Last week you calculated survival probabilities and worked through the steps involved in the Kaplan-Meier method. This week you'll learn about the more flexible Cox proportional hazards model. With this method you will be able to compare the survival of multiple groups of patients at the same time.

Like the name suggests, the model is formulated around the concept of hazards. You've already seen examples of the hazard function. The hazard function h(t) is the probability of the event happening at time t, given that it has not yet happened. **In other words, h(t) is the probability of dying at time t having survived up to time t.** While the concept sounds fairly straightforward, there's no easy formula to compute h(t) by hand. If you are comfortable with formulae, you can follow this link to an article explaining the hazard function http://data.princeton.edu/wws509/notes/c7s1.html

An important concept involved in the calculation of the hazard is the risk set. Just like the risk of dying (or experiencing some specific event) changes over time, so the number of patients that are subjected to that risk change over time as people die or drop out. **The risk set at time t is defined as the set of patients at time t that are at risk of experiencing the event.** You saw this in the earlier calculations for the Kaplan-Meier method when we made adjustment for patients who dropped out. Survival analysis consists of a family of methods, and one way that they differ is in their handling of drop-outs and other issues when they define the risk set.

Usually in survival analysis, we are interested in the difference between survival curves of different groups of patients. Earlier you saw the log-rank test, which gives a p value for comparing the survival curves between different groups of patients with a Kaplan-Meier plot. The p value tells you nothing about the size of the difference between the survival curves, however. This is done by dividing one hazard by another to give a hazard ratio. For example, dividing the hazard for females by the hazard for males gives you a hazard ratio for females compared with males. It tells you how much more likely female patients will die than male patients.

I'll now introduce you to the Cox model and explain how its hazard and hazard ratios work.

Source: Coursera Survival analysis in R Public Health