TMA4275 Lifetime Analysis

Obligatory project 1

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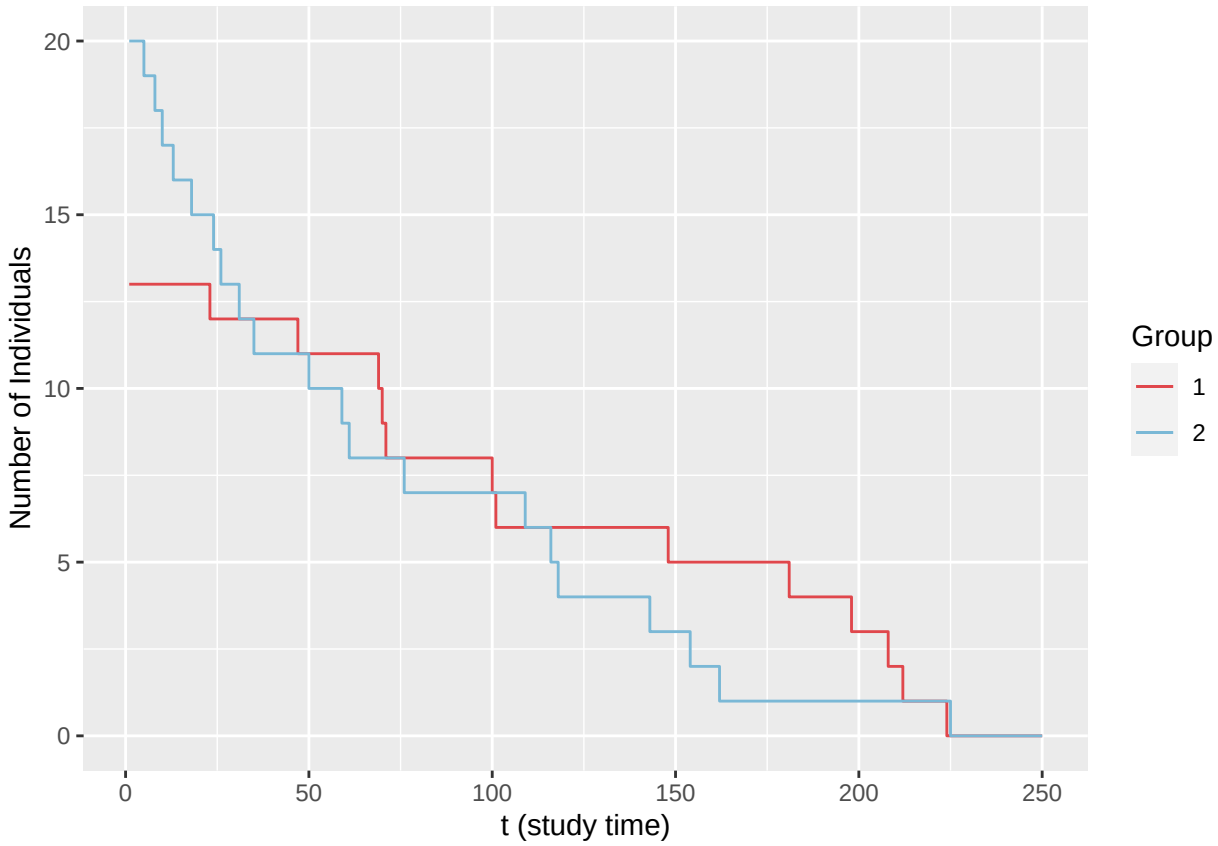
Problem 1

a)

Some intro and description... First, we create data frame containing the relevant data.

```
df <- data.frame(
  months = c(23,47,69,70,71,100,101,148,181,198,208,212,224,
             5,8,10,13,18,24,26,31,35,50,59,61,76,109,116,118,143,154,162,225),
  stained =  c(0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1),
  censored = c(0,0,0,1,1,1,1,0,0,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,1))
```

```
group1 <- filter(df, stained == 0)
group2 <- filter(df, stained == 1)
n <- 250 # Points on the time-axis
t <- 1:n
y1 <- rep(0,n)
y2 <- rep(0,n)
for(i in 1:length(t)){
  y1[i] <- sum(group1$months > t[i])
  y2[i] <- sum(group2$months > t[i])
}
ggplot(data.frame(t = t, y1 = y1, y2 = y2)) + geom_step(aes(t, y1, color = "1")) + geom_step(aes(t, y2,
  ylab("Number of Individuals") + xlab("t (study time)") +
  scale_color_manual(name = "Group", values = c("1" = "#e0474c", "2" = "#7ab8d6"))
```

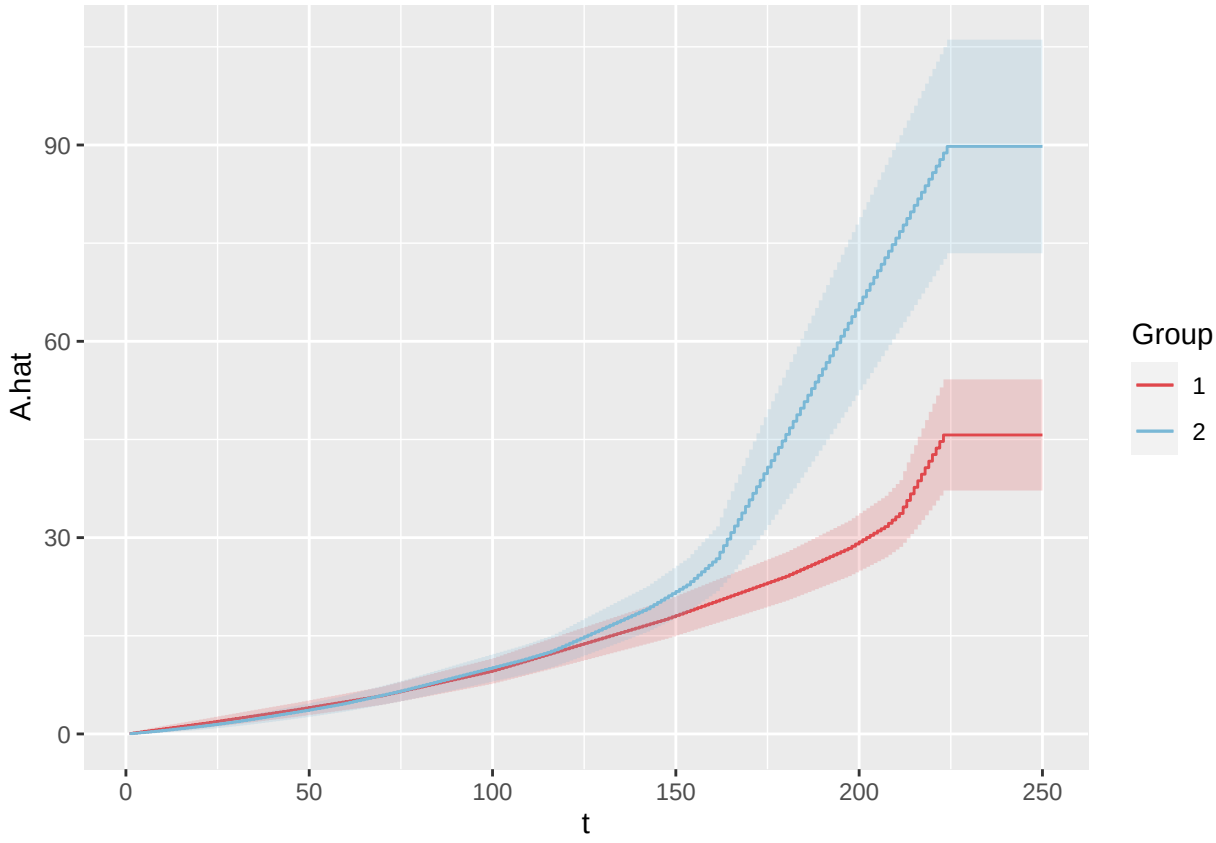


b)

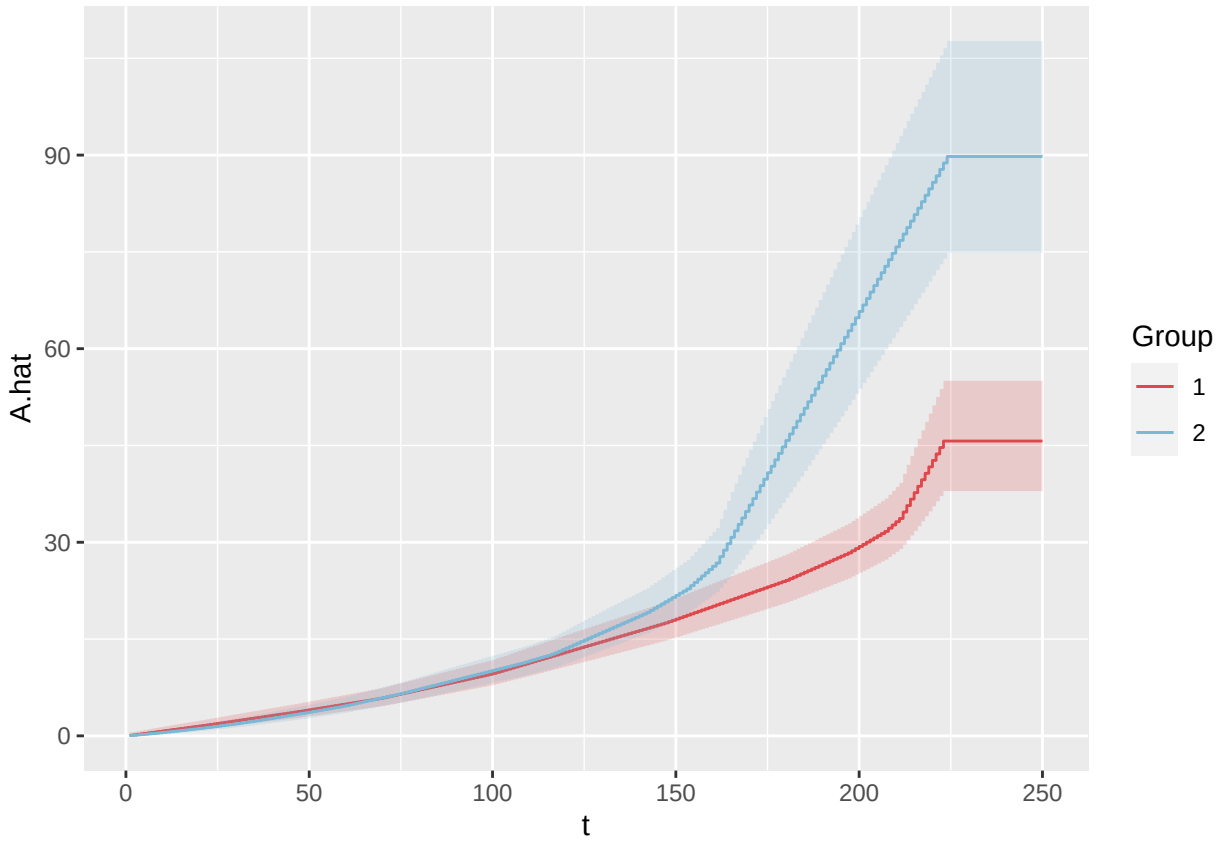
```r
N.A.est <- function(df, alpha, conf.int.type, t){
  y <- rep(0, length(t))
  for(i in 1:length(t)){
    y[i] <- sum(df$months > t[i])
  }
  A.hat <- cumsum(1/y)
  # Fix infinite values:
  A.hat[min(which(!is.finite(A.hat))):length(A.hat)] <- A.hat[min(which(!is.finite(A.hat))) - 1]
  sigma.hat <- sqrt(cumsum(1/y^2))
   # Fix infinite values:
  sigma.hat[min(which(!is.finite(sigma.hat))):length(sigma.hat)] <- sigma.hat[min(which(!is.finite(sigma
  z = qnorm(1 - alpha/2)
  upper <- lower <- NA
  if(conf.int.type == 1){
    upper <-  A.hat + z*sigma.hat
    lower <- A.hat - z*sigma.hat
  }
  else if(conf.int.type == 2){
    upper <- A.hat * exp(z*sigma.hat/A.hat)
    lower <- A.hat * exp(-z*sigma.hat/A.hat)
  }
  else{
    stop("Invalid conf.int.type")
```

```
  }
  return(data.frame(A.hat = A.hat, upper = upper, lower = lower, t = t))
}
```

```
df1 <- N.A.est(group1, 0.05, 1, t)
df2 <- N.A.est(group2, 0.05, 1, t)
ggplot(df1) + geom_step(aes(x = t, y = A.hat, color = "1")) +
  geom_stepconfint(aes(x = t, ymin=lower, ymax=upper),fill = "#e0474c", alpha = 0.2) +
  geom_step(data = df2, aes(x = t, y = A.hat, color = "2")) +
  geom_stepconfint(data = df2, aes(x = t, ymin=lower, ymax=upper), fill = "#7ab8d6", alpha = 0.2) +
  scale_color_manual(name = "Group", values = c("1" = "#e0474c", "2" = "#7ab8d6"))
```




```
df1 <- N.A.est(group1, 0.05, 2, t)
df2 <- N.A.est(group2, 0.05, 2, t)
ggplot(df1) + geom_step(aes(x = t, y = A.hat, color = "1")) +
  geom_stepconfint(aes(x = t, ymin=lower, ymax=upper),fill = "#e0474c", alpha = 0.2) +
  geom_step(data = df2, aes(x = t, y = A.hat, color = "2")) +
  geom_stepconfint(data = df2, aes(x = t, ymin=lower, ymax=upper), fill = "#7ab8d6", alpha = 0.2) +
  scale_color_manual(name = "Group", values = c("1" = "#e0474c", "2" = "#7ab8d6"))
```



Problem 2