```
model {
# Routine data
for (ag in 1:4) {
 r.routine[ag] ~ dbin(p.routine[ag],N.routine[ag])
 p.routine[ag] <- 1 - exp(-lambda.PID.diag[ag])
 lambda.PID.diag[ag] ~ dexp(0.0001)
 range.temp[ag] ~ dunif(0,range.max[ag])
 range[ag] <- cut(range.temp[ag])
 lambda.PID[ag] <- (lambda.PID.diag[ag] + (range[ag] /
N.routine[ag])) /
                   (1 - psi[1])
# output for Multivariate Normal #prior
 lnlambda.PID[ag] <- log(lambda.PID[ag])
 }
N.routine[1] <- sum(N[16:19])
N.routine[2] <- sum(N[20:24])
N.routine[3] <- sum(N[25:34])
N.routine[4] <- sum(N[35:44])

lambda.PID1624 <- (lambda.PID[1] * N.routine[1] +
                   lambda.PID[2] * N.routine[2]) / sum(N[16:24])
lambda.PID2544 <- (lambda.PID[3] * N.routine[3] +
                   lambda.PID[4] * N.routine[4]) / sum(N[25:44])
lambda.PID1644 <- (lambda.PID[1] * sum(N[16:19]) +
                   lambda.PID[2] * sum(N[20:24]) +
                   lambda.PID[3] * sum(N[25:34]) +
                   lambda.PID[4] * sum(N[35:44])) /
                  sum(N[16:44])
RatioofPIDnums <- (lambda.PID2544 * (N.routine[3] + N.routine[4])) /
                  (lambda.PID1624 * (N.routine[1] + N.routine[2]) +
                   lambda.PID2544 * (N.routine[3] + N.routine[4]))


# Wolner Hanssen
r.wh.undiagpop ~ dbin(psi[1],n.wh.all)
r.wh.asymp ~ dbin(psi[2],n.wh.undiag)
log(lgpsi[1]) <- psi[1]
log(lgpsi[2]) <- psi[2]
logit(lgtpsi[1]) <- psi[1]
logit(lgtpsi[2]) <- psi[2]
psi[1] ~ dbeta(1,1)
psi[2] ~ dbeta(1,1)

# POPI data
r.POPI ~ dbin(p.POPI,n.POPI)
p.POPI <- 1 - exp(-lambda.POPI)
lambda.POPI <- lambda.PID1624 * (1 - (psi[1] * psi[2]))

# Residual Deviance
for (ag in 1:4) {
 dev[ag] <- 2 * (r.routine[ag] * log(r.routine[ag] / (p.routine[ag] *
                 N.routine[ag])) + (N.routine[ag] - r.routine[ag]) *
                 log((N.routine[ag] - r.routine[ag])
                 / (N.routine[ag] - (N.routine[ag] *
p.routine[ag]))))
      }
dev[5] <- 2 * (r.wh.undiagpop * log(r.wh.undiagpop / (psi[1] *
n.wh.all)) +
              (n.wh.all - r.wh.undiagpop) * log((n.wh.all -
r.wh.undiagpop)
               /(n.wh.all - (n.wh.all * psi[1]))))
```

```
dev[6] <- 2 * (r.wh.asymp * log(r.wh.asymp / (psi[2] * n.wh.undiag))
+
               (n.wh.undiag - r.wh.asymp) * log((n.wh.undiag -
r.wh.asymp) /
               (n.wh.undiag - (n.wh.undiag * psi[2]))))
dev[7] <- 2 * (r.POPI * log(r.POPI / (p.POPI * n.POPI)) +
               (n.POPI - r.POPI) * log((n.POPI - r.POPI) /
               (n.POPI - (n.POPI * p.POPI))))
sumdev <- sum(dev[ ])
}

# Data
list(
# Routine data
r.routine = c(8295,13241,18851,11914),
range.max = c(1233,3101,9756,9609),

# Census data - 2002
N=c(NA,NA,NA,NA,NA, NA,NA,NA,NA,NA, NA,NA,NA,NA,NA,
305500,306300,296400,291400,294800,
310100,313900,305600,294700,295000,
304100,317000,329600,349600,370300,
380900,376900,387800,390900,399400,
401200,402600,398700,391900,381900, 370900,356200,349000,343800),

# Wolner-Hansenn
r.wh.undiagpop = 25, n.wh.all = 36
r.wh.asymp = 4, n.wh.undiag = 25

# POPI
r.POPI = 23,n.POPI = 1186
)

# Initial values 1
list(
# population PID incidence
lambda.PID.diag = c(0.01,0.01,0.01,0.01), range.temp = c(1,1,1,1),

# Proportion of PID cases diagnosed
psi = c(0.4,0.5)
)

# Initial values 2
list(
# population PID incidence
lambda.PID.diag = c(0.1,0.1,0.1,0.1), range.temp =
c(1000,1000,1000,1000),

# Proportion of PID cases diagnosed
psi = c(0.1,0.1)
)
```