APPENDIX 1. Bayesian Region-Prevalence estimation

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| --- | --- |
| Model  |  |
| { |  |
| for(i in 1:k)  | #Command designating number of loops to be performed  |
| {  |  |
| y[i]~dbin(ap[i], n)  | #Likelihood function for the ith province  |
| ap[i] <- tp[i]\*SeCE+(1-tp[i])\*(1-SpCE)  | #Function showing relationship between apparent and true prevalences for ith province |
| tp[i] <- tpstar[i]\*pinf[i]  | #Function showing relationship between true prevalence and infection probability for ith province |
| pinf[i]~dbern(tau)  | #Prior distribution of probability of infection for ith province  |
| tpstar[i]~dbeta(alpha,beta)  | #Prior distribution of true prevalence for ith province given true prevalence >0 |
| }  |  |
| SeCE~dbeta(6.835, 1.7212)  | #Prior distribution of CE test sensitivity. Mode=0.89, 95% sure SeCE >0.55 |
| SpCE~dbeta(79.0317, 25.6416)  | #Prior distribution of CE test speciﬁcity. Mode=0.76, 95% sure SpCE <0.82 |
| tau~dbeta(1.5385, 2.2565)  | #Prior distribution for province probability of infection. Mode=0.03, 95% sure <0.08 |
| alpha <- mu\*psi  | #Relationship of distribution parameters to mean (mu) and psi (variance related parameter) |
| beta <- psi\*(1-mu)  |  |
| mu~dbeta(3.9968, 13.7759)  | #Prior distribution for mean (mu) of prevalence distribution Mode=0.19, 95% sure <0.4, derived from Sardinian data |
| psi~dgamma(4.524, 0.387)  | #Prior distribution for psi (variability related parameter). Uses median of 95th percentile of prevalence distribution=0.30 and 99% sure this number is <0.50, derived from Sardinian data. |
| P~dbern(tau)  | #Prior distribution of probability of infection for randomly chosen province |
| tpstarP~dbeta(alpha,beta)  | #Prior distribution of true prevalence for randomly chosen province given true prevalence >0 |
| tpP <-P\*tpstarP  | #Function showing relationship between true prevalence and infection probability for ith province |
| a1 <- 1-step(tpP-0.05)  | #Probability that a randomly chosen province has true prevalence<0.05  |
| a2 <- 1-step(tpP-0.2)  | #Probability that a randomly chosen province has true prevalence<0.20  |
| }  |  |