**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 Gamma(\( \alpha, \beta \)).

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

**WinBUGS code:**

```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)
diff <- nonwarave - warave
list(y = c(7,9,8,7,6,6,5,5,7,9,10,8,8,8,7))
```

**Results**
Difference between non-war and war years
marriage rate

Overall marriage rate:
If $\lambda_i \sim \text{Gamma}(\alpha, \beta)$, then $E(\lambda_i | y) = \frac{\alpha}{\beta}$. 

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>sd</th>
<th>2.5%</th>
<th>median</th>
<th>97.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>overallrate</td>
<td>7.362</td>
<td>1.068</td>
<td>5.508</td>
<td>7.285</td>
<td>9.665</td>
</tr>
<tr>
<td>overallstd</td>
<td>2.281</td>
<td>0.394</td>
<td>1.59</td>
<td>2.266</td>
<td>3.125</td>
</tr>
</tbody>
</table>