Replicated Lab 3

Megan Hall

2023-11-28

```
knitr::opts_chunk$set(echo = TRUE)

#Packages
library(tidyr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
library(magrittr) # to get %$% operator
```

```
##
## Attaching package: 'magrittr'

## The following object is masked from 'package:tidyr':
##
##     extract
```

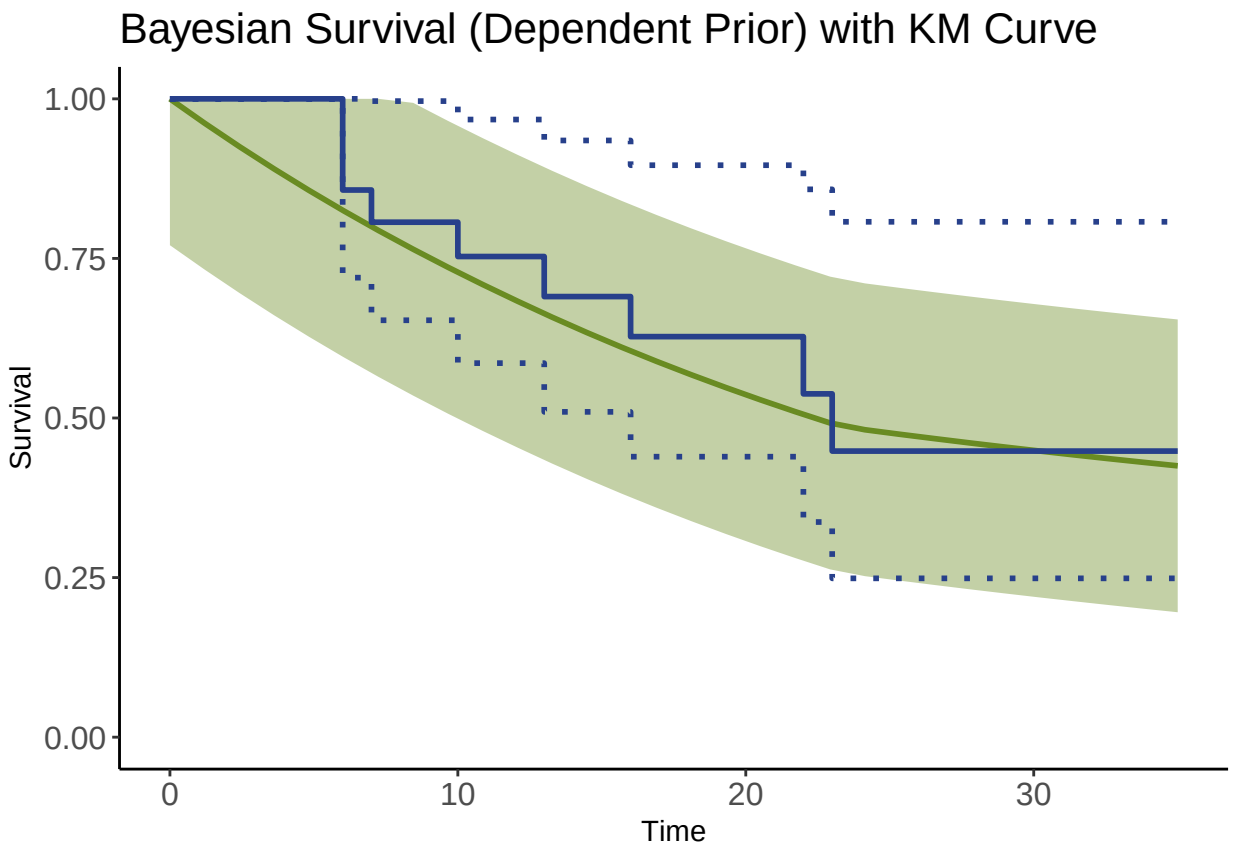
```
library(survival)
library(KMsurv)
library(BayesSurvival) #our package
library(GGally) #for ggsurv fxn
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

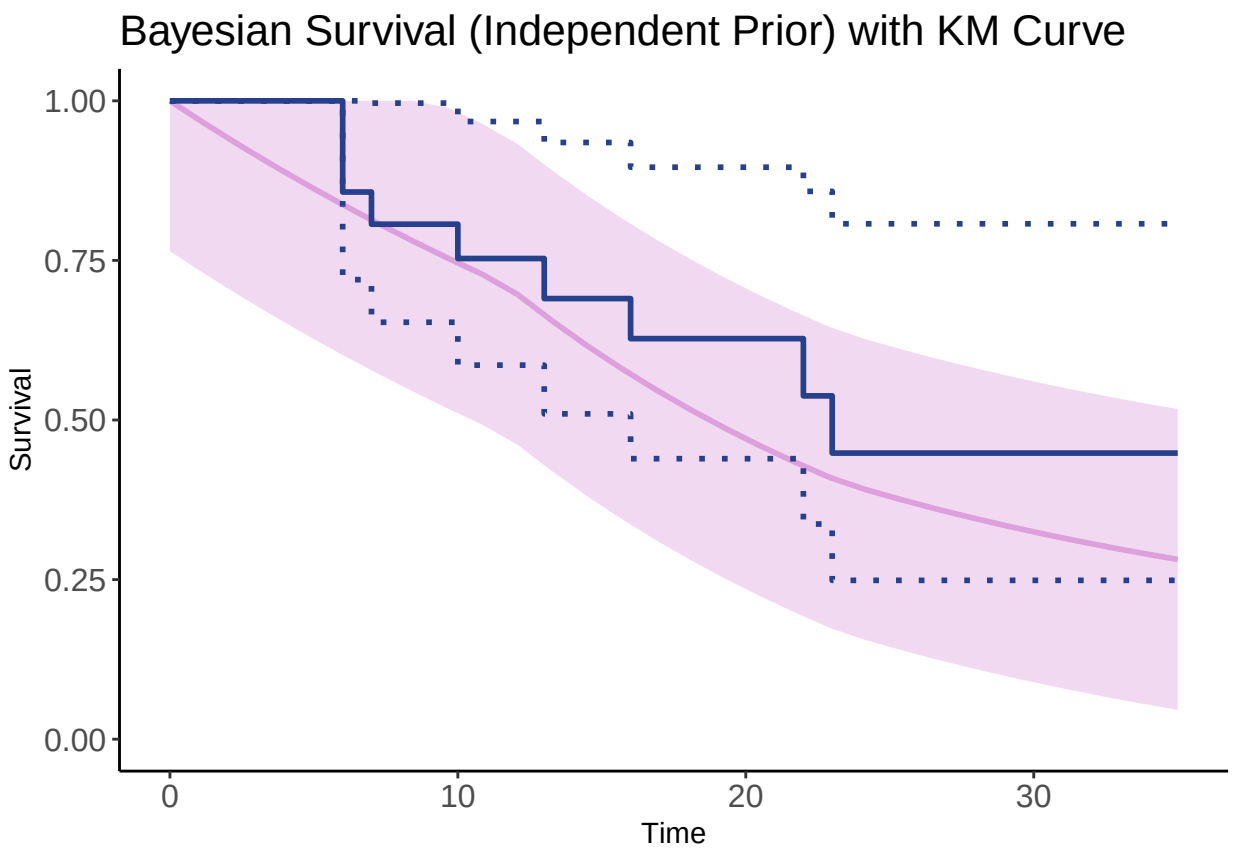
```
#Data Setup
data(drug6mp)

#create a Surv object using time=t2 and event=relapse
surv6mp <- as_tibble(drug6mp) %>% arrange(t2) %$% Surv(time=t2, event=relapse)
```

Kaplan-Meier Surivival Curves Here are the Kaplan-Meier survival curves.

```
#KM Curve from Lab
  #survfit object
  lab_km_surv <- survfit(surv6mp~1, type="kaplan-meier")
  #dataframe of time and survival
  lab_km <- data.frame(t = lab_km_surv$time, surv = lab_km_surv$surv)
  #KM Curve
  km = ggsurv(lab_km_surv, main = 'KM Survival Curve From Lab',
              back.white = TRUE, size.est = 1, size.ci = 1,
              surv.col = 'royalblue4')

#Bayesian - Dependent
  #Bayesian Survival object
  bayes_dep <- BayesSurv(drug6mp, "t2", "relapse", prior = 'Dependent')

  #Plot Bayesian survival curve
  km_plot_bayes_dep <- PlotBayesSurv(bayes_dep, object = "survival",
               color = 'olivedrab4', legend = FALSE,
               ylab = 'Survival', xlab = 'Time',
               plot.title = 'Bayesian Survival (Dependent Prior) with KM Curve')

  #Add KM curve (+ CI) to Bayesian survival curve
  km_plot_bayes_dep <- km_plot_bayes_dep +
                       geom_step(data = km$data,aes(x = time, y = surv),
                                 col = 'royalblue4', linewidth = 1) +
                       geom_step(data = km$data, aes(x = time, y = up),
                                 col = 'royalblue4', linewidth = 1,
                                 linetype = 81) +
                       geom_step(data = km$data, aes(x = time, y = low),
                                 col = 'royalblue4', linewidth = 1,
                                 linetype = 81)
  km_plot_bayes_dep
```



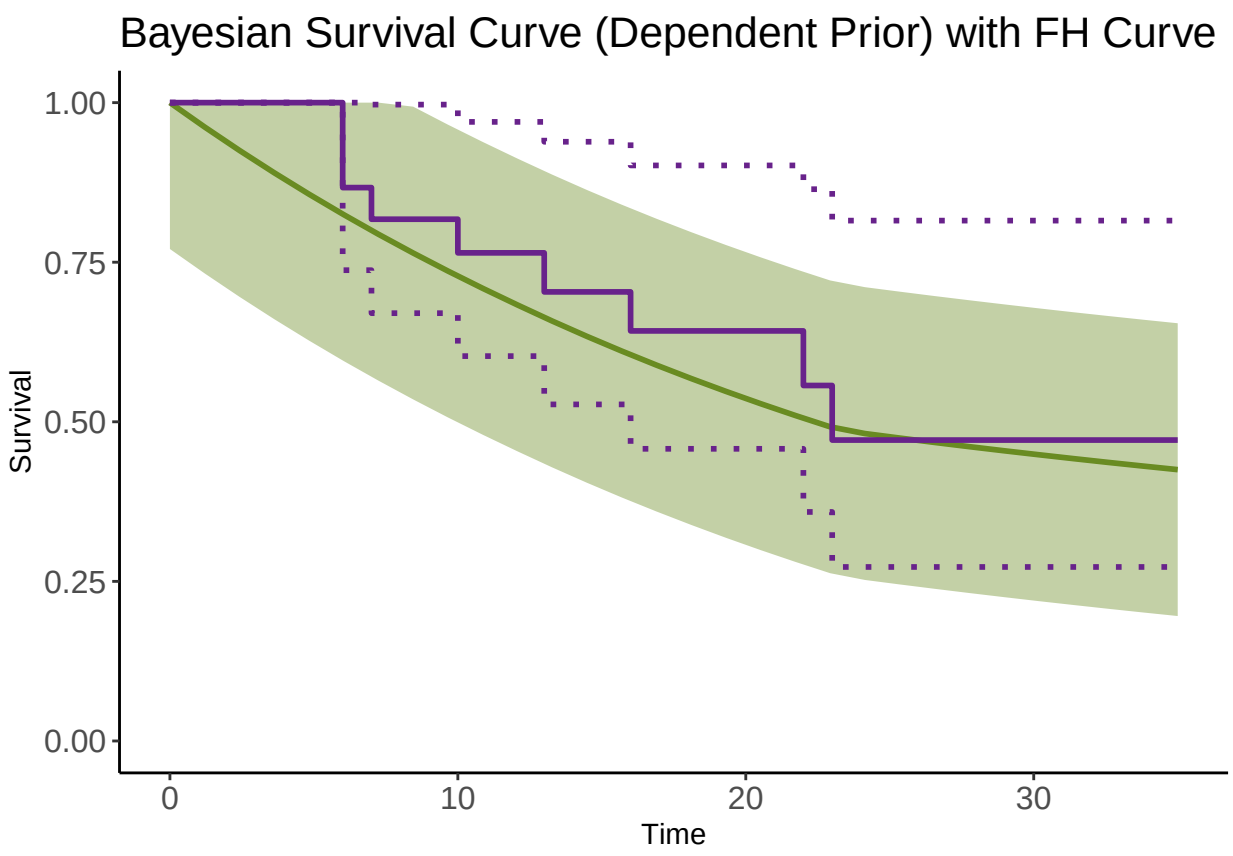

```
#Bayesian - Independent
  #Bayesian Survival object
  bayes_indep <- BayesSurv(drug6mp, "t2", "relapse", prior = 'Independent')

  #Plot Bayesian survival curve
  km_plot_bayes_indep <- PlotBayesSurv(bayes_indep, object = "survival",
             color = 'plum', legend = FALSE,
             ylab = 'Survival', xlab = 'Time',
             plot.title = 'Bayesian Survival (Independent Prior) with KM Curve')

  #Add KM curve (+ CI) to Bayesian survival curve
  km_plot_bayes_indep <- km_plot_bayes_indep +
                         geom_step(data = km$data, aes(x = time, y = surv),
                                   col = 'royalblue4', linewidth = 1) +
                         geom_step(data = km$data, aes(x = time, y = up),
                                   col = 'royalblue4', linewidth = 1,
                                   linetype = 81) +
                         geom_step(data = km$data, aes(x = time, y = low),
                                   col = 'royalblue4', linewidth = 1,
                                   linetype = 81)
  km_plot_bayes_indep
```



Fleming-Harrington Surivival Curves Here are the Fleming-Harrington survival curves.

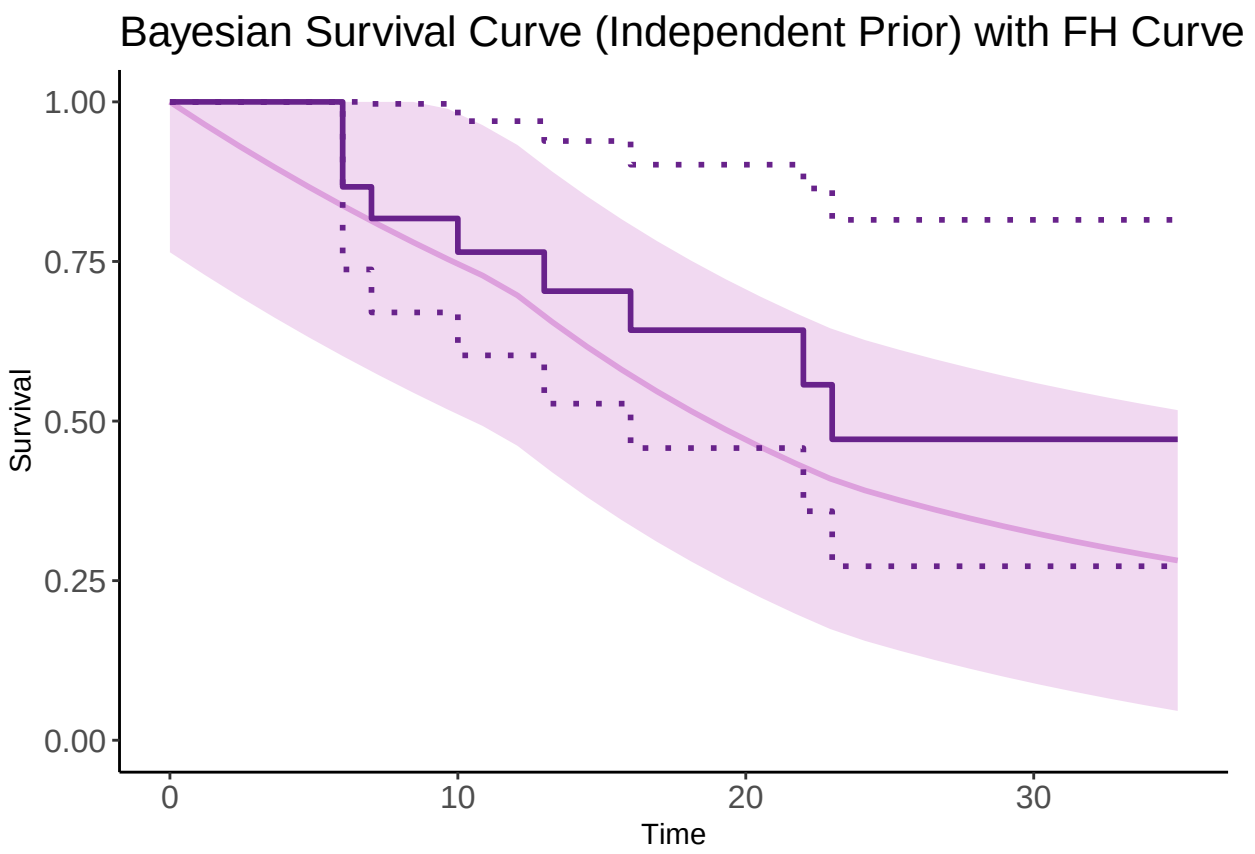
```
#FH Curve from Lab
  #survfit object
  lab_fh_surv <- survfit(surv6mp~1, type="fleming-harrington")
  #dataframe of time and survival
  lab_fh <- data.frame(t = lab_fh_surv$time, surv = lab_fh_surv$surv)
  #FH Curve
  fh = ggsurv(lab_fh_surv, main = 'FH Survival Curve From Lab',
              back.white = TRUE, size.est = 1, size.ci = 1,
              surv.col = 'darkorchid4')

#Bayesian - Dependent
  #Plot Bayesian survival curve
  fh_plot_bayes_dep <- PlotBayesSurv(bayes_dep, object = "survival",
        color = 'olivedrab4', legend = FALSE,
        ylab = 'Survival', xlab = 'Time',
        plot.title = 'Bayesian Survival Curve (Dependent Prior) with FH Curve')

  #Add FH curve (+ CI) to Bayesian survival curve
  fh_plot_bayes_dep <- fh_plot_bayes_dep + geom_step(data = fh$data,
                                                     aes(x = time, y = surv),
                                                         col = 'darkorchid4',
                                                     linewidth = 1) +
                                           geom_step(data = fh$data,
                                                     aes(x = time, y = up),
```

```
                                          col = 'darkorchid4',
                                          linewidth = 1,
                                          linetype = 81) +
                                geom_step(data = fh$data,
                                          aes(x = time, y = low),
                                          col = 'darkorchid4',
                                          linewidth = 1,
                                          linetype = 81)
fh_plot_bayes_dep
```




```
#Bayesian - Dependent
  #Plot Bayesian survival curve
  fh_plot_bayes_indep <- PlotBayesSurv(bayes_indep, object = "survival",
      color = 'plum', legend = FALSE,
      ylab = 'Survival', xlab = 'Time',
      plot.title = 'Bayesian Survival Curve (Independent Prior) with FH Curve')

  #Add FH curve (+ CI) to Bayesian survival curve
  fh_plot_bayes_indep <- fh_plot_bayes_indep + geom_step(data = fh$data,
                                          aes(x = time, y = surv),
                                              col = 'darkorchid4',
                                          linewidth = 1) +
                                geom_step(data = fh$data,
                                          aes(x = time, y = up),
                                          col = 'darkorchid4',
                                          linewidth = 1,
```

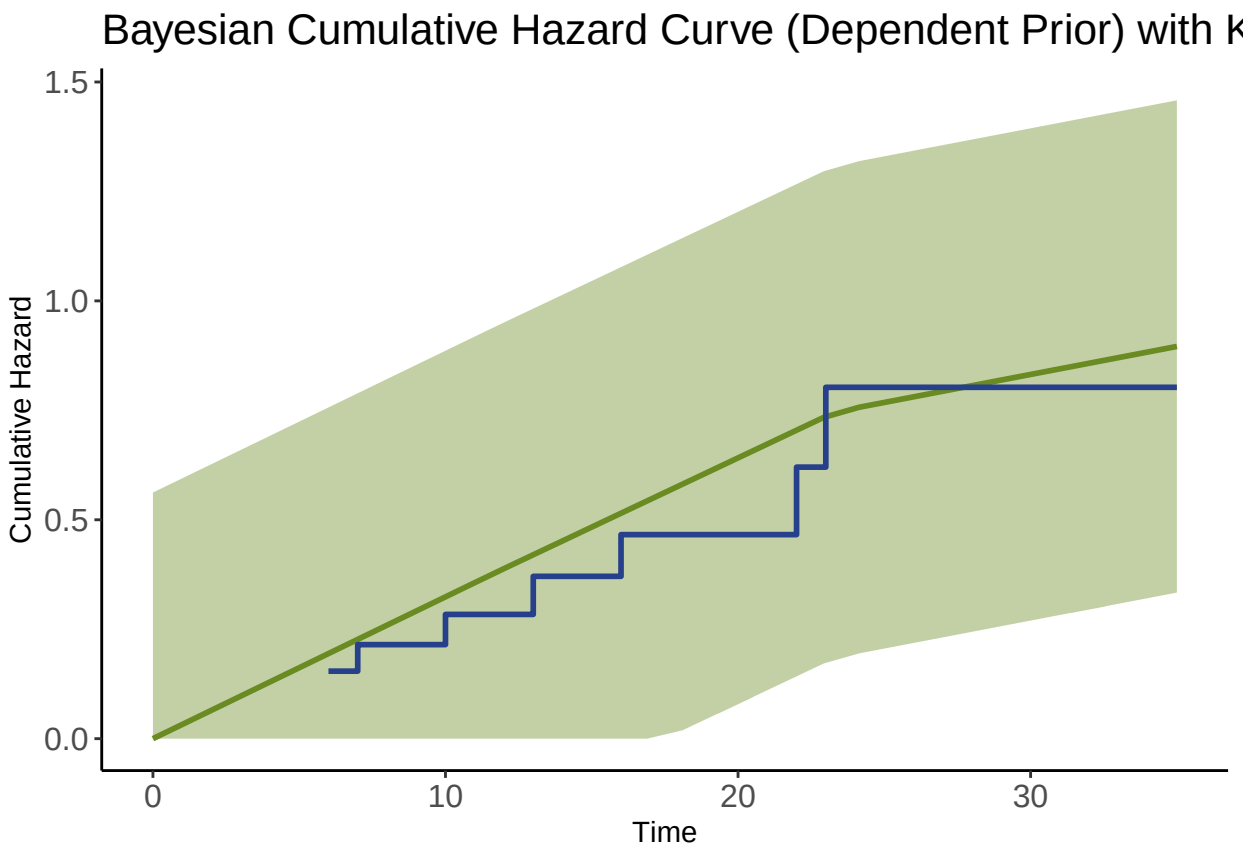
```
                                                linetype = 81) +
                                    geom_step(data = fh$data,
                                              aes(x = time, y = low),
                                              col = 'darkorchid4',
                                              linewidth = 1,
                                              linetype = 81)
  fh_plot_bayes_indep
```



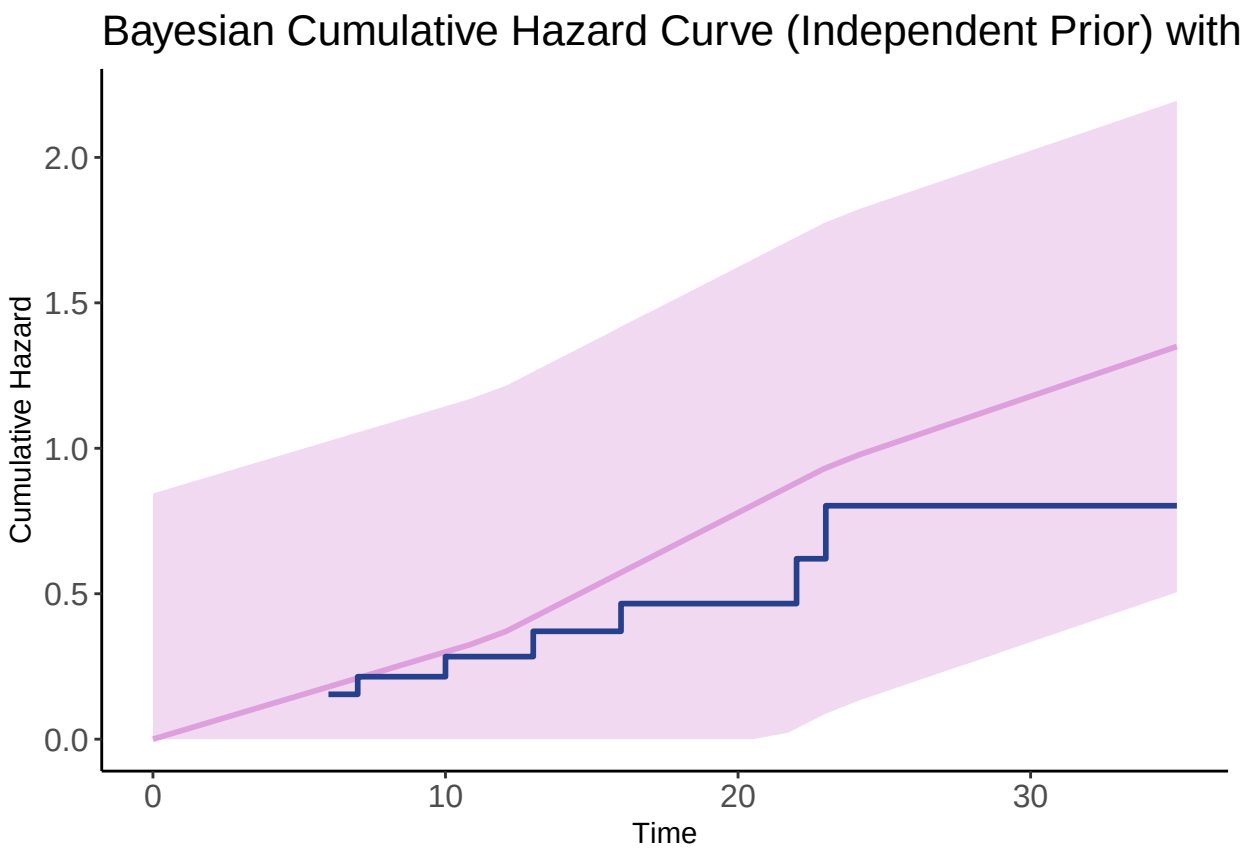
Kaplan-Meier Cumulative Hazard Curves Here are the Kaplan-Meier cumulative hazard curves.

```
#KM Cumulative Hazard Curve from Lab
  #dataframe of time and cumulative hazard
  lab_km_chaz <- data.frame(t = lab_km_surv$time, chaz = -log(lab_km_surv$surv))
  #KM curve
  km_chaz = ggplot() + geom_step(data = lab_km_chaz,
                                 aes(x = t, y = chaz), col = 'royalblue4',
                                 linewidth = 1)


#Bayesian - Dependent
  #Plot Bayesian cumulative hazard curve
  km_plot_bayes_dep <- PlotBayesSurv(bayes_dep, object = "cumhaz",
color = 'olivedrab4', legend = FALSE,
ylab = 'Cumulative Hazard', xlab = 'Time',
plot.title = 'Bayesian Cumulative Hazard Curve (Dependent Prior) with KM Curve')
```

```
#Add KM curve (+ CI) to Bayesian cumulative hazard curve
km_plot_bayes_dep <- km_plot_bayes_dep + geom_step(data = lab_km_chaz,
                                                   aes(x = t, y = chaz),
                                                  col = 'royalblue4',
                                                  linewidth = 1)

km_plot_bayes_dep
```

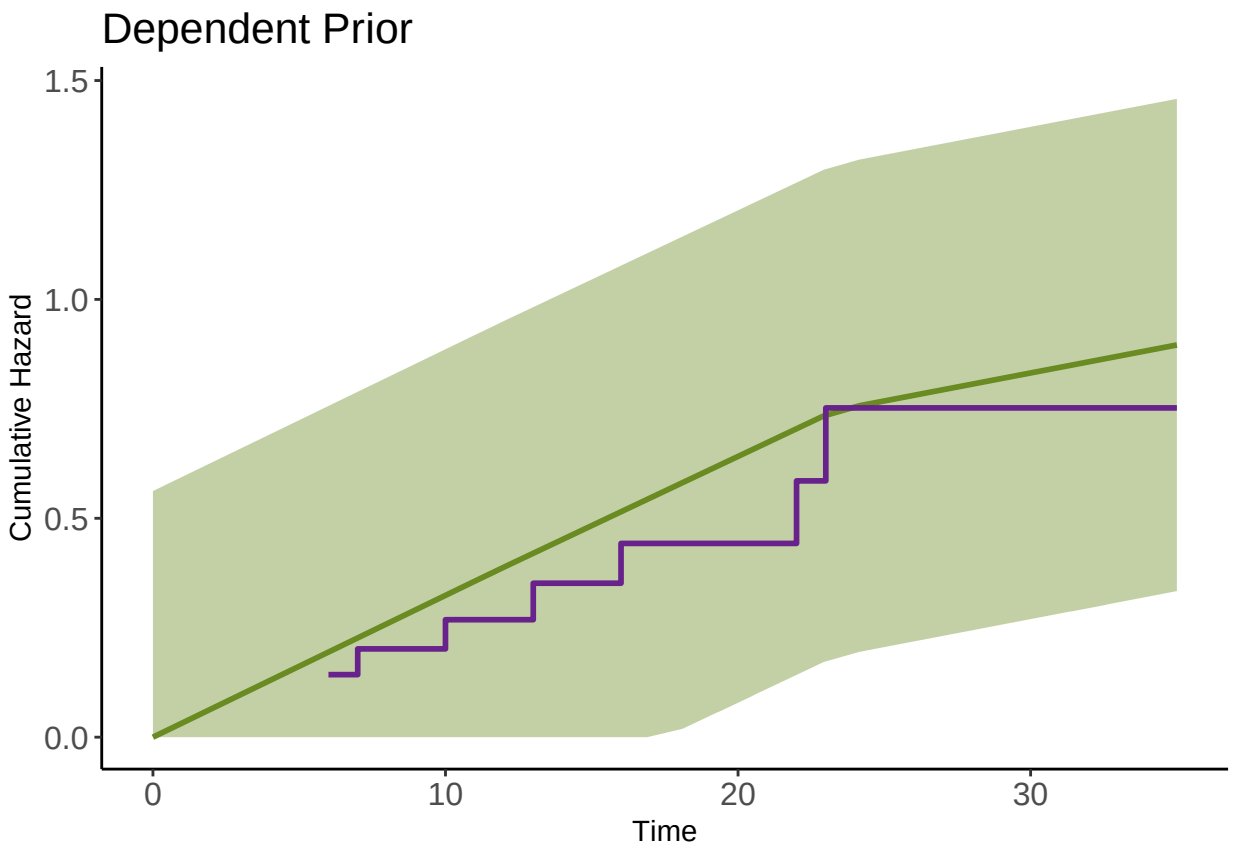



```
#Bayesian - Independent
  #Plot Bayesian cumulative hazard curve
  km_plot_bayes_indep <- PlotBayesSurv(bayes_indep, object = "cumhaz",
 color = 'plum', legend = FALSE,
 ylab = 'Cumulative Hazard', xlab = 'Time',
 plot.title = 'Bayesian Cumulative Hazard Curve (Independent Prior) with KM Curve')

  #Add KM curve (+ CI) to Bayesian cumulative hazard curve
  km_plot_bayes_indep <- km_plot_bayes_indep + geom_step(data = lab_km_chaz,
                                                   aes(x = t, y = chaz),
                                                   col = 'royalblue4',
                                                   linewidth = 1)

  km_plot_bayes_indep
```

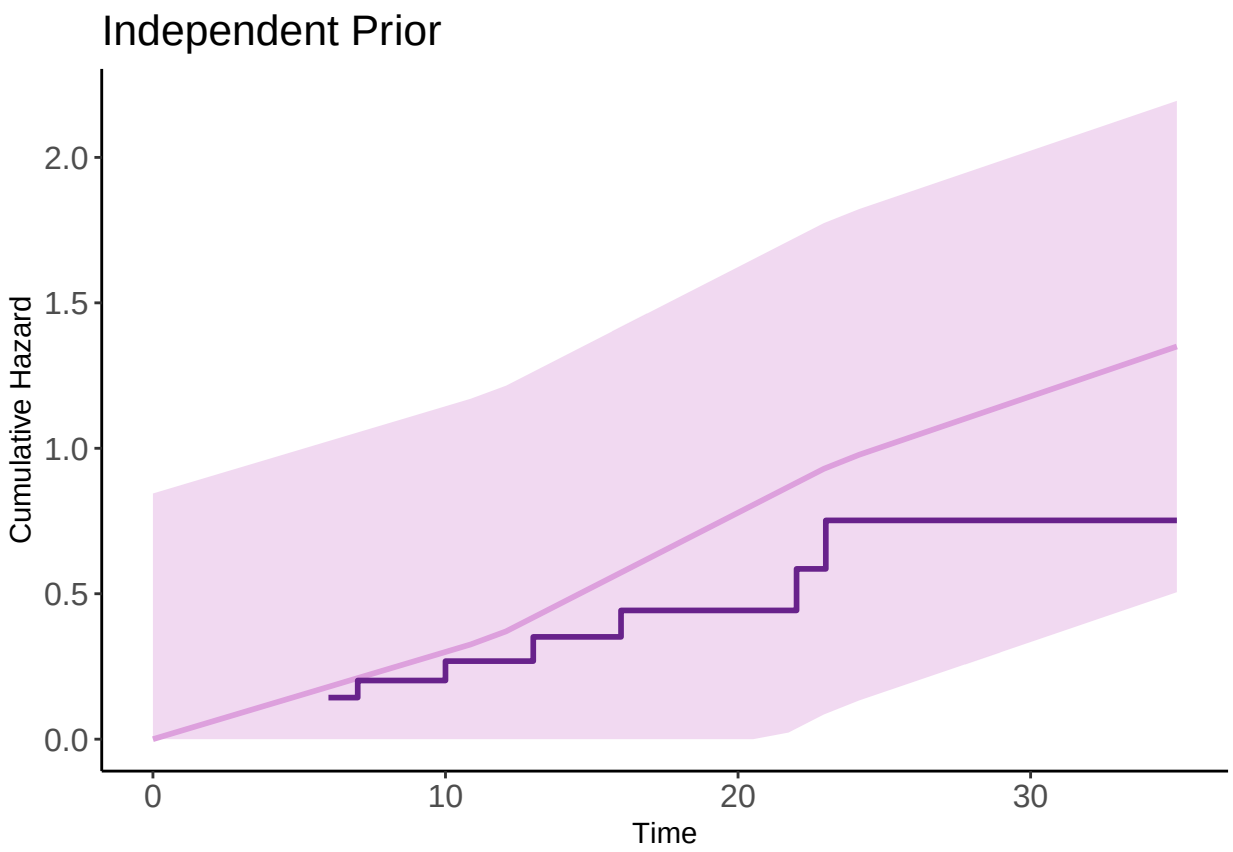


Fleming-Harrington Cumulative Hazard Curves Here are the Kaplan-Meier cumulative hazard curves.

```
#FH Cumulative Hazard Curve from Lab
  lab_fh_chaz <- data.frame(t = lab_fh_surv$time, chaz = -log(lab_fh_surv$surv))

#FH Curve
  fh_chaz = ggplot() + geom_step(data = lab_fh_chaz, aes(x = t, y = chaz),
                                 col = 'royalblue4', linewidth = 1)


#Bayesian - Dependent
  #Plot Bayesian cumulative hazard curve
  fh_plot_bayes_dep <- PlotBayesSurv(bayes_dep, object = "cumhaz",
color = 'olivedrab4', legend = FALSE,
ylab = 'Cumulative Hazard', xlab = 'Time',
plot.title = 'Dependent Prior')

  #Add FH curve (+ CI) to Bayesian cumulative hazard curve
  fh_plot_bayes_dep <- fh_plot_bayes_dep + geom_step(data = lab_fh_chaz,
                                                     aes(x = t, y = chaz),
                                                     col = 'darkorchid4',
                                                     linewidth = 1)

  fh_plot_bayes_dep
```




```
#Bayesian - Independent
#Plot Bayesian cumulative hazard curve
  fh_plot_bayes_indep <- PlotBayesSurv(bayes_indep, object = "cumhaz",
color = 'plum', legend = FALSE,
ylab = 'Cumulative Hazard', xlab = 'Time',
plot.title = 'Independent Prior')

  #Add FH curve (+ CI) to Bayesian cumulative hazard curve
  fh_plot_bayes_indep <- fh_plot_bayes_indep + geom_step(data = lab_fh_chaz,
                                                         aes(x = t, y = chaz),
                                                             col = 'darkorchid4',
                                                         linewidth = 1)


  fh_plot_bayes_indep
```


Independent Prior
Cumulative Hazard
2.0
1.5
1.0
0.5
0.0
0
10
20
30
Time