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Analysis of Survival Data

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CONTENTS

Today:
- Right, left and interval censoring
- Right and left truncation
- Likelihood for censored

0.1. **Censored observations.**

Something that is very typical for survival data is not all individuals do experience the event of interest during time of study. When the sutyd is closed, some of the patients have experienced the events, and others have not. Or, some patients may have experienced the event but the exact time point is unknown. The observation for an individual who has not experienced the event, or for whom the time point is unknown, is said to be a *censored observation*.

Example: Patients with a certain disease are being followed for 15 days after starting a new treatment to see how long it takes before they respond to the treatment. So our event is treatment response, and the variable is timed treatment response in days.
The first patient experiences the event (treatment response) after approximately five days. A second patient goes through the 15 days without response. All we know is that the patient has not responded to the treatment, what happens after 15 days we do not know since we stop following. This is a censored observation.

Survival analysis takes censoring into account, and calculates likelihoods based on the combination of the probability to experience the event at a certain time with the probability to experience the event at a certain time or *later*.

There are different categories of censoring:
- Right censoring
- Left censoring
- Interval censoring

The reason we learn about these different types is that each type will lead to a different Likelihood function.

0.1.1. *Right censoring.* Right censoring occurs when the event is observed only if it occurs before a certain, e.g the predetermined end of a study. Starting times and censoring times may be fixed or vary from indivudal to individual. This means there are different types of right censoring:
- Type I censoring
     Starting point is the same for all individuals, but censoring times may vary.
- Progressive Type I censoring
- Generalized Type I censoring
- Type II censoring
- Rando censoring

All of these are different types of right censoring.