	1,052	84,859	1,725,127	20.20
59–60	.01366	84,334	1,152	83,759	1,640,268	19.45
60–61	.01503	83,182	1,250	82,557	1,556,509	18.71
61–62	.01641	81,932	1,345	81,259	1,473,952	17.99
62–63	.01788	80,587	1,440	79,867	1,392,693	17.28
63–64	.01947	79,147	1,541	78,377	1,312,826	16.59
64–65	.02118	77,606	1,644	76,784	1,234,449	15.91
65–66	.02297	75,962	1,745	75,089	1,157,665	15.24
99–100	.32413	774	251	649	1,808	2.33
100–101	.34033	523	178	434	1,159	2.21
101–102	.35735	345	123	284	725	2.10
102–103	.37522	222	83	180	441	1.99
103–104	.39398	139	55	112	261	1.88
104–105	.41368	84	35	66	149	1.78
105–106	.43436	49	21	39	83	1.68
106–107	.45608	28	13	21	44	1.58
107–108	.47888	15	7	12	23	1.49
108–109	.50282	8	4	8	11	1.41
109–110	.52797	4	2	3	5	1.32

Table 2. Life Table for Mr. ABC, WM age 60: proj. q = EDR + q′(USLT 1989–91)

Age x (1)	Exp. q′ (2)	EDR (3)	Proj. q (4)	Cohort (5)	Deaths (6)	L (7)	T (8)	ê (9)
60	0.01503	0.03000	0.0450	1000.0	45.0	977.5	10713.6	10.7
61	0.01641	0.0300	0.0464	955.0	44.3	932.8	9736.1	10.2
62	0.01788	0.0300	0.0479	910.6	43.6	888.8	8803.3	9.7
63	0.01947	0.0300	0.0495	867.0	42.9	845.6	7914.5	9.1
64	0.02118	0.0300	0.0512	824.2	42.2	803.1	7068.9	8.6
65	0.02297	0.0550	0.0780	782.0	61.0	751.5	6265.8	8.0
66	0.02483	0.0550	0.0798	721.0	57.6	692.2	5514.3	7.6
67	0.02689	0.0550	0.0819	663.4	54.3	636.3	4822.1	7.3
68	0.02926	0.0550	0.0843	609.1	51.3	583.5	4185.8	6.9
69	0.03200	0.0550	0.0870	557.8	48.5	533.5	3602.4	6.5
70	0.03509	0.0910	0.1261	509.3	64.2	477.2	3068.8	6.0
71	0.03848	0.0910	0.1295	445.1	57.6	416.2	2591.7	5.8
72	0.04215	0.0910	0.1332	387.4	51.6	361.6	2175.4	5.6
73	0.04598	0.0910	0.1370	335.8	46.0	312.8	1813.8	5.4
74	0.04993	0.0910	0.1409	289.8	40.8	269.4	1501.0	5.2
75	0.05414	0.1000	0.1541	249.0	38.4	229.8	1231.5	4.9
76	0.05875	0.1000	0.1588	210.6	33.4	193.9	1001.7	4.8
77	0.06372	0.1000	0.1637	177.2	29.0	162.7	807.8	4.6
78	0.06920	0.1000	0.1692	148.2	25.1	135.6	645.2	4.4
79	0.07533	0.1000	0.1753	123.1	21.6	112.3	509.5	4.1
80	0.08246	0.1170	0.1995	101.5	20.2	91.4	397.2	3.9
81	0.09049	0.1170	0.2075	81.3	16.9	72.8	305.8	3.8
82	0.09891	0.1170	0.2159	64.4	13.9	57.5	233.0	3.6
83	0.10715	0.1170	0.2242	50.5	11.3	44.8	175.6	3.5
84	0.11519	0.1170	0.2322	39.2	9.1	34.6	130.7	3.3
85	0.12436	0.1170	0.2414	30.1	7.3	26.5	96.1	3.2
86	0.13522	0.1170	0.2522	22.8	5.8	19.9	69.6	3.1
87	0.14695	0.1170	0.2640	17.1	4.5	14.8	49.7	2.9
88	0.15927	0.1170	0.2763	12.6	3.5	10.8	34.9	2.8
89	0.17219	0.1170	0.2892	9.1	2.6	7.8	24.0	2.6
90	0.18617	0.1170	0.3032	6.5	2.0	5.5	16.3	2.5
91	0.20159	0.1170	0.3186	4.5	1.4	3.8	10.8	2.4
92	0.21773	0.1170	0.3347	3.1	1.0	2.6	7.0	2.3
93	0.23376	0.1170	0.3508	2.0	0.7	1.7	4.4	2.2
94	0.24893	0.1170	0.3659	1.3	0.5	1.1	2.8	2.1
95	0.26329	0.1170	0.3803	0.8	0.3	0.7	1.7	2.0
96	0.27914	0.1170	0.3961	0.5	0.2	0.4	1.0	1.9
97	0.28299	0.1170	0.4000	0.3	0.1	0.3	0.6	1.8
98	0.30869	0.1170	0.4257	0.2	0.1	0.1	0.3	1.7
99	0.32413	0.1170	0.4411	0.1	0.0	0.1	0.2	1.7
100	0.34033	0.1170	0.4573	0.1	0.0	0.0	0.1	1.6
101	0.35735	0.1170	0.4744	0.0	0.0	0.0	0.1	1.5
102	0.37522	0.1170	0.4922	0.0	0.0	0.0	0.0	1.5
103	0.39398	0.1170	0.5110	0.0	0.0	0.0	0.0	1.4
104	0.41368	0.1170	0.5307	0.0	0.0	0.0	0.0	1.3
105	0.43436	0.1170	0.5514	0.0	0.0	0.0	0.0	1.3
106	0.45608	0.1170	0.5731	0.0	0.0	0.0	0.0	1.2
107	0.47888	0.1170	0.5959	0.0	0.0	0.0	0.0	1.1
108	0.50282	0.1170	0.6198	0.0	0.0	0.0	0.0	0.9
109	0.52797	0.1170	0.6450	0.0	0.0	0.0	0.0	0.7

10713.6. Finally, in column 9, the last column to the right, we arrive at the life expectancy, ê. The calculation for this is: ê = T/Cohort = 11228.2/1000.0 = 11.8 years. Values of ê are derived not only for the starting age, 60 years, but also for all attained ages. When T/Cohort becomes 0.0/0.0 starting at age 102, ê does not become indeterminate. Instead, successive values are still displayed, decreasing from 1.7 at age 102 to 1.0 at age 109. The reason for this is that 16 decimal places are carried for arithmetical calculations in the memory of the computer but not displayed in the table, for which only one decimal place has been selected for these variables.

SAMPLE CASE REPORT

Let us suppose you have an interest in life table methodology and life expectancy and would like to prepare an occasional case report as described in this article. From a personal notice that you've placed in the *National Law Review,* an assistant US attorney calls you. The attorney is charged with defense of a suit against the United States for wrongful death of a veteran due to complications following an operation at a Veterans Hospital. Before the operation, the veteran had at least 3 mortality risk factors: a history of heavy smoking, obesity and hypertension.

The attorney probes your qualifications and ascertains your fee schedule and availability, if needed, to make a deposition (in your home city) and to testify in trial (at a US District Court, usually in a distant city). He asks for your curriculum vitae, and if he is satisfied with your qualifications he calls you again, and requests you to make a report after you have reviewed the medical records. Customarily, you are requested to make a preliminary estimate of the life expectancy after you have reviewed the records. Then you call the attorney and discuss your estimate, so that he may confirm the preparation of the report or rarely to ask you to stop further work on the case. It sometimes happens that a case may be settled before you have written the report. In working for the Department of Justice, you will sign a contract that specifies a budget total, based on hours of work estimated in the US attorney's office and the hourly rate. However, this is subject to modification if the hours prove to be insufficient.

Medical records are organized, and the pages numbered in the attorney's office. For this case, you receive two thick loose-leaf volumes of the complete medical records from outpatient clinics, hospital admissions and test procedures at units of the Department of Veterans Affairs (DVA). The case involves a veteran, Mr. ABC, who had 4 years of Army service. He was age 60 when he was admitted to the DVA hospital for a routine operation for benign prostatic hypertrophy (BPH). Unfortunately during recovery, he had a mucous plug obstructing his trachea, which produced anoxia and irreversible brain damage before it was discovered and aspirated. ABC was adjudged to be brain dead and assisted ventilation was discontinued at the request of the family. The suit against the physician, the hospital and the United States was for $25,000,000.

You have several inches of medical records to review. You will pay special attention to the discharge summaries, important records of the hospital admissions, which are almost always typed and therefore easily legible, and the chief source of medical information pertinent to your assessment of life expectancy. Outpatient records are generally handwritten and often illegible. In this case, however, there is a history of borderline and increasing blood pressures, culminating in a hospital admission 5 years prior to death with diagnosis of definite hypertension. Antihypertensive drugs were prescribed and ABC was followed in the clinic with many blood pressures recorded. As a conscientious reviewer, you accordingly review the outpatient records page by page and record all the blood pressure readings in your notes, so that you can arrive at an average under recent treatment. Some records may be of importance, such as x-rays, electrocardiograms, special tests, consultants' reports, and letters from physicians. You will seldom find any mortal-

ity risk information in other hospital records such as progress notes, nurses' records, doctors' order sheets and the myriad of miscellaneous sheets. For important information in your notes, you should record the page number, so you can refer back for details in writing your report.

In the case of ABC, your review confirms the 3 common, significant risk factors as described by the attorney with no other significant ones, past or recent. You prepare a worksheet to record each of these and your source data for EDR by age and duration. A subject-classified source for follow-up studies is in a recently published bibliographic index.[4] You should be familiar with mortality articles in recent issues of the *Journal of Insurance Medicine.* I have seldom needed to do a literature search if time was available to make one. Excess mortality should be measured as EDR, not MR for reasons detailed in several articles.[2,3,5,6] The mortality risk factors you list are as follows.

History of Smoking

ABC was a heavy smoker of cigarettes, over one pack per day for 45 years. I prefer to use the very large American Cancer Society 12-year follow-up of smokers and nonsmokers as developed in Abstract 311 in the *1990 Medical Risks* monograph.[7] Mortality rates per 1000 are given for 4 different categories. From the rate for All Smokers, I have subtracted the rate for All Healthy Subjects, as the control q′. These rates are given for quinquennial attained age groups from 40–44 through 85–89, and they increase progressively with age. These differences, which I consider to be a good estimate of excess mortality in men smoking a pack or more per day are:

Age	60–64	65–69	70–64	75–79	80 up
EDR	13	19	26	38	55

Obesity

ABC was 5′10″ tall and weighed 230 lb. On examination, he was generally described as obese. The best source, of course, is the 1979 Build Study.[8] For ABC's age and height the average weight is 177 lb. He was therefore 30% overweight. Table D63 should be used, because it gives excess mortality by duration for men with and without minor impairments, and excess mortality, even by MR, increases with duration of follow-up. It is unfortunate that excess mortality by EDR is not given in the Build Study. However, it may be calculated from the MR and expected mortality rates given in a table on page 9, as shown below, for men aged 40–69:

Duration	5–10	10–15	15–22
Decimal MR	1.45	1.57	1.62 (all overweights)
1000q′	23	43	68
1000q	33	68	110
EDR	10	25	42

History of Hypertension

A diagnosis of definite hypertension was established at a DVA hospitalization 5 years prior to the year of death of ABC, after scattered blood pressure readings in routine clinic visits increased from borderline to about 160/95. Labile readings about this level were confirmed on admission and as the blood pressure was monitored thereafter. Various studies were normal, including heart size by chest x-ray, electrocardiogram, urinalysis, echocardiogram, renal function and other studies. ABC was started on antihypertensive medication, discharged, and followed in the hypertension clinic. In all, 34 readings were recorded over the next 5 years. These averaged at 139/85 indicating good control under medication, although occasional readings were still over 140/90. For excess mortality, you consult the separate results summarized in a 1986 article in the *Journal of Insurance Medicine,*[9] not the combined standard and substandard results of the 1979 Blood Pressure Study. ABC should be in the substandard experience of Table 3 of the 1986 cited article (men aged 40–69), because of the history of hypertension and current readings being under treatment. His average of 139/85

is in the Class C range of 138–147/83–92. Since the average covers a period of 5 years since diagnosis at age 55, we should use the experience from 5 to 22 years for attained ages 60 and up:

Attained age	60–64	65–69	≥70
EDR	7	10	20

You are now ready to display this table by attained age of the individual and total EDR values:

Age	60–64	65–69	70–64	75–79	≥80
Smoking	13	19	29	38	55
Obesity	10	25	42	42	42
High BP	7	11	20	20	20
Total EDR	30	55	91	100	117

ORGANIZATION OF REPORT

After completion of your EDR analysis and construction of the life table, you are ready to begin your report (assuming you have confirmation from the attorney). The organization I use is intended to be complete, logical and clear to the attorneys on both sides, any mediator, and the judge, if the case comes to trial. Your objective is to clarify the concepts of excess mortality, EDR, and their application to the life table method of calculating life expectancy. I use the following order of presentation.

Introduction

The introduction confirms that the letter is a report on the life expectancy of the designated individual at the request of the attorney. In this paragraph, you should state the reason for the suit, the records reviewed as listed in the attorney's letter of transmittal, the citation for the method used,[1] an outline of the report, the hourly fee agreed on, reference to the curriculum vitae previously sent, and a list of depositions and trial testimonies made in the past 4 years requested by the attorney.

Summary of Qualifications

I insert this paragraph to circumvent the need for the reader to consult a separate document. This should emphasize your expertise in medical risk appraisal and the use of life table methodology. (These two paragraphs usually take up the first page.)

Medical History

This is a chronological account of the medical history of the case, based on your notes and reference to the original records for details when needed. You will probably have some reorganizing to do because the records are seldom in completely chronological order, and sometimes duplicates are included. Labeling and indexing are sometimes provided by the staff in the attorney's office. You may have to request records that appear to be missing. Preparing a clear chronological history is a challenge, but it is necessary for the next step.

Mortality Risk Factors

Dating the assessment of risk factors is based on your judgment after discussion with the attorney. The date may not be the latest available, including the date of death, if death is involved. It might be before a diagnosis is made or a major operation is carried out. In this section, you list the risk factors, cite the source you select for EDR data in each one, describe the study very briefly, and give the EDR values by duration, converted to attained age. This has already been done for this case. The sample text is more detailed than needed, because details would ordinarily be in the Medical History section. At the end of this section, you would insert the summary EDR table.

Life Expectancy Table

This again refers to the methodology article and the need to use decimal EDR values. The life table (Table 2) may appear bewildering because of its size and the amount of

data. However, the arithmetic relations of the variables are simple. The relations are then described column by column, as they have been in the Methods section above.

Conclusion

''On the basis of the foregoing analysis, I conclude with a reasonable degree of medical probability that the life expectancy of a group of 60-year-old white men with the same set of risk factors as those seen in Mr. ABC is 10.7 years. This is a reduction of 48% below the life expectancy of 19.4 years for the average 60-year-old, US white male. If you have any questions, please do not hesitate to call or write.''

This is a verbatim transcript of the concluding paragraph that I use.

References

The methodology article and all follow-up studies cited should be listed in accordance with the numbers in the text.

COMMENT

To me the most convincing element of a report such as this is the life table, which incorporates all the EDR elements of the individual risk factors in deriving the life expectancy. As evidence, it is highly quantitative and definite, which the attorney likes. It is not necessary to emphasize that risk appraisal remains both an art and a science, and I avoid any mention of confidence limits. The life table itself is a more than sufficient trial of the mathematical comprehension of the attorneys involved. If you intend to enter this kind of consulting work, I consider it mandatory that you become thoroughly familiar with the life table, all its variables, and the construction of it in a spreadsheet program.

During almost 100 years of substandard underwriting, it has been postulated that debits for separate impairments are additive, even though the possibility has been recognized that the excess mortality for the combination might be smaller or larger than the sum of the debits. Little has been done to test the validity of this postulate until the recent publication of the Multiple Medical Impairment Study,[10] a pioneering effort accomplished by Harry Woodman and his committee. Unfortunately, I believe no one has yet made an analysis of excess mortality in the various combinations in relation to the sum of the debits or EDR values for the individual risk factors.

It should be emphasized that in my experience, there are multiple risk factors in most of these cases, with an average of 4 or 5 per case, and a range of 1–11 factors. Sometimes these are very high risk factors such as symptomatic congestive heart failure and stroke. The total EDR is even more often apt to be very high, over 100 per 1000 per year. In such cases, I often discount the total EDR by 20% or more, to allow for overlap in the multiple risk factors and for future improvement in medical care with general reduction in mortality. The decrease in life expectancy is relatively small, and this provides verisimilitude to the process for the opposing attorney when you are reporting to the attorney for the defense, as in this simulated case. I consider it only a partly explored area of risk appraisal when many risk factors and a high total EDR are involved.

Long-term future mortality is a part of life expectancy, as emphasized in the articles on structured settlement annuities.[5,6] This is in contrast to risk appraisal for life insurance, in which attention is focused on the short-term risk. Since the policyholder has the right to request a reduction in rating after a short period, there is a steady attrition of policies at risk due to lapse or surrender (not seen in annuities). The timeframes of reference are very different for life insurance risk appraisal and the calculation of life expectancy.

In a survey of my recent cases, I found that the range of age is wide, from young children to age 80. However, cases tend to be concentrated in the decade 50–59 years, and males outnumber females. Many cases involve injuries often due to motor vehicle accidents. Although these predominate in structured

settlement applicants,[5,11,12] in the tort cases I have handled medical conditions predominate. These include many common conditions, such as all forms of coronary heart disease, smoking, hypertension, overweight, stroke, cancer, congestive heart failure, and chronic pulmonary disease. Cases of disability have also been handled due to head injury, other brain damage, or to spinal cord damage. Most cases had more than the 3 risk factors chosen for this example. Over 90% of my cases were prepared for attorneys for the defense.

Some very unusual diagnoses challenged the assessment of mortality risk. One was delay in the diagnosis of neck pain in an older woman with cervical arthritis. By the time the unusual diagnosis of epidural abscess was confirmed, she had total tetraplegia.

Another case was a young woman who had a large brain tumor surrounding the pituitary fossa. The tumor was radiosensitive and it melted away and did not recur over a period of many years. However, radiation was so intensive that the pituitary was damaged with complicating diabetes insipidus and hypernatremia, which are both difficult to control and require frequent hospitalization.

Yet another case was one of disabling osteogenesis imperfecta. A literature search was made yielding an article of only a single page but with 4 survival curves. This led to correspondence with the authors, the sharing of data and the publication of a mortality article in the *Journal of Insurance Medicine.*[13] The senior investigator in this study, Dr. Colin Paterson, is an international authority on osteogenesis imperfecta. With the Brittle Bone Society that he founded in 1980, a registry of such cases in the United Kingdom provided his follow-up data.

An excellent reference book on life expectancy in tort cases is entitled *Life Expectancy in Court,* by TW Anderson.[14] Although it is subtitled as a ''textbook for doctors and lawyers,'' I consider it a reference book because of the wealth of tables and graphs illustrating trends and relationships of MR and EDR with life expectancy. Dr. Anderson is now an emeritus professor of Health Care and Epidemiology in the medical school of the University of British Columbia, Vancouver. He has vast experience as a recognized expert witness on life expectancy in Canadian courts. The book reflects a wide knowledge of mortality follow-up studies. The organization of the book is a novel one. Thirteen chapters take up only 100 pages, but there are copious references in the text to ''Chapter Notes,'' which provide another 66 pages of additional text, tables and graphs, as well as the source citations. The standard life table format is the basis for the discussion and the calculation of life expectancy, with the use of either MR (as a multiple rather than a percentage) or EDR (as a decimal in the life table). Life table extracts are generally given for decennial ages or only a small range of annual ages. (Also see articles by Anderson[15] and Strauss[16])

In Anderson's ''double table,'' the expected life table values are given on the left side, columns for MR and MR in the middle (but only one is used at a time), and the new life table values after change of q, by operation of MR or EDR on q'. Trends with age of some life table variables are also shown graphically. However, most of the tables and graphs deal with other aspects or trends of MR, EDR and life expectancy in their various relationships. All of this material is of great pertinence to the subject matter, but the concepts are intricate and require careful study by the reader.

One interesting feature is the reconstructed extension of the 1989–91 Life Table for the US female population to ages 110–114 (chapter note 2.9, pages 119–120). This was accomplished by Dr. Anderson by increasing the q' at age 109 by the annual factor of 1.06 (the average annual increase from ages 100–109). By this calculation, there are no survivors at age 114. An ingenious reconstruction of the unpublished last few years of the Decennial US Life Table for the female population.

The life expectancy report as described in this article is clearly only one of many formats that might be used. The emphasis on the

life table calculation of life expectancy appears to be powerful evidence, because most of the cases in which I have been involved have been settled before coming to trial. Attorneys for the defense have generally assured me that the report did materially assist in achieving a satisfactory settlement.

REFERENCES

1. US Department of Health and Human Services, National Center for Health Statistics. *US Decennial Life Tables for 1989–91.* Volume 1, Number 1. Hyattsville, Md: 1997. (DHHS Publication No. PHS-98-1150-1).
2. Singer RB. A Method of Relating Life Expectancy in the U.S. Population Life Tables to Excess Mortality. *J Insur Med.* 1992;24:32–41.
3. Singer RB. ''The Impact of Excess Mortality on Life Expectancy: Tables Based on Levels of EDR (Excess Death Rate) and Rates in the Decennial U.S. Life Table for 1989–91 (White Population). *J Insur Med.* 1998;30:138–154.
4. Singer RB, Kita M, Avery J. *A Descriptive Index of Mortality Studies from Selected Sources 1951–1995.* Westwood, Mass: CMAS Books; 2001.
5. Schmidt C, Singer RB. Structured Settlement Annuities Part I: Overview and the Underwriting Process. *J Insur Med.* 2000;32:131–136.
6. Singer RB, Schmidt C. Structured Settlement Annuities Part II: Mortality Experience 1967–1995 and the Estimation of Life Expectancy. *J Insur Med.* 2000;32:137–154.
7. Lew EA, Gajewski J, eds. *Medical Risks—Mortality by Age and Time Elapsed.* Vol 2. Westport, Conn: 1990.
8. Build Study 1979. Compiled and published by the Society of Actuaries and the Association of Life Insurance Medical Directors of America. 1983; Table D63, page 90.
9. Singer RB. Summary Data (Exposures, Deaths, Mortality Ratios and Excess Death Rates) for the Separate Standard and Substandard Experience of the 1979 Blood Pressure Study. *J Insur Med.* 1986; 18:17–23.
10. SOA/AAIM/HOLUA-IHOU Mortality and Morbidity Liaison Committee, MIB Inc. *Multiple Medical Impairment Study.* Westwood, Mass: CMAS Books; 1998.
11. Butz RH. The Epidemiology of Severe Injuries in Structured Settlement Applicants. *J Insur Med.* 1986;18:2–16.
12. Ryan JJ Jr, Harbin RF. Structured Settlements. In: Brackenridge RDC, Elder WJ, eds. *Medical Selection of Life Risks.* 4th ed. New York, NY: Stockton Press; 1998:173–180.
13. Singer RB, Ogston S, Paterson C. Mortality in Various Types of Osteogenesis Imperfecta. *J Insur Med.* 2001;33:16–22.
14. Anderson TW. *Life Expectancy in Court—A Textbook for Doctors and Lawyers.* Vancouver, British Columbia, Canada: Teviot Press; 2002.
15. Anderson TW, Marion SA. Estimating Mortality Rates: The Role of Proportional Life Expectancy. 2005;37:35–42.
16. Straus DJ, Vachon PJ, Shavelle RM. Estimation of Future Mortality Rates and Life Expectancy in Chronic Medical Conditions. 2005;37;20–35.

How a case proceeds through the courts. A tort case begins when a party files a complaint in the appropriate court. The other side has time to respond. The parties have time to conduct discovery in order to learn about the case and gather evidence. One or both parties can bring preliminary motions.Â They must know how to prepare filing documents. Even things like serving court papers on the other party or serving a subpoena can make a critical difference. Trial lawyers must be confident in their decisions.Â Tort law is challenging. It gives the attorneys who practice it the opportunity to become experts in their field. They learn to evaluate cases, build evidence, conduct trials and make strategic decisions that are calculated to achieve the best possible outcome in the case. Life expectancy in a group with excess mortality may be computed by either adding the decimal excess death rate (EDR) to q' for each year of attained age to age 109 or multiplying q' by the decimal MR for each year to age 109. An example is given for men age 60 with localized prostate cancer; annual EDRs from a large published cancer study are used at duration 0-24 years, and the last EDR is assumed constant to age 109. This value of e is compared with e from constant initial values of EDR or MR after the first year. Interrelations of age, sex, e, and EDR and MR are discussed and ill...Â How to prepare a life expectancy report for an attorney in a tort case. R. Singer. Medicine. statistics to predict life expectancy and work-life expectancy (both Years of Remaining Labor Force Participation and Years Remaining until Final Retirement). I circulate copies of the Future Damage Calculator during class. Students enjoy finding their own life expectancies.14. I briefly describe the three general methods courts use for addressing inflation: (1) the â€œinflation-discount methodâ€ that requires an expert to calculate inflation and rates of return for future years,15 (2) the â€œreal interest methodâ€ that requires an expert to predict the difference between inflation and interest rate Tort law determines whether a person should be held legally accountable for an injury against another, as well as what type of compensation the injured party is entitled to. The four elements to every successful tort case are: duty, breach of duty, causation and injury. For a tort claim to be well-founded, there must have been a breach of duty made by the defendant against the plaintiff, which resulted in an injury. Tort lawsuits are the biggest category of civil litigation, and can encompass a wide range of personal injury cases - however, there are three main types: intentional torts, neglig How to prepare a life expectancy report for an attorney in a tort case. Article. Feb 2005. J Insur Med. Richard B Singer. The purpose of this methodology article is to describe a suitable format for a legally acceptable report on the life expectancy of the principal in a tort case that is being advocated or defended by an attorney. Life insurance medical directors and underwriters are clearly skilled and experienced in mortality risk classification for life insurance. However, the judicial system is accustomed to measuring excess mortality only in terms of reduced life expectancy.