**Supplementary Material TextS1**

model{

#Likelihood

 x[1:4] ~ dmulti(p[1:4], n)

 p[1] <- pi\*((1-Se1)\*(1-Se2)+covDp) + (1-pi)\*(Sp1\*Sp2+covDn)

 p[2] <- pi\*((1-Se1)\*Se2-covDp) + (1-pi)\*(Sp1\*(1-Sp2)-covDn)

 p[3] <- pi\*(Se1\*(1-Se2)-covDp) + (1-pi)\*((1-Sp1)\*Sp2-covDn)

 p[4] <- pi\*(Se1\*Se2+covDp) + (1-pi)\*((1-Sp1)\*(1-Sp2)+covDn)

 ls <- 0

 us <- min(Se1,Se2) - Se1\*Se2

 lc <- 0

 uc <- min(Sp1,Sp2) - Sp1\*Sp2

 covDn ~ dunif(lc, uc)

 covDp ~ dunif(ls, us)

 rhoD <- covDp / sqrt(Se1\*(1-Se1)\*Se2\*(1-Se2))

 rhoDc <- covDn / sqrt(Sp1\*(1-Sp1)\*Sp2\*(1-Sp2))

#Prior

 pi ~ dbeta(1,1)

 Se1 ~ dbeta(1,1)

 Sp1 ~ dbeta(1,1)

 Se2 ~ dbeta(1,1)

 Sp2 ~ dbeta(1,1)

}

#end BUGS model specification

#Data

list(x= c(560, 41, 22, 61), n = 684)

#Initial value

list(pi=0.51,Se1=0.50, Sp1=0.50, Se2=0.49, Sp2=0.51)