STA442 A3

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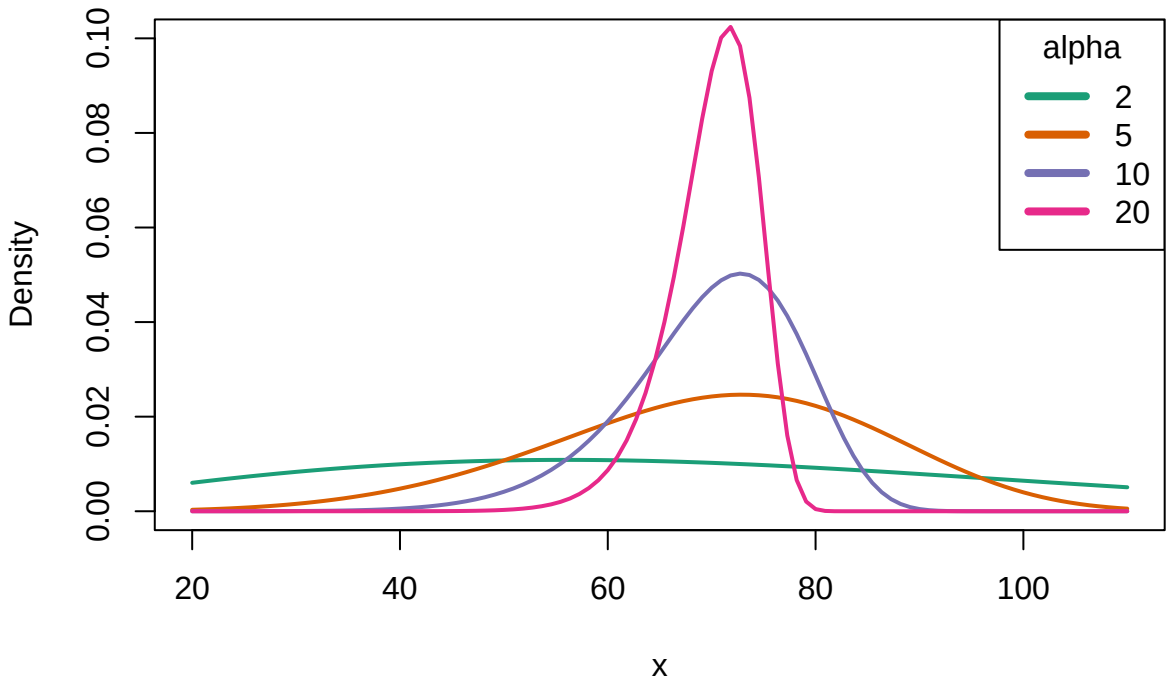
```
library(INLA)
```

```
## Loading required package: Matrix

## Loading required package: foreach

## Loading required package: parallel

## Loading required package: sp

## This is INLA_21.02.23 built 2021-10-07 01:02:09 UTC.
##  - See www.r-inla.org/contact-us for how to get help.
##  - To enable PARDISO sparse library; see inla.pardiso()
##  - Save 350.5Mb of storage running 'inla.prune()'
```

```
library(survival)
data("cricketer",package="DAAG")
dat<- cricketer[cricketer$year < 1890 & cricketer$acd==1,] #filtered accidental death
dat$ones<- 1

xSeq = seq(20, 110, len=100)
Sshape = c(2 ,5, 10, 20)
names(Sshape) = RColorBrewer::brewer.pal(length(Sshape), 'Dark2')
yMat = NULL
for(Dshape in Sshape)
  yMat = cbind(yMat, dweibull(xSeq, shape=Dshape,
      scale=70/gamma(1+1/Dshape))
  )
matplot(xSeq, yMat, type='l', lty=1, col=names(Sshape), lwd=2,
  ylim = c(0, 0.1), xlab='x',ylab='Density', main="Prior Alpha")
legend('topright', lty=1, col=names(Sshape), legend=Sshape, lwd=4,
  title = 'alpha')
```




```
dat$decade <- (dat$year-1850)/10
dat$lifeC <- dat$life/100
##use Bayesian Inference
cFitI <- inla(lifeC ~ decade +left, data=dat, family='weibull',
              control.family=list(variant=1, hyper=list(alpha=list(
                prior='normal', param =c(log(7.5),(2/3)^(-2))
              ))
), control.compute=list(config=TRUE))
knitr::kable(rbind(cFitI$summary.fixed[,c(1,2,3,5)],
          cFitI$summary.hyper[,c(1,2,3,5)]), digits=3)
```

	mean	sd	0.025quant	0.975quant
(Intercept)	0.613	0.180	0.239	0.947
decade	0.131	0.060	0.018	0.254
leftleft	0.076	0.135	-0.198	0.336
alpha parameter for weibull	1.727	0.110	1.521	1.953

```
exp(qnorm(c(0.025, 0.5, 0.975), mean=log(7.5), sd=2/3))
```

```
## [1]  2.030456  7.500000 27.703138
```

```
cricketer$decade =(cricketer$year -1850)/10
cricketer$acddead= as.numeric((cricketer$kia==0) & (cricketer$inbed==0) & (cricketer$dead==1))
```

```
library(INLA)
cricketer$lifeC <- cricketer$life / 100
cricketer$timeC <- (cricketer$year - 1900)/100
cricketer$deadacd = as.numeric((cricketer$kia==0) & (cricketer$inbed==0) & (cricketer$acd==1))
cFitC <- inla(inla.surv(lifeC, deadacd) ~ timeC + left,data=cricketer, family='weibullsurv',
control.family = list(variant=1, hyper=list(alpha = list(
prior = 'normal', param = c(log(7.5), (2/3)^(-2)) ))), control.compute = list(config=TRUE),
control.inla = list(strategy='laplace', fast=FALSE, h=0.0001),
control.mode = list(theta = log(6), restart=TRUE))
knitr::kable(rbind(cFitC$summary.fixed[, c(1,3, 5)], cFitC$summary.hyper[, c(1, 3, 5)]),digits = 3)
```

	mean	0.025quant	0.975quant
(Intercept)	-2.844	-3.301	-2.430
timeC	-0.264	-0.844	0.303
leftleft	0.024	-0.443	0.453
alpha parameter for weibullsurv	1.366	1.212	1.533

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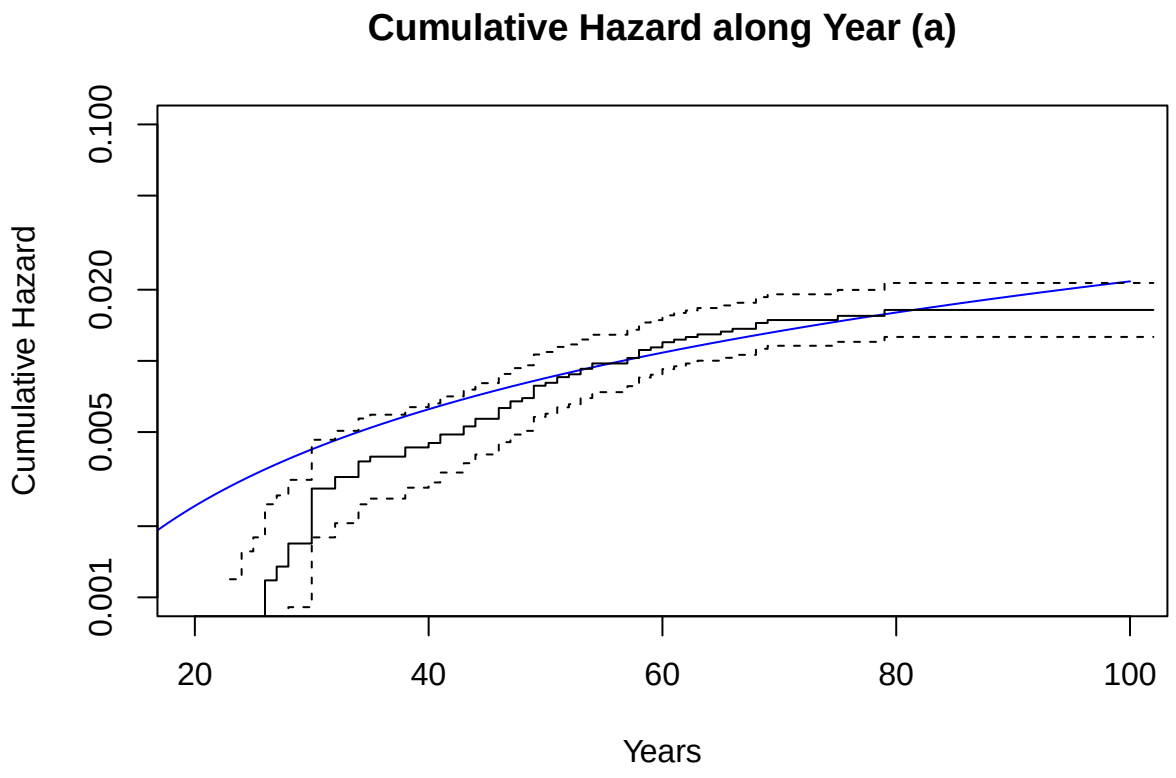
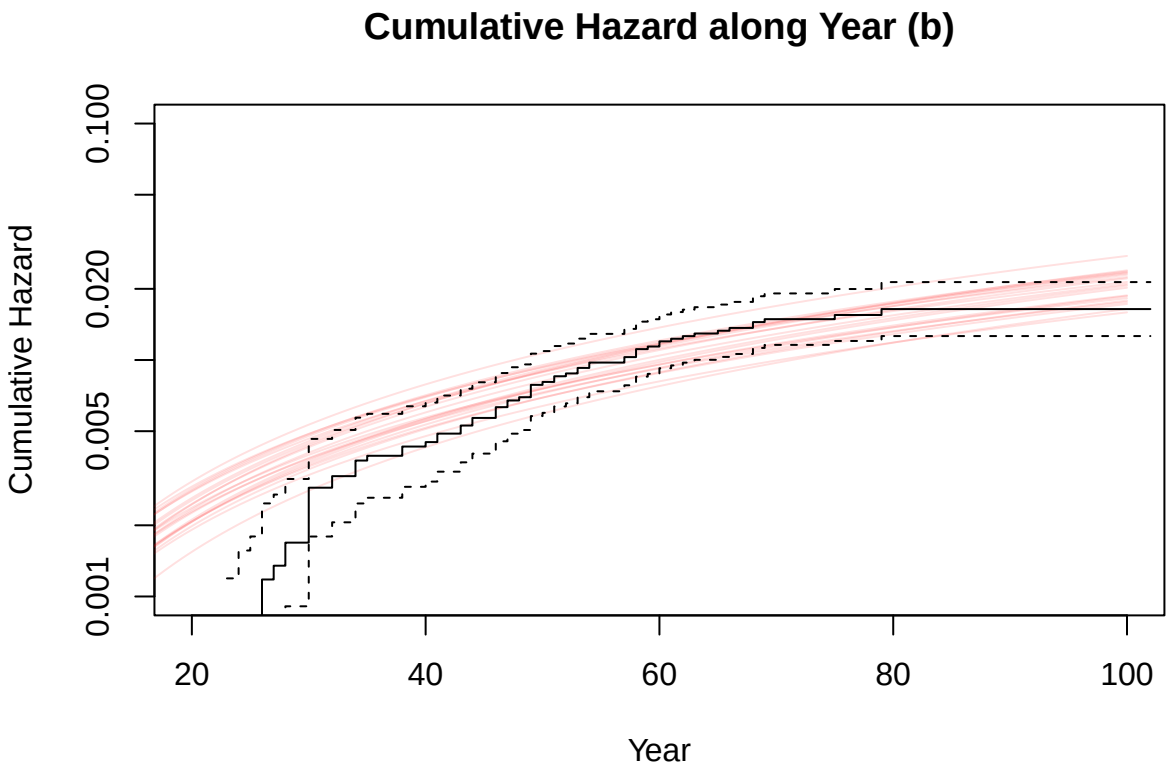
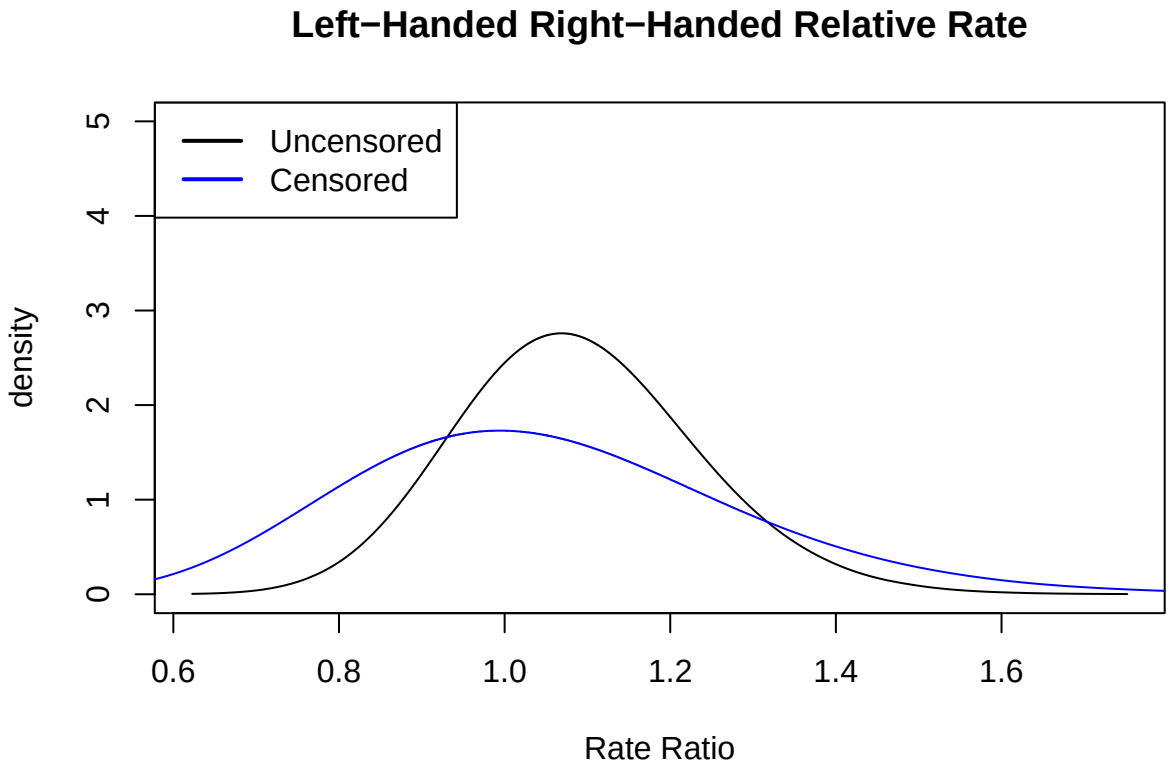
```
#INLA's Posterior mode v data
xSeq <- seq(0,100,len=1000)
kappa <- cFitC$summary.hyper['alpha','mode']
lambda <- exp(-cFitC$summary.fixed['(Intercept)', 'mode'])
plot(xSeq, (xSeq/(100*lambda))^kappa, col="blue", type="l", log="y", ylim=c(0.001, 0.1), xlim=c(20,100)
hazEst =survfit(Surv(life, deadacd) ~ 1, data=cricketer)
lines(hazEst, fun='cumhaz')
```



```
xSeq=seq(0, 100, len=1000)
densHaz=Pmisc::sampleDensHaz(fit=cFitC, x=xSeq, n=20, scale= 100)
matplot(xSeq, densHaz[, "cumhaz", ], type="l", lty = 1, col="#FF000020", log="y", ylim=c(0.001, 0.1), xl
lines(hazEst, fun="cumhaz")
```




```
plot(inla.tmarginal(exp, cFitI$marginals.fixed$leftleft, n=10000), type="l", xlab="Rate Ratio", ylab="d
lines(inla.tmarginal(exp, cFitC$marginals.fixed$leftleft, n=20000), col="blue")
legend("topleft", col=c("black", "blue"), lty=1, lwd=2, legend=c("Uncensored", "Censored"))
```


Left−Handed Right−Handed Relative Rate
Uncensored
Censored
density
0
1
2
3
4
5
0.6
0.8
1.0
1.2
1.4
1.6
Rate Ratio