**#BAYESIAN MODEL: Prevalence of ALS/NMD in Portugal 2009-2016 - A Pharmacoepidemiologic Bayesian Multi-Paramater Evidence Synthesis Model**

```
model
{
```

**#BAYESIAN MULTI-PARAMETER EVIDENCE SYNTHESIS MODEL (EXAMPLE CODE FOR 2016 WITH SEX AND AGE SPECIFIC PREVALENCE ESTIMATES)**

**# N_comp_RILU (Number of riluzole 50mg tablets used during one year)**
**# Q_mg_RILU (Total amount of riluzole used in miligrams during one year)**
**# Q_DDD_RILU (Total amount of riluzole used in number of Defined Daily Doses (DDD) [DDD for riluzole = 100 mg] during one year)**

```
Q_mg_RILU<- N_comp_RILU * 50
Q_DDD_RILU<- Q_mg_RILU / 100
```

**#ADJUSTMENTS FOR NON-COMPLIANCE OR IMPERFECT COMPLIANCE**

**# Z [] (Compliance rate)**
**# Y [] (Total amount of riluzole used during one year adjusted for the compliance rate)**
**# Pt_RILU (Number of ALS/MND patients taking riluzole)**

```
for (j in 1:1000)  {Z[j] ~ dbeta(alpha,beta)
Y[j]<- (Z[j])*(100)*(365.25)
}
cum[1] <- Y[1]
for (j in 2:1000)  {
cum[j] <- cum[j - 1] + Y[j]
}
for (j in 1:1000)  {
cum.step[j] <- j*step(Q_mg_RILU - cum[j])
}
Pt_RILU <- ranked(cum.step[], 1000)  # maximum number in cum.step
check <- equals(cum.step[1000], 0)  # always 1 if J=1000 big enough
```

**#ADJUSTMENTS FOR THE PROPORTION OF ALS/MND PATIENTS NOT TAKING RILUZOLE**

**# r[i], p[i] and n[i] (Number and proportion of patients taking riluzole and total number of patients assessed in each of the three studies available regarding this issue)**
**# p.overall (Random effects meta-analytical pooled measure of proportions of patients taking riluzole)**
**# Pt_TOT (Total number of ALS/MND patients after taking into account those that were not using riluzole)**

```
for (i in 1:nstudies) {
                        r[i] ~ dbin(p[i],n[i])
                        logit(p[i]) <- mu[i]
                        mu[i] ~ dnorm(mu.overall,prec)
                }
                prec <- 1/pow(tau,2)
                tau ~ dunif(0,2)
                mu.overall ~ dnorm(0.0,0.1)
                p.overall <- exp(mu.overall)/(1+exp(mu.overall))
                mu.new ~ dt(mu.overall, tau, 4)
                p.new <- exp(mu.new)/(1+exp(mu.new))

Inv_p.overall<-1/p.overall
Pt_TOT<- Pt_RILU*Inv_p.overall
```

**#CALCULATING SEX AND AGE SPECIFIC PREVALENCE ESTIMATES**

**# n_id_s, P_id_s, N_tot_id_s (Number and proportion of patients in a given age and sex group and total number of patients assessed)**
**# NumP_H_B… and Prev_100k… (number of ALS/MND patients and prevalence per 100,000 inhabitants for each sex and age group)**

```
n_id_s[1:10] ~ dmulti (P_id_s[ ], N_tot_id_s)
                P_id_s[1:10] ~ ddirch (Prior_id_s[ ])
        for ( k in 1:10 ) {
                Prior_id_s[k] <- 1
                                }
```

```
NumP_H_B_50<- Pt_TOT*P_id_s[1]
NumP_H_51_60<- Pt_TOT*P_id_s[2]
NumP_H_61_70<- Pt_TOT*P_id_s[3]
NumP_H_71_80<- Pt_TOT*P_id_s[4]
NumP_H_A_80<- Pt_TOT*P_id_s[5]
NumP_H<- Pt_TOT*(P_id_s[1]+ P_id_s[2]+ P_id_s[3]+ P_id_s[4]+ P_id_s[5])
NumP_M_B_50<- Pt_TOT*P_id_s[6]
NumP_M_51_60<- Pt_TOT*P_id_s[7]
NumP_M_61_70<- Pt_TOT*P_id_s[8]
NumP_M_71_80<- Pt_TOT*P_id_s[9]
NumP_M_A_80<- Pt_TOT*P_id_s[10]
NumP_M<- Pt_TOT*(P_id_s[6]+ P_id_s[7]+ P_id_s[8]+ P_id_s[9]+ P_id_s[10])

Prev_100k_H_B_50<- (((Pt_TOT*P_id_s[1])/Popul_H_B_50)*100000)
Prev_100k_H_51_60<- (((Pt_TOT*P_id_s[2])/Popul_H_51_60)*100000)
Prev_100k_H_61_70<- (((Pt_TOT*P_id_s[3])/Popul_H_61_70)*100000)
Prev_100k_H_71_80<- (((Pt_TOT*P_id_s[4])/Popul_H_71_80)*100000)
Prev_100k_H_A_80<- (((Pt_TOT*P_id_s[5])/Popul_H_A_80)*100000)
Prev_100k_H<-
((NumP_H/(Popul_H_B_50+Popul_H_51_60+Popul_H_61_70+Popul_H_71_80+P
opul_H_A_80))*100000)
Prev_100k_M_B_50<- (((Pt_TOT*P_id_s[6])/Popul_M_B_50)*100000)
Prev_100k_M_51_60<- (((Pt_TOT*P_id_s[7])/Popul_M_51_60)*100000)
Prev_100k_M_61_70<- (((Pt_TOT*P_id_s[8])/Popul_M_61_70)*100000)
Prev_100k_M_71_80<- (((Pt_TOT*P_id_s[9])/Popul_M_71_80)*100000)
Prev_100k_M_A_80<- (((Pt_TOT*P_id_s[10])/Popul_M_A_80)*100000)
Prev_100k_M<-
((NumP_M/(Popul_M_B_50+Popul_M_51_60+Popul_M_61_70+Popul_M_71_80+
Popul_M_A_80))*100000)

Prev_100k<- ((Pt_TOT / Tot_Popul) * 100000)

NumP[1]<-Pt_RILU
NumP[2]<-Pt_TOT
NumP[3]<-NumP_H_B_50
NumP[4]<-NumP_H_51_60
NumP[5]<-NumP_H_61_70
NumP[6]<-NumP_H_71_80
NumP[7]<-NumP_H_A_80
NumP[8]<-NumP_H
NumP[9]<-NumP_M_B_50
NumP[10]<-NumP_M_51_60
NumP[11]<-NumP_M_61_70
NumP[12]<-NumP_M_71_80
NumP[13]<-NumP_M_A_80
NumP[14]<-NumP_M
```

```
Prev100k[1]<-Prev_100k
Prev100k[2]<-Prev_100k_H_B_50
Prev100k[3]<-Prev_100k_H_51_60
Prev100k[4]<-Prev_100k_H_61_70
Prev100k[5]<-Prev_100k_H_71_80
Prev100k[6]<-Prev_100k_H_A_80
Prev100k[7]<-Prev_100k_H
Prev100k[8]<-Prev_100k_M_B_50
Prev100k[9]<-Prev_100k_M_51_60
Prev100k[10]<-Prev_100k_M_61_70
Prev100k[11]<-Prev_100k_M_71_80
Prev100k[12]<-Prev_100k_M_A_80
Prev100k[13]<-Prev_100k_M

}
```

**#DATA**

```
list(N_comp_RILU=450654,                    # 2016 Total
P_RILU_ALS_MND=1,                  #
nstudies=3,              #
r=c(229, 354, 95),                 #
n=c(343, 463, 145),                #
alpha=2.137,             #
beta=0.2225,             #
N_tot_id_s=928,          #
n_id_s=c(50, 78, 164, 174, 54, 32, 57, 139, 134, 46),        #
Popul_H_B_50=2878777,              #
Popul_H_51_60=654993,              #
Popul_H_61_70=546824,              #
Popul_H_71_80=375024,              #
Popul_H_A_80=188299,               #
Popul_M_B_50=2946259,              #
Popul_M_51_60=729554,              #
Popul_M_61_70=639470,              #
Popul_M_71_80=502703,              #
Popul_M_A_80=347511,               #
Popul_R_Nor=3682370,               #
Popul_R_Cen=1744525,               #
Popul_R_LVT_Alt=4169720,           #
Popul_R_Alg=451006,                #
Tot_Popul=9809414)
```