

## Italian marriages – Example

Gill (2002) collected data on the number of marriages per 1,000 people in Italy during 1936-1951.

Question: did the number of marriages decrease during WWII years? (1939 – 1945).

### Model:

Number of marriages  $y_i$  are Poisson with year-specific means  $\lambda_i$ .

Assuming that rates of marriages are exchangeable across years, we model the  $\lambda_i$  as  $\text{Gamma}(\alpha, \beta)$ .

To complete model specification, place independent Gamma priors on  $(\alpha, \beta)$ , with known hyper-parameter values.

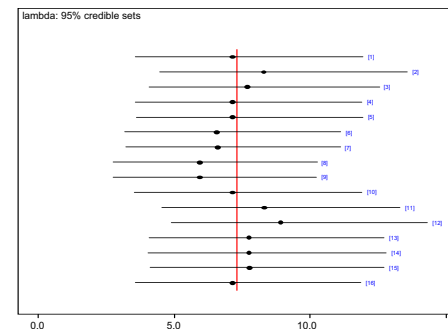
### WinBUGS code:

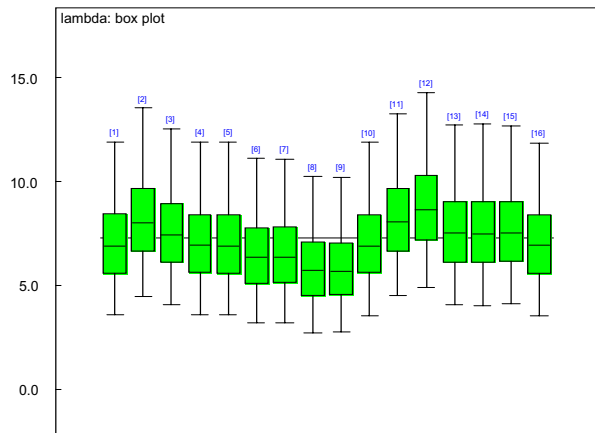
```
model {
  for (i in 1:16) {
    y[i] ~ dpois(l[i])
    l[i] ~ dgamma(alpha, beta)
  }

  alpha ~ dgamma(1,1)
  beta ~ dgamma(1,1)
  warave <- (l[4]+l[5]+ l[6]+l[7]+l[8]+l[9]+l[10]) / 7
  nonwarave <-
  (l[1]+l[2]+l[3]+l[11]+l[12]+l[13]+l[14]+l[15]+l[16]) / 9
  diff <- nonwarave - warave
}

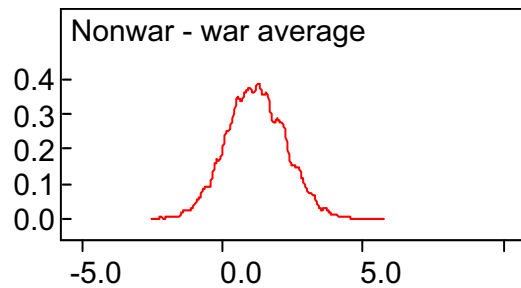
list(y = c(7,9,8,7,7,6,6,5,5,7,9,10,8,8,8,7))
```

### Results





Difference between non-war and war years marriage rate



Overall marriage rate:

If  $\lambda_i \sim \text{Gamma}(\alpha, \beta)$ , then  $E(\lambda_i | y) = \alpha / \beta$ .

	mean	sd	2.5%	median	97.5%
overallrate	7.362	1.068	5.508	7.285	9.665
overallstd	2.281	0.394	1.59	2.266	3.125

