require(jagsUI)

require(loo)

setwd("C:/R files BHMRA")

attach("DS\_11\_7.Rdata")

n=DS\_11\_7$n

m=2

**# index for accumulating log-likelihoods over subject-eye pairs**

idx=matrix(,197,2)

ndx=0

for (i in 1:n) {for (j in 1:m){ndx = ndx+1; idx[i,j]=ndx}}

DS\_11\_7$idx=idx

**#**

**# Excluding Frailty**

**#**

cat("

model {for (i in 1:n) {

**# time[] are times/durations (etc) regardless whether fail or not**

**# t[] are actual times for fails, but NA for censored**

**# censored=1 or 0 according survival time censored or not**

for (j in 1:m) { censored[i,j] ~ dinterval(t[i,j], time[i,j])

t[i,j] ~ dweib(kap[j],lam[i,j])

tnew[i,j] ~ dweib(kap[j],lam[i,j])

log(lam[i,j]) <- beta[1] + beta[2] \*age[i]/10 +

beta[3]\*trt[i,j]+beta[4]\*type[i]

S[i,j] <- exp(-lam[i,j]\*pow(t[i,j],kap[j]))

h[i,j] <- kap[j]\*lam[i,j]\*pow(t[i,j],kap[j]-1)

# log-likelihood

loglik[idx[i,j]] <- (1-censored[i,j])\*log(h[i,j])+log(S[i,j])}}

# hazard ratio for untreated eyes

theta <- exp(-beta[3])

# hyperpriors

for (j in 1:2) {kap[j] ~ dgamma(1,0.001)}

for (j in 1:4) {beta[j] ~ dnorm(0, 0.001)}}

", file="model1.jag")

**# Initial values and estimation**

inits1 <- list(kap=c(1,1),beta=c(0,0,0,0))

inits2 <- list(kap=c(2,2),beta=c(0,0,0,0))

inits=list(inits1,inits2)

pars <- c("beta","kap","theta","loglik")

R1 <- autojags(DS\_11\_7, inits, pars,model.file= "model1.jag",2,

iter.increment=2000, n.burnin=500,Rhat.limit=1.1, max.iter=10000, seed=1234,codaOnly=c("loglik"))

R1$summary

**# WAIC and LOO-IC, by observation**

WAIC=waic(R1$sims.list$loglik,pointwise=T)

waic.pw=WAIC$pointwise[,3]

LOO=loo(R1$sims.list$loglik,pointwise=T)

loo.pw=LOO$pointwise[,3]

eye=rep(1:2,197)

subject=rep(1:197,each=2)

list <- data.frame(loo.pw,waic.pw,subject,eye)

list=list[order(-list$loo.pw),]

head(list,10)

**#**

**# Including Frailty**

**#**

cat("model {for (i in 1:n) {b[i] ~ dnorm(0, tau.b)

# time[] are times/durations (etc) regardless whether fail or not

# t[] are actual times for fails, but NA for censored

# censored=1 or 0 according survival time censored or not

for (j in 1:m) { censored[i,j] ~ dinterval(t[i,j], time[i,j])

t[i,j] ~ dweib(kap[j],lam[i,j])

tnew[i,j] ~ dweib(kap[j],lam[i,j])

log(lam[i,j]) <- beta[1] + beta[2] \*age[i]/10 +

beta[3]\*trt[i,j]+beta[4]\*type[i]+b[i]

S[i,j] <- exp(-lam[i,j]\*pow(t[i,j],kap[j]))

h[i,j] <- kap[j]\*lam[i,j]\*pow(t[i,j],kap[j]-1)

# log-likelihood

loglik[idx[i,j]] <- (1-censored[i,j])\*log(h[i,j])+log(S[i,j])}}

# hazard ratio for untreated eyes

theta <- exp(-beta[3])

# uniform prior on SD(frailty)

sig.b~ dunif(0,10)

tau.b <-1/(sig.b\*sig.b);

# hyperpriors

for (j in 1:2) {kap[j] ~ dgamma(1,0.001)}

for (j in 1:4) {beta[j] ~ dnorm(0, 0.001)}}

", file="model2.jag")

# Initial values and estimation

inits1 = list(kap=c(1,1),beta=c(0,0,0,0), sig.b=0.2)

inits2 = list(kap=c(2,2),beta=c(0,0,0,0), sig.b=0.5)

inits=list(inits1,inits2)

pars = c("beta","kap","theta","loglik","sig.b","b")

R2 = autojags(DS\_11\_7, inits, pars,model.file= "model2.jag",2,iter.increment=2000, n.burnin=500,Rhat.limit=1.1, max.iter=10000, seed=1234,codaOnly=c("loglik","b"))

R2$summary

**# WAIC and LOO-IC, by observation**

WAIC=waic(R2$sims.list$loglik,pointwise=T)

waic.pw=WAIC$pointwise[,3]

LOO=loo(R2$sims.list$loglik,pointwise=T)

loo.pw=LOO$pointwise[,3]

eye=rep(1:2,197)

subject=rep(1:197,each=2)

list <- data.frame(loo.pw,waic.pw,subject,eye)

list=list[order(-list$loo.pw),]

head(list,10)

**# plot of frailty effects**

**b.mn=apply(**R2$sims.list$b,2,mean)

hist(b.mn,prob=T,breaks=20,xlab=("Frailty"),main=("Figure 11.8 Posterior Mean Frailties"),col="gray")

lines(density(b.mn))