Survival analysis 3rd semester

# Chapter #1 & 2

# Short questions

* ***What is survival data analysis?***

**It deals with the statistical methods for analyzing survival data which is obtained from the laborites, studies of animals and clinical trials of events.**

* ***Write down the basic terminologies of survival data analysis.***

1. **Acute disease**
2. **Survival time**
3. **Remission time**
4. **Tumor free time**
5. **End point**
6. **Mean time**
7. **Risk or prognostic factor**

* ***Define acute disease***

**A disease is said to be an acute disease if it possessive one of following two characteristics.**

1. **Rapid onset**
2. **Short course/period**

* ***What is survival time?***

**It can be defined as time to be occurs through a given event. That event can be the development of a disease, respond to a treatment, relapse, or death.**

* ***Define remission time***

**The time when a disease is not active after the first time an individual has the symptoms of a disease is called remission time.**

**It is a time between recovery and relapse.**

* ***What is relapse?***

**Relapse is the reoccurrence of a disease.**

* **What is tumor free time?**

**A time taken to be the development of a disease when an individual is exposed against a disease is known as tumor free time.**

* ***What is end point?***

**It is define as the ultimate outcome. The target outcomes of an experiment.**

* ***Define mean lifetime*?**

**The average lifetime of individual being studied is called mean lifetime.**

**In survival analysis we use median as measure of mean lifetime.**

* ***What risk or prognostic factor?***

**The factors which can affect the outcome of a disease are called risk factor or prognostic factor.**

**For example age, gender , physical health.**

* ***What is censored observation?***

**The observation in which some patients may still be alive or disease at the end of study period the exact survival times of the subjects are unknown they are called censored observation or censored time.**

* ***Uncensored observation***

**Survival time recorded for animals that died during the study period or the times from start of experiment to their death these are called uncensored observation.**

* ***What is parametric in survival analysis?***

**If the distribution of the survival time is known to be normal then it is parametric distribution.**

* ***What is non parametric in survival analysis?***

**If the distribution of the survival time is unknown to be normal then it is called non parametric.**

* ***What is left censoring?***

**When it is known that event of interest occurred prior to a certain time “t” but the exact time occurrence these are known as left censoring.**

**For example an epidemiologist wishes to know the age at diagnosis in follow up the study of the diabetic retinopathy. At the time of examination a fifty years old patient was found to have already develop retinopathy but there is no record of exact time at which initial evidence was found. Thus the age of diagnosis is a left censored observation. It means that the age of diagnosis for the patient is at most 50 years.**

* ***Define right censoring?***

**All of the type of censoring i.e. type I, II, and III censoring are also called right censoring or censoring to the right.**

* ***Interval censoring***

**It means that when the event of interest are known to have occurred between time ‘’a’’ and ‘’b’’.**

**For example if the medical records indicate that at age 45 the patient did not have retinopathy. His age at diagnosis is between 45 and 50 years.**

* ***What is singly censored?***

**Type I and II censored observations are also called singly censored data.**

* ***Progressively or random censored?***

**Type III censoring is also called progressively censored data by Cohen in 1965. Third type of censoring is also called random censoring.**

* ***Define the types of censoring***

1. **Type I censoring**

**In this type of censoring if there are no accidental losses, all censored observation equally the length of study period. Survival times recorded for the animal that died during the study period are the times from the start of the experiment to their death. These are called exact or uncensored observation.**

**For exasmple suppose that six rats have been exposed to carcinogens by injecting tumor cells into their foot pads. The time to develop a tumor of a given sizes are observed. The investigator decides to terminate the experiment after 30 weeks. Figure given below is a plot of the development times of the tumors. Rats A,B, and D develop tumor after 10, 15, and 25 weeks respectively. Rats C and E did not develop tumor by the end of the study. Their tumor free times are thus 30 plus weeks. Rat F died accidently without tumor after 19 weeks of the observation. The survival free times are 10, 15, 30,25 and 30,19 weeks.**

1. **Type II censoring**

**In this type of censoring there is no accidental losses the censored observations are equal to the largest uncensored observations. In experiment of six rats the investigator may decide to terminate the study after that all the rats develop tumor. The survival free time is 10, 15, 35, 25, 35+ and 19+.**

1. **Type III censoring**

**This type of censoring is also called random censoring and progressively censored data by Cohen in 1965. If the period of study is fixed and patient enters the study of different times during that period some may die before the end of the study. There exact survival times are known other may be drop before the end of the study and lost to follow up. Still others may be alive at the end of study for lost patient. Survival times are at least from the entrance to the last contact. ‘’ for the patient still alive’’ survival times are at least from the entering to the end of the study. Later two kinds of observation are censored.**

* **Define the life table analysis?**

**The life table method is one of the oldest methods for measuring mortality and describing survival experiment of a population.**

* **Define population life table?**

**Stats and local government also publish life tables. These life tables summarizing the mortality experience of a specific population for a specific period of time are called population life table.**

* **Define the clinical life table?**

**Life table constructed for patients are called clinical life table.**

* **Difference between clinical and population life table?**

**Although population and clinical life tables are same Just only the difference is in calculation the source of required data are different.**

* **How can we use clinical life table in medical?**

**As clinical epidemiologic research become more common life table method has been applied to patients with a given disease who has been followed by period of time.**

* **Where has been use life table analysis?**

**It has been used by demographers, government agencies and medical researchers in studies of survival population, growth, fertility migration, length of married life, length of working life and so on.**

* **Give the history of clinical life table.**

**Berkson and Gage (1950) and Cutler and Ederer (1958) gives method for estimating survivorship function. Gehan (1969) provide method for estimating all three functions.**

1. **Survivorship**
2. **Density**
3. **Hazard**

* **Give the computation of clinical life table. With example.**

**The life table method requires fairly a large number of observations so that survival time can be grounded into interval. The life table method incorporates all survival information accumulated up to termination of study.**

**Example: In computation of 5-years survival rate of cancer patients one need not restrict oneself only to these patients who have entered on the study for 5 or more years.**

**Patient who have entered for four, three, two and even one year contribute useful information to the evaluation of 5 year survival.**

**In this way life table use incomplete data such as loss to follow up and persons with drawn alive as well as complete death rate.**

* **Parametric tests**

**These tests are based on assumptions that the sampled populations are approximately normal with equal variance. These tests are called parametric tests.**

**Z-test, t-test, chi square test, f-test**

* **Non parametric tests**

**There are many situations in science in which normality assumption is in fact not meet and parametric test cannot be carried out. In such situation the techniques that can be used are called non parametric tests. Such as sign test, Wilcox test and etc.**