**Exercise 3 – Two test, two population model**

1. Load the dataset that is as a csv file (ex3\_data.csv) in your working directory

df <- read.csv(“ex3\_data.csv”)

1. Create a contingency table for each population

table(df$test1, df$test2, df$Pop, dnn=c(“test1”, “test2”, “Population”))

1. Write the model and save as “2\_pop\_mod.bug”

model{

# Likelihood part:

##population 1

p1[1] <- pi1\*se1\*se2 + (1-pi1)\*(1-sp1)\*(1-sp2) ###11

p1[2] <- pi1\*se1\*(1-se2) + (1-pi1)\*(1-sp1)\*(sp2) ###10

p1[3] <- pi1\*(1-se1)\*se2 + (1-pi1)\*(sp1)\*(1-sp2) ###01

p1[4] <- pi1\*(1-se1)\*(1-se2) + (1-pi1)\*(sp1)\*(sp2) ###00]

##population 2

p2[1] <- pi2\*se1\*se2 + (1-pi2)\*(1-sp1)\*(1-sp2) ###11

p2[2] <- pi2\*se1\*(1-se2) + (1-pi2)\*(1-sp1)\*(sp2) ###10

p2[3] <- pi2\*(1-se1)\*se2 + (1-pi2)\*(sp1)\*(1-sp2) ###01

p2[4] <- pi2\*(1-se1)\*(1-se2) + (1-pi2)\*(sp1)\*(sp2) ###00

###likelihood of contingency tables

t1[1:4] ~ dmulti(p1[1:4], n1)

t2[1:4] ~ dmulti(p2[1:4], n2)

# Prior part:

pi1 ~ dbeta(3, 7)

pi2 ~ dbeta(2.5, 7.5)

se1 ~ dbeta(1, 1)

se2 ~ dbeta(1, 1)

sp1 ~ dbeta(90, 10)

sp2 ~ dbeta(90, 10)

# Hooks for automatic integration with R:

#data# t1, t2, n1, n2

#monitor# pi1, pi2, se1, se2, sp1, sp2

#inits# se1

}

1. Provide the data of the cell counts

t1 = c(32, 35, 11, 172)

n1=250

t2 = c(11, 16, 0, 223)

n2=250

1. Provide initial values and run the model

se1 <- list(chain1=0.05, chain2=0.95)

results <- run.jags(‘2\_pop\_mod.bug’, n.chains=2, burnin=1000, sample=10000)

plot(results, var=’se1’)

results

1. Change the priors to beta(1,1) one by one and see what happens to your estimate – how does the sensitivity of this model to the priors compare with the priors for the one population model?

# You will need to open the "2\_pop\_mod.bug" file and change the dbetas() in the prior part one by one

# REMEMBER to save the bug file each time and repeat steps 3-5 again for each scenario.