

Figure 24.8. Spatial correlated random effects plotted with ggplot2. The numbers inside a county reflect the percentage change due to a spatial random effect  $u_i$ . The spatial random effect  $u_i$  for a county with a thick border is important.



Figure 24.9. Spatial correlated random effects plotted with spplot. The actual posterior mean values of the  $u_s$  are plotted.

## 24.6.5 Model validation

Pottering around with spplot settings to generate Figure 24.9 is nice, but before we invest all that time in cosmetics we must ensure that the model complies with all its assumptions. This means that it is time for model validation. As part of this process we need to plot residuals versus fitted values, residuals versus each available covariate, and assess whether the model can cope with 83% zeros. There is not much point in applying a variogram on the residuals as this is not geostatistical data.

We already have the fitted values; see Subsection 24.6.2. Pearson residuals are obtained via

Using standard plotting tools we produced various model validation graphs in Figure 24.10. Because of the large sample size it is difficult to say anything significant about these graphs.