

## Homework Chapter 2

Q1. Consider the mortality table based on 608 known deaths of Dall Mountain Sheep. The data are expressed per 1,000 sheep on the table below.

- a. Compute and plot:
  - i. the estimated survivorship,
  - ii. the probability density, and
  - iii. the hazard function.
- b. Discuss the hazard function in depth.
- c. Estimate the mean and median lifetimes of this species.

**HINT: Use PROC LIFETEST with the LT option**

Survival Time t (months)	Number Survivors @ Begin	Number Dying in Interval
0	1,000	199
1	801	12
2	789	13
3	776	12
4	764	30
5	734	46
6	688	48
7	640	69
8	571	132
9	439	187
10	252	156
11	96	90
12	6	3
13	3	3

Q2. Consider the remission data of 40 female patients diagnosed with breast cancer in a certain hospital during the years 1989–93. The data include: the age of the patient as of last contact (follow up/death), stage of cancer at time of diagnosis, date of last contact, status (alive/dead), the number of days lived, the number of years lived. The data are given on the following page

- a. Compute and plot the PL estimates of  $S(t)$  at every time to death for the Stage 1 and 2 groups.
  - i. Compare the survival functions
  - ii. Compute the survival function and the *variance*:
    1. of  $S(2)$  in the stage 1 patients and
    2. of  $S(3)$  in the stage 2 group.
- b. Estimate the median remission times of the two treatment groups.

**HINT: Use PROC LIFETEST with the PL option**

ID	Age	Stage	Date		Status	Time	
			Diagnosis	Last		Days	Years
1	39	1	02/01/89	10/23/92	A	1360	3.723
2	55	1	03/22/89	02/12/95	A	2153	5.895
3	56	2	04/16/89	09/05/89	D	142	0.389
4	63	1	05/23/89	12/20/92	D	1307	3.578
5	62	2	06/12/89	12/28/95	A	2390	6.543
6	42	2	09/05/89	12/17/90	A	468	1.281
7	45	1	10/05/89	08/04/95	A	2129	5.829
8	38	2	11/30/89	11/10/91	D	710	1.944
9	53	2	01/07/90	10/25/90	D	291	0.797
10	55	1	02/03/90	01/31/91	D	362	0.991
11	49	2	03/23/90	08/29/92	A	890	2.437
12	61	1	04/28/90	05/13/94	A	1476	4.041
13	58	1	05/14/90	06/01/90	A	18	0.049
14	45	2	07/15/90	09/10/93	D	1153	3.157
15	60	2	08/03/90	11/27/94	A	1577	4.318
16	69	1	08/31/90	10/06/95	D	1862	5.098
17	58	2	09/18/90	01/02/93	D	837	2.292
18	54	2	11/09/90	06/18/95	A	1682	4.605
19	56	2	11/28/90	06/27/95	D	1672	4.578
20	52	1	12/12/90	05/13/95	D	1613	4.416
21	67	2	01/24/91	12/23/94	D	1429	3.912
22	64	2	02/17/91	06/09/94	D	1208	3.307
23	73	1	04/21/91	12/24/93	A	978	2.678
24	48	2	06/09/91	06/26/94	A	1113	3.047
25	42	2	06/20/90	03/15/92	D	634	1.736
26	56	2	08/25/90	08/19/94	A	1455	3.984
27	43	1	03/01/92	06/06/94	D	827	2.264
28	64	2	04/12/92	02/13/95	D	1037	2.839
29	35	2	04/13/92	04/15/94	D	732	2.004
30	77	1	05/05/92	05/10/95	A	1100	3.012
31	59	2	08/10/92	11/08/92	D	90	0.246
32	68	1	10/13/92	10/21/93	D	373	1.021
33	70	1	11/10/92	12/20/95	A	1135	3.107
34	58	1	01/17/93	10/29/94	A	650	1.780
35	75	2	02/02/93	03/10/94	D	401	1.098
36	55	2	02/03/93	09/29/93	D	238	0.652
37	45	1	05/11/93	07/02/94	D	417	1.142
38	69	1	11/19/93	05/26/95	A	553	1.514
39	70	1	07/12/93	05/27/95	A	684	1.873
40	27	1	12/13/93	06/03/95	A	537	1.470

- Q3. Using the data in problem, Q2, is there a difference in the survival functions by stage of cancer assessed at the time of diagnosis?

Discuss your findings! Compare survival functions, median lifetimes, ...

**HINT: Use PROC LIFETEST with the Stage as the strata**