University of California, Davis
Department of Public Health Sciences

Fall 2024	**Survival Analysis**	**BST 222**
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Homework Assignment 2

Due October 17, 2024

1. The SSA standard mortality table for 2019 is found at Mortality Table. You will need to select the year 2019 from the dropdown menu instead of the 2021 table which appears at first. Compute the net present value of a series of two payments of $1000 at the end of year 1 and at the end of year 2, each payment contingent on at least one of two people being alive at the time of the scheduled payment. Individual 1 is male aged 80 and individual 2 is female aged 75. You can assume that the chance of surviving a year at a given age is as given in the table. Use a discount rate of 5%.

2. A toxicology study with ten mice was conducted with results in the table below. For mice with Status = 1, the `Time` column is the elapsed time from administration of the toxin until the death of the mouse. For mice with Status = 0, the `Time` column is the elapsed time to end of the study, at which time the mouse is still alive.

   Construct the Kaplan-Meir product-limit estimator of the survival function for this experiment.

Mouse	Time	Status
1	8	1
2	10	1
3	5	1
4	3	1
5	7	1
6	7	0
7	7	0
8	3	1
9	3	0
10	1	1

3. The data set `tongue` from `KMsurv` is described in KM section 1.11

```
Description:
     The 'tongue' data frame has 80 rows and 3 columns.
Format:
     This data frame contains the following columns:

     type Tumor DNA profile (1=Aneuploid Tumor, 2=Diploid Tumor)
     time Time to death or on-study time, weeks
     delta Death indicator (0=alive, 1=dead)
```

   (a) Construct and plot the Kaplan-Meier survival function estimates for the two types of tumors, first without the confidence limits and then with the confidence limits.

   (b) Use `survdiff` to test the hypothesis that the two true survival curves are the same. Interpret the results.

   (c) Compare the two Kaplan-Meier curves to the Nelson-Aalen estimates graphically. Interpret the results.

   (d) To investigate the proportionality of the two hazard curves, compute and plot the Nelson-Aalen cumulative hazards, the ratio of the cumulative hazards, and the smoothed hazards using `muhaz`. Does it look as if the hazards are proportional?